

### 1. General Description

#### A: SPECIFICATION

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

## GENERAL DESCRIPTION

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

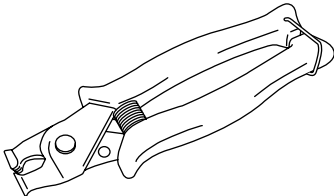
### 1. General Description

#### A: CAUTION

- Wear working 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 or 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 safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the negative terminal from battery.

#### B: PREPARATION TOOL

##### 1. SPECIAL TOOLS

| ILLUSTRATION                                                                                            | TOOL NUMBER | DESCRIPTION  | REMARKS                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------|-------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><br>ST18353AA000 | 18353AA000  | CLAMP PLIERS | <ul style="list-style-type: none"><li>• Used for removing and installing PCV hose.</li><li>• This tool is a general tool that is made by CAILLAU in France. (Code: 54.0.000.205)</li></ul> Tool number is fixed as special tool in order to obtain it as easily as SUBARU genuine parts. |

# BASIC DIAGNOSTIC PROCEDURE

## ENGINE (DIAGNOSTICS)

### 1. Basic Diagnostic Procedure

#### A: PROCEDURE

##### 1. ENGINE

| Step                                                                                                                                                                                                                                                                                                                                                                  | Check                                                                    | Yes                                                                                                                                                         | No                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK ENGINE START FAILURE.</b><br>1) Ask the customer when and how trouble occurred using the interview check list. <Ref. to EN(H4DOTC)-3, CHECK, Check List for Interview.><br>2) Start the engine.                                                                                                                                                            | Does the engine start?                                                   | Go to step 2.                                                                                                                                               | Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC)-56, Diagnostics for Engine Starting Failure.>                                                                                                                                          |
| <b>2 CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.</b>                                                                                                                                                                                                                                                                                                           | Does the malfunction indicator light illuminate?                         | Go to step 3.                                                                                                                                               | Inspection using "General Diagnostics Table". <Ref. to EN(H4DOTC)-384, General Diagnostic Table.>                                                                                                                                                                   |
| <b>3 CHECK INDICATION OF DTC ON DISPLAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector.<br>3) Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON.<br>4) Read the DTC on Subaru Select Monitor or OBD-II general scan tool. | Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC? | Record the DTC code. Repair the trouble cause. <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> Go to step 4.                                | Repair the related parts.<br><br>NOTE:<br>If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)-47, Malfunction Indicator Light.> |
| <b>4 PERFORM THE DIAGNOSIS.</b><br>1) Perform the clear memory mode. <Ref. to EN(H4DOTC)-44, Clear Memory Mode.><br>2) Perform the inspection mode. <Ref. to EN(H4DOTC)-36, Inspection Mode.>                                                                                                                                                                         | Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC? | Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-75, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> | Complete the diagnosis.                                                                                                                                                                                                                                             |

## 13. Clear Memory Mode

### A: OPERATION

#### 1. SUBARU SELECT MONITOR (NORMAL MODE)

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

#### NOTE:

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

#### 2. SUBARU SELECT MONITOR (OBD MODE)

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

#### NOTE:

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

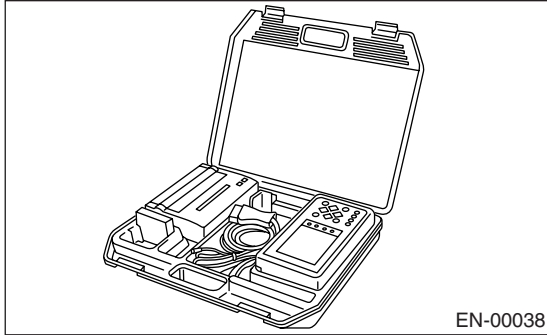
#### 3. OBD-II GENERAL SCAN TOOL

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

## 14. Compulsory Valve Operation Check Mode

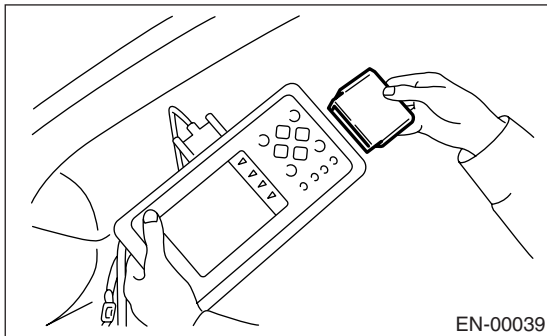
### A: OPERATION

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

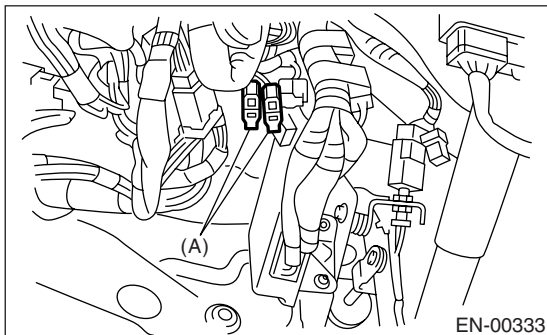


2) Connect the diagnosis cable to Subaru Select Monitor.

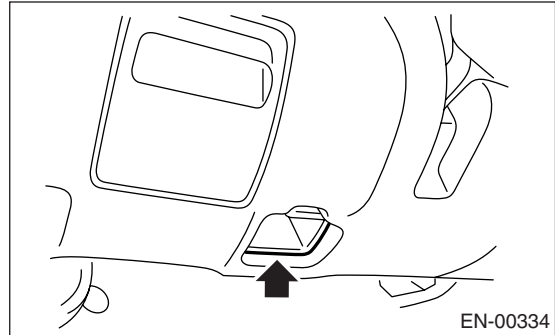
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)-7, PREPARATION TOOL, General Description.>



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



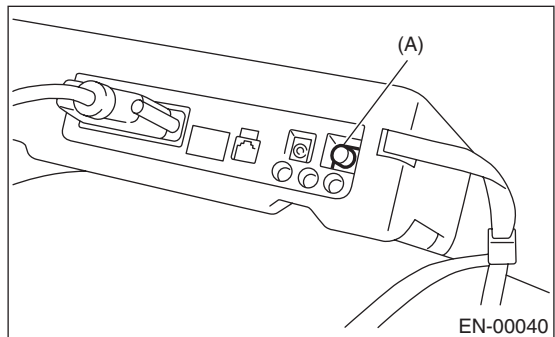
5) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



### CAUTION:

**Do not connect scan tools except for the Subaru Select Monitor and OBD-II 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 the {2. Each System Check} and press the [YES] key.

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

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

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

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

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

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

## COMPULSORY VALVE OPERATION CHECK MODE

### ENGINE (DIAGNOSTICS)

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

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

#### NOTE:

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

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

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

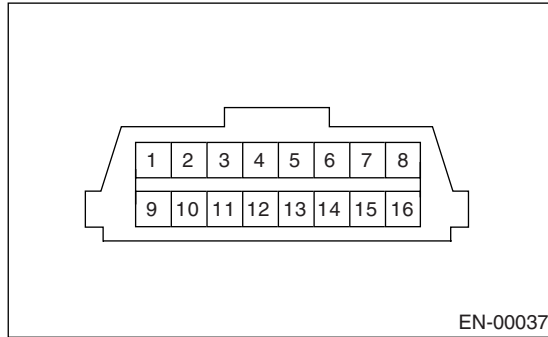
## 7. Data Link Connector

### A: NOTE

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

### CAUTION:

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



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

## 18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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

**DTC DETECTING CONDITION:**

Immediately at fault recognition

**TROUBLE SYMPTOM:**

- Engine stalls.
- Erroneous idling

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, Inspection Mode.>.

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Check                                                                                          | Yes                                                                                                                                                                                                                                                                                                                                    | No                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Is any other DTC displayed?                                                                    | Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>                                                                                                                                                                                                | Go to step 2.                                                                                                                                                                  |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine and let it idle.<br>2) Inspect the VVT advance timing and OCV duty output using Subaru Select Monitor and OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the VVT advance timing more than approx. 0°C and the OCV duty output more than approx. 10%? | Inspect the following items and repair or replace if necessary.<br>• Engine oil (amount, contamination)<br>• Oil pipe (clog)<br>• Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve)<br>• Intake camshaft (sludge, damage at camshaft)<br>• Timing belt (timing mark aligning) | A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

#### DTC DETECTING CONDITION:

Immediately at fault recognition

#### TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Check                                                                                          | Yes                                                                                                                                                                                                                                                                                                                                                                                                     | No                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Is any other DTC displayed?                                                                    | Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>                                                                                                                                                                                                                                                                 | Go to step 2.                                                                                                                                                                  |
| 2<br><b>CHECK CURRENT DATA.</b><br>1) Start the engine and let it idle.<br>2) Inspect the VVT advance timing and OCV duty output using Subaru Select Monitor and OBD-II general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the VVT advance timing more than approx. 0°C and the OCV duty output more than approx. 10%? | Inspect the following items and repair or replace if necessary. <ul style="list-style-type: none"><li>• Engine oil (amount, contamination)</li><li>• Oil pipe (clog)</li><li>• Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve)</li><li>• Intake camshaft (sludge, damage at camshaft)</li><li>• Timing belt (timing mark aligning)</li></ul> | A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. |

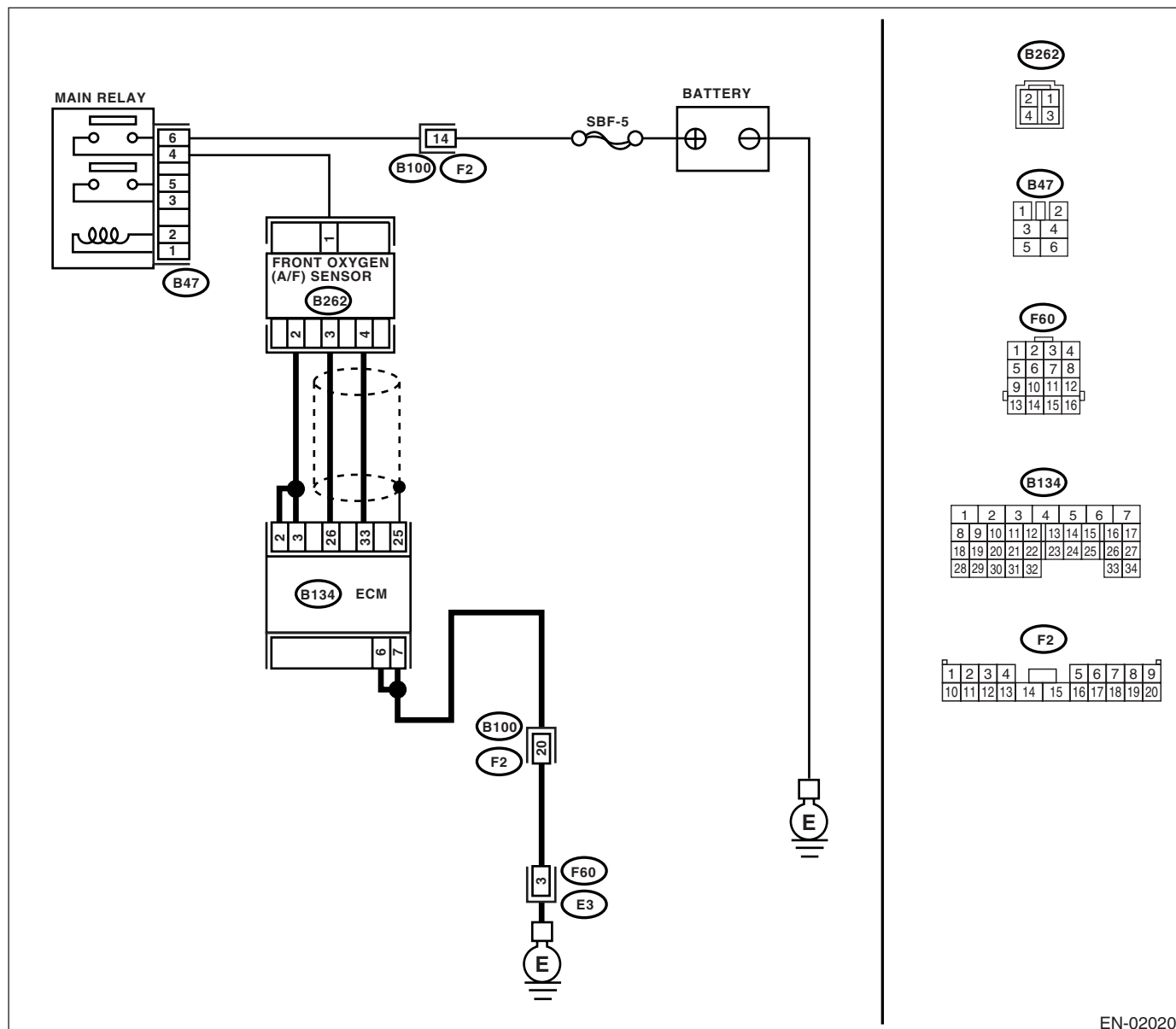
### C: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) — DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Check                                                                | Yes                                                                    | No                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Start the engine and warm-up engine.<br>2) Turn the ignition switch to OFF.<br>3) Disconnect the connectors from ECM and front oxygen (A/F) sensor.<br>4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 2 — (B262) No. 2:</b><br><b>(B134) No. 3 — (B262) No. 2:</b> | Is the resistance less than 1 $\Omega$ ?                             | Go to step 2.                                                          | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.    |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — (B262) No. 3:</b><br><b>(B134) No. 33 — (B262) No. 4:</b>                                                                                                                                                            | Is the resistance less than 1 $\Omega$ ?                             | Go to step 3.                                                          | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.    |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B47) No. 4 — (B262) No. 1:</b>                                                                                                                                                                                               | Is the resistance less than 1 $\Omega$ ?                             | Go to step 4.                                                          | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.    |
| <b>4</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR.</b><br>Measure the resistance between front oxygen (A/F) sensor connector terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                                                                             | Is the resistance less than 5 $\Omega$ ?                             | Go to step 5.                                                          | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> |
| <b>5</b><br><b>CHECK POOR CONTACT.</b><br>Check the poor contact in ECM and front oxygen (A/F) sensor connector.                                                                                                                                                                                                                                                                                                                                              | Is there poor contact in ECM or front oxygen (A/F) sensor connector? | Repair the poor contact in ECM or front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> |

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

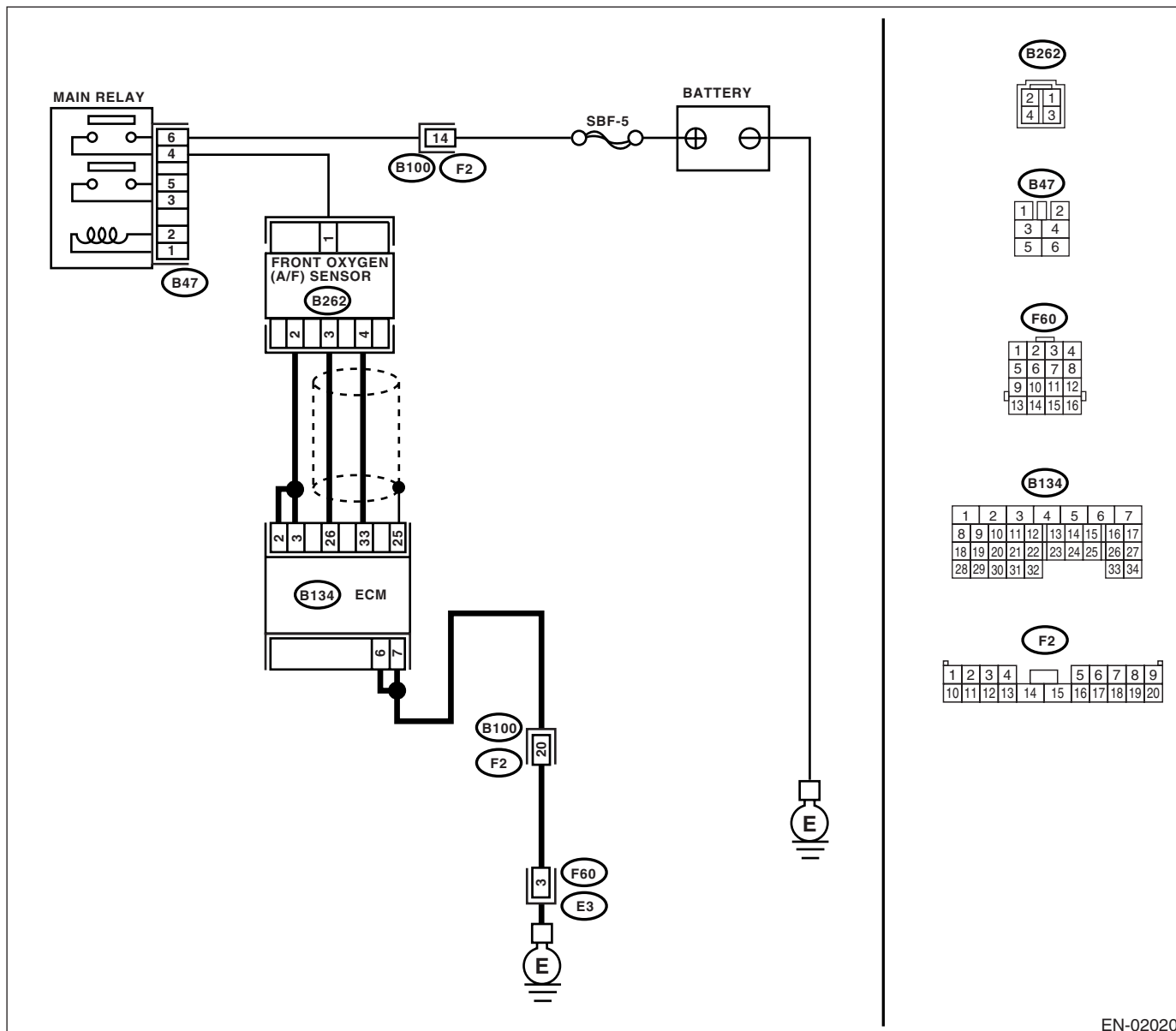
#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-14, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Check                                                                                                  | Yes                                                                                                                                                                                                                                           | No                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK POWER SUPPLY TO FRONT OXY-GEN (A/F) SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from front oxygen (A/F) sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B262) No. 1 (+) — Engine ground (-):</b>                                                                                                                                                                                       | Is the voltage more than 10 V?                                                                         | Go to step 2.                                                                                                                                                                                                                                 | Repair the power supply line.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and front oxygen (A/F) sensor connector</li> <li>• Poor contact in front oxygen (A/F) sensor connector</li> <li>• Poor contact in main relay connector</li> </ul> |
| <b>2 CHECK GROUND CIRCUIT OF ECM.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 6 — Chassis ground:</b><br><b>(B134) No. 7 — Chassis ground:</b>                                                                                                                                                                                                                                                                                                                                | Is the resistance less than 5 $\Omega$ ?                                                               | Go to step 3.                                                                                                                                                                                                                                 | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine ground cable</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul>                                            |
| <b>3 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> <li>• OBD-II scan tool</li> </ul> For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the current more than 0.2 A?                                                                        | Repair the poor contact in connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in front oxygen (A/F) sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> | Go to step 4.                                                                                                                                                                                                                                                                                                                              |
| <b>4 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Start and idle the engine.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 2 (+) — Chassis ground (-):</b><br><b>(B134) No. 3 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                         | Is the voltage less than 1 V?                                                                          | Go to step 6.                                                                                                                                                                                                                                 | Go to step 5.                                                                                                                                                                                                                                                                                                                              |
| <b>5 CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 2 (+) — Chassis ground (-):</b><br><b>(B134) No. 3 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                             | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.                                                                                                                                                                                                     | Go to step 6.                                                                                                                                                                                                                                                                                                                              |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                        | Check                                     | Yes                                                                                                                                                                                                                                                                                                                                          | No                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between front oxygen (A/F) sensor connector terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance less than 10 $\Omega$ ? | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector</li><li>• Poor contact in front oxygen (A/F) sensor connector</li><li>• Poor contact in ECM connector</li></ul> | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> |

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

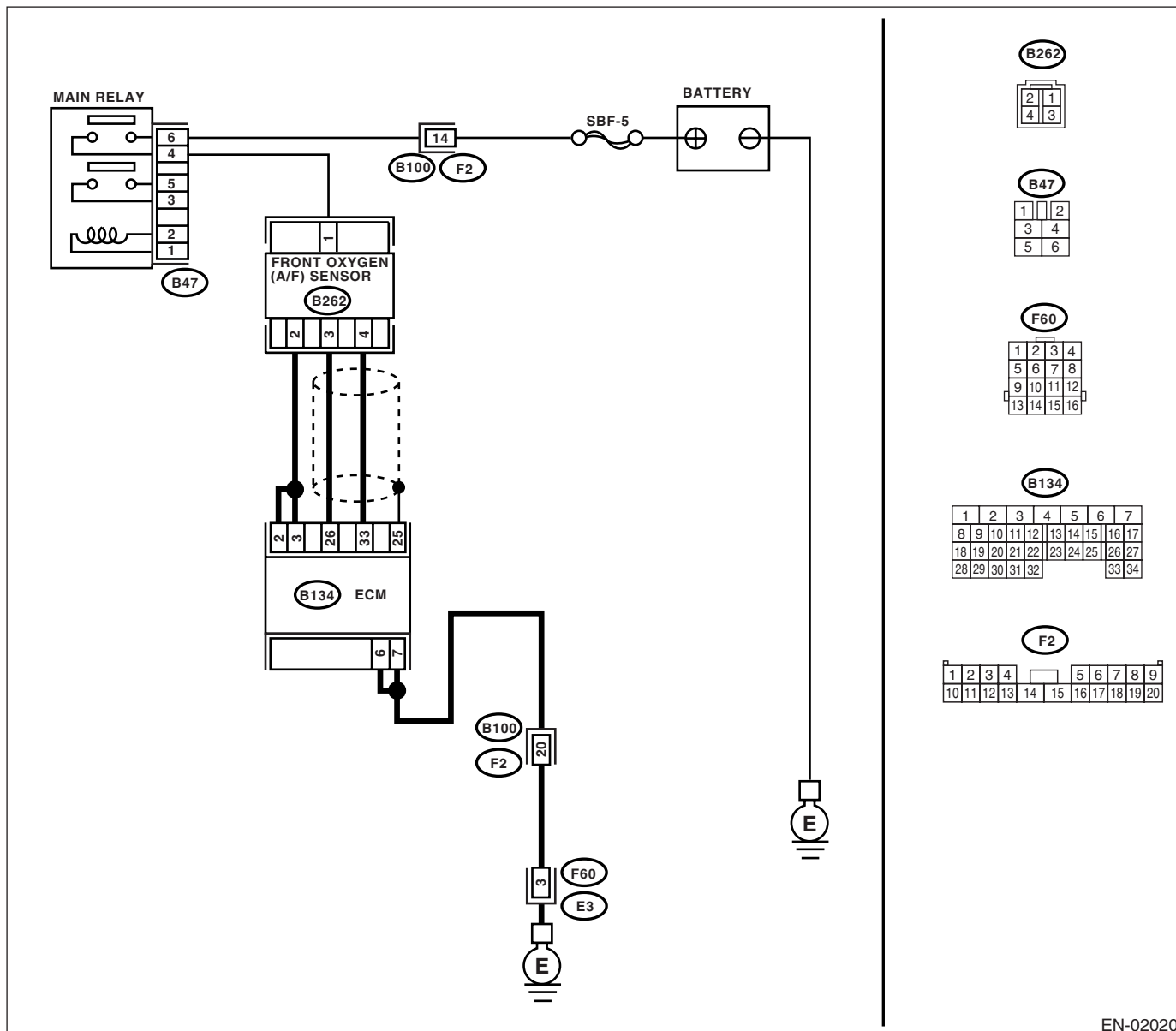
**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-16, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Check                                                                                                  | Yes                                                                                              | No            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 2 (+) — Chassis ground (-):</b><br><b>(B134) No. 3 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Is the voltage more than 8 V?                                                                          | Go to step 3.                                                                                    | Go to step 2. |
| <b>2</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.</b><br>1) Turn the ignition switch to OFF.<br>2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>OBD-II general scan tool</li> </ul> For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. | Is the current more than 2.3 A?                                                                        | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                        | END           |
| <b>3</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 2 (+) — Chassis ground (-):</b><br><b>(B134) No. 3 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. | END           |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

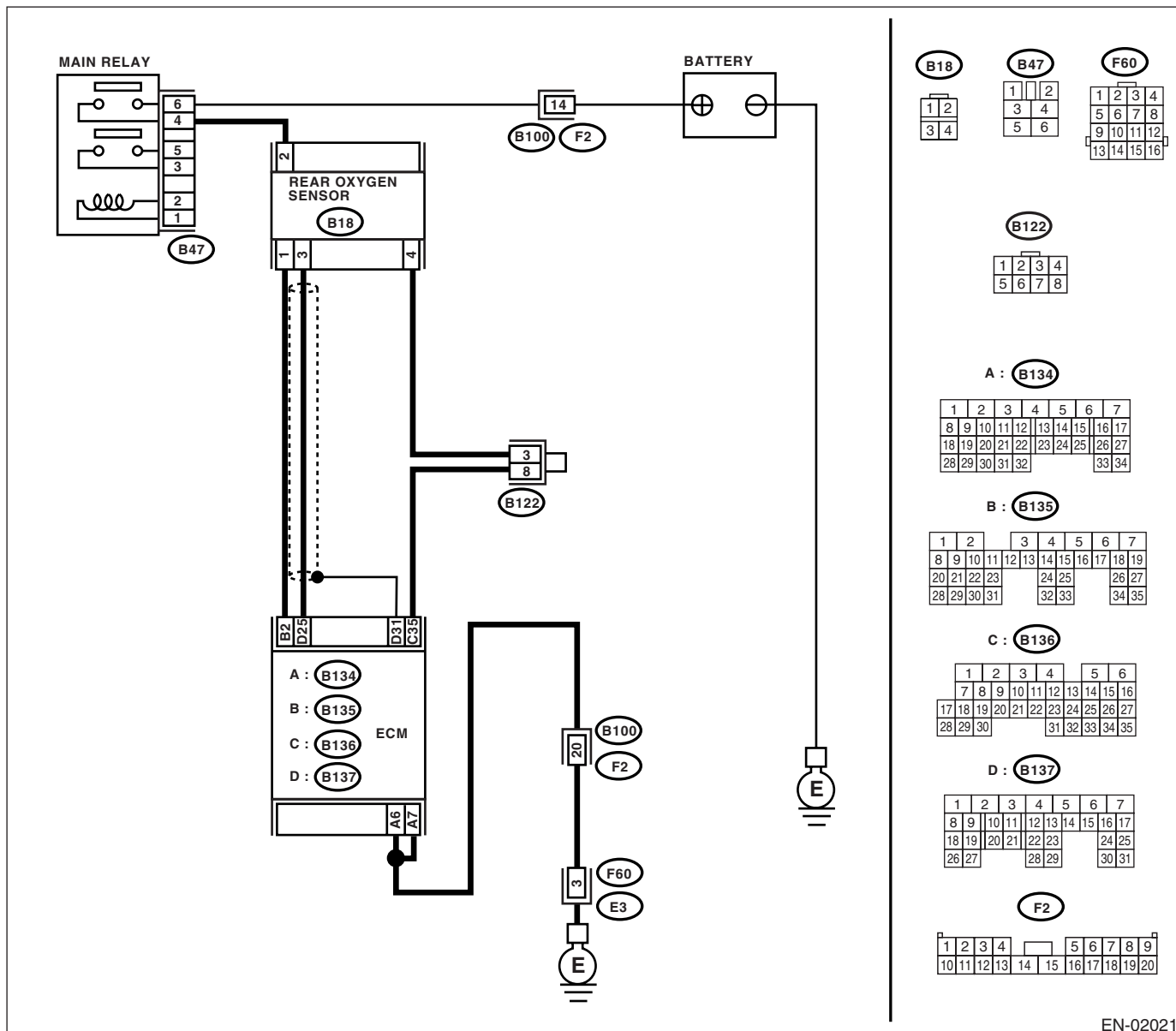
#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-18, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02021

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Check                                                                                                  | Yes                                                                                                                                                                                                                                                                                               | No                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK GROUND CIRCUIT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 6 — Chassis ground:</b><br><b>(B134) No. 7 — Chassis ground:</b>                                                                                                                                                                                                                                      | Is the resistance less than 5 $\Omega$ ?                                                               | Go to step 2.                                                                                                                                                                                                                                                                                     | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine ground cable</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>2 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> <li>• OBD-II scan tool</li> </ul> For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the current more than 0.2 A?                                                                        | Repair the connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in rear oxygen sensor connecting harness connector</li> <li>• Poor contact in ECM connector</li> </ul> | Go to step 3.                                                                                                                                                                                                                                                                                   |
| <b>3 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Start and idle the engine.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                   | Is the voltage less than 1 V?                                                                          | Go to step 6.                                                                                                                                                                                                                                                                                     | Go to step 4.                                                                                                                                                                                                                                                                                   |
| <b>4 CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                       | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.                                                                                                                                                                                                                                                         | Go to step 5.                                                                                                                                                                                                                                                                                   |
| <b>5 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                     | Is the voltage less than 1 V?                                                                          | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                                                                                                                                                            | Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                                                  |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                     | Check                                     | Yes                                                                                                                                                                                                                                                                                                                                                              | No                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B18) No. 2 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?            | Go to step 7.                                                                                                                                                                                                                                                                                                                                                    | Repair the power supply line.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and rear oxygen sensor connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>7</b><br><b>CHECK REAR OXYGEN SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between rear oxygen sensor connector terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                            | Is the resistance less than 30 $\Omega$ ? | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.>                                                                                                                                                                                                                                            |

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

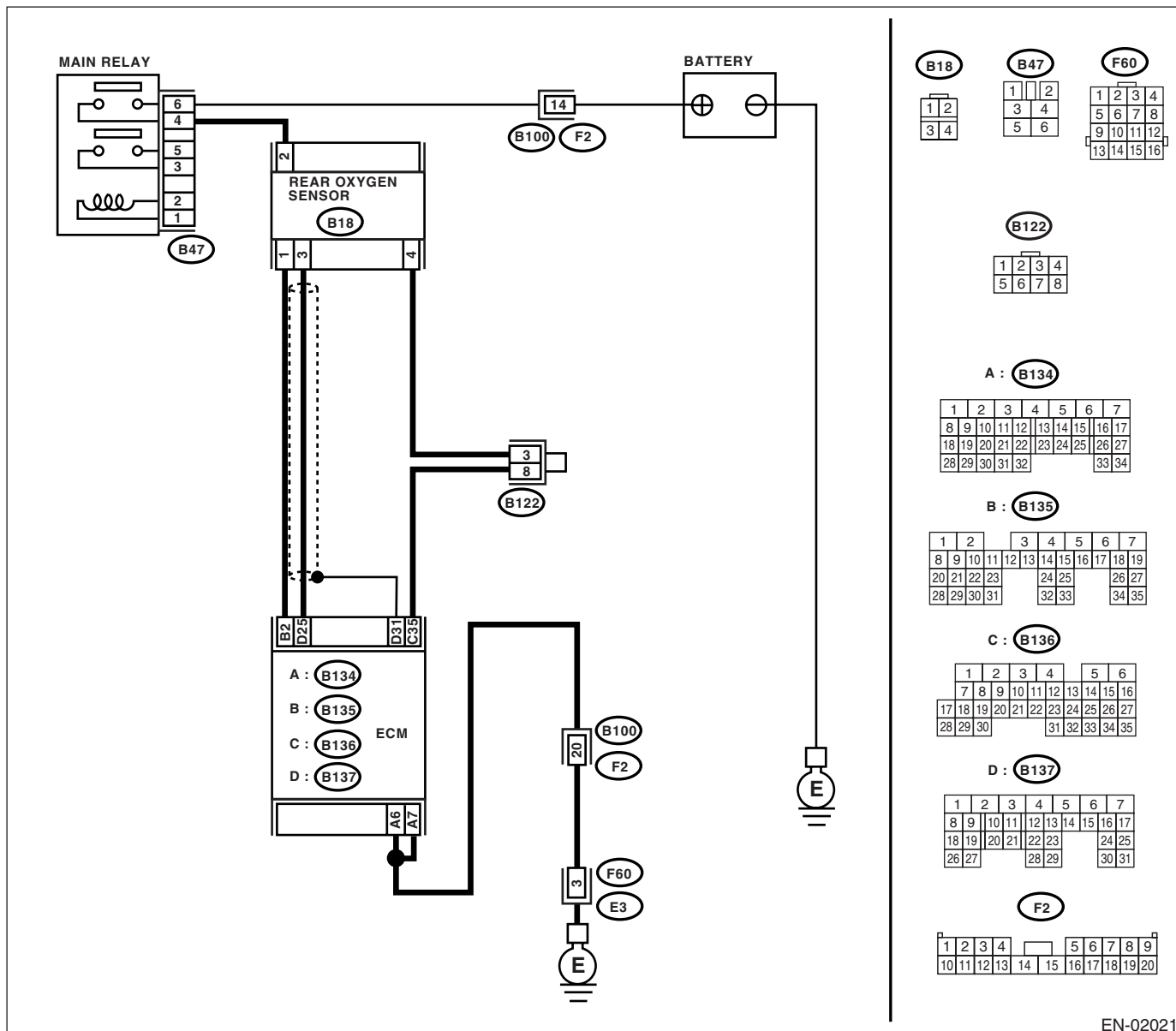
#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-20, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02021

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Check                                   | Yes                                                                       | No            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------|---------------|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                | Is the voltage more than 8 V?           | Go to step 2.                                                             | Go to step 3. |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector.<br>2) Turn the ignition switch to ON.<br>3) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. | Is the current more than 7 A?           | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | END           |
| <b>3</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Is there poor contact in ECM connector? | Repair the poor contact in ECM connector.                                 | END           |

## H: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-22, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

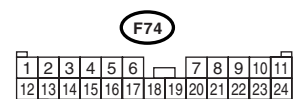
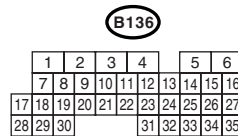
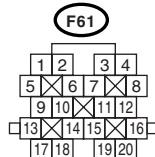
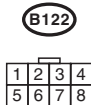
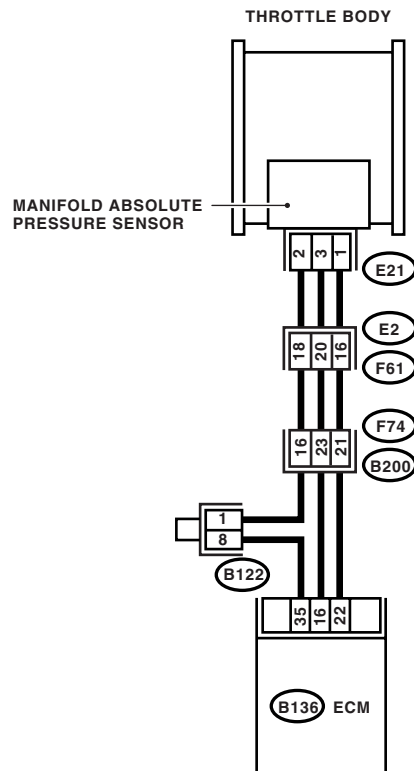
### TROUBLE SYMPTOM:

Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02022

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                   | Check                                                                            | Yes                                                                                                                                                                                                               | No                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK IDLE SWITCH SIGNAL.</b><br>1) Turn the ignition switch to ON.<br>2) Operate the LED operation mode for engine using Subaru Select Monitor.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE".<br><Ref. to EN(H4DOTC)-29, 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)-374, DTC P2135 — THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A"/"B" VOLTAGE RATIO- NALITY —, Diag- nostic Procedure with Diagnostic Trouble Code (DTC).><br><b>NOTE:</b><br>In this case, it is not necessary to inspect DTC P0106. |
| <b>2 CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                               | Is any other DTC displayed?                                                      | Inspect the rele- vant DTC. "List of Diagnostic Trou- ble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><b>NOTE:</b><br>In this case, it is not necessary to inspect DTC P0106. | Go to step 3.                                                                                                                                                                                                                                                                                    |
| <b>3 CHECK CONDITION OF MANIFOLD ABSO- LUTE PRESSURE SENSOR.</b>                                                                                                                                                                                                                                                                       | Is the manifold absolute pres- sure sensor installation bolt tightened securely? | Go to step 4.                                                                                                                                                                                                     | Tighten the mani- fold absolute pres- sure sensor installation bolt securely.                                                                                                                                                                                                                    |
| <b>4 CHECK CONDITION OF THROTTLE BODY.</b>                                                                                                                                                                                                                                                                                             | Is the throttle body installation bolt tightened securely?                       | Replace the mani- fold absolute pres- sure sensor. <Ref. to FU(H4DOTC)- 31, Manifold Abso- lute Pressure Sen- sor.>                                                                                               | Tighten the throttle body installation bolt securely.                                                                                                                                                                                                                                            |

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

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-24, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

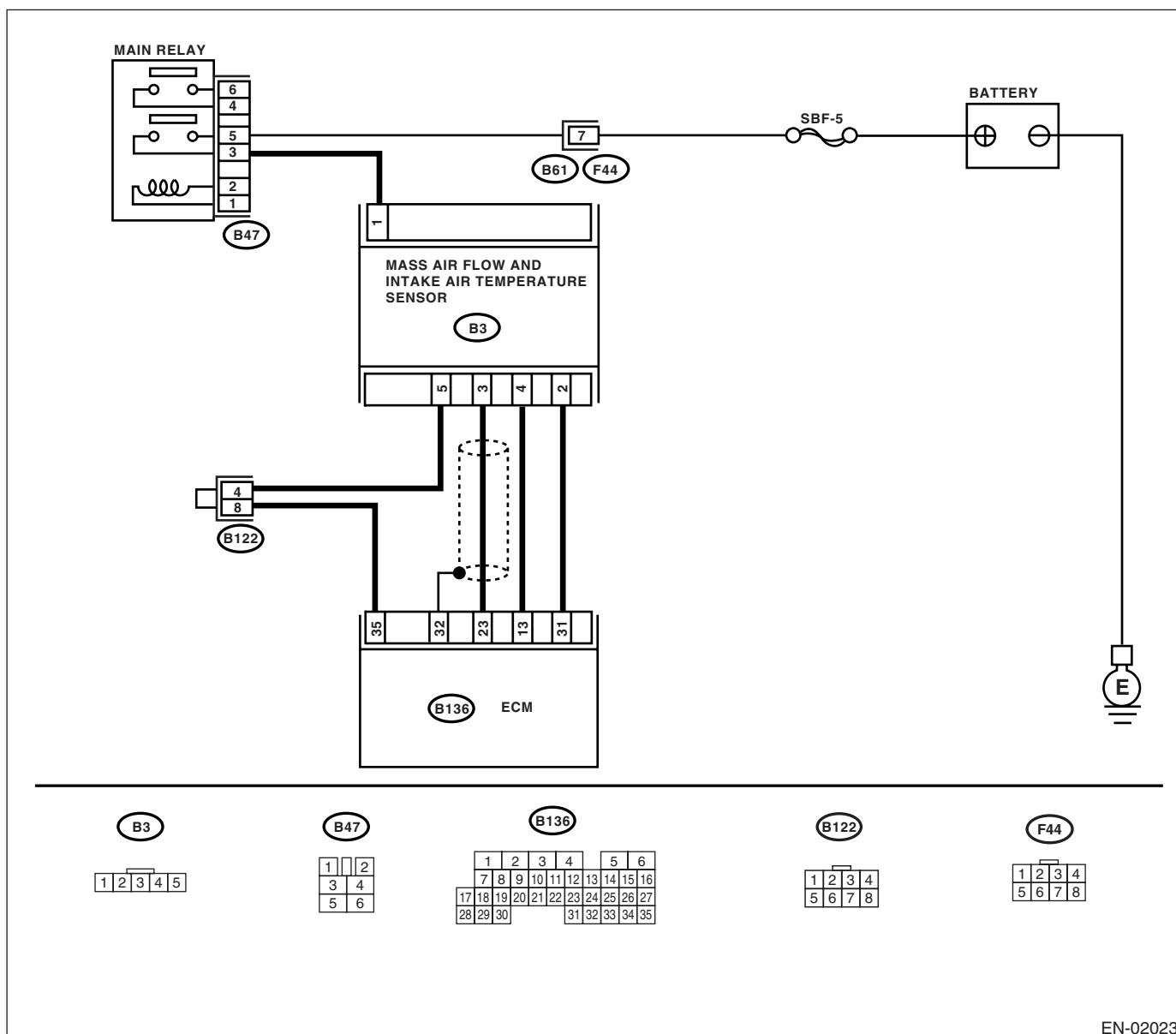
#### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02023

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                        | Check                       | Yes                                                                                                                                                                                                             | No                                                                                                                                     |
|---------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0101. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.> |

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

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-27, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

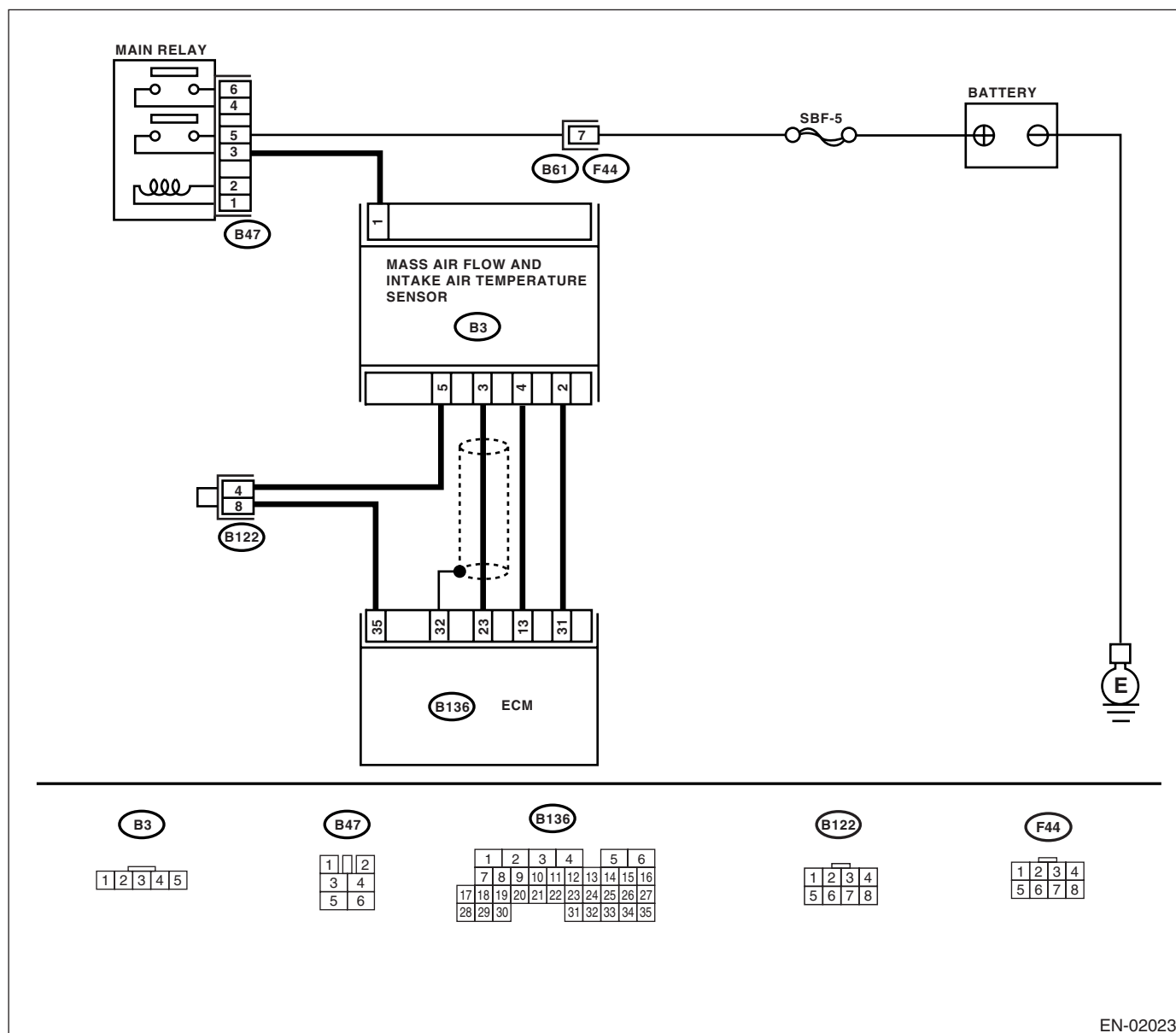
#### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02023

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Check                                                                                                          | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector.<br>3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.<br>4) Start the engine.<br>5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the voltage 0.2 — 4.7 V?                                                                                    | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open or ground short circuit in harness between mass air flow sensor and ECM connector<br>• Poor contact in mass air flow sensor or ECM connector | Go to step 2.                                                                                                                                     |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground while engine is idling.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 23 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Is the voltage more than 0.2 V?                                                                                | Go to step 4.                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Go to step 3.                                                                                                                                     |
| <b>3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).</b><br>Measure the voltage between ECM connector and chassis ground while engine is idling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change? | Repair the poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                         | Contact your SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |
| <b>4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from mass air flow sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between mass air flow sensor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B3) No. 1 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                                 | Is the voltage more than 5 V?                                                                                  | Go to step 5.                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Repair the open circuit between mass air flow sensor and main relay.                                                                              |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                          | Check                                                    | Yes                                                        | No                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>5</b><br><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and mass air flow sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 23 — (B3) No. 3:</i><br><i>(B136) No. 31 — (B3) No. 2:</i><br><i>(B136) No. 35 — (B3) No. 5:</i> | Is the resistance less than 1 $\Omega$ ?                 | Go to step 6.                                              | Repair the open circuit between ECM and mass air flow sensor connector.                                                                |
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR</b><br>Measure the resistance of harness between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 23 — Chassis ground:</i><br><i>(B136) No. 31 — Chassis ground:</i><br><i>(B136) No. 35 — Chassis ground:</i>                                                                                         | Is the resistance more than 1 M $\Omega$ ?               | Go to step 7.                                              | Repair the ground short circuit between ECM and mass air flow sensor connector.                                                        |
| <b>7</b><br><b>CHECK POOR CONTACT</b><br>Check poor contact in mass air flow sensor connector.                                                                                                                                                                                                                                                                                                                | Is there poor contact in mass air flow sensor connector? | Repair the poor contact in mass air flow sensor connector. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## K: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-29, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

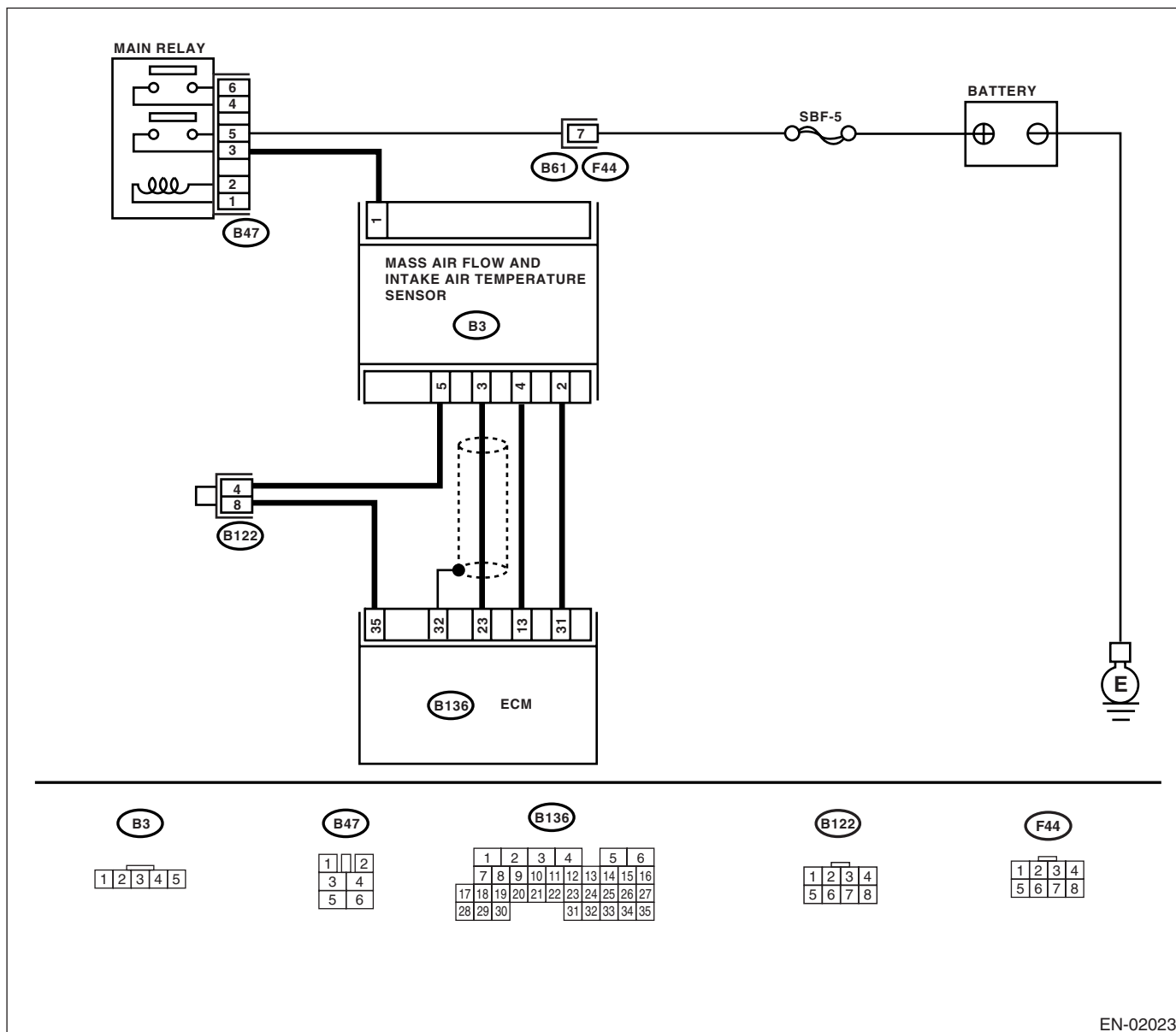
## TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

## CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

## WIRING DIAGRAM:



EN-02023

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Check                                    | Yes                                                                                                            | No                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>1 CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector.<br>3) Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.<br>4) Start the engine.<br>5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the voltage 0.2 — 4.7 V?              | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.    | Go to step 2.                                                                     |
| <b>2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from mass air flow sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between mass air flow sensor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B3) No. 3 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                       | Is the voltage more than 5 V?            | Repair the battery short of harness between mass air flow sensor connector and ECM connector.                  | Go to step 3.                                                                     |
| <b>3 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between ECM connector and mass air flow sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B3) No. 2 — (B136) No. 31:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Is the resistance less than 1 $\Omega$ ? | Replace the mass air flow sensor.<br><Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.> | Repair the open harness between mass air flow sensor connector and ECM connector. |

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

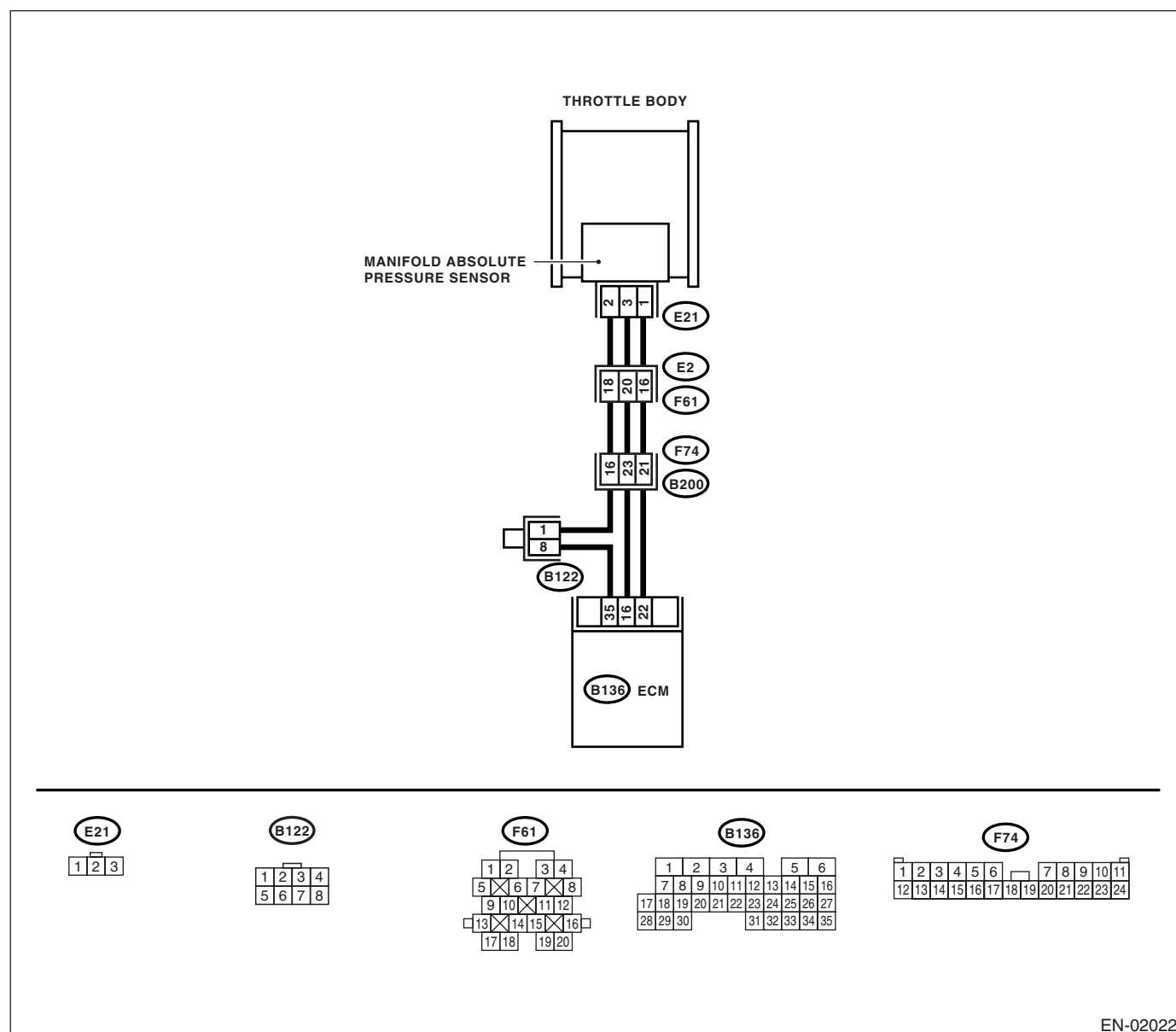
**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-31, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02022

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                 | Check                                                                                                  | Yes                                                                     | No                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                 | Is the voltage more than 4.5 V?                                                                        | Go to step 3.                                                           | Go to step 2.                                                                                                                                     |
| <b>2</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                 | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.                               | Contact your SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |
| <b>3</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 22 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                           | Is the voltage less than 0.7 V?                                                                        | Go to step 4.                                                           | Contact your SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between manifold absolute pressure sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E21) No. 3 (+) — Engine ground (-):</b> | Is the voltage more than 4.5 V?                                                                        | Go to step 5.                                                           | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.                                                   |
| <b>5</b><br><b>CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 35 — (E21) No. 2:</b>                                                                         | Is the resistance less than 1 $\Omega$ ?                                                               | Go to step 6.                                                           | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.                                                   |
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E21) No. 1 — Engine ground:</b>                                                                                                                                                  | Is the resistance more than 1 M $\Omega$ ?                                                             | Go to step 7.                                                           | Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.                                           |
| <b>7</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in manifold absolute pressure sensor connector.                                                                                                                                                                                                                                                                                                                         | Is there poor contact in manifold absolute pressure sensor connector?                                  | Repair the poor contact in manifold absolute pressure sensor connector. | Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-31, Manifold Absolute Pressure Sensor.>                                        |

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

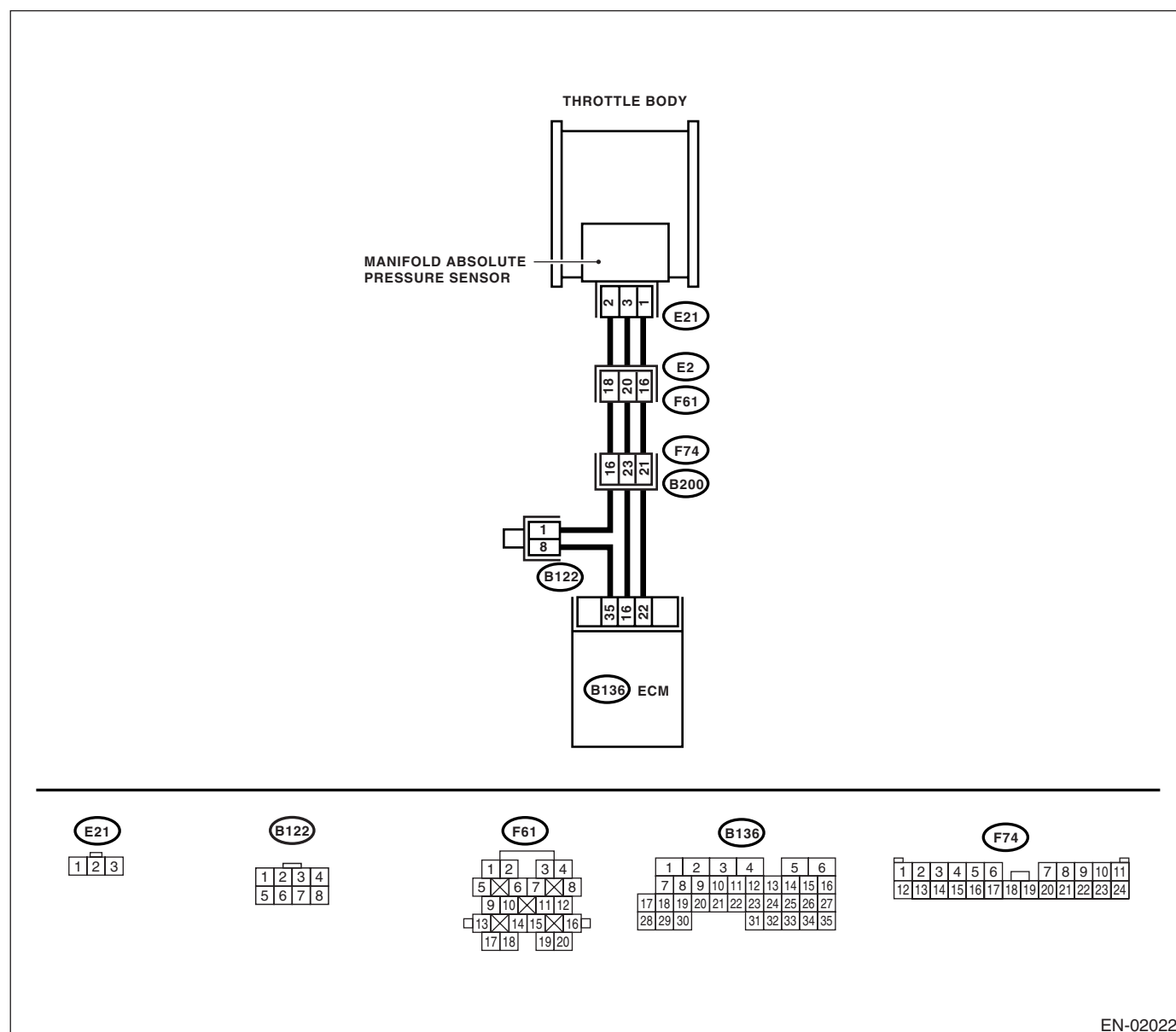
**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-33, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02022

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                       | Check                                                                                                  | Yes                                                                     | No                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                 | Is the voltage more than 4.5 V?                                                                        | Go to step 3.                                                           | Go to step 2.                                                                                                                                 |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                 | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.                               | Contact your SOA Service Center.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 22 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                 | Is the voltage more than 4.5 V?                                                                        | Go to step 4.                                                           | Contact your SOA Service Center.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |
| <b>4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between manifold absolute pressure sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E21) No. 3 (+) — Engine ground (-):</b> | Is the voltage more than 4.5 V?                                                                        | Go to step 5.                                                           | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.                                               |
| <b>5 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 22 — (E21) No. 1:</b>                                                                         | Is the resistance less than 1 $\Omega$ ?                                                               | Go to step 6.                                                           | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.                                               |
| <b>6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 35 — (E21) No. 2:</b>                                                                                                                                                            | Is the resistance less than 1 $\Omega$ ?                                                               | Go to step 7.                                                           | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.                                               |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in manifold absolute pressure sensor connector.                                                                                                                                                                                                                                                                                                                         | Is there poor contact in manifold absolute pressure sensor connector?                                  | Repair the poor contact in manifold absolute pressure sensor connector. | Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-31, Manifold Absolute Pressure Sensor.>                                    |

**N: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —**

**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-35, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

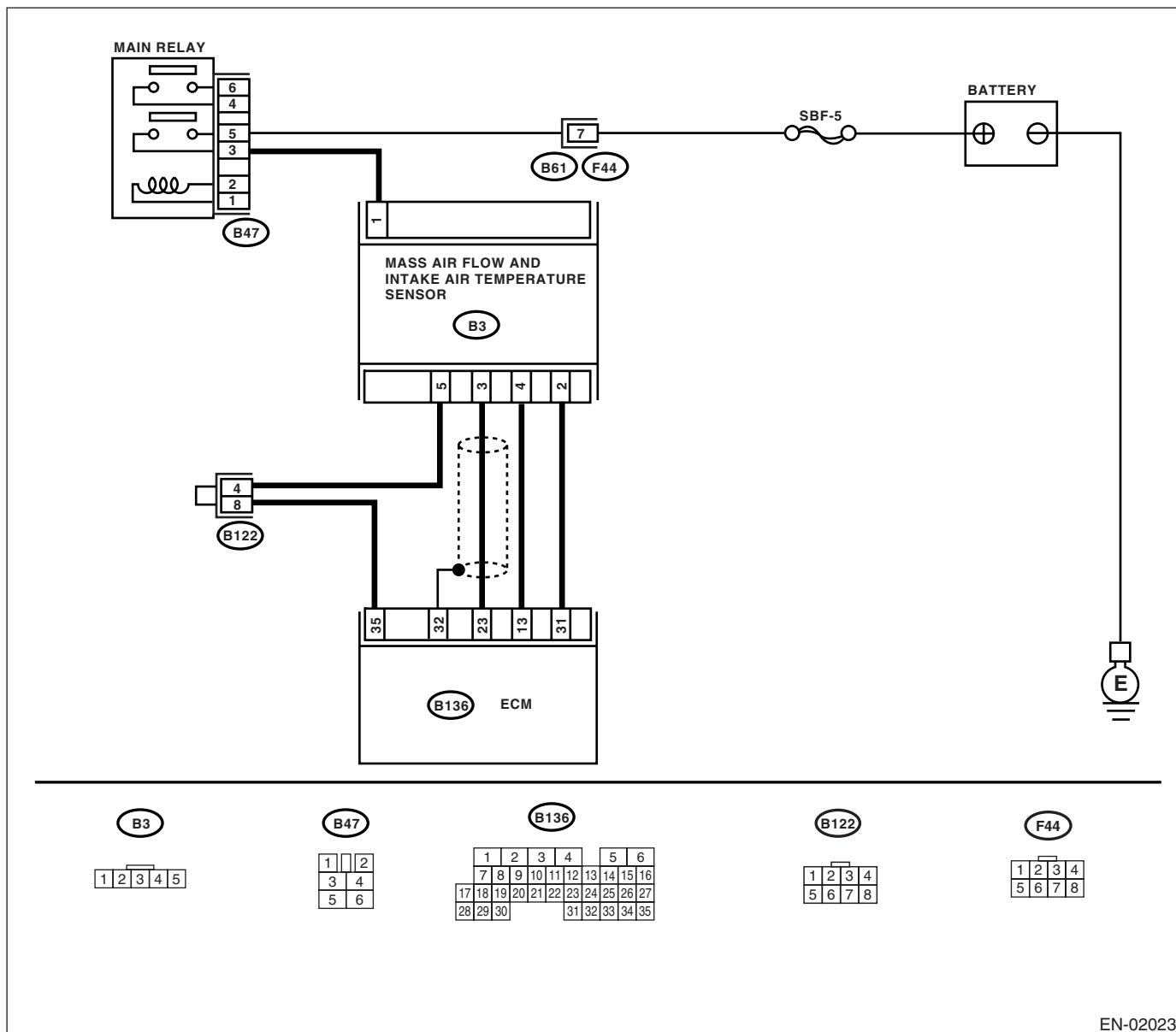
**TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02023

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Check                                                          | Yes                                                                                                                                                                                                             | No                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Is any other DTC displayed?                                    | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0111. | Go to step 2.                                                                                                                        |
| <b>2</b><br><b>CHECK ENGINE COOLANT TEMPERATURE.</b><br>1) Start the engine and warm it up completely.<br>2) Measure the engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the engine coolant temperature 75°C (167°F) — 95°C (203°F)? | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>                                                                          | Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## O: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-37, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

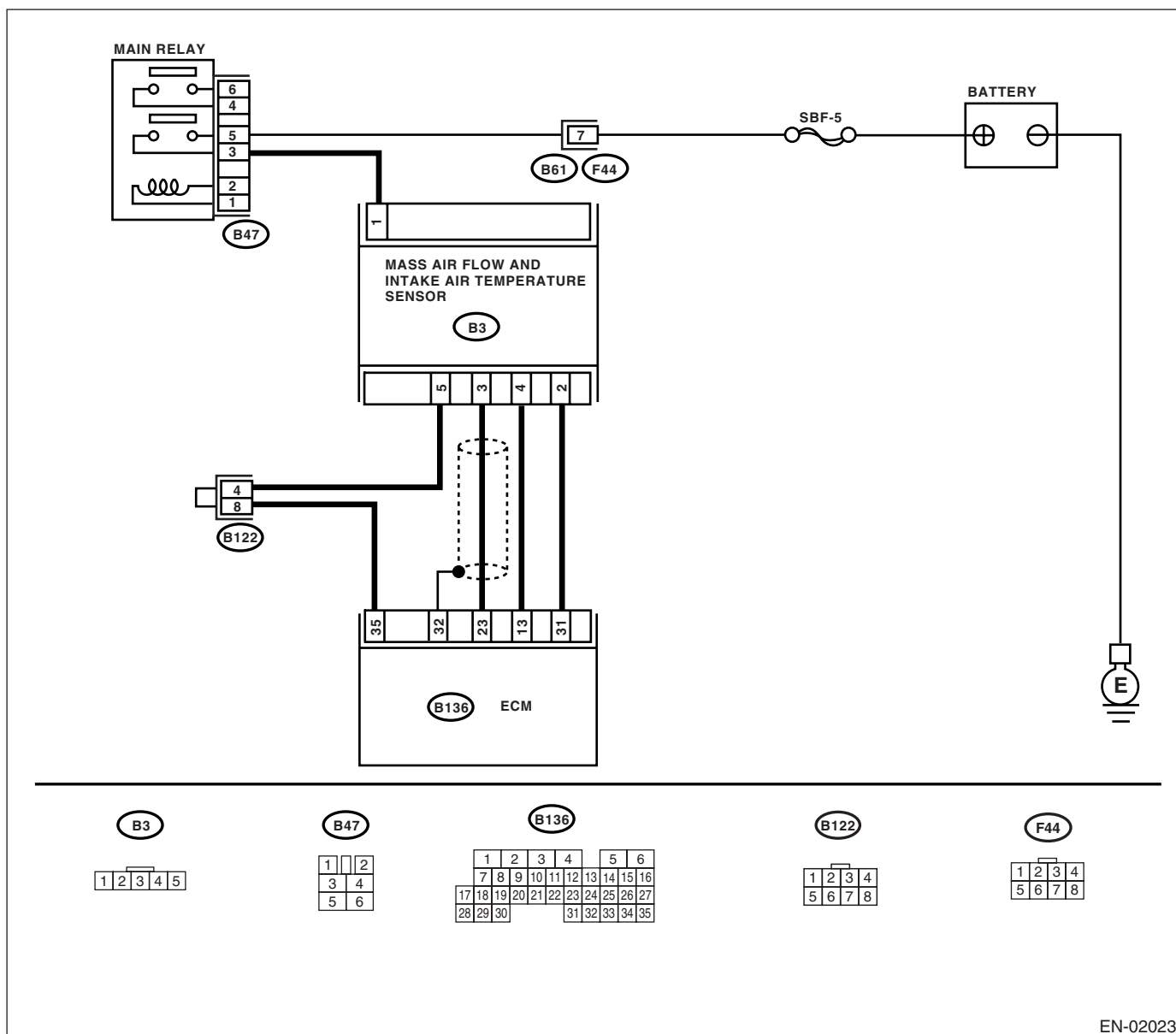
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02023

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Check                                       | Yes                                                                                                                                    | No                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.                                                                                                                                                                                                                | Is the temperature more than 55°C (131°F)?  | Go to step 2.                                                                                                                          | Repair the poor contact.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact mass air flow and intake air temperature sensor<br>• Poor contact in ECM<br>• Poor contact in joint connector |
| <b>2</b><br><b>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from mass air flow and intake air temperature sensor.<br>3) Turn the ignition switch to ON.<br>4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. | Is the temperature less than -36°C (-33°F)? | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.> | Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.                                                                                        |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## P: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-39, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

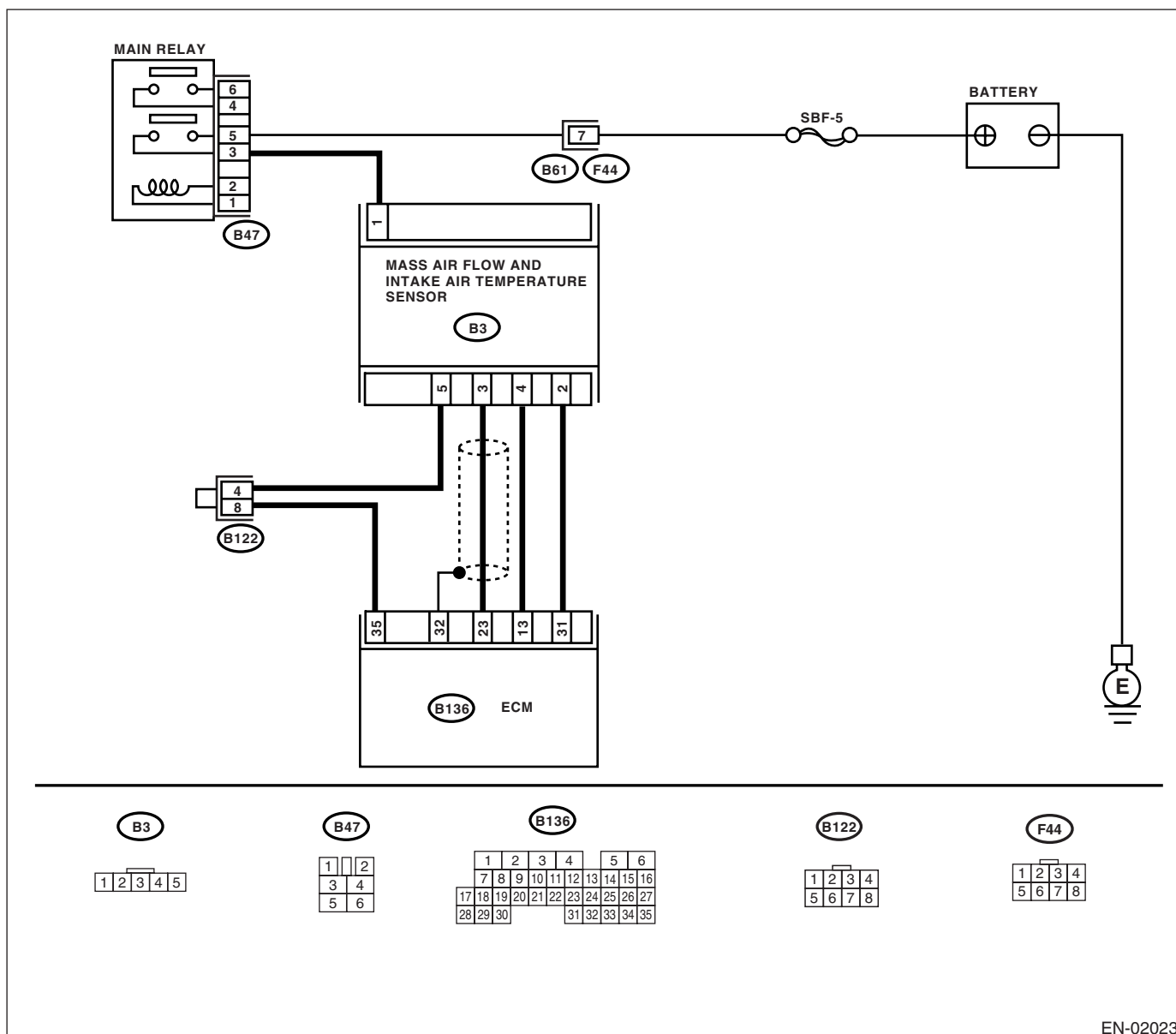
## TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

## CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

## WIRING DIAGRAM:



EN-02023

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Check                                                                         | Yes                                                                                                                    | No                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. | Is the temperature less than $-36^{\circ}\text{C}$ ( $-33^{\circ}\text{F}$ )? | Go to step 2.                                                                                                          | Repair the poor contact.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in mass air flow and intake air temperature sensor<br>• Poor contact in ECM<br>• Poor contact in joint connector                                                                                                                 |
| <b>2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from mass air flow and intake air temperature sensor.<br>3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B3) No. 4 (+) — Engine ground (-):</b>                                                           | Is the voltage more than 10 V?                                                | Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector. | Go to step 3.                                                                                                                                                                                                                                                                                                                          |
| <b>3 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B3) No. 4 (+) — Engine ground (-):</b>                                                                                                                                                 | Is the voltage more than 10 V?                                                | Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector. | Go to step 4.                                                                                                                                                                                                                                                                                                                          |
| <b>4 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between mass air flow and intake air temperature sensor and manifold absolute pressure sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B3) No. 4 (+) — Engine ground (-):</b>                                                                                                                                                    | Is the voltage more than 4 V?                                                 | Go to step 5.                                                                                                          | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector<br>• Poor contact in mass air flow and intake air temperature sensor<br>• Poor contact in ECM<br>• Poor contact in joint connector |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                    | Check                                    | Yes                                                                                                                                    | No                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5<br><b>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B3) No. 5 — Engine ground:</b> | Is the resistance less than 5 $\Omega$ ? | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.> | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector</li><li>• Poor contact in mass air flow and intake air temperature sensor</li><li>• Poor contact in ECM</li><li>• Poor contact in joint connector</li></ul> |

### Q: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-41, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

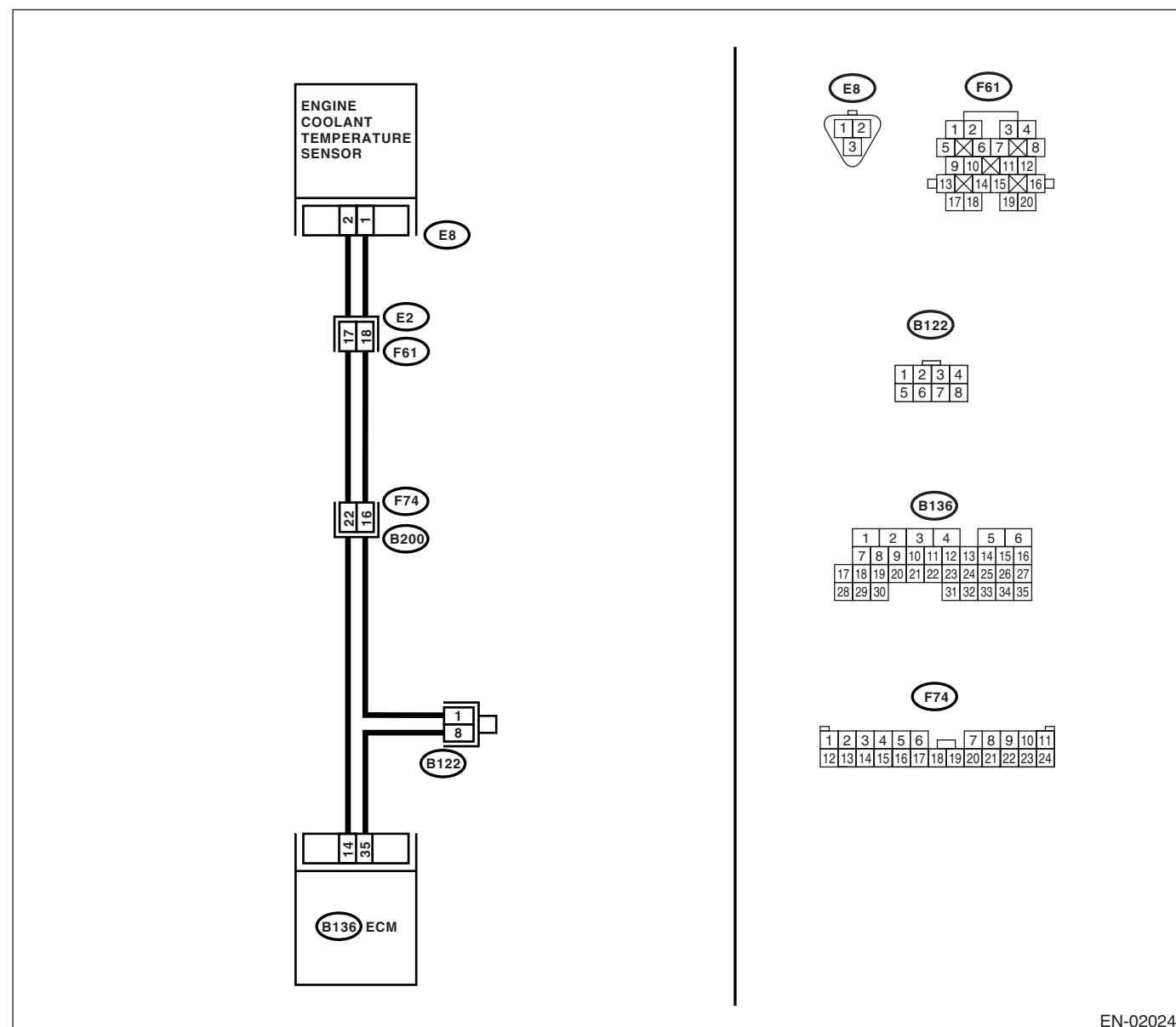
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02024

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Check                                       | Yes                                                                                                        | No                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.                                                                                                                                                                                    | Is the temperature more than 120°C (248°F)? | Go to step 2.                                                                                              | Repair the poor contact.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in engine coolant temperature sensor<br>• Poor contact in ECM<br>• Poor contact in coupling connector<br>• Poor contact in joint connector |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from engine coolant temperature sensor.<br>3) Turn the ignition switch to ON.<br>4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the temperature more than -40°C (-40°F)? | Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.> | Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.                                                                                                                                          |

### R: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-43, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

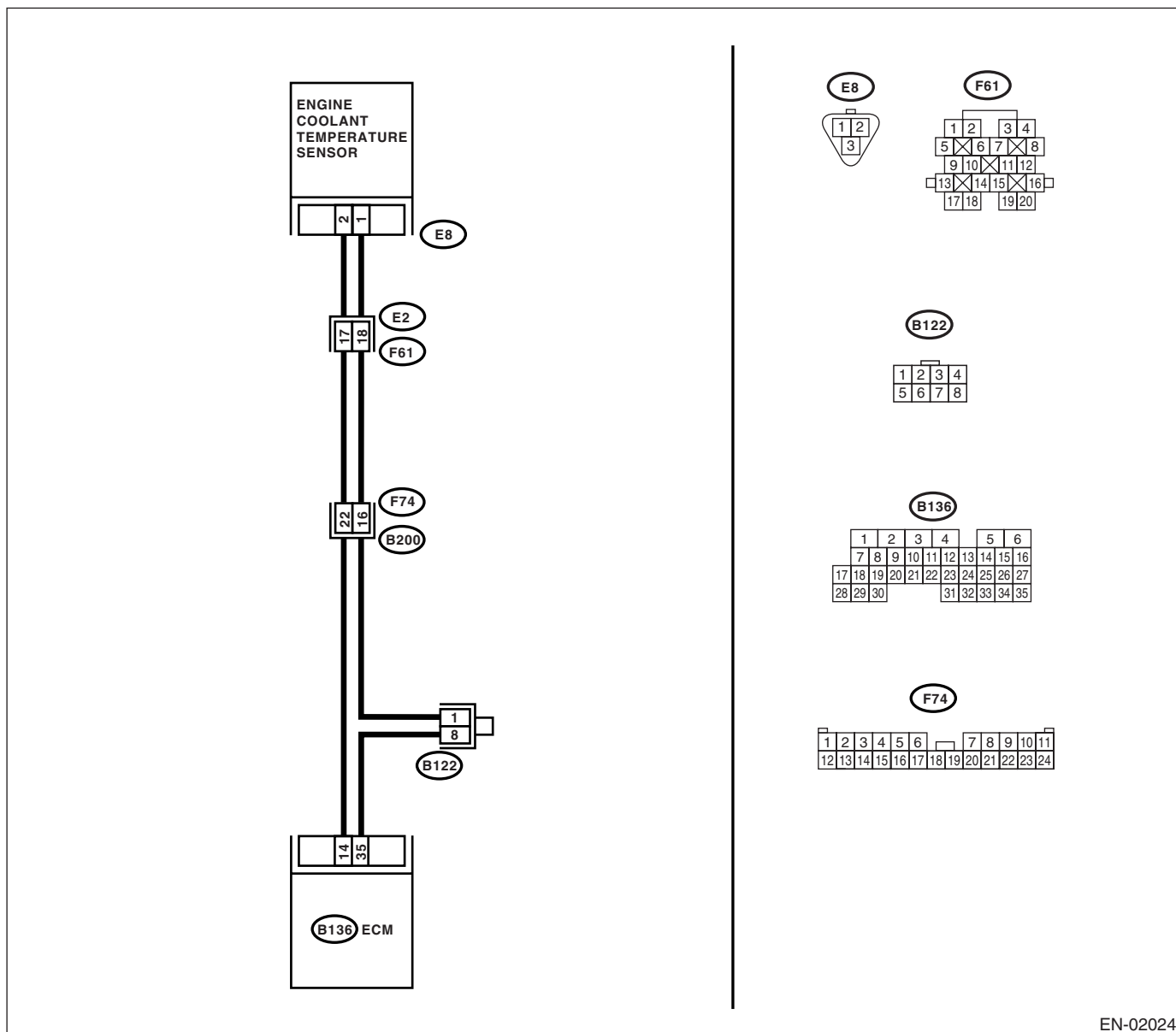
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02024

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Check                                       | Yes                                                                                                      | No                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>OBD-II general scan tool</li> </ul> For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the temperature less than -40°C (-40°F)? | Go to step 2.                                                                                            | Repair the poor contact.<br><br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>Poor contact in engine coolant temperature sensor</li> <li>Poor contact in ECM</li> <li>Poor contact in coupling connector</li> <li>Poor contact in joint connector</li> </ul>                                                                                                                           |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from engine coolant temperature sensor.<br>3) Measure the voltage between engine coolant temperature sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(E8) No. 2 (+) — Engine ground (-):</b>                                                                                                                                                                                                | Is the voltage more than 10 V?              | Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector. | Go to step 3.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between engine coolant temperature sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(E8) No. 2 (+) — Engine ground (-):</b>                                                                                                                                                                                                                                                                        | Is the voltage more than 10 V?              | Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector. | Go to step 4.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between engine coolant temperature sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(E8) No. 2 (+) — Engine ground (-):</b>                                                                                                                                                                                                                                                                                                                 | Is the voltage more than 4 V?               | Go to step 5.                                                                                            | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>Poor contact in engine coolant temperature sensor connector</li> <li>Poor contact in ECM connector</li> <li>Poor contact in coupling connector</li> <li>Poor contact in joint connector</li> </ul> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                         | Check                                    | Yes                                                                                                        | No                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>5</b><br><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E8) No. 1 — Engine ground:</b> | Is the resistance less than 5 $\Omega$ ? | Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.> | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>• Poor contact in engine coolant temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

---

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

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-45, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

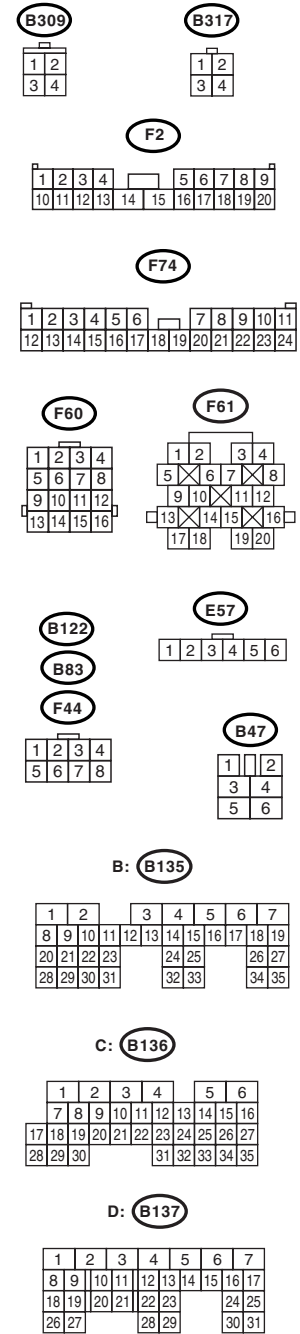
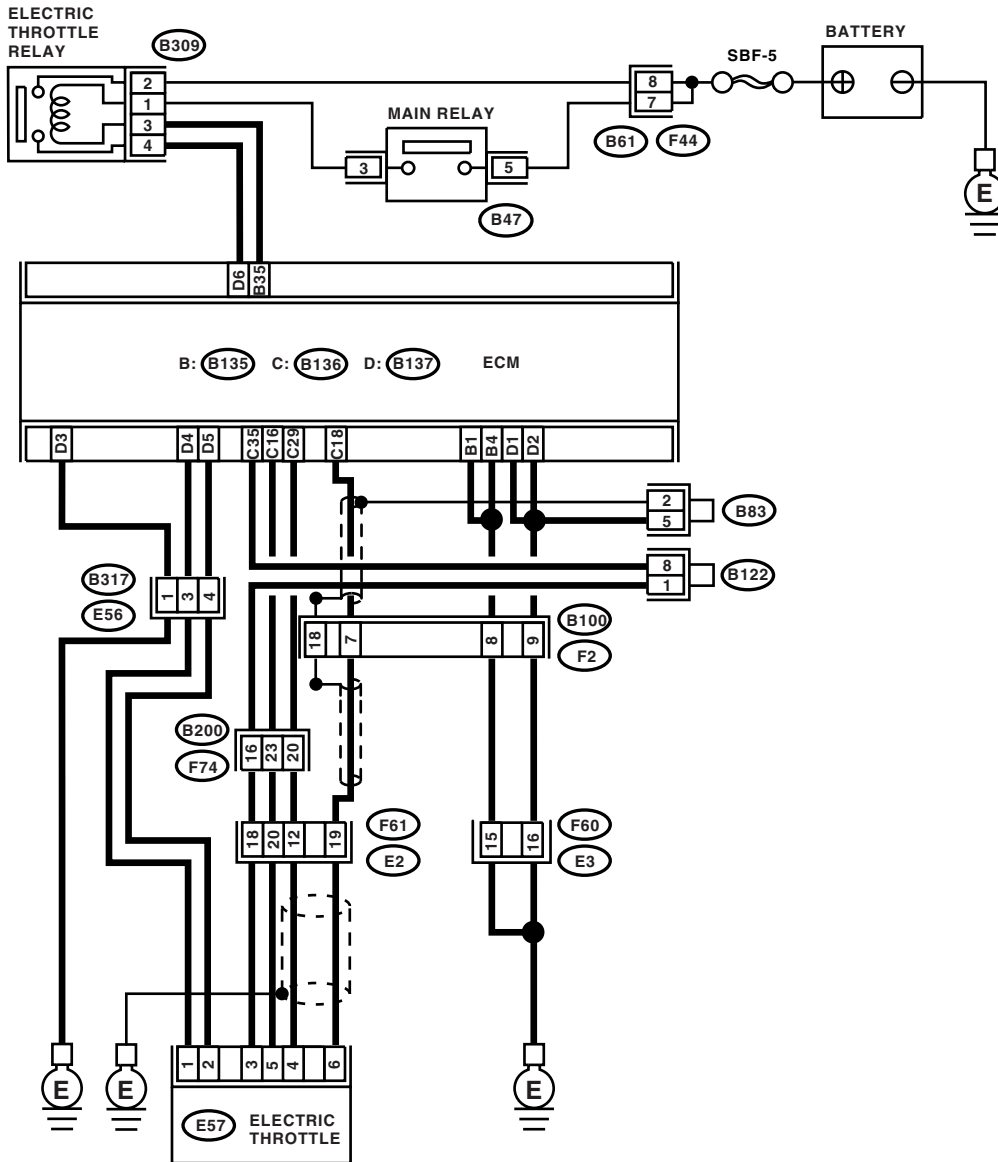
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                            | Check                                                                      | Yes                                                                                                                   | No                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 29 (+) — (B136) No. 35 (-):</b><br>3) Shake the ECM harness and connector, engine harness connectors and electric throttle.                                                                       | Is the voltage more than 0.4 V?                                            | Go to step 2.                                                                                                         | Go to step 3.                                                                                                                             |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electric throttle.                                                                                                                                                                                                                                                                               | Is there poor contact in the connectors between ECM and electric throttle? | Repair the poor contact in connectors.                                                                                | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                    |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electric throttle.<br>4) Measure the resistance between ECM connector and electric throttle connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 — (E57) No. 5:</b>                                  | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 4.                                                                                                         | Repair open of harness connector.                                                                                                         |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>Measure the resistance between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 18 — Chassis ground:</b><br><b>(B136) No. 16 — Chassis ground:</b>                                                                                                                                            | Is the resistance more than 1 M $\Omega$ ?                                 | Go to step 5.                                                                                                         | Repair the chassis short of harness.                                                                                                      |
| <b>5 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage 4.5 — 5.5 V?                                                | Go to step 6.                                                                                                         | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>     |
| <b>6 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 — Engine ground:</b>                                                                                                                                                               | Is the resistance more than 10 $\Omega$ ?                                  | Repair the poor contact in electric throttle connector. If problem persists, replace the accelerator position sensor. | Repair the poor the contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |

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

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-47, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

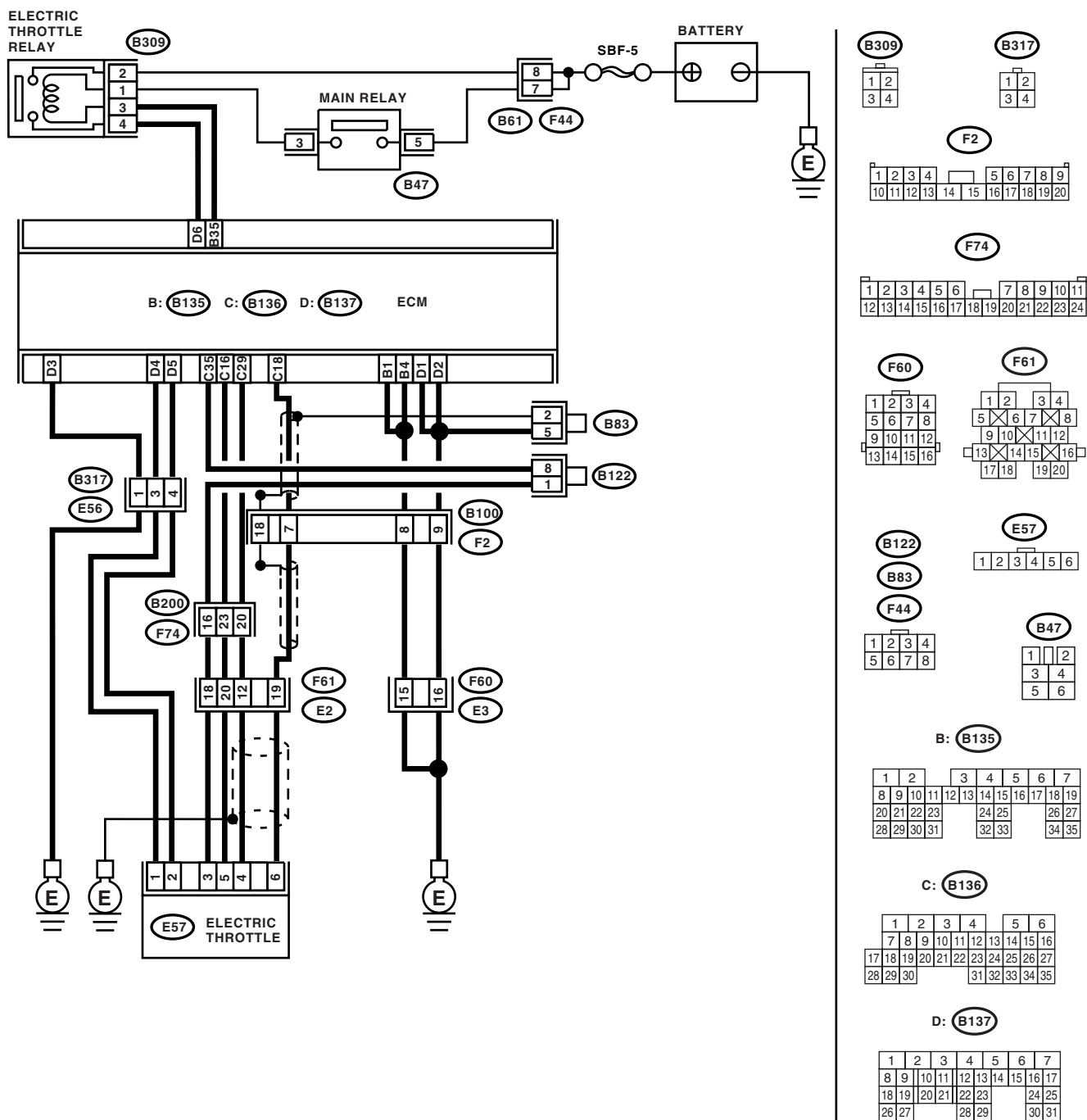
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                    | Check                                                                      | Yes                                    | No                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main throttle sensor signals, using the Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.                                                                                 | Is the voltage less than 4.63 V?                                           | Go to step 2.                          | Go to step 3.                                                                                                                             |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electric throttle.                                                                                                                                                                                                                                                                                       | Is there poor contact in the connectors between ECM and electric throttle? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                    |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Disconnect the connectors from electric throttle.<br>4) Measure the resistance between ECM connector and electric throttle connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 18 — (E57) No. 6:</b><br><b>(B136) No. 35 — (E57) No. 3:</b> | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 4.                          | Repair the open of harness connector.                                                                                                     |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between the electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 3 — Engine ground:</b>                                                                                                                                            | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 5.                          | Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b><br>3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                       | Is the voltage more than 10 V?                                             | Go to step 6.                          | Repair the battery short of harness between ECM connector and electric throttle connector.                                                |
| <b>6 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Measure the voltage between the electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 (+) — Engine ground (-):</b><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                                                                            | Is the voltage less than 10 V?                                             | Go to step 7.                          | Repair the short of harness between ECM connector and electric throttle connector.                                                        |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                 | Check                             | Yes                                                                   | No                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------|
| <b>7</b><br><b>CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between ECM connectors.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 18 — (B136) No. 16:</i> | Is the resistance more than 1 MΩ? | Repair the poor contact in harness.<br>Replace the electric throttle. | Repair the short of harness of power supply to sensor. |

### U: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-49, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

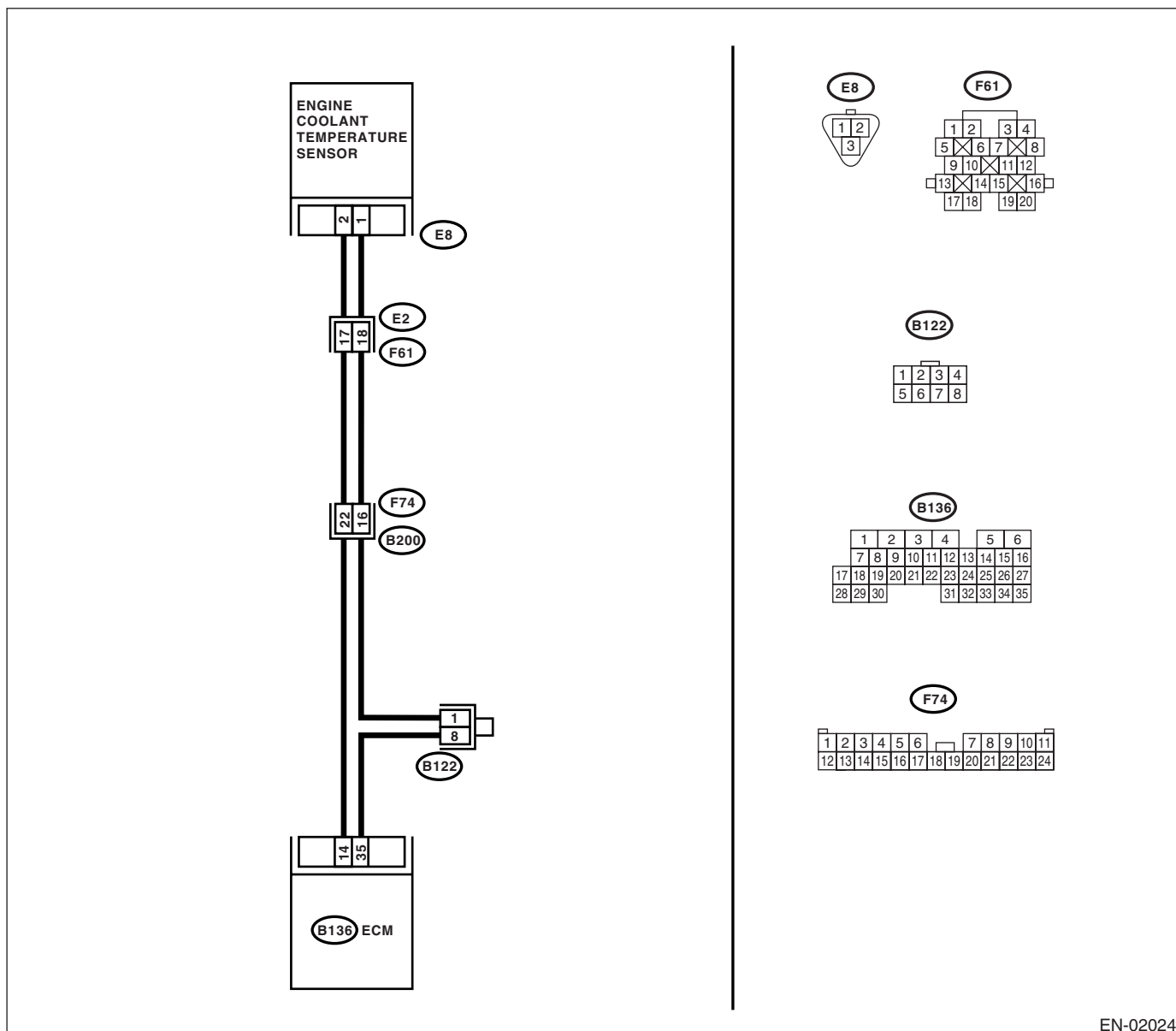
#### TROUBLE SYMPTOM:

Engine will not return to idling.

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02024

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                        | Check                                      | Yes                                                                                                                                                                                                             | No                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                          | Is any other DTC displayed?                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0125. | Go to step 2.                                                                                              |
| <b>2</b><br><b>CHECK ENGINE COOLING SYSTEM.</b><br><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Thermostat open stuck</li><li>• Coolant level</li><li>• Coolant freeze</li><li>• Tire diameter</li></ul> | Is there a fault in engine cooling system? | Replace the thermostat. <Ref. to CO(H4SO)-24, Thermostat.>                                                                                                                                                      | Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.> |

### V: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-51, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

Thermostat remains open.

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                                                                        | Check                                                                                 | Yes                                                                                                                                              | No                                                                              |
|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 1<br><b>CHECK VEHICLE CONDITION.</b>                                                        | Was the vehicle driven or idled with the engine partially submerged under water?      | In this case, it is not necessary to inspect DTC P0128.                                                                                          | Go to step 2.                                                                   |
| 2<br><b>CHECK FOR OTHER DTC ON DISPLAY.</b>                                                 | Is any other DTC displayed?                                                           | Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>         | Go to step 3.                                                                   |
| 3<br><b>CHECK ENGINE COOLANT.</b>                                                           | Are coolant level and mixture ratio of cooling water to anti-freeze solution correct? | Go to step 4.                                                                                                                                    | Replace the engine coolant. <Ref. to CO(H4SO)-17, REPLACEMENT, Engine Coolant.> |
| 4<br><b>CHECK RADIATOR FAN.</b><br>1) Start the engine.<br>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)-33, 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)-24, Thermostat.>                      |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

### W: DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-53, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                 | Check                       | Yes                                                                                                                                               | No                                                 |
|--------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Is any other DTC displayed? | Replace the ECM.<br><Ref. to<br>FU(H4DOTC)-42,<br>Engine Control<br>Module (ECM).><br><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. | NOTE:<br>It is not necessary to inspect DTC P0129. |

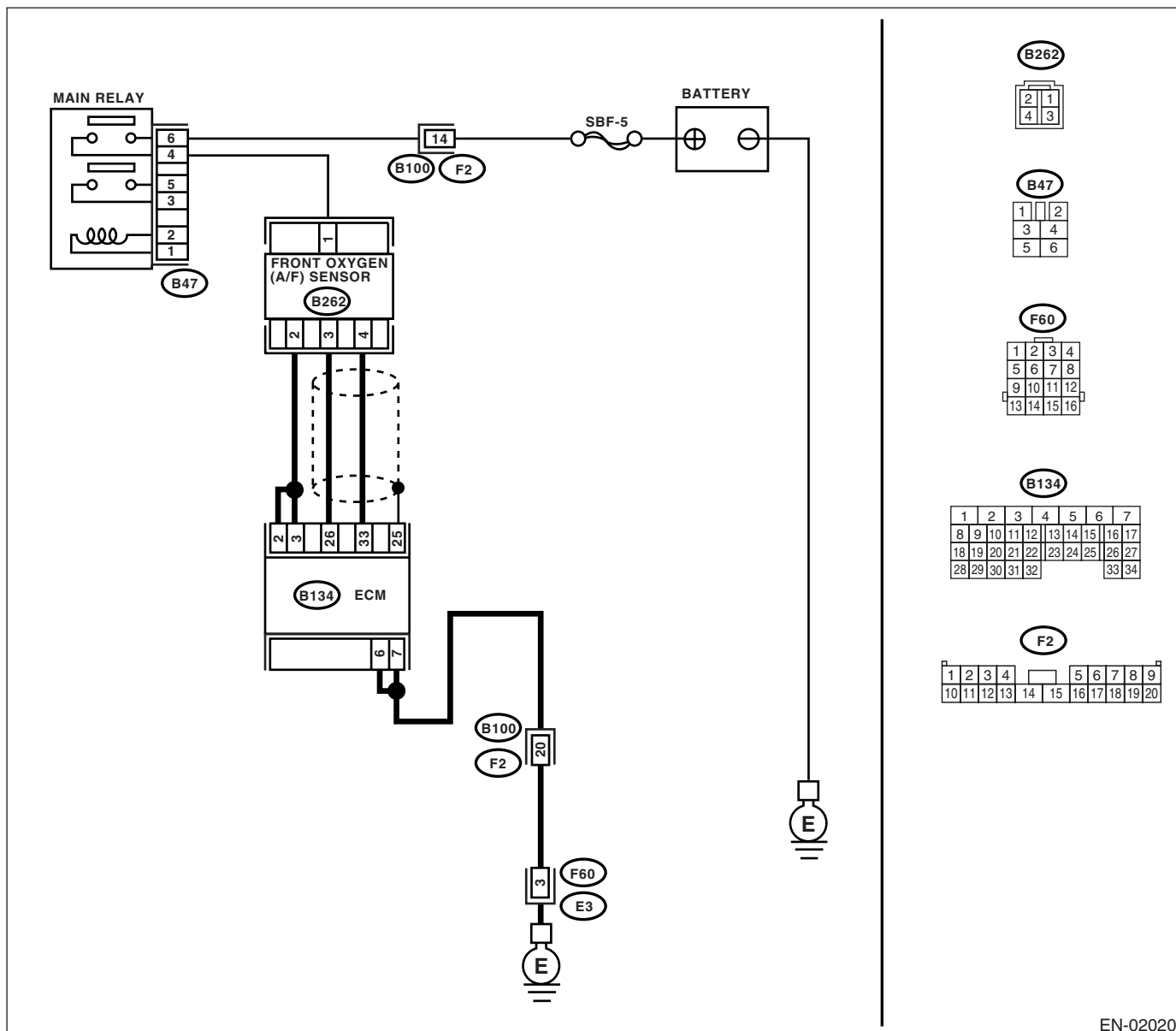
### X: DTC P0131 — O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-54, DTC P0131 — O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                   | Check                             | Yes                                                                                        | No                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — Chassis ground:</b><br><b>(B134) No. 33 — Chassis ground:</b> | Is the resistance more than 1 MΩ? | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> | Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector. |

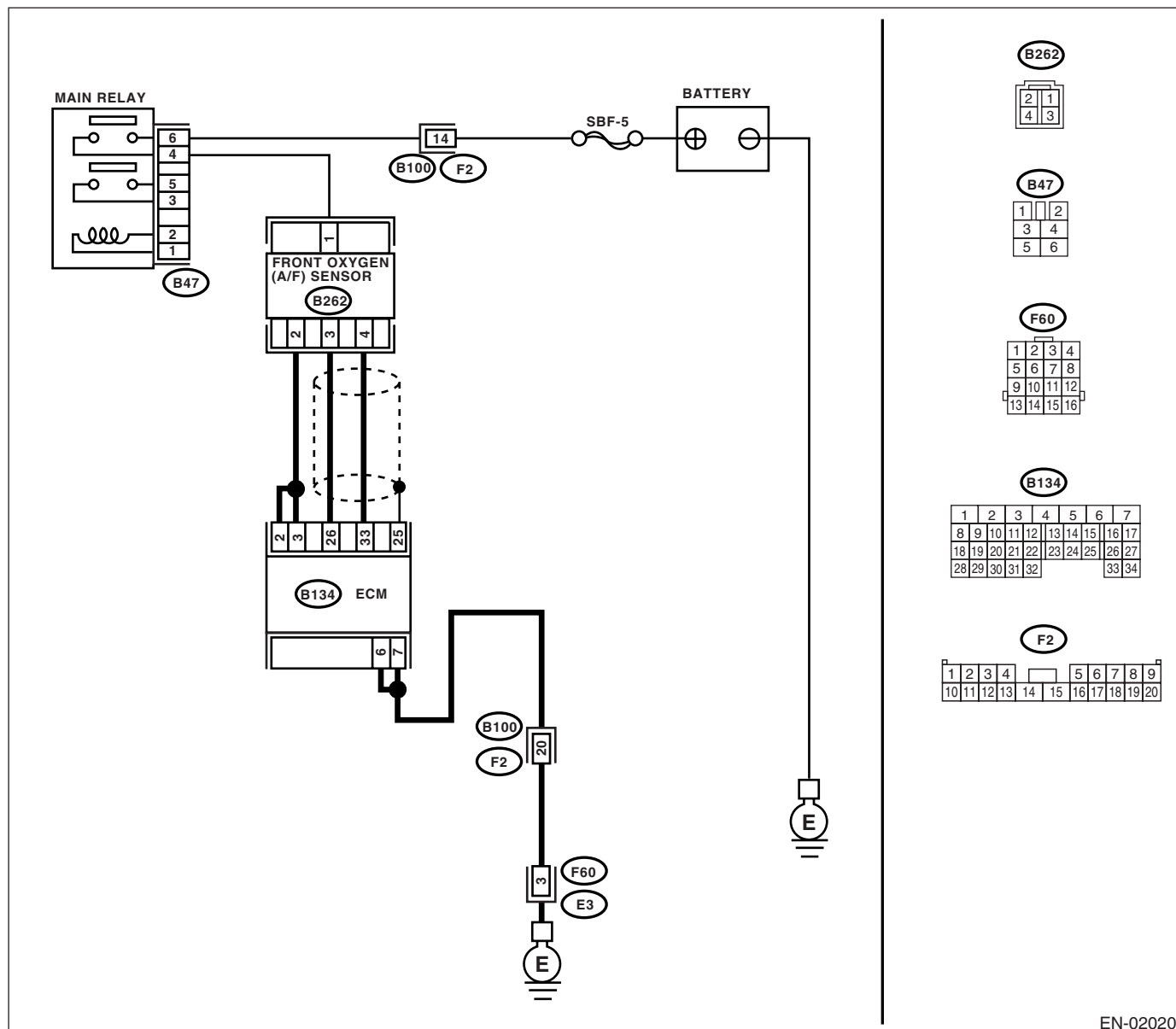
### Y: DTC P0132 — O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-56, DTC P0132 — O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                              | Check                         | Yes                                                                                        | No                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Disconnect the connectors from front oxygen (A/F) sensor.<br>3) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 (+) — Chassis ground (-):</b><br><b>(B134) No. 33 (+) — Chassis ground (-):</b> | Is the voltage more than 8 V? | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> | Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. |

### Z: DTC P0133 — O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

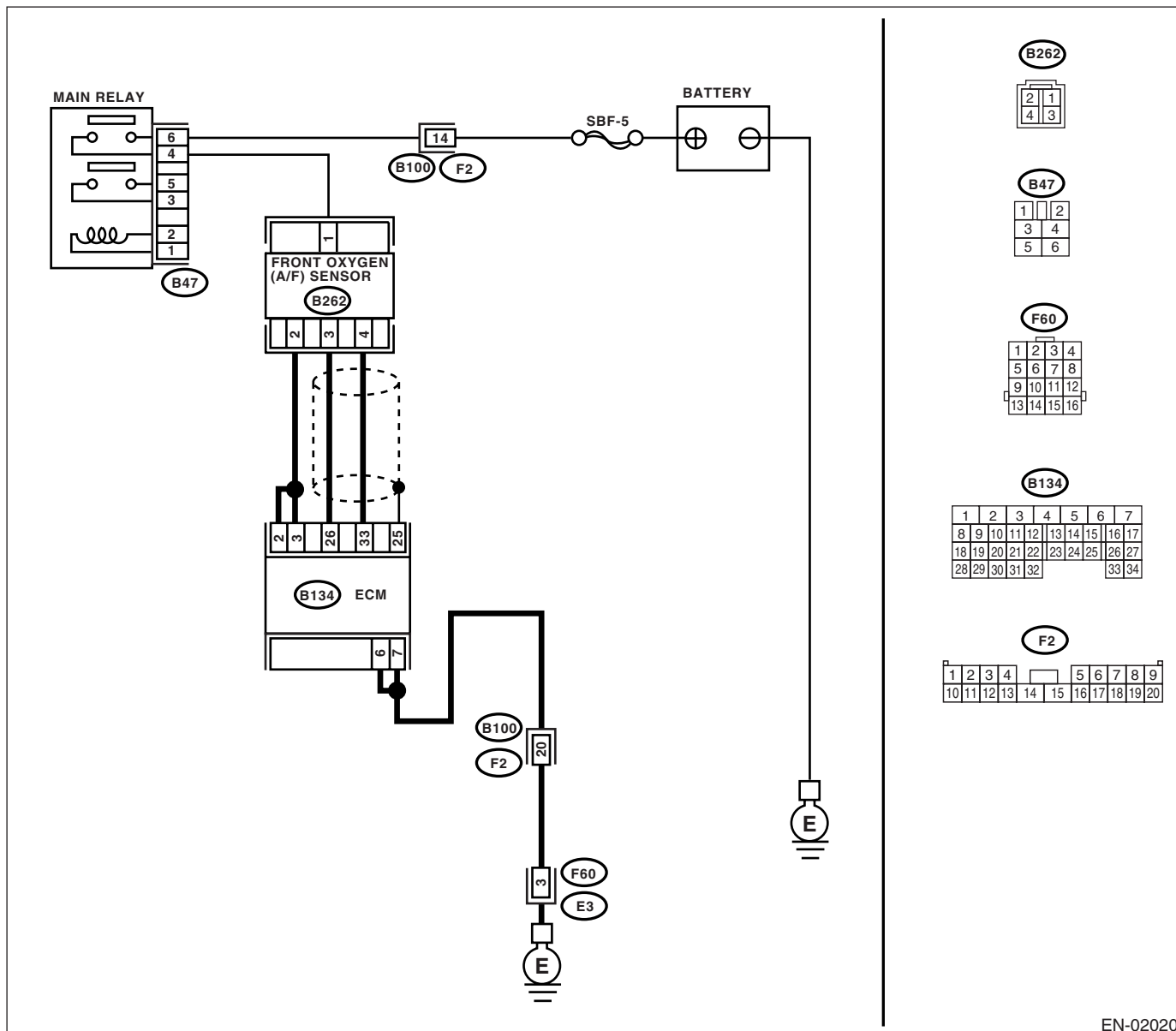
#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-58, DTC P0133 — O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                      | Check                               | Yes                                                                                                                                                                                                                | No                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                        | Is any other DTC displayed?         | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><b>NOTE:</b><br>In this case, it is not necessary to inspect DTC P0133. | Go to step 2.                                                                              |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br><b>NOTE:</b><br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of front portion of exhaust pipe onto cylinder heads</li><li>• Loose connection between front exhaust pipe and front catalytic converter</li><li>• Damage of exhaust pipe resulting in a hole</li></ul> | Is there a fault in exhaust system? | Repair the exhaust system.                                                                                                                                                                                         | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> |

### AA: DTC P0134 — O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

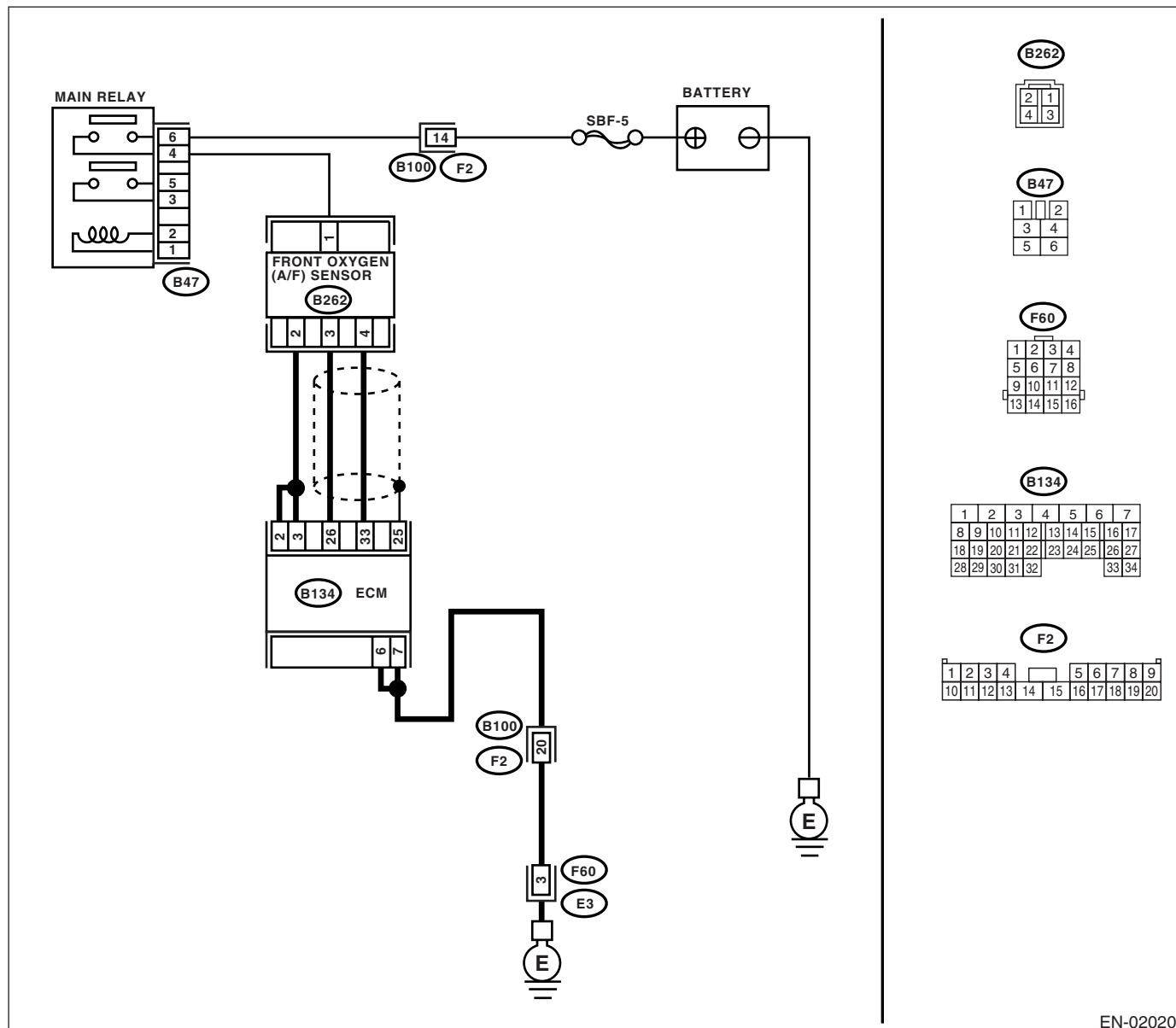
#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-61, DTC P0134 — O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                           | Check                                    | Yes                                                                                        | No                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — (B262) No. 3:</b><br><b>(B134) No. 33 — (B262) No. 4:</b> | Is the resistance less than 1 $\Omega$ ? | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> | Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector. |

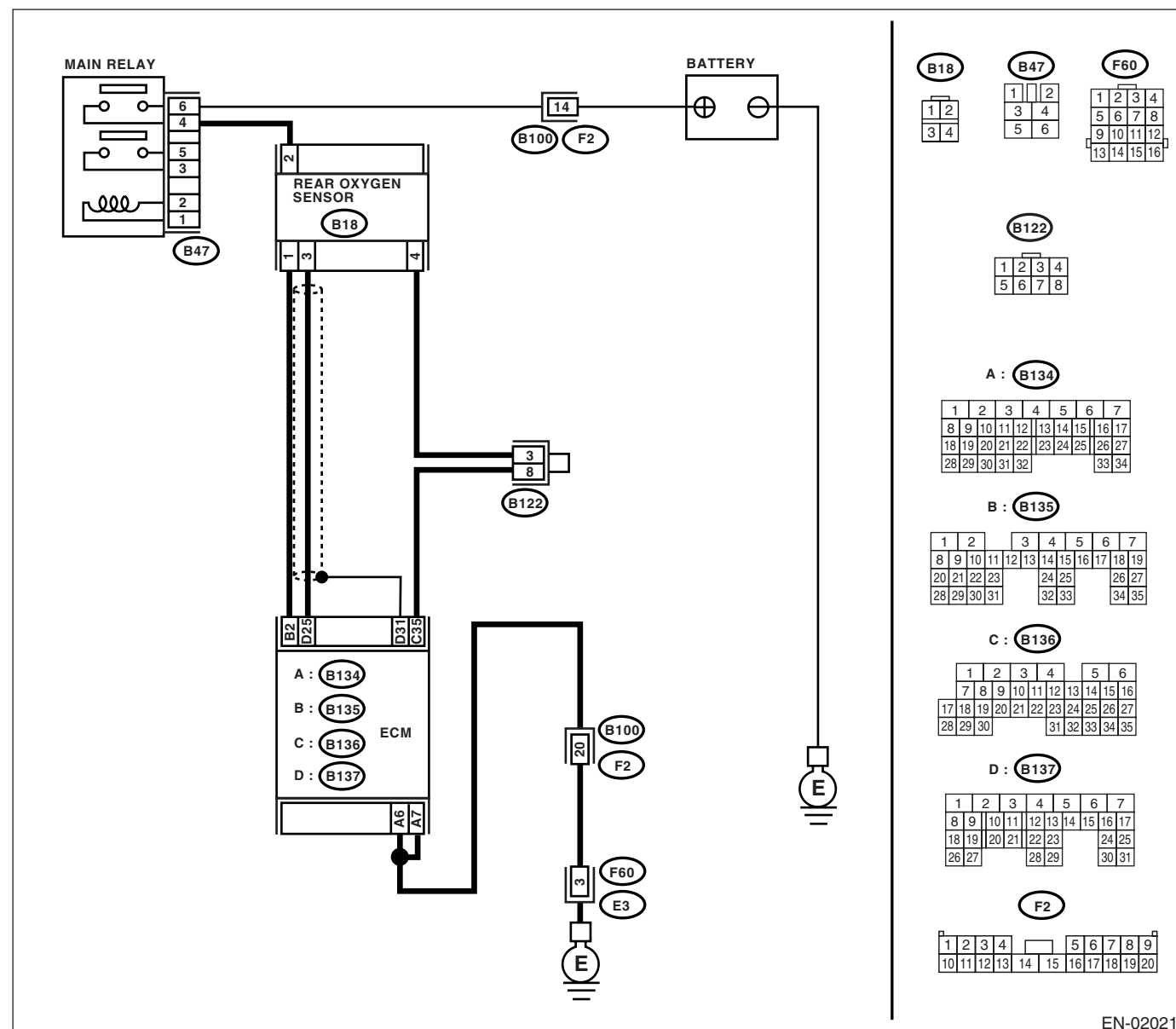
### AB:DTC P0137 — O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) — DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-63, DTC P0137 — O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02021

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Check                            | Yes                                                                                                                                         | No                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Is any other DTC displayed?      | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                                                                                                                                                                                           |
| <b>2</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes.<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Does the value fluctuate?        | Go to step 6.                                                                                                                               | Go to step 3.                                                                                                                                                                                                                                           |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Is the voltage 0.2 — 0.4 V?      | Go to step 4.                                                                                                                               | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.>                                                                                                                                                                         |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 25 — (B18) No. 3:</b>                                                                                                                                                                                                                                                                                      | Is the resistance more than 3 Ω? | Repair the open circuit in harness between ECM and rear oxygen sensor connector.                                                            | Go to step 5.                                                                                                                                                                                                                                           |
| <b>5</b><br><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B18) No. 3 (+) — Engine ground (-):</b>                                                                                                                                                                                                                           | Is the voltage more than 0.2 V?  | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.>                                                             | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between rear oxygen sensor and ECM connector<br>• Poor contact in rear oxygen sensor connector<br>• Poor contact in ECM connector |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                          | Check                               | Yes                                 | No                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check the exhaust system parts.<br><b>NOTE:</b><br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of portions</li><li>• Damage (crack, hole etc.) of parts</li><li>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li></ul> | Is there a fault in exhaust system? | Repair or replace the faulty parts. | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

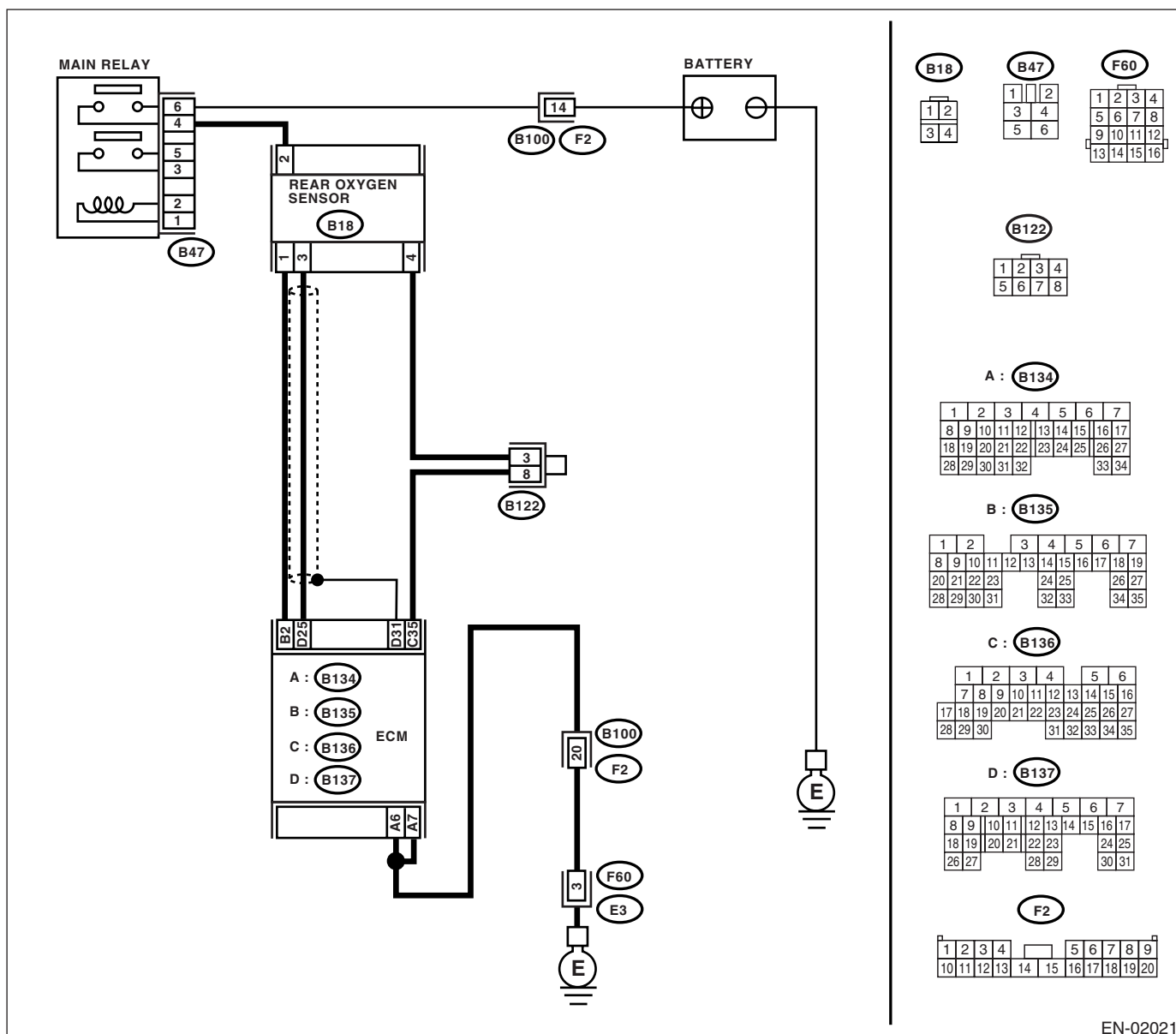
## AC:DTC P0138 — O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) — DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-65, DTC P0138 — O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02021

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Check                            | Yes                                                                                                                                         | No                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Is any other DTC displayed?      | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                                                                                                                                                                                           |
| <b>2</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes.<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Does the value fluctuate?        | Go to step 6.                                                                                                                               | Go to step 3.                                                                                                                                                                                                                                           |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Is the voltage 0.2 — 0.4 V?      | Go to step 4.                                                                                                                               | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.>                                                                                                                                                                         |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 25 — (B18) No. 3:</b>                                                                                                                                                                                                                                                                                      | Is the resistance more than 3 Ω? | Repair the open circuit in harness between ECM and rear oxygen sensor connector.                                                            | Go to step 5.                                                                                                                                                                                                                                           |
| <b>5</b><br><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B18) No. 3 (+) — Engine ground (-):</b>                                                                                                                                                                                                                           | Is the voltage more than 0.2 V?  | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.>                                                             | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between rear oxygen sensor and ECM connector<br>• Poor contact in rear oxygen sensor connector<br>• Poor contact in ECM connector |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                          | Check                               | Yes                                 | No                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check the exhaust system parts.<br><b>NOTE:</b><br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of portions</li><li>• Damage (crack, hole etc.) of parts</li><li>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li></ul> | Is there a fault in exhaust system? | Repair or replace the faulty parts. | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.> |

### AD:DTC P0139 — O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

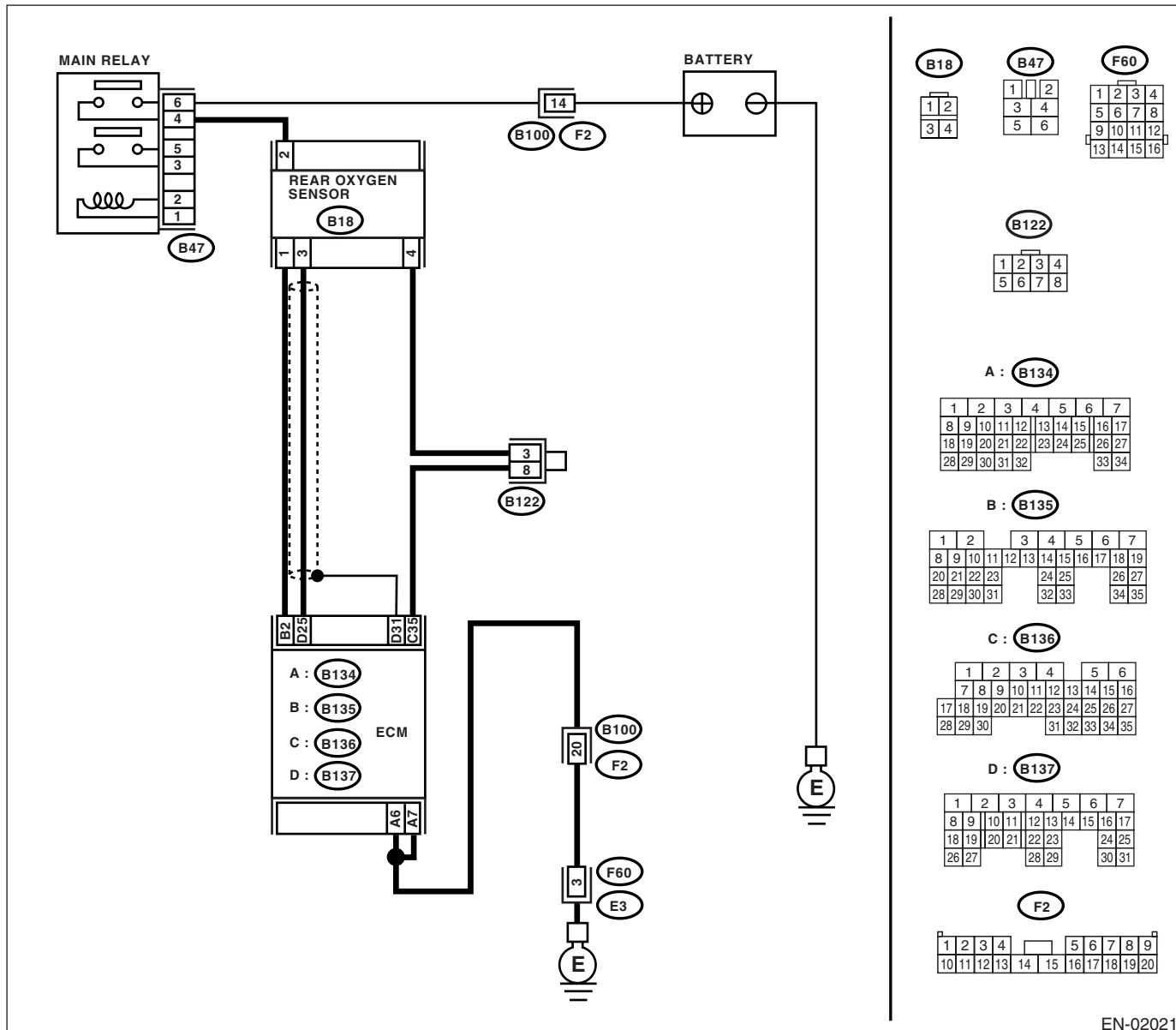
#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-67, DTC P0139 — O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02021

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                        | Check                       | Yes                                                                                                                                                                                                             | No                                                                              |
|---------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0139. | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.> |

**AE:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —****NOTE:**

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)-142, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### AF:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-70, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-73, DTC P0172 — SYSTEM TOO RICH (BANK 1) — , Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Check                                                                             | Yes                           | No                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK EXHAUST SYSTEM.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Are there holes or loose bolts on exhaust system?                                 | Repair the exhaust system.    | Go to step 2.                                                                                                                                                                                                                                                                           |
| 2<br><b>CHECK AIR INTAKE SYSTEM.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Are there holes, loose bolts or disconnection of hose on air intake system?       | Repair the air intake system. | Go to step 3.                                                                                                                                                                                                                                                                           |
| 3<br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b> <ul style="list-style-type: none"><li>• Place “NO FIRE” signs near the working area.</li><li>• Be careful not to spill fuel on the floor.</li></ul> <ol style="list-style-type: none"><li>1) Release the fuel pressure.<ol style="list-style-type: none"><li>(1) Disconnect the connector from fuel pump relay.</li><li>(2) Start the engine and run it until it stalls.</li><li>(3) After the engine stalls, crank it for 5 more seconds.</li><li>(4) Turn the ignition switch to OFF.</li></ol></li><li>2) Connect the connector to fuel pump relay.</li><li>3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge.</li><li>4) Install the fuel filler cap.</li><li>5) Start the engine and idle while gear position is neutral.</li><li>6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.</li></ol> <b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br><b>NOTE:</b><br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. | Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm <sup>2</sup> , 41 — 46 psi)? | Go to step 4.                 | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"><li>• Clogged fuel return line or bent hose</li></ul> Fuel pressure too low: <ul style="list-style-type: none"><li>• Improper fuel pump discharge</li><li>• Clogged fuel supply line</li></ul> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Check                                                                                                                                                                             | Yes           | No                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>4 CHECK FUEL PRESSURE.</b><br>After connecting the pressure regulator vacuum hose, measure fuel pressure.<br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul>                                                                                                                                                                                                                                                                                          | Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm <sup>2</sup> , 30 — 34 psi)?                                                                                                 | Go to step 5. | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>Faulty pressure regulator</li> <li>Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>Faulty pressure regulator</li> <li>Improper fuel pump discharge</li> <li>Clogged fuel supply line</li> </ul> |
| <b>5 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b><br>1) Start the engine and warm-up completely.<br>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b> <ul style="list-style-type: none"> <li>Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> <li>OBD-II general scan tool</li> </ul> For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.                                                                                                                                                                                                     | Is the temperature more than 60°C (140°F)?                                                                                                                                        | Go to step 6. | Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>                                                                                                                                                                                                                                                   |
| <b>6 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b><br>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br>2) Place the shift lever in neutral position.<br>3) Turn the A/C switch to OFF.<br>4) Turn all accessory switches to OFF.<br>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b> <ul style="list-style-type: none"> <li>Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> <li>OBD-II general scan tool</li> </ul> For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. | Is the measured value within the followings? Ignition ON:<br>73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)<br>Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg) | Go to step 7. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>                                                                                                                                                                                                                       |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Check                                                                                                    | Yes                                                                                                                                               | No                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>7</b><br><b>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b><br>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br>2) Place the shift lever in neutral position.<br>3) Turn the A/C switch to OFF.<br>4) Turn all accessory switches to OFF.<br>5) Open the front hood.<br>6) Measure the ambient temperature.<br>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. | Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (14 — 122°F)? | Contact your SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. | Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.> |

### AG:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

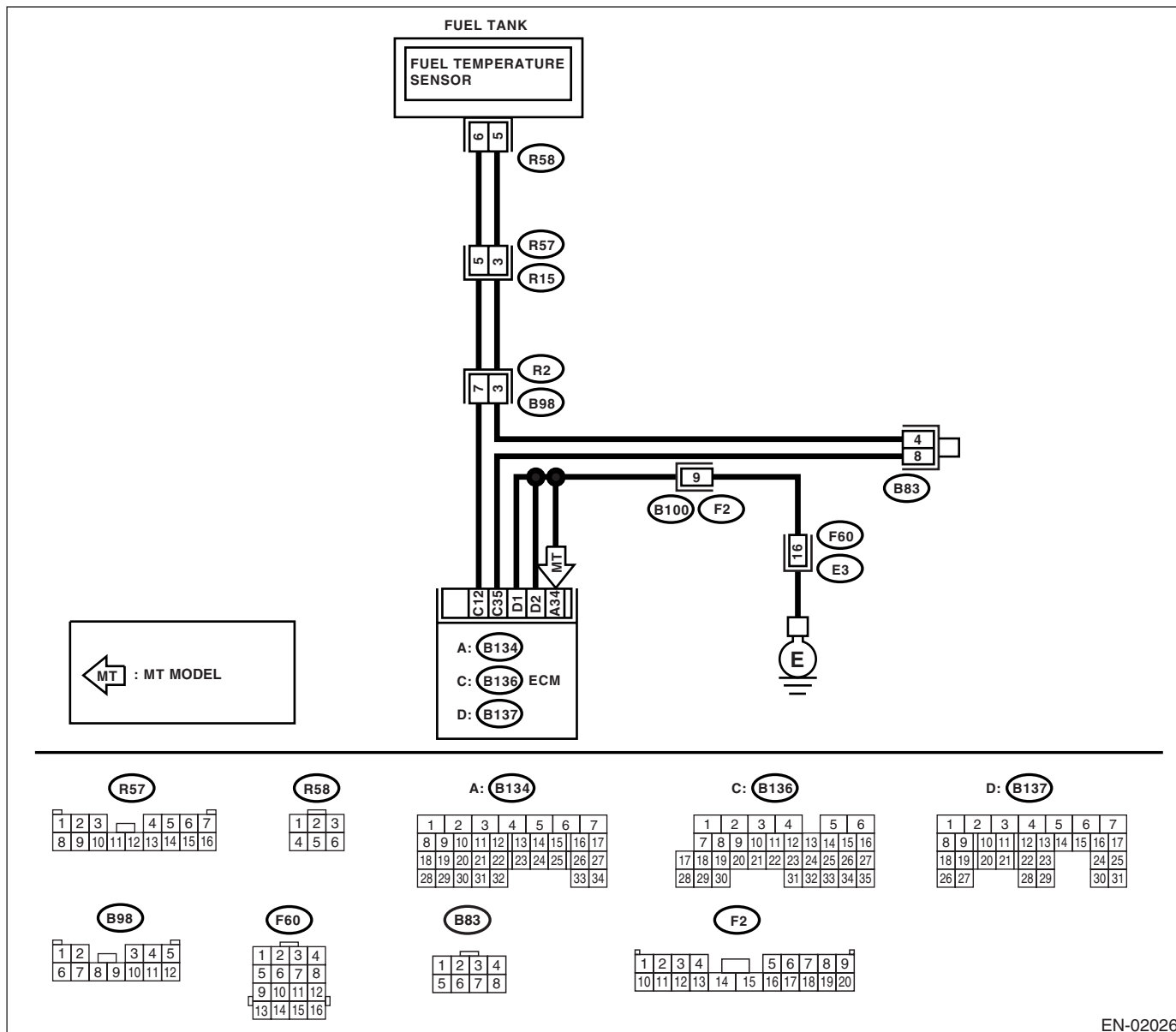
#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-76, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02026

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                        | Check                       | Yes                                                                                                                                                                                                              | No                                                                                    |
|---------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1<br><b>CHECK FOR OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0181. | Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.> |

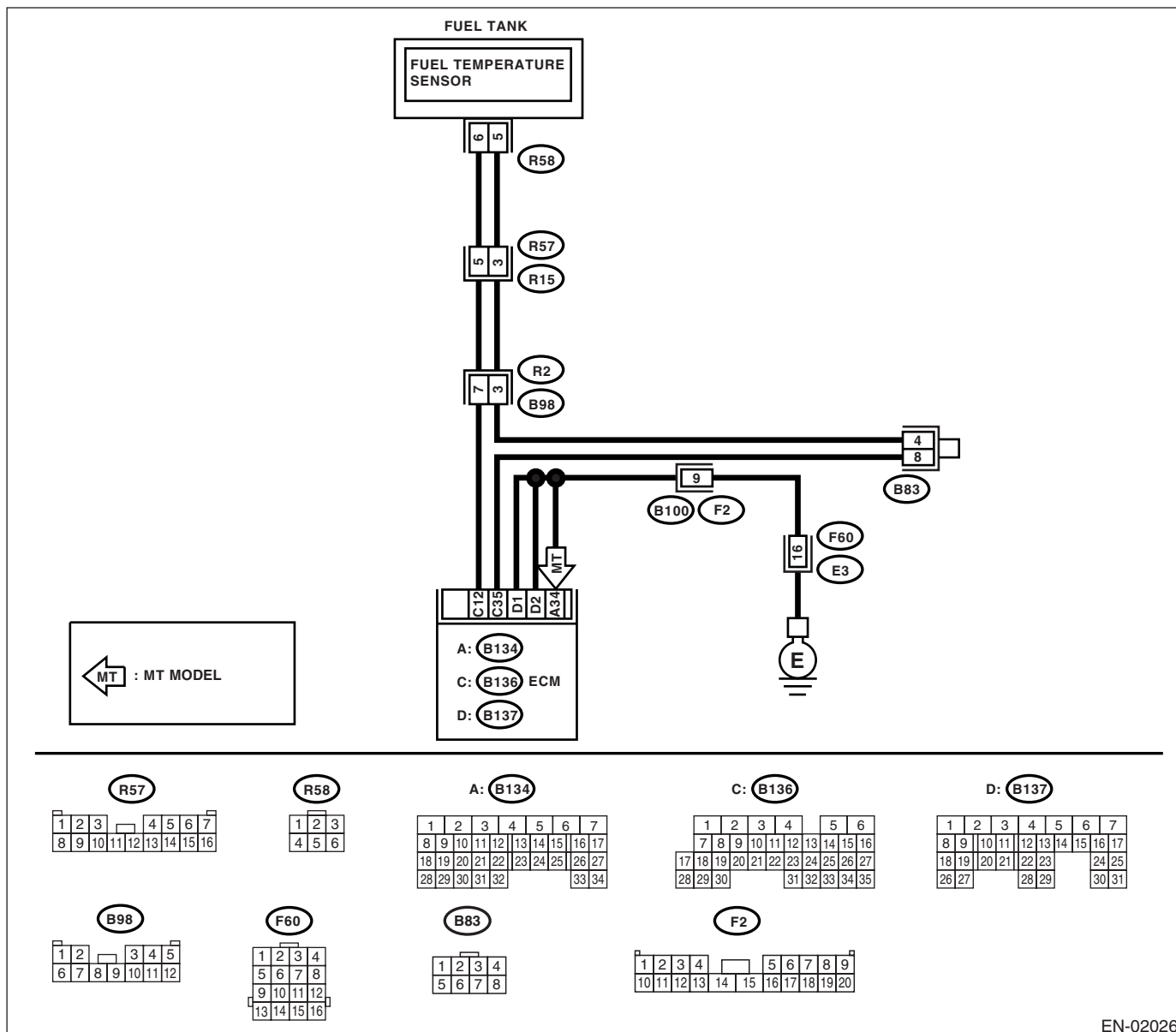
### AH:DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-79, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02026

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Check                                       | Yes                                                                                   | No                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.                                                                                                                               | Is the temperature more than 150°C (302°F)? | Go to step 2.                                                                         | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the access hole lid.<br>3) Disconnect the connector from fuel pump.<br>4) Turn ignition switch to ON.<br>5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the temperature less than -40°C (-40°F)? | Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.> | Repair short circuit to ground in harness between fuel pump and ECM connector.                                     |

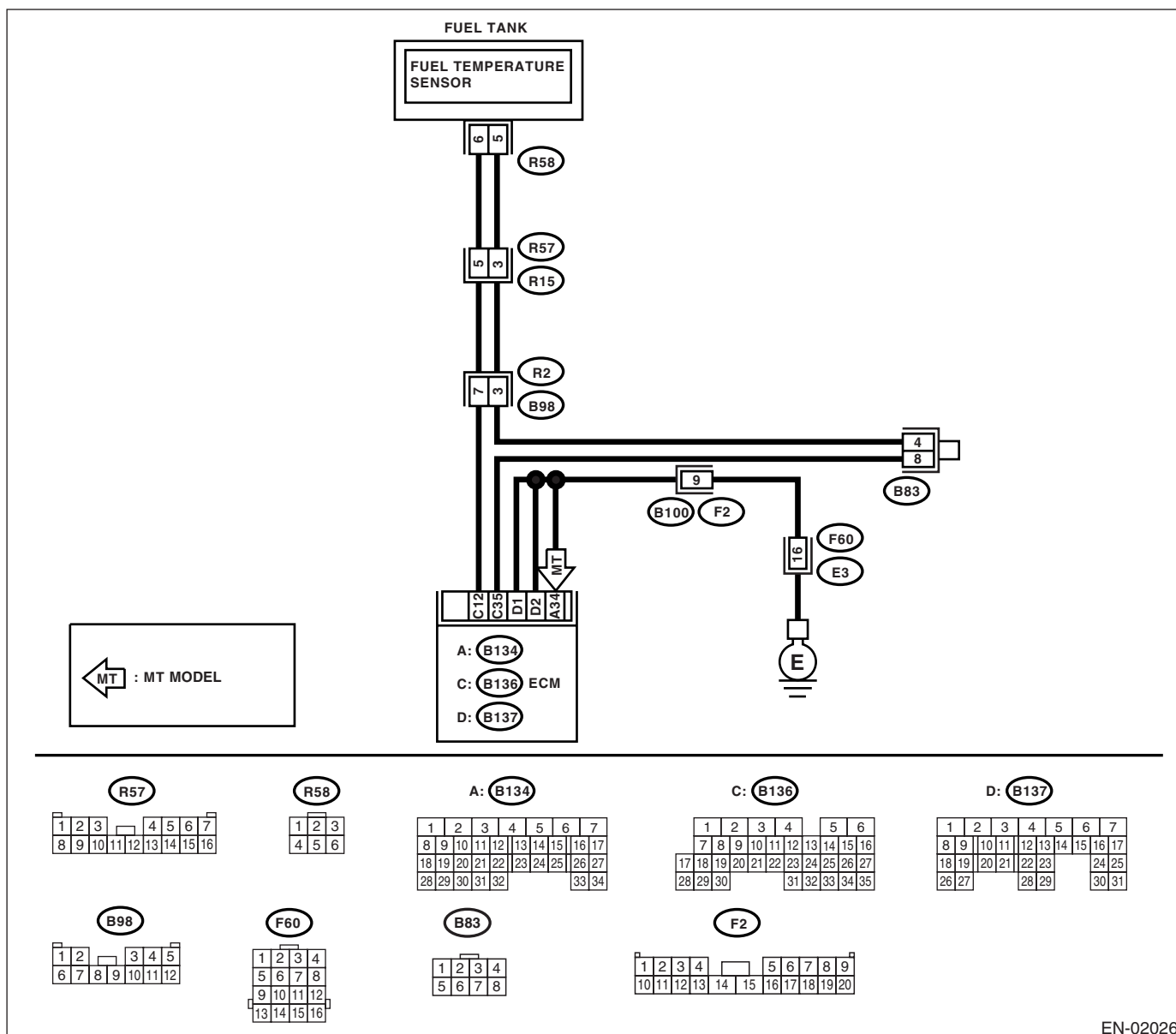
## AI: DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-81, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02026

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Check                                       | Yes                                                                             | No                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the temperature less than -40°C (-40°F)? | Go to step 2.                                                                   | Repair poor contact.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in fuel pump connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector<br>• Poor contact in joint connector                                      |
| <b>2</b><br><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the access hole lid.<br>3) Disconnect the connector from fuel pump.<br>4) Measure the voltage between fuel pump connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>                                                                                                                  | Is the voltage more than 10 V?              | Repair short circuit to battery in harness between ECM and fuel pump connector. | Go to step 3.                                                                                                                                                                                                                                                             |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between fuel pump connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>                                                                                                                                                                                                    | Is the voltage more than 10 V?              | Repair short circuit to battery in harness between ECM and fuel pump connector. | Go to step 4.                                                                                                                                                                                                                                                             |
| <b>4</b><br><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between fuel pump connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                         | Is the voltage more than 4 V?               | Go to step 5.                                                                   | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and fuel pump connector<br>• Poor contact in fuel pump connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                   | Check                                    | Yes                                                                                   | No                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>5</b><br><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between fuel pump connector and ECM.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 5 — (B136) No. 35:</b> | Is the resistance less than 1 $\Omega$ ? | Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.> | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open circuit in harness between ECM and fuel pump connector</li><li>• Poor contact in fuel pump connector</li><li>• Poor contact in ECM connector</li><li>• Poor contact in coupling connector</li><li>• Poor contact in joint connector</li></ul> |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

---

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

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-83, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

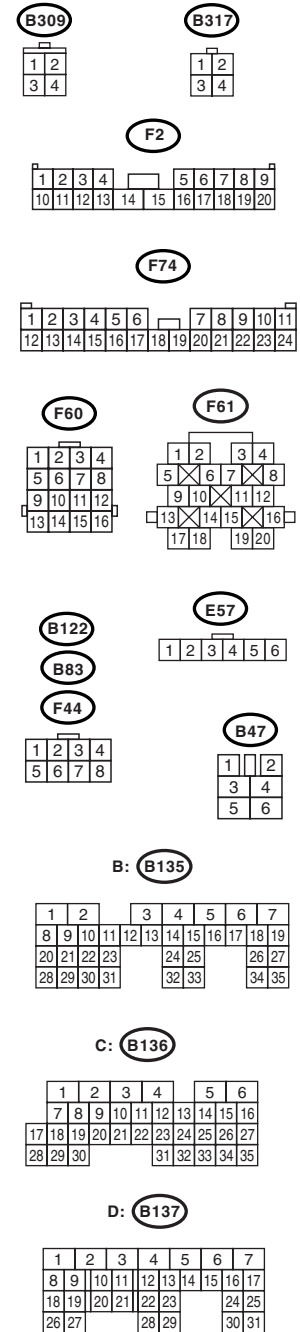
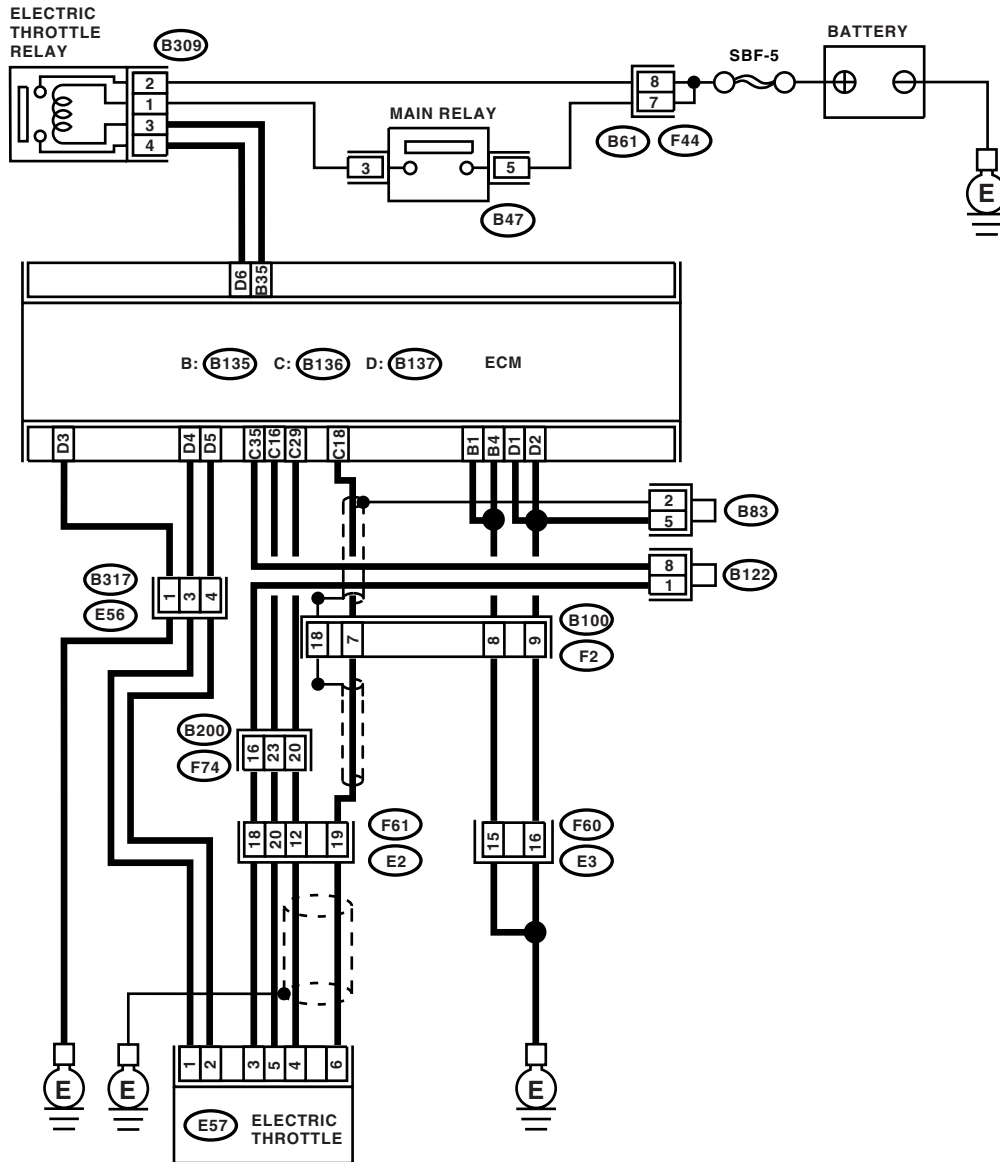
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                             | Check                                                                      | Yes                                                                                                         | No                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 29 (+) — (B136) No. 35 (-):</b><br>3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electric throttle connector harness while monitoring value of voltage meter.      | Is the voltage more than 0.8 V?                                            | Go to step 2.                                                                                               | Go to step 3.                                                                                                                          |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in the connectors between the ECM and electric throttle.                                                                                                                                                                                                                                                                        | Is there poor contact in the connectors between ECM and electric throttle? | Repair the poor contact in connectors.                                                                      | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                 |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electric throttle.<br>4) Measure the resistance between the ECM connector and electric throttle connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 — (E57) No. 5:</b>                               | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 4.                                                                                               | Repair the open circuit of harness connector.                                                                                          |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>Check the resistance between the ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 29 — Chassis ground:</b><br><b>(B136) No. 16 — Chassis ground:</b>                                                                                                                                           | Is the resistance more than 1 M $\Omega$ ?                                 | Go to step 5.                                                                                               | Repair the chassis short of harness.                                                                                                   |
| <b>5 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage 4.5 — 5.5 V?                                                | Go to step 6.                                                                                               | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>  |
| <b>6 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 4 — Engine ground:</b>                                                                                                                                                                | Is the resistance more than 10 $\Omega$ ?                                  | Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle. | Repair the poor contact in ECM connectors. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |

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

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

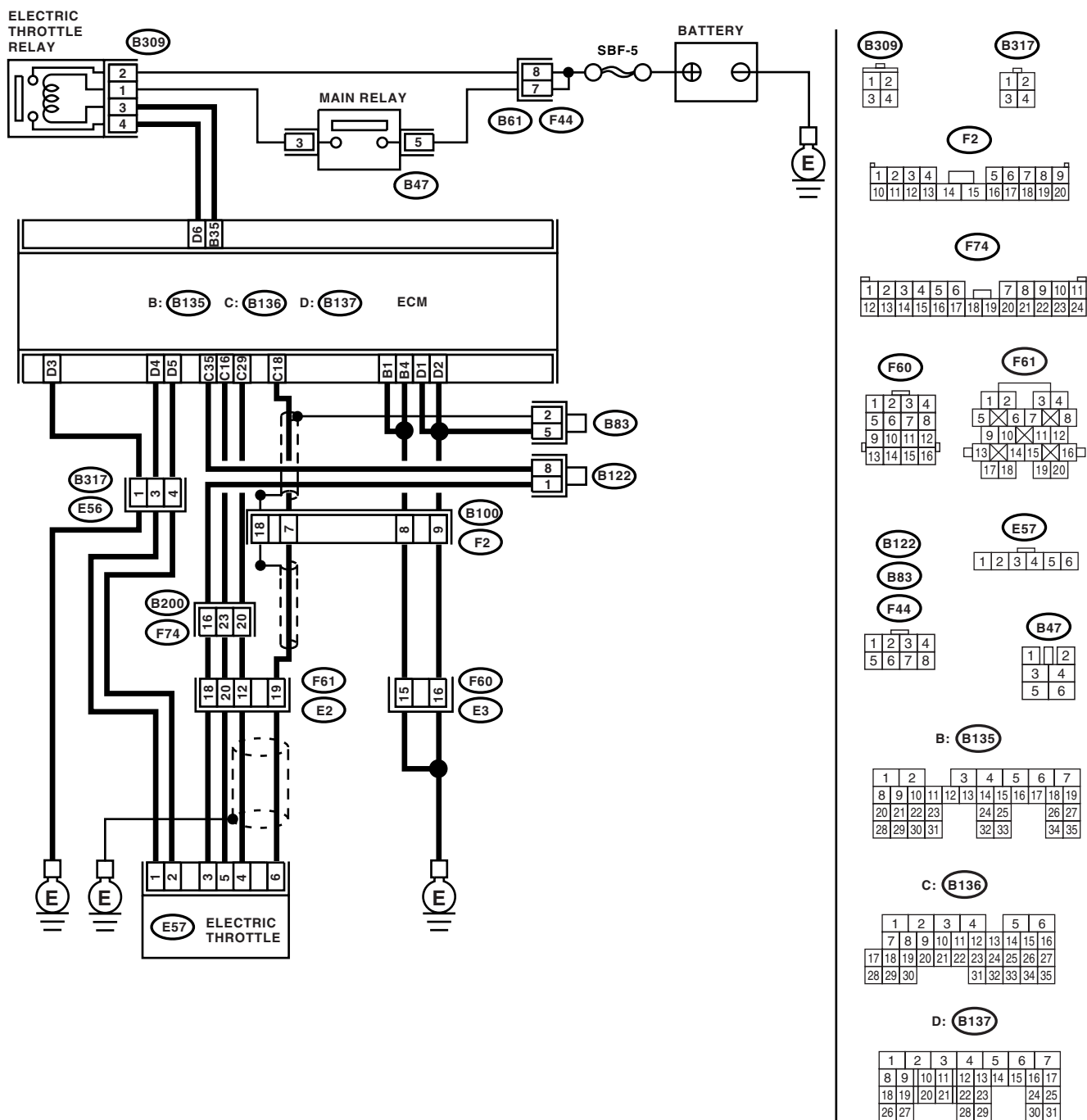
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                       | Check                                                                      | Yes                                    | No                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.                                                                                     | Is the voltage less than 4.73 V?                                           | Go to step 2.                          | Go to step 3.                                                                                                                             |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electric throttle.                                                                                                                                                                                                                                                                                          | Is there poor contact in the connectors between ECM and electric throttle? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                    |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Disconnect the connectors from electric throttle.<br>4) Measure the resistance between ECM connector and electric throttle connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 35 — (E57) No. 3:</b><br><b>(B136) No. 29 — (E57) No. 4:</b>    | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 4.                          | Repair the open circuit of harness connector.                                                                                             |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between the electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 3 — Engine ground:</b>                                                                                                                                               | Is the resistance less than 5 $\Omega$ ?                                   | Go to step 5.                          | Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 — Engine ground:</b><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage more than 10 V?                                             | Go to step 6.                          | Repair the battery short of harness between ECM connector and electric throttle connector.                                                |
| <b>6 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Measure the voltage between the electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 4 (+) — Engine ground (-):</b><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                                                            | Is the voltage less than 10 V?                                             | Go to step 7.                          | Repair the short of harness between ECM connector and electric throttle connector.                                                        |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                          | Check                                      | Yes                                                                                                         | No                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| <b>7</b><br><b>CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the voltage between connectors.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 29 — (B136) No. 16:</b> | Is the resistance more than 1 M $\Omega$ ? | Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle. | Short circuit of sensor power supply may be the cause. |

### AL:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

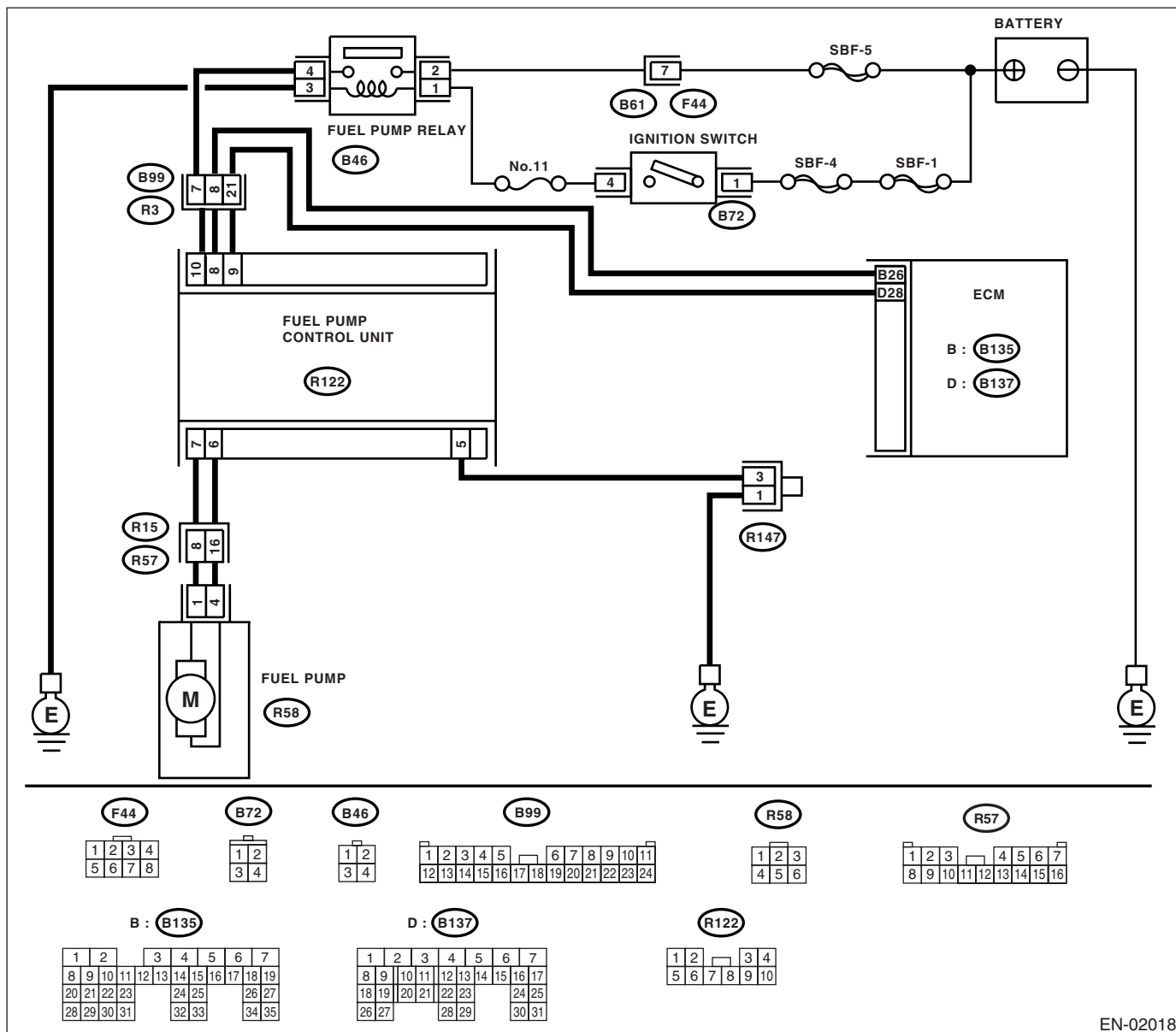
#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-87, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02018

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                | Check                                      | Yes           | No                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel pump control unit.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between fuel pump control unit and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R122) No. 10 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?             | Go to step 2. | Repair the power supply circuit.<br><b>NOTE:</b><br>In this case repair the following:<br>• Open or ground short circuit in harness between fuel pump relay and fuel pump control unit<br>• Poor contact in fuel pump control unit connector<br>• Poor contact in fuel pump relay connector |
| <b>2</b><br><b>CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between fuel pump control unit and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R122) No. 5 — Chassis ground:</b>                                                                                                    | Is the resistance less than 5 $\Omega$ ?   | Go to step 3. | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit between fuel pump control unit and chassis ground<br>• Poor contact in fuel pump control unit connector                                                                          |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.</b><br>1) Disconnect the connector from fuel pump.<br>2) Measure the resistance of harness between fuel pump control unit and fuel pump connector.<br><b>Connector &amp; terminal</b><br><b>(R122) No. 7 — (R58) No. 1:</b><br><b>(R122) No. 6 — (R58) No. 4:</b>                              | Is the resistance less than 1 $\Omega$ ?   | Go to step 4. | Repair the open circuit between fuel pump control unit and fuel pump.                                                                                                                                                                                                                       |
| <b>4</b><br><b>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.</b><br>Measure the resistance of harness between fuel pump control unit and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R122) No. 7 — Chassis ground:</b><br><b>(R122) No. 6 — Chassis ground:</b>                                                                               | Is the resistance more than 1 M $\Omega$ ? | Go to step 5. | Repair the ground short circuit between fuel pump control unit and fuel pump.                                                                                                                                                                                                               |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                  | Check                                                              | Yes                                                                                                                | No                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>5 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between fuel pump control unit and ECM connector.<br><b>Connector &amp; terminal</b><br><b>(R122) No. 9 — (B137) No. 28:</b><br><b>(R122) No. 8 — (B135) No. 26:</b> | Is the resistance less than 1 $\Omega$ ?                           | Go to step 6.                                                                                                      | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit between fuel pump control unit and ECM</li> <li>• Poor contact in fuel pump control unit and ECM connector</li> </ul> |
| <b>6 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.</b><br>Measure the resistance of harness between fuel pump control unit and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R122) No. 9 — Chassis ground:</b><br><b>(R122) No. 8 — Chassis ground:</b>                                                                                 | Is the resistance more than 1 M $\Omega$ ?                         | Go to step 7.                                                                                                      | Repair the ground short circuit between fuel pump control unit and ECM.                                                                                                                                                                                                 |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in ECM and fuel pump control unit connector.                                                                                                                                                                                                                                                                       | Is there poor contact in ECM and fuel pump control unit connector? | Repair the poor contact in ECM and fuel pump control unit.                                                         | Go to step 8.                                                                                                                                                                                                                                                           |
| <b>8 CHECK EXPERIENCE OF OUT OF GAS.</b>                                                                                                                                                                                                                                                                                                                              | Have the vehicle been out of gas before?                           | Complete the diagnosis.<br><b>NOTE:</b><br>DTC may be recorded due to the idle running of fuel pump at out of gas. | Replace the fuel pump control unit.<br><Ref. to FU(H4DOTC)-45, Fuel Pump Control Unit.>                                                                                                                                                                                 |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-89, DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

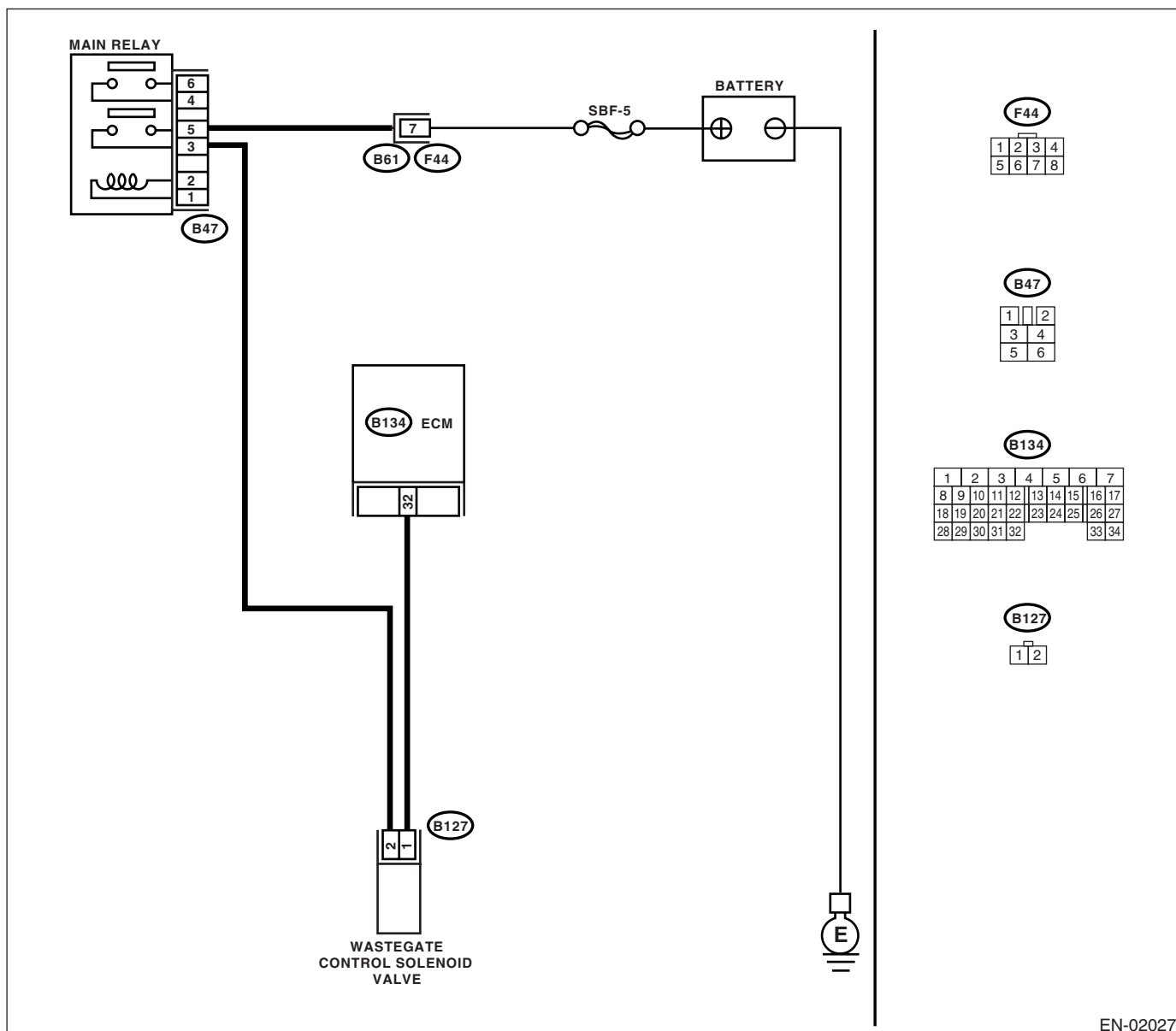
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02027

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                        | Check                       | Yes                                                                                                                                                                                                             | No                                                                                                          |
|---------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0244. | Replace the wastegate control solenoid valve.<br><Ref. to FU(H4DOTC)-36, Wastegate Control Solenoid Valve.> |

**AN:DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A”  
LOW —**

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-91, DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

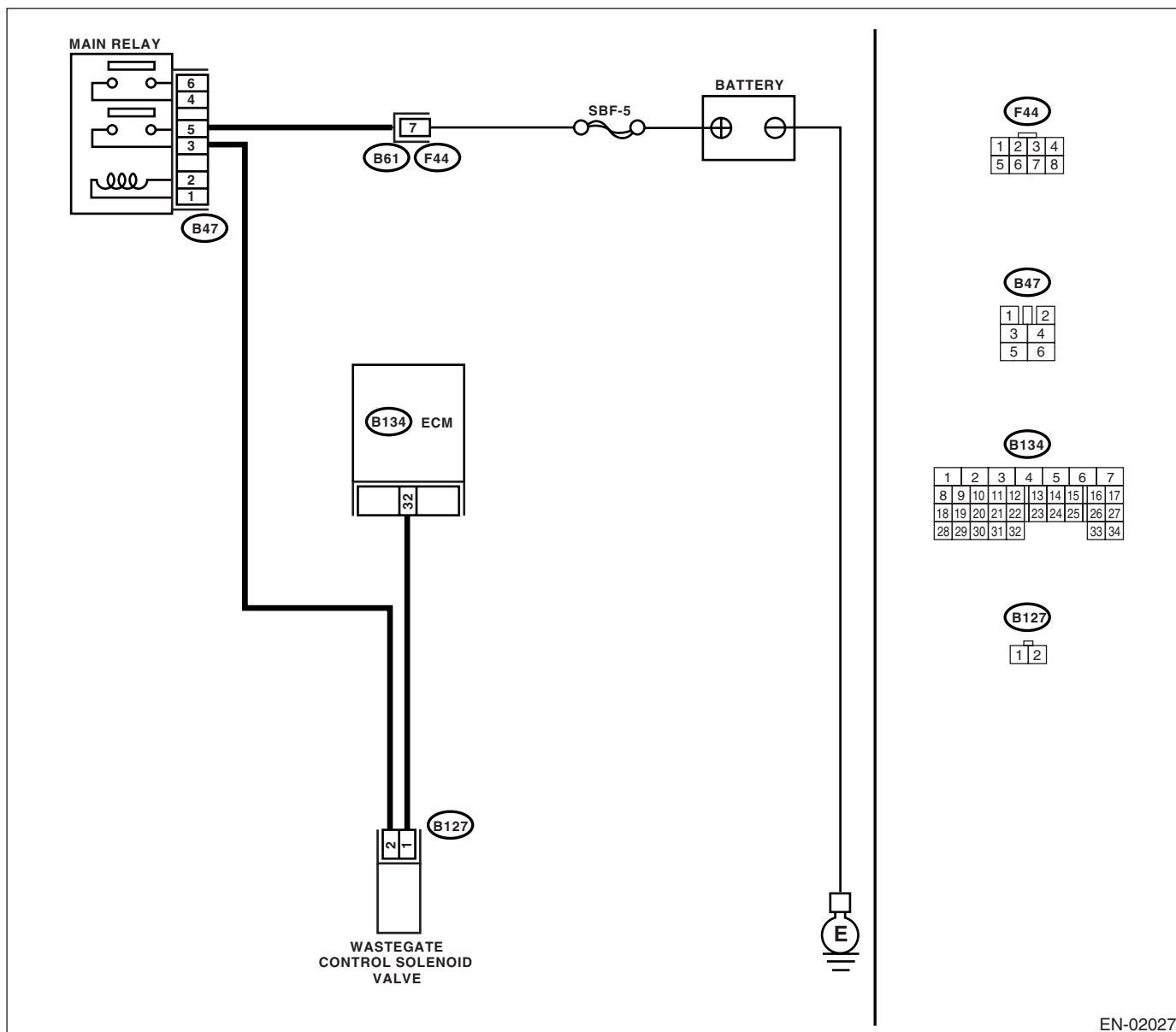
**TROUBLE SYMPTOM:**

Erroneous idling

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02027

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                        | Check                                                                | Yes                                                                                                         | No                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 32 (+) — Chassis ground (-):</b>                                                                                                                                                                       | Is the voltage more than 10 V?                                       | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. | Go to step 2.                                                                                                                                                                                                                                     |
| <b>2</b><br><b>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from wastegate control solenoid valve and ECM.<br>3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B127) No. 1 — Engine ground:</b> | Is the resistance less than 10 $\Omega$ ?                            | Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.      | Go to step 3.                                                                                                                                                                                                                                     |
| <b>3</b><br><b>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 32 — (B127) No. 1:</b>                                                                                                                         | Is the resistance less than 1 $\Omega$ ?                             | Go to step 4.                                                                                               | Repair the open circuit in harness between ECM and wastegate control solenoid valve connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and wastegate control solenoid valve connector |
| <b>4</b><br><b>CHECK WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Remove the wastegate control solenoid valve.<br>2) Measure the resistance between wastegate control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                 | Is the resistance 30 — 40 $\Omega$ ?                                 | Go to step 5.                                                                                               | Replace the wastegate control solenoid valve.<br><Ref. to FU(H4DOTC)-36, Wastegate Control Solenoid Valve.>                                                                                                                                       |
| <b>5</b><br><b>CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between wastegate control solenoid valve and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B127) No. 2 (+) — Engine ground (-):</b>                                                                                                                   | Is the voltage more than 10 V?                                       | Go to step 6.                                                                                               | Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.                                                                                                                                             |
| <b>6</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in wastegate control solenoid valve connector.                                                                                                                                                                                                                                                                                                 | Is there poor contact in wastegate control solenoid valve connector? | Repair the poor contact in wastegate control solenoid valve connector.                                      | Contact your SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                                                                 |

## ENGINE (DIAGNOSTICS)

**DTC DETECTING CONDITION:**

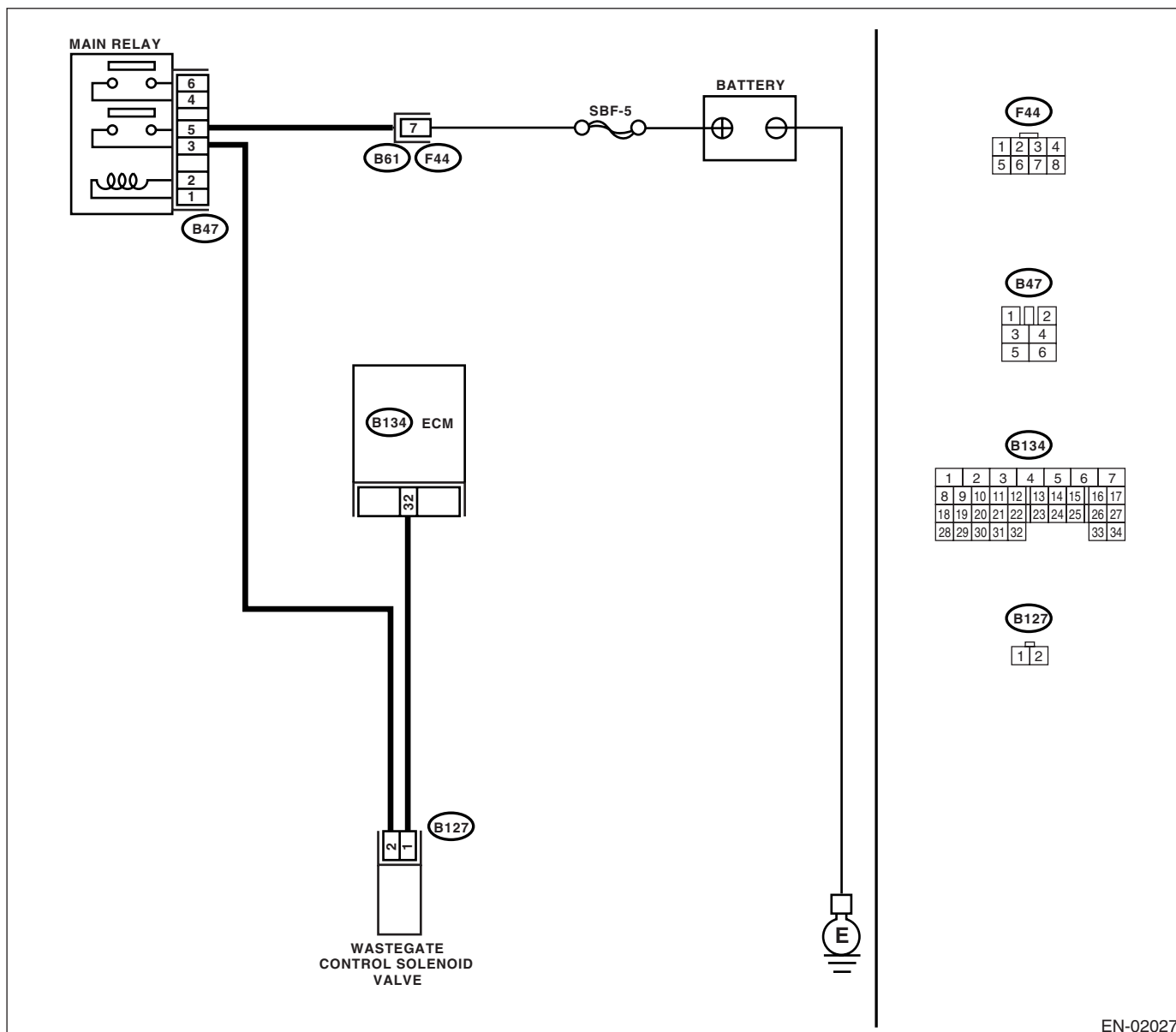
- TROUBLE SYMPTOM:**

## Erroneous idling

**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                           | Check                                    | Yes                                                                                                                                                                                          | No                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 32 (+) — Chassis ground (-):</b>                                                                                                                                                          | Is the voltage more than 10 V?           | Go to step 3.                                                                                                                                                                                | Go to step 2.                                                          |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                 | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.                                                                                                                                                    | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from wastegate control solenoid valve.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 32 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Go to step 4.                                                          |
| <b>4</b><br><b>CHECK WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between wastegate control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                | Is the resistance less than 1 $\Omega$ ? | Replace the wastegate control solenoid valve <Ref. to FU(H4DOTC)-36, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                        | Go to step 5.                                                          |
| <b>5</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                 | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.                                                                                                                                                    | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

---

### **AP:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —**

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-169, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **AQ:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —**

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-169, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **AR:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —**

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-169, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**AS:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —****DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-95, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**TROUBLE SYMPTOM:**

- Engine stalls.
- Erroneous idling
- Rough driving

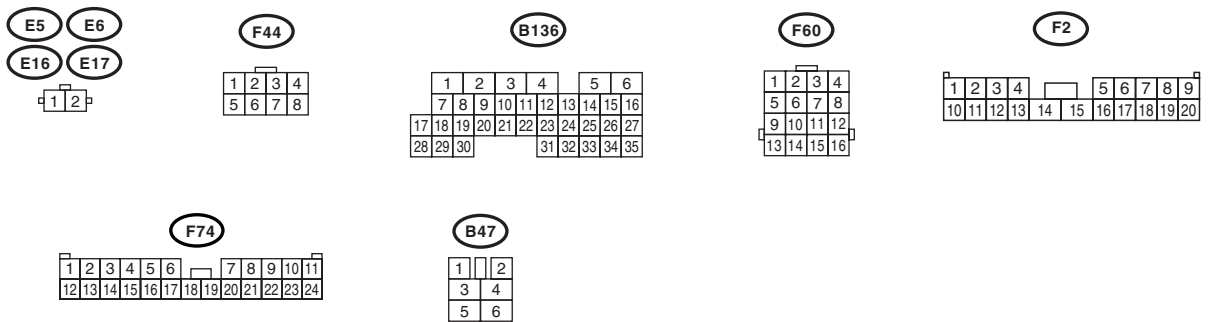
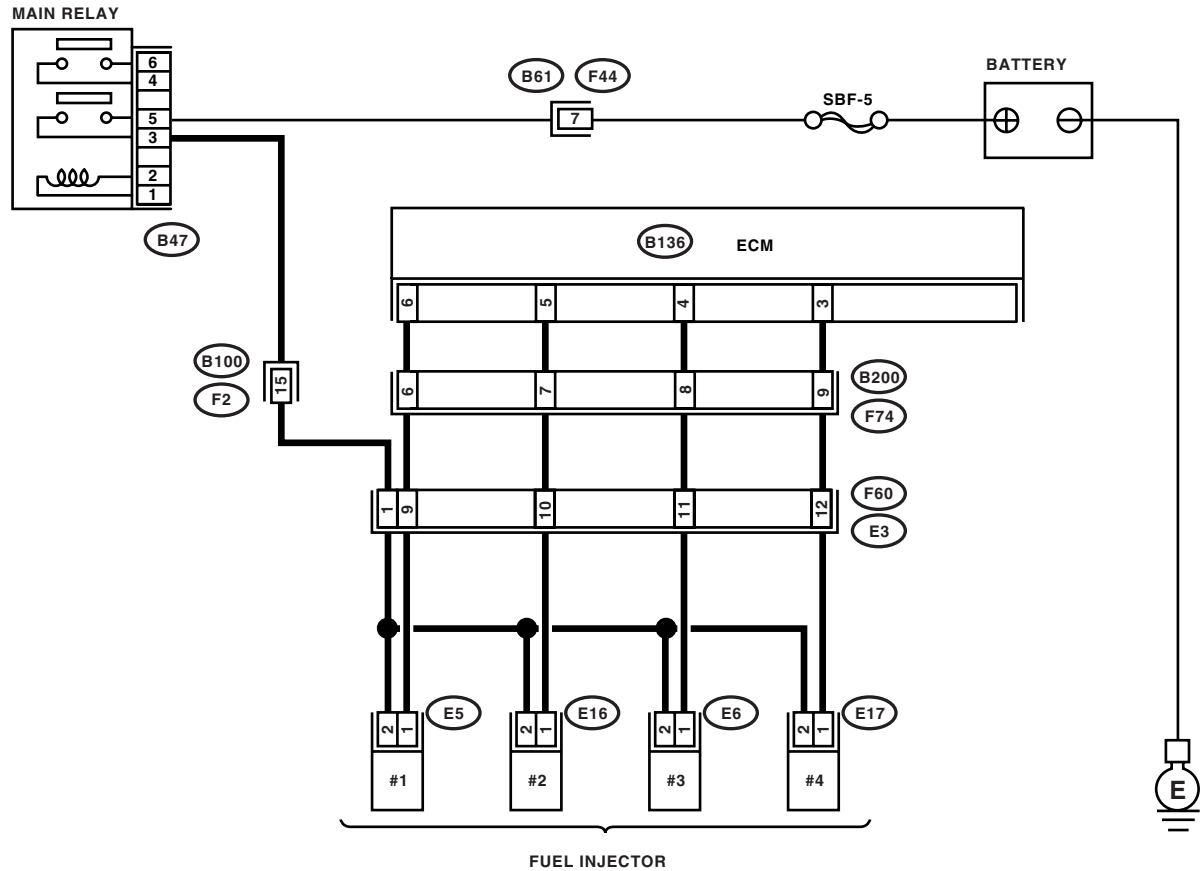
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02019

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Check                             | Yes                                                                                                                                     | No                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Is any other DTC displayed?       | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                                                                                                                                         |
| 2<br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (B136) No. 6 (+) — Chassis ground (-):</b><br><b>#2 (B136) No. 5 (+) — Chassis ground (-):</b><br><b>#3 (B136) No. 4 (+) — Chassis ground (-):</b><br><b>#4 (B136) No. 3 (+) — Chassis ground (-):</b>                                                                                                   | Is the voltage more than 10 V?    | Go to step 7.                                                                                                                           | Go to step 3.                                                                                                                                                                                         |
| 3<br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel injector on faulty cylinders.<br>3) Disconnect the connector from ECM.<br>4) Measure the resistance between ECM connector and engine ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (E5) No. 1 — Engine ground:</b><br><b>#2 (E16) No. 1 — Engine ground:</b><br><b>#3 (E6) No. 1 — Engine ground:</b><br><b>#4 (E17) No. 1 — Engine ground:</b> | Is the resistance more than 1 MΩ? | Go to step 4.                                                                                                                           | Repair the ground short circuit in harness between fuel injector and ECM connector.                                                                                                                   |
| 4<br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (B136) No. 6 — (E5) No. 1:</b><br><b>#2 (B136) No. 5 — (E16) No. 1:</b><br><b>#3 (B136) No. 4 — (E6) No. 1:</b><br><b>#4 (B136) No. 3 — (E17) No. 1:</b>                                                                                                                                          | Is the resistance less than 1 Ω?  | Go to step 5.                                                                                                                           | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and fuel injector connector<br>• Poor contact in coupling connector |
| 5<br><b>CHECK FUEL INJECTOR.</b><br>Measure the resistance between fuel injector terminals on faulty cylinder.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                                                                                                                                                                  | Is the resistance 5 — 20 Ω?       | Go to step 6.                                                                                                                           | Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-32, Fuel Injector.>                                                                                                                             |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Check                                                                            | Yes                                                                                                                                                             | No                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK POWER SUPPLY LINE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between fuel injector and engine ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (E5) No. 2 (+) — Engine ground (-):</b><br><b>#2 (E16) No. 2 (+) — Engine ground (-):</b><br><b>#3 (E6) No. 2 (+) — Engine ground (-):</b><br><b>#4 (E17) No. 2 (+) — Engine ground (-):</b>                                                                                                                                                       | Is the voltage more than 10 V?                                                   | Repair the poor contact in all connectors in fuel injector circuit.                                                                                             | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel injector connector on faulty cylinders</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> <li>• Poor contact in fuel injector connector on faulty cylinders</li> </ul> |
| <b>7</b><br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel injector on faulty cylinder.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (B136) No. 6 (+) — Chassis ground (-):</b><br><b>#2 (B136) No. 5 (+) — Chassis ground (-):</b><br><b>#3 (B136) No. 4 (+) — Chassis ground (-):</b><br><b>#4 (B136) No. 3 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                                                   | Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Go to step 8.                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>8</b><br><b>CHECK FUEL INJECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between fuel injector terminals on faulty cylinder.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                                                                                                                                                            | Is the resistance less than 1 $\Omega$ ?                                         | Replace the faulty fuel injector <Ref. to FU(H4DOTC)-32, Fuel Injector.> and ECM <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                          | Go to step 9.                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>9</b><br><b>CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Is the camshaft position sensor or crankshaft position sensor loosely installed? | Tighten the camshaft position sensor or crankshaft position sensor.                                                                                             | Go to step 10.                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>10</b><br><b>CHECK CRANK SPROCKET.</b><br>Remove the timing belt cover.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Is the crank sprocket rusted or does it have broken teeth?                       | Replace the crank sprocket. <Ref. to ME(H4DOTC)-60, Crank Sprocket.>                                                                                            | Go to step 11.                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>11</b><br><b>CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br>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)-50, Timing Belt Assembly.>                                                                | Go to step 12.                                                                                                                                                                                                                                                                                                                                                                                               |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                 | Check                                                          | Yes                                                                                                                                                                                                                                                                            | No                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>12</b> <b>CHECK FUEL LEVEL.</b>                                                                                                                                                                                                   | Is the fuel meter indication higher than the "Lower" level?    | Go to step <b>13</b> .                                                                                                                                                                                                                                                         | Replenish the fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel; Go to step <b>13</b> .                                                                                                                                                                                                                |
| <b>13</b> <b>CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.</b><br>1) Clear the memory using Subaru Select Monitor.<br><Ref. to EN(H4DOTC)-44, Clear Memory Mode.><br>2) Start the engine, and drive the vehicle more than 10 minutes. | Is the malfunction indicator light coming on or blinking?      | Go to step <b>15</b> .                                                                                                                                                                                                                                                         | Go to step <b>14</b> .                                                                                                                                                                                                                                                                                                                       |
| <b>14</b> <b>CHECK CAUSE OF MISFIRE DIAGNOSED.</b>                                                                                                                                                                                   | Was the cause of misfire diagnosed when the engine is running? | Finish the diagnostics operation, if the engine has no abnormality.                                                                                                                                                                                                            | Repair the poor contact.<br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in ignition coil connector</li> <li>• Poor contact in fuel injector connector on faulty cylinders</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>15</b> <b>CHECK AIR INTAKE SYSTEM.</b>                                                                                                                                                                                            | Is there a fault in air intake system?                         | Repair the air intake system.<br><b>NOTE:</b><br>Check the following items:<br><ul style="list-style-type: none"> <li>• Are there air leaks or air suction caused by loose or dislocated nuts and bolts?</li> <li>• Are there cracks or any disconnection of hoses?</li> </ul> | Go to step <b>16</b> .                                                                                                                                                                                                                                                                                                                       |
| <b>16</b> <b>CHECK CYLINDER.</b>                                                                                                                                                                                                     | Is there a fault in that cylinder?                             | Repair or replace the faulty parts.<br><b>NOTE:</b><br>Check the following items.<br><ul style="list-style-type: none"> <li>• Spark plug</li> <li>• Fuel injector</li> <li>• Compression pressure</li> </ul>                                                                   | Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC)-141, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                                                                                                                                                                        |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-103, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

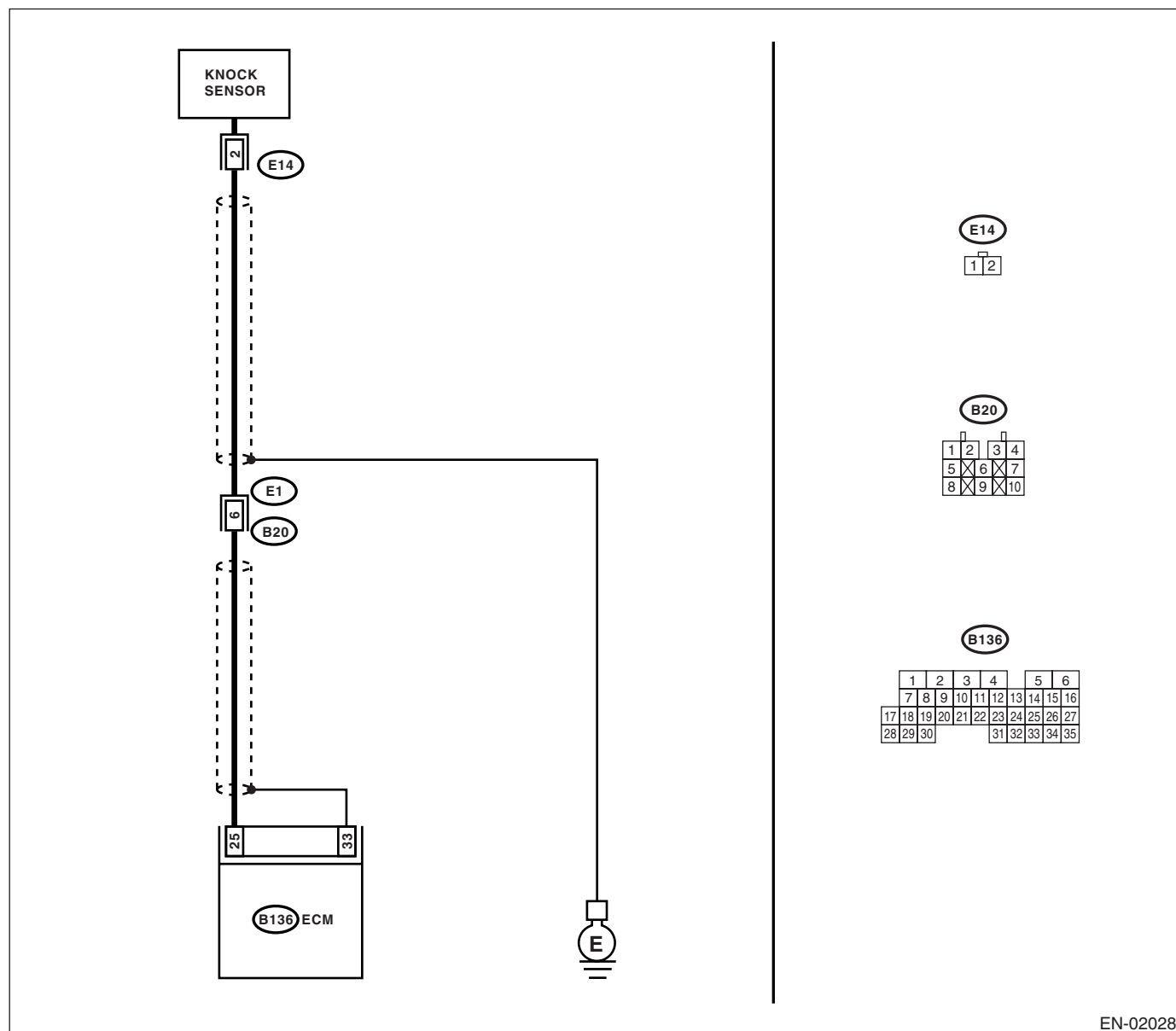
### TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02028

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                 | Check                                                     | Yes                                                              | No                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between ECM harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 25 — Chassis ground:</b> | Is the resistance more than 700 k $\Omega$ ?              | Go to step 2.                                                    | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between knock sensor and ECM connector</li> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>2</b><br><b>CHECK KNOCK SENSOR.</b><br>1) Disconnect the connector from knock sensor.<br>2) Measure the resistance between knock sensor connector terminal and engine ground.<br><b>Terminals</b><br><b>No. 2 — Engine ground:</b>                                                                                | Is the resistance more than 700 k $\Omega$ ?              | Go to step 3.                                                    | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>                                                                           |
| <b>3</b><br><b>CHECK CONDITION OF KNOCK SENSOR INSTALLATION.</b>                                                                                                                                                                                                                                                     | Is the knock sensor installation bolt tightened securely? | Replace the knock sensor. <Ref. to FU(H4DOTC)-29, Knock Sensor.> | Tighten the knock sensor installation bolt securely.                                                                                                                                                                                                                                                           |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## AU:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-105, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

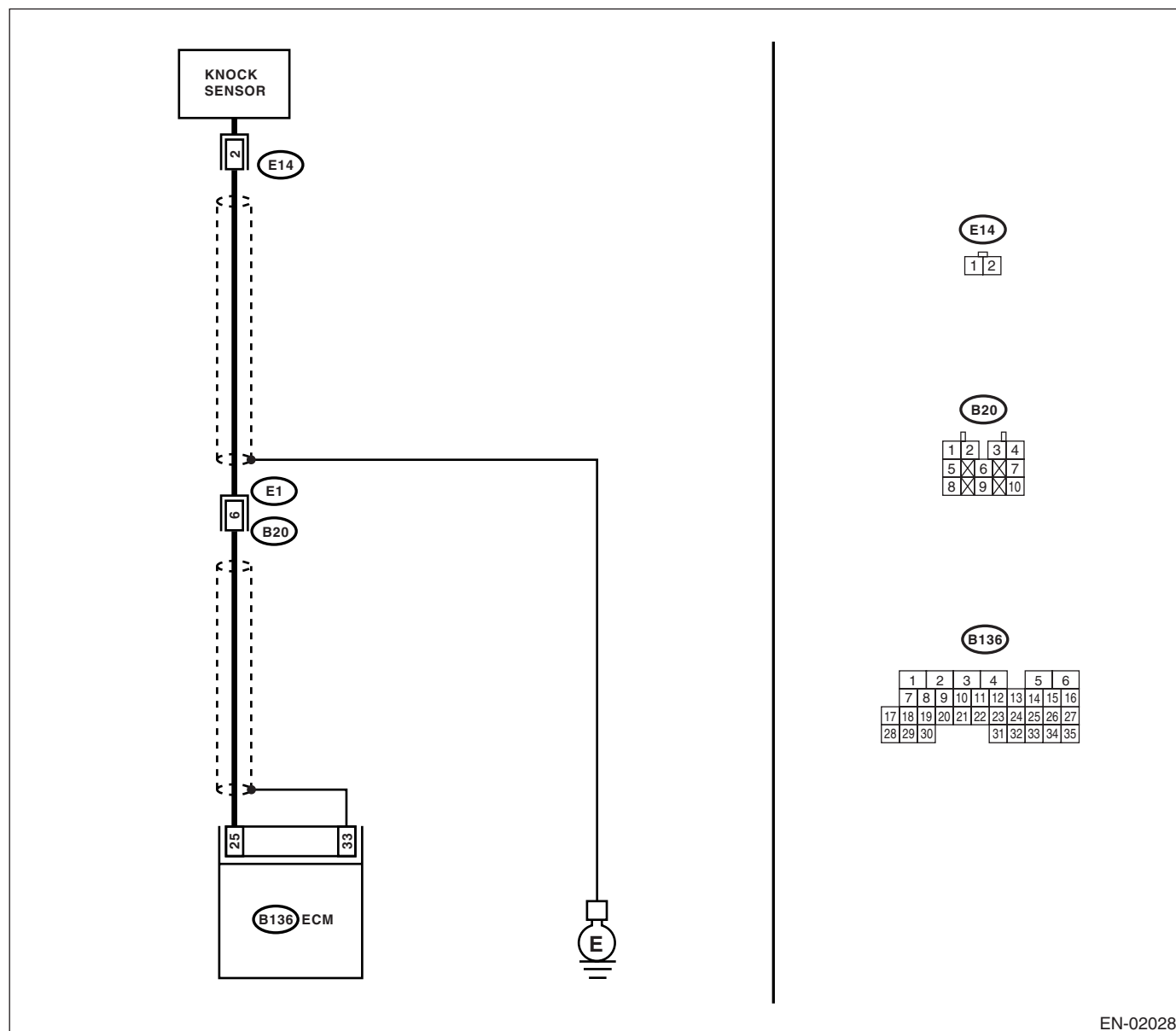
### TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02028

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                      | Check                                        | Yes                                                                                                                                                                                                                                                                                                                                                                                                            | No                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 25 — Chassis ground:</b>                                                      | Is the resistance less than 400 k $\Omega$ ? | Go to step 2.                                                                                                                                                                                                                                                                                                                                                                                                  | Go to step 3.                                                                                                                                                                                                           |
| <b>2</b><br><b>CHECK KNOCK SENSOR.</b><br>1) Disconnect the connector from knock sensor.<br>2) Measure the resistance between knock sensor connector terminal and engine ground.<br><b>Terminals</b><br><b>No. 2 — Engine ground:</b>                                                     | Is the resistance less than 400 k $\Omega$ ? | Replace the knock sensor. <Ref. to FU(H4DOTC)-29, Knock Sensor.>                                                                                                                                                                                                                                                                                                                                               | Repair the ground short circuit in harness between knock sensor connector and ECM connector.<br><br>NOTE:<br>The harness between both connectors is shielded. Repair the short circuit of harness together with shield. |
| <b>3</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Connect the connectors to ECM and knock sensor.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 25 (+) — Chassis ground (-):</b> | Is the voltage more than 2 V?                | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | Repair the poor contact in ECM connector.                                                                                                                                                                               |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## AV:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-107, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

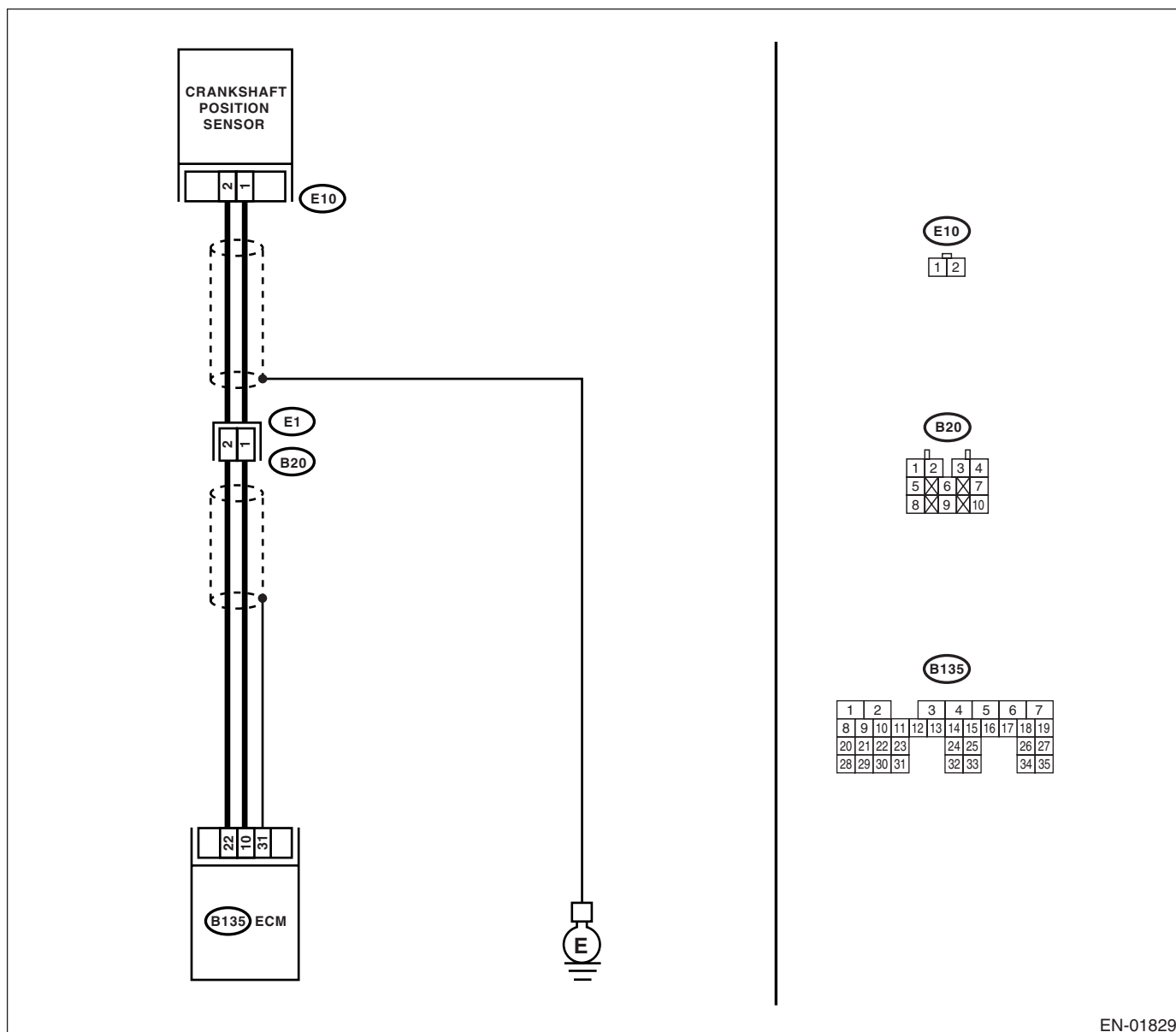
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-01829

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                            | Check                                                                   | Yes                                                                                                                                                                                                                                                                                                              | No                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from crankshaft position sensor.<br>3) Measure the resistance of harness between crankshaft position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E10) No. 1 — Engine ground:</b> | Is the resistance more than 100 k $\Omega$ ?                            | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between crankshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | Go to step 2.                                                                                                                                                                                                                                                                                                    |
| <b>2</b><br><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between crankshaft position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E10) No. 1 — Engine ground:</b>                                                                                                           | Is the resistance more than 1 M $\Omega$ ?                              | Go to step 3.                                                                                                                                                                                                                                                                                                    | Repair the ground short circuit in harness between crankshaft position sensor and ECM connector.<br><br>NOTE:<br>The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.                                                                                  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between crankshaft position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E10) No. 2 — Engine ground:</b>                                                                                                           | Is the resistance less than 5 $\Omega$ ?                                | Go to step 4.                                                                                                                                                                                                                                                                                                    | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between crankshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>4</b><br><b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b>                                                                                                                                                                                                                                                                                                               | Is the crankshaft position sensor installation bolt tightened securely? | Go to step 5.                                                                                                                                                                                                                                                                                                    | Tighten the crankshaft position sensor installation bolt securely.                                                                                                                                                                                                                                               |
| <b>5</b><br><b>CHECK CRANKSHAFT POSITION SENSOR.</b><br>1) Remove the crankshaft position sensor.<br>2) Measure the resistance between connector terminals of crankshaft position sensor.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                          | Is the resistance 1 — 4 k $\Omega$ ?                                    | Repair the poor contact in crankshaft position sensor connector.                                                                                                                                                                                                                                                 | Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.>                                                                                                                                                                                                                     |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## AW:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-109, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

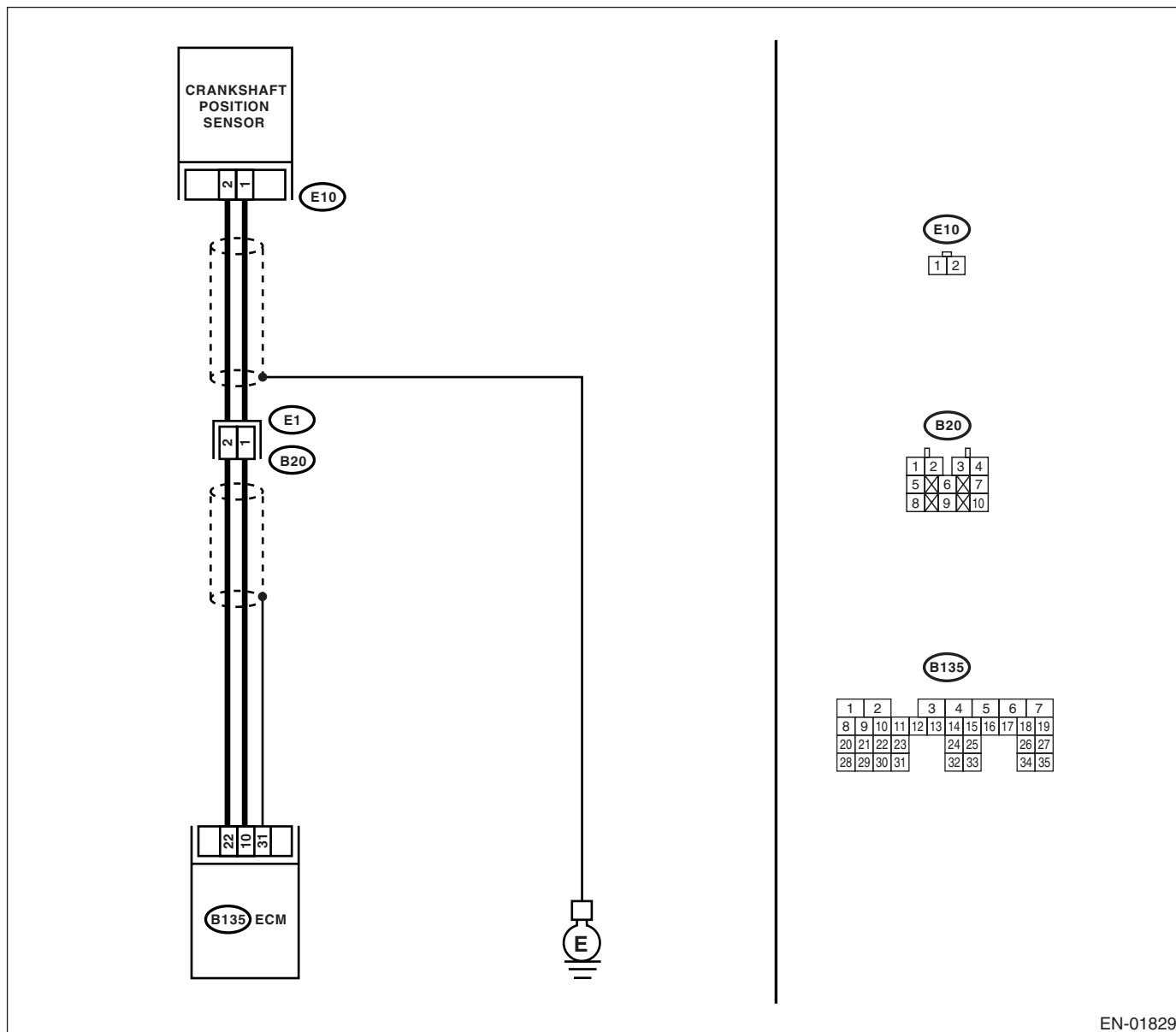
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                      | Check                                                                   | Yes                                                                                                                                     | No                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                        | Is any other DTC displayed?                                             | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                                |
| <b>2</b><br><b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b><br>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.                           |
| <b>3</b><br><b>CHECK CRANK SPROCKET.</b><br>Remove the front belt cover.                                                                                                  | Are the crank sprocket teeth cracked or damaged?                        | Replace the crank sprocket. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.>                                                        | Go to step 4.                                                                                |
| <b>4</b><br><b>CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br>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)-50, Timing Belt Assembly.>                                        | Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-111, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

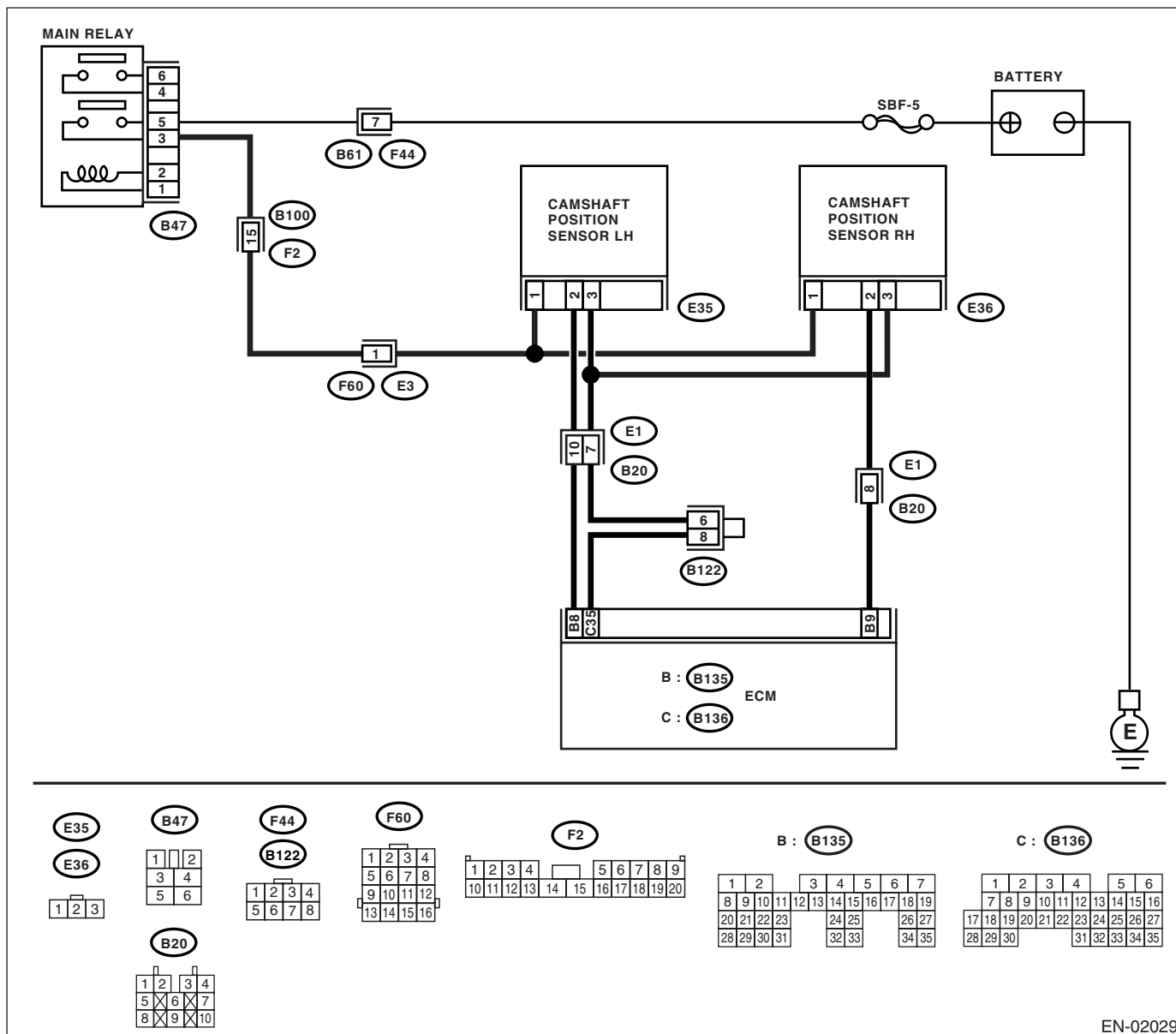
#### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02029

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                    | Check                                                                 | Yes                                                                                                  | No                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from camshaft position sensor.<br>3) Measure the voltage between camshaft position sensor and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E36) No. 1 (+) — Engine ground (-):</b>           | Is the voltage more than 10 V?                                        | Repair the ground short circuit between main relay connector and camshaft position sensor connector. | Go to step 2.                                                                                                |
| <b>2 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between camshaft position sensor and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E36) No. 1 (+) — Engine ground (-):</b>                                                                          | 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. |
| <b>3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between camshaft position sensor and ECM.<br><b>Connector &amp; terminal</b><br><b>(E36) No. 2 — (B135) No. 9:</b><br><b>(E35) No. 3 — (B136) No. 35:</b> | Is the resistance less than 1 $\Omega$ ?                              | Go to step 4.                                                                                        | Repair the open circuit between camshaft position sensor and ECM.                                            |
| <b>4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>Measure the resistance between camshaft position sensor and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E36) No. 2 — Engine ground:</b><br><b>(E35) No. 3 — Engine ground:</b>                                                                         | Is the resistance more than 1 M $\Omega$ ?                            | Go to step 5.                                                                                        | Repair the ground short circuit between camshaft position sensor and ECM.                                    |
| <b>5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>                                                                                                                                                                                                                                                                                   | Is the camshaft position sensor installation bolt tightened securely? | Go to step 6.                                                                                        | Tighten the camshaft position sensor installation bolt securely.                                             |
| <b>6 CHECK CAMSHAFT POSITION SENSOR.</b><br>Check the camshaft position sensor waveform. <Ref. to EN(H4DOTC)-19, Engine Control Module (ECM) I/O Signal.>                                                                                                                                                                               | Is any abnormality found in waveform?                                 | Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-28, Camshaft Position Sensor.>             | Go to step 7.                                                                                                |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                                    | Is there poor contact in ECM connector?                               | Repair the poor contact in ECM connector.                                                            | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                       |

## ENGINE (DIAGNOSTICS)

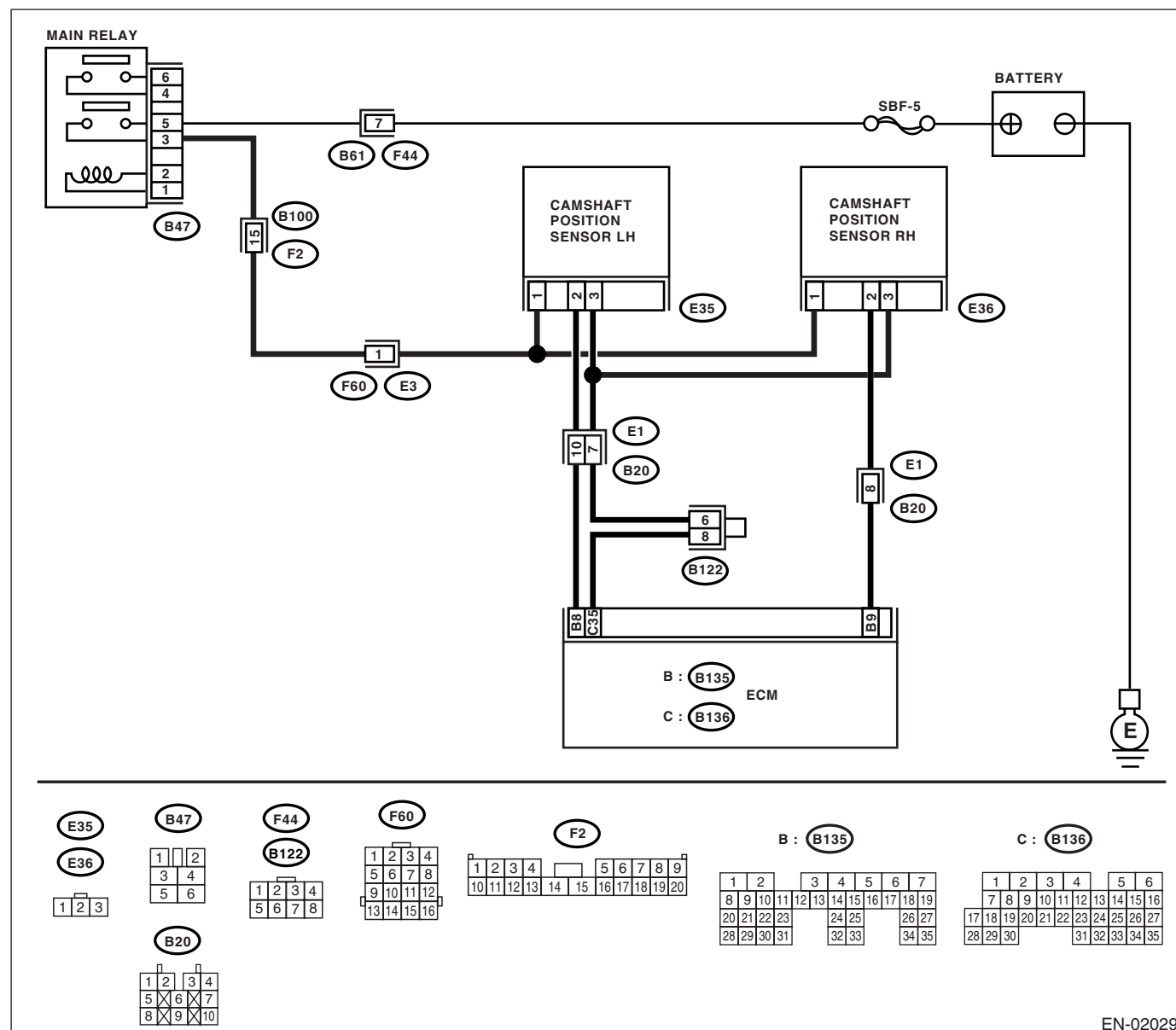
**DTC DETECTING CONDITION:**

- TROUBLE SYMPTOM:**

- CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                              | Check                                                                 | Yes                                                                                                   | No                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from camshaft position sensor.<br>3) Measure the voltage between camshaft position sensor and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E35) No. 1 (+) — Engine ground (-):</b>           | 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.                                                                                                |
| <b>2</b><br><b>CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between camshaft position sensor and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E35) No. 1 (+) — Engine ground (-):</b>                                                                          | 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. |
| <b>3</b><br><b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between camshaft position sensor and ECM.<br><b>Connector &amp; terminal</b><br><b>(E35) No. 2 — (B135) No. 8:</b><br><b>(E35) No. 3 — (B136) No. 35:</b> | Is the resistance less than 1 $\Omega$ ?                              | Go to step 4.                                                                                         | Repair the open circuit between camshaft position sensor and ECM.                                            |
| <b>4</b><br><b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>Measure the resistance between camshaft position sensor and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E35) No. 2 — Engine ground:</b><br><b>(E35) No. 3 — Engine ground:</b>                                                                         | Is the resistance more than 1 M $\Omega$ ?                            | Go to step 5.                                                                                         | Repair the ground short circuit between camshaft position sensor and ECM.                                    |
| <b>5</b><br><b>CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>                                                                                                                                                                                                                                                                                   | Is the camshaft position sensor installation bolt tightened securely? | Go to step 6.                                                                                         | Tighten the camshaft position sensor installation bolt securely.                                             |
| <b>6</b><br><b>CHECK CAMSHAFT POSITION SENSOR.</b><br>Check the camshaft position sensor waveform. <Ref. to EN(H4DOTC)-19, Engine Control Module (ECM) I/O Signal.>                                                                                                                                                                               | Is any abnormality found in waveform?                                 | Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-28, Camshaft Position Sensor.>              | Go to step 7.                                                                                                |
| <b>7</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                                    | Is there poor contact in ECM connector?                               | Repair the poor contact in ECM connector.                                                             | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                       |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## AZ:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-114, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

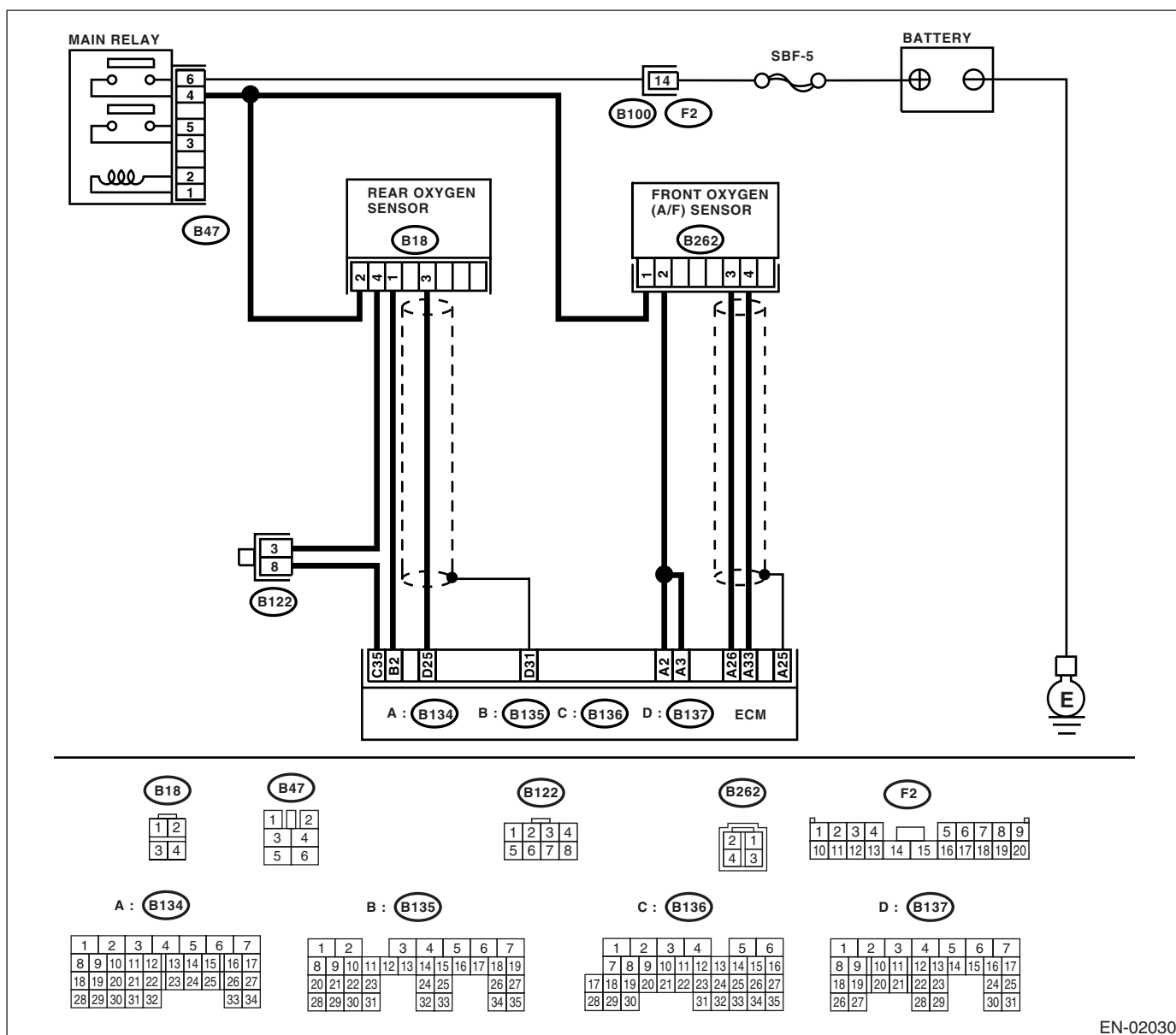
### TROUBLE SYMPTOM:

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

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02030

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                        | Check                                                         | Yes                                                                                                                                                                                                         | No                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                          | Is any other DTC displayed?                                   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0420. | Go to step 2.                                                                                                                          |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes.<br>NOTE:<br>Check the following positions.<br>• Between cylinder head and front exhaust pipe<br>• Between front exhaust pipe and front catalytic converter<br>• Between front catalytic converter and rear catalytic converter | Is there a fault in exhaust system?                           | Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>                                                                                                                          | Go to step 3.                                                                                                                          |
| <b>3</b><br><b>CHECK REAR CATALYTIC CONVERTER.</b><br>Separate the rear catalytic converter from rear exhaust pipe.                                                                                                                                                                                                                                                                         | Is there damage at rear face of rear catalyst?                | Replace the front catalytic converter. <Ref. to EC(H4DOTC)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(H4DOTC)-4, Rear Catalytic Converter.>                                    | Go to step 4.                                                                                                                          |
| <b>4</b><br><b>CHECK FRONT CATALYTIC CONVERTER.</b><br>Remove the front catalytic converter.                                                                                                                                                                                                                                                                                                | Is there damage at rear face or front face of front catalyst? | Replace the front catalytic converter. <Ref. to EC(H4DOTC)-3, Front Catalytic Converter.>                                                                                                                   | Contact your SOA Service Center.<br>NOTE:<br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

---

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

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-117, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

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

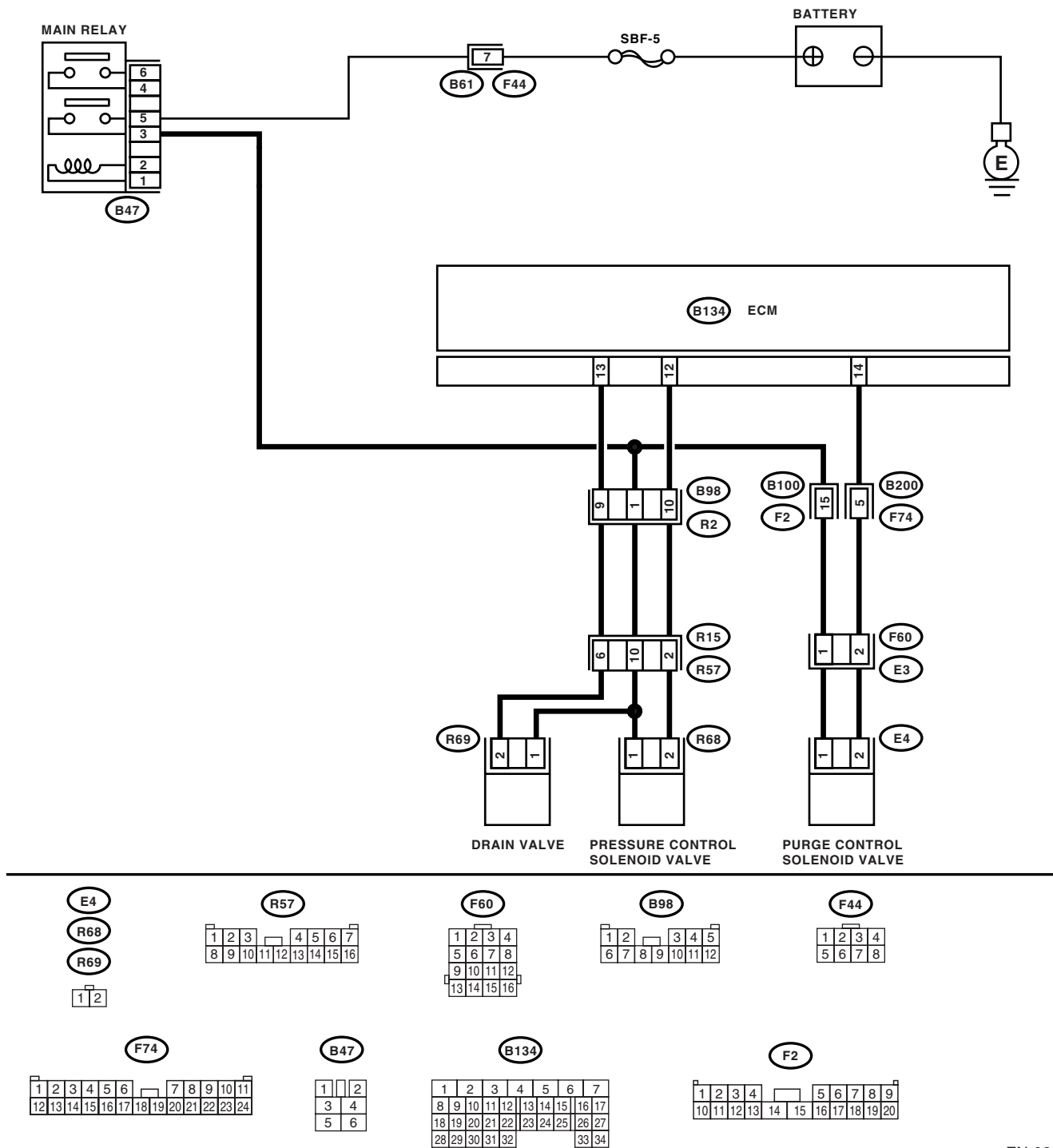
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02031

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                          | Check                                                                         | Yes                                                                                                                                     | No                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK FOR OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                            | Is any other DTC displayed?                                                   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                                          |
| <b>2</b><br><b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><b>NOTE:</b><br>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.                                                                      |
| <b>3</b><br><b>CHECK FUEL FILLER CAP.</b>                                                                                                                                                                                                                                                                                                                                     | Is the fuel filler cap SUBARU genuine?                                        | Go to step 4.                                                                                                                           | Replace with a SUBARU genuine fuel filler cap.                                                         |
| <b>4</b><br><b>CHECK FUEL FILLER PIPE PACKING.</b>                                                                                                                                                                                                                                                                                                                            | 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)-50, Fuel Filler Pipe.>                                  | Go to step 5.                                                                                          |
| <b>5</b><br><b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><b>NOTE:</b><br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?                                                 | Go to step 6.                                                                                                                           | Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>                                         |
| <b>6</b><br><b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><b>NOTE:</b><br>Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.                                                                                                                           | Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>        |
| <b>7</b><br><b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><b>NOTE:</b><br>Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.                                                                                                                           | Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-13, Pressure Control Solenoid Valve.> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                               | Check                                                                                                                                                                  | Yes                                                                                                           | No                                                                                                                                                |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>8</b><br><b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b><br>Turn ignition switch to OFF. | Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?                                                                                                | Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-63, Fuel Delivery, Return and Evaporation Lines.> | Go to step <b>9</b> .                                                                                                                             |
| <b>9</b><br><b>CHECK CANISTER.</b>                                                                 | 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)-6, Canister.>                                             | Go to step <b>10</b> .                                                                                                                            |
| <b>10</b><br><b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4DOTC)-47, Fuel Tank.>  | Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?                                                                                  | Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-47, Fuel Tank.>                                          | Go to step <b>11</b> .                                                                                                                            |
| <b>11</b><br><b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>     | Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.                                                                         | Contact with SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |

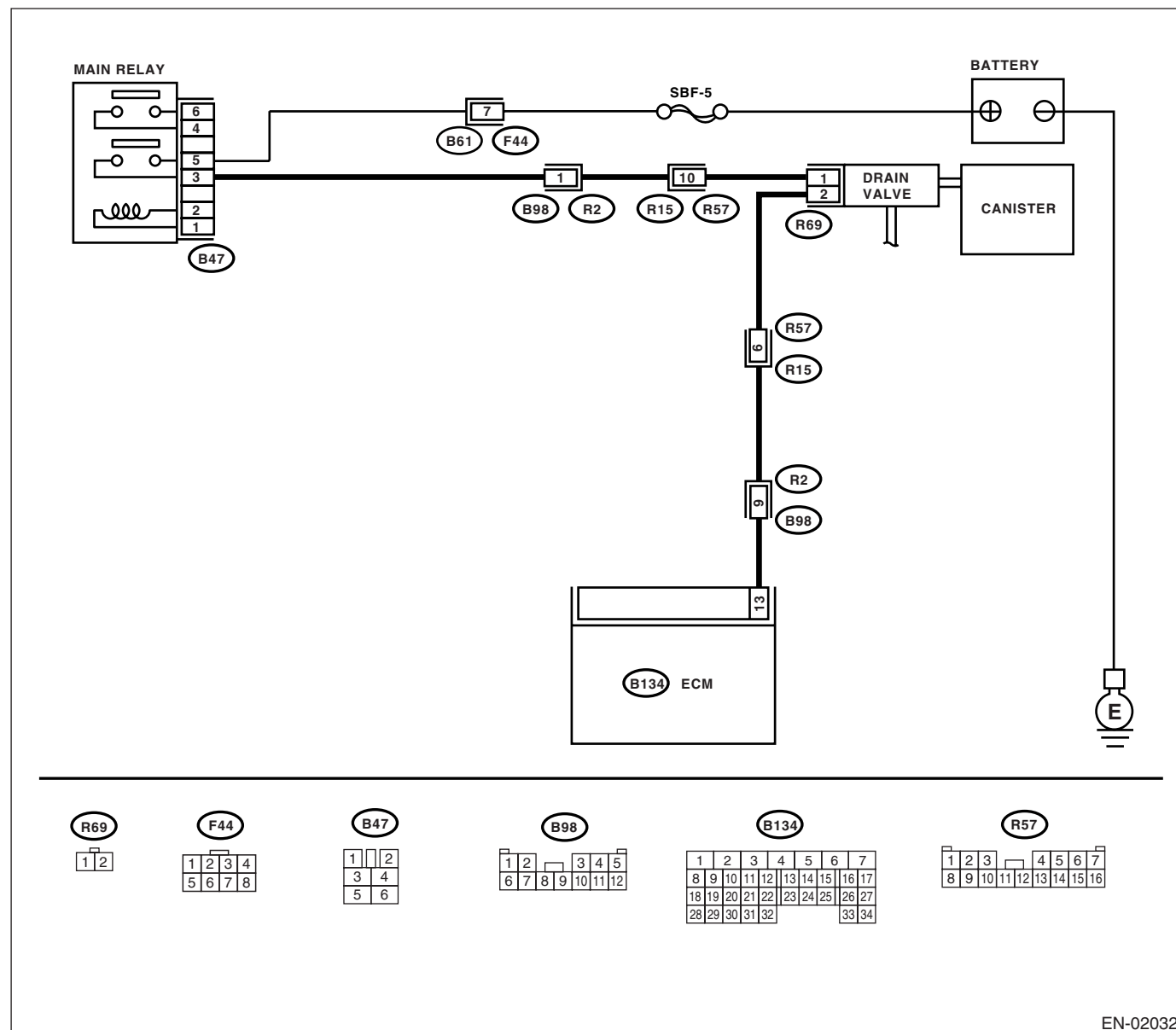
## ENGINE (DIAGNOSTICS)

**DTC DETECTING CONDITION:**

- CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                      | Check                                   | Yes                                   | No                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 13 (+) — Chassis ground (-):</b>                                                                                                         | Is the voltage more than 10 V?          | Go to step 2.                         | Go to step 3.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                    | Is there poor contact in ECM connector? | Repair poor contact in ECM connector. | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.<br>(However, the possibility of poor contact still remains.)<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in drain valve connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from drain valve and ECM.<br>3) Measure the resistance of harness between drain valve connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R69) No. 2 — Chassis ground:</b> | Is the resistance more than 1 MΩ?       | Go to step 4.                         | Repair short circuit to ground in harness between ECM and drain valve connector.                                                                                                                                                                                                                                                                                                                                        |
| <b>4</b><br><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and drain valve connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 13 — (R69) No. 2:</b>                                                                                                             | Is the resistance less than 1 Ω?        | Go to step 5.                         | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and drain valve connector</li> <li>• Poor contact in coupling connector</li> </ul>                                                                                                                                                                    |
| <b>5</b><br><b>CHECK DRAIN VALVE.</b><br>Measure the resistance between drain valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                               | Is the resistance 10 — 100 Ω?           | Go to step 6.                         | Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>                                                                                                                                                                                                                                                                                                                                                          |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                         | Check                                           | Yes                                           | No                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK POWER SUPPLY TO DRAIN VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between drain valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R69) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                  | Go to step 7.                                 | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and drain valve</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |
| <b>7</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for 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.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                                                                                                                     |

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

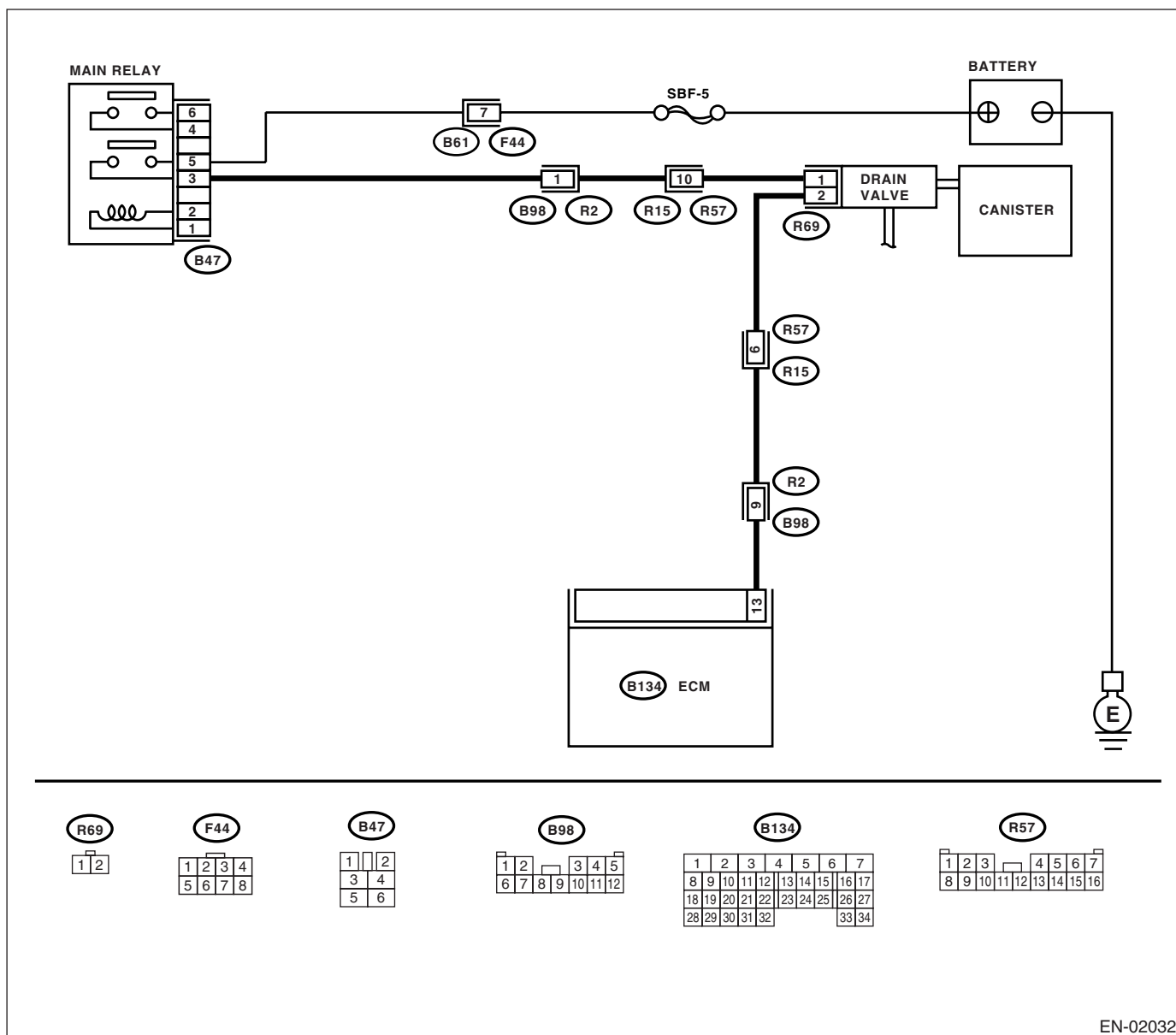
#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-144, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02032

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Check                                    | Yes                                                                                                                                                                       | No                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) While operating the drain valve, measure voltage between ECM and chassis ground.<br><b>NOTE:</b><br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<br><Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.><br><b>Connector &amp; terminal</b><br><b>(B134) No. 13 (+) — Chassis ground (-):</b> | Is the voltage 0 — 10 V?                 | Go to step 2.                                                                                                                                                             | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector. |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 13 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                      | Is the voltage more than 10 V?           | Go to step 4.                                                                                                                                                             | Go to step 3.                                                                                                                                                          |
| <b>3 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.                                                                                                                                     | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                              |
| <b>4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from drain valve.<br>3) Turn ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 13 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                         | Is the voltage more than 10 V?           | Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Go to step 5.                                                                                                                                                          |
| <b>5 CHECK DRAIN VALVE.</b><br>1) Turn ignition switch to OFF.<br>2) Measure the resistance between drain valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Is the resistance less than 1 $\Omega$ ? | Replace the drain valve <Ref. to EC(H4DOTC)-19, Drain Valve.> and ECM <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>.                                              | Go to step 6.                                                                                                                                                          |
| <b>6 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.                                                                                                                                     | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                              |

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

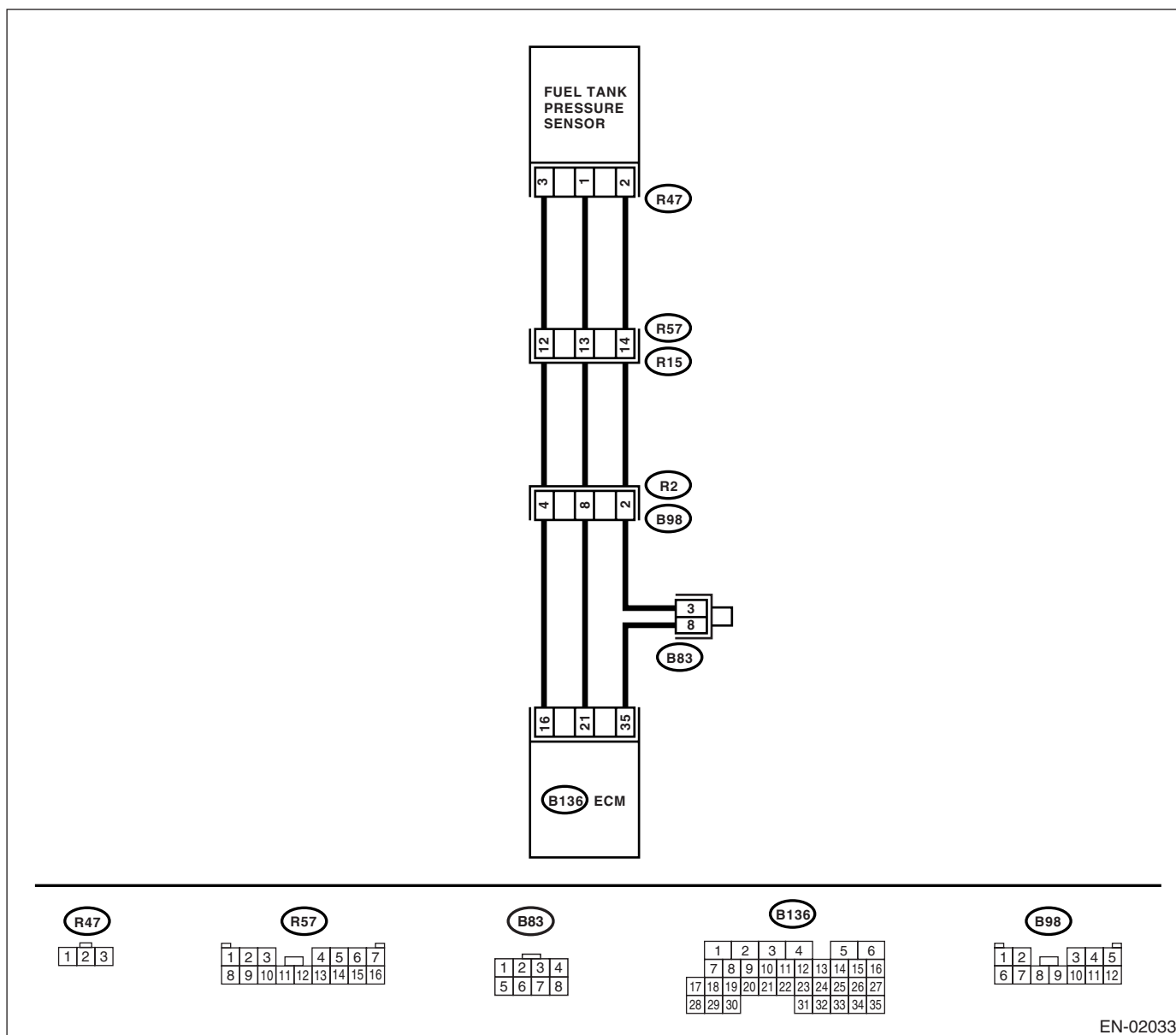
#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-146, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02033

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                              | Check                                      | Yes                                                                                                                                     | No                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK FOR OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                | Is any other DTC displayed?                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step <b>2</b> .                                                                      |
| <b>2</b><br><b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Open the fuel flap.                                                                                                                                                                                                                                                                            | Is the fuel filler cap tightened securely? | Go to step <b>3</b> .                                                                                                                   | Tighten fuel filler cap securely.                                                          |
| <b>3</b><br><b>CHECK PRESSURE/VACUUM LINE.</b><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank</li><li>• Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank</li></ul> | 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)-11, Fuel Tank Pressure Sensor.> |

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

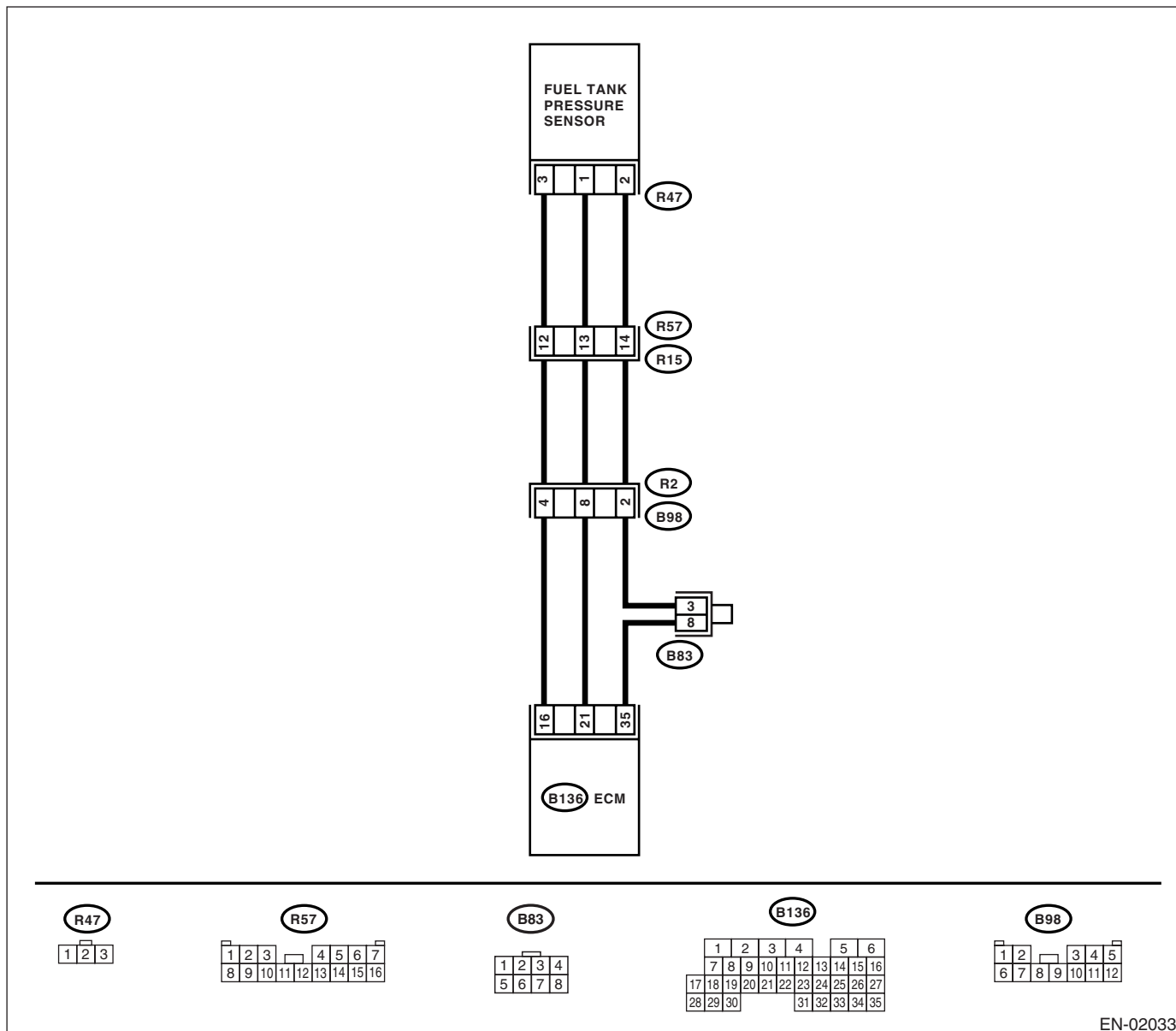
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-148, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02033

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Check                                                                                        | Yes                                   | No                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK CURRENT DATA.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the fuel filler cap.<br>3) Install the fuel filler cap.<br>4) Turn ignition switch to ON.<br>5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the measured value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?                          | Go to step 2.                         | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.                                                                                          |
| <b>2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                     | Is the voltage more than 4.5 V?                                                              | Go to step 4.                         | Go to step 3.                                                                                                                                                                                               |
| <b>3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                     | Is the voltage more than 4.5 V?                                                              | Repair poor contact in ECM connector. | Contact with SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                           |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 21 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                                    | Is the voltage less than 0.2 V?                                                              | Go to step 6.                         | Go to step 5.                                                                                                                                                                                               |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b><br>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.>                                                                                                                                                                                                                                                                     | Does the measured value exceed the specified value by shaking the ECM harness and connector? | Repair poor contact in ECM connector. | Go to step 6.                                                                                                                                                                                               |
| <b>6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the rear seat cushion.<br>3) Separate rear wiring harness and fuel tank cord.<br>4) Turn ignition switch to ON.<br>5) Measure the voltage between rear wiring harness connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R15) No. 12 (+) — Chassis ground (-):</b>                                                                                                                                                                           | Is the voltage more than 4.5 V?                                                              | Go to step 7.                         | Repair harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and rear wiring harness connector<br>• Poor contact in coupling connector |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                            | Check                                                         | Yes                                                         | No                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and rear wiring harness connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 35 — (R15) No. 14:</b> | Is the resistance less than 1 $\Omega$ ?                      | Go to step 8.                                               | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and rear wiring harness connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <b>8 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>Measure the resistance of harness between rear wiring harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R15) No. 14 — Chassis ground:</b>                                                                    | Is the resistance more than 1 M $\Omega$ ?                    | Go to step 9.                                               | Repair short circuit to ground in harness between ECM and rear wiring harness connector.                                                                                                                                                                                                                |
| <b>9 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel tank pressure sensor.<br>2) Measure the resistance of fuel tank cord.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 12 — (R47) No. 3:</b>                                                                                                          | Is the resistance less than 1 $\Omega$ ?                      | Go to step 10.                                              | Repair open circuit in fuel tank cord.                                                                                                                                                                                                                                                                  |
| <b>10 CHECK FUEL TANK CORD.</b><br>Measure the resistance of fuel tank cord.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 14 — (R47) No. 2:</b>                                                                                                                                                                           | Is the resistance less than 1 $\Omega$ ?                      | Go to step 11.                                              | Repair open circuit in fuel tank cord.                                                                                                                                                                                                                                                                  |
| <b>11 CHECK FUEL TANK CORD.</b><br>Measure the resistance of harness between fuel tank pressure sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(R47) No. 1 — Chassis ground:</b>                                                                                                                  | Is the resistance more than 1 M $\Omega$ ?                    | Go to step 12.                                              | Repair short circuit to ground in fuel tank cord.                                                                                                                                                                                                                                                       |
| <b>12 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank pressure sensor connector.                                                                                                                                                                                                                             | Is there poor contact in fuel tank pressure sensor connector? | Repair poor contact in fuel tank pressure sensor connector. | Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>                                                                                                                                                                                                              |

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

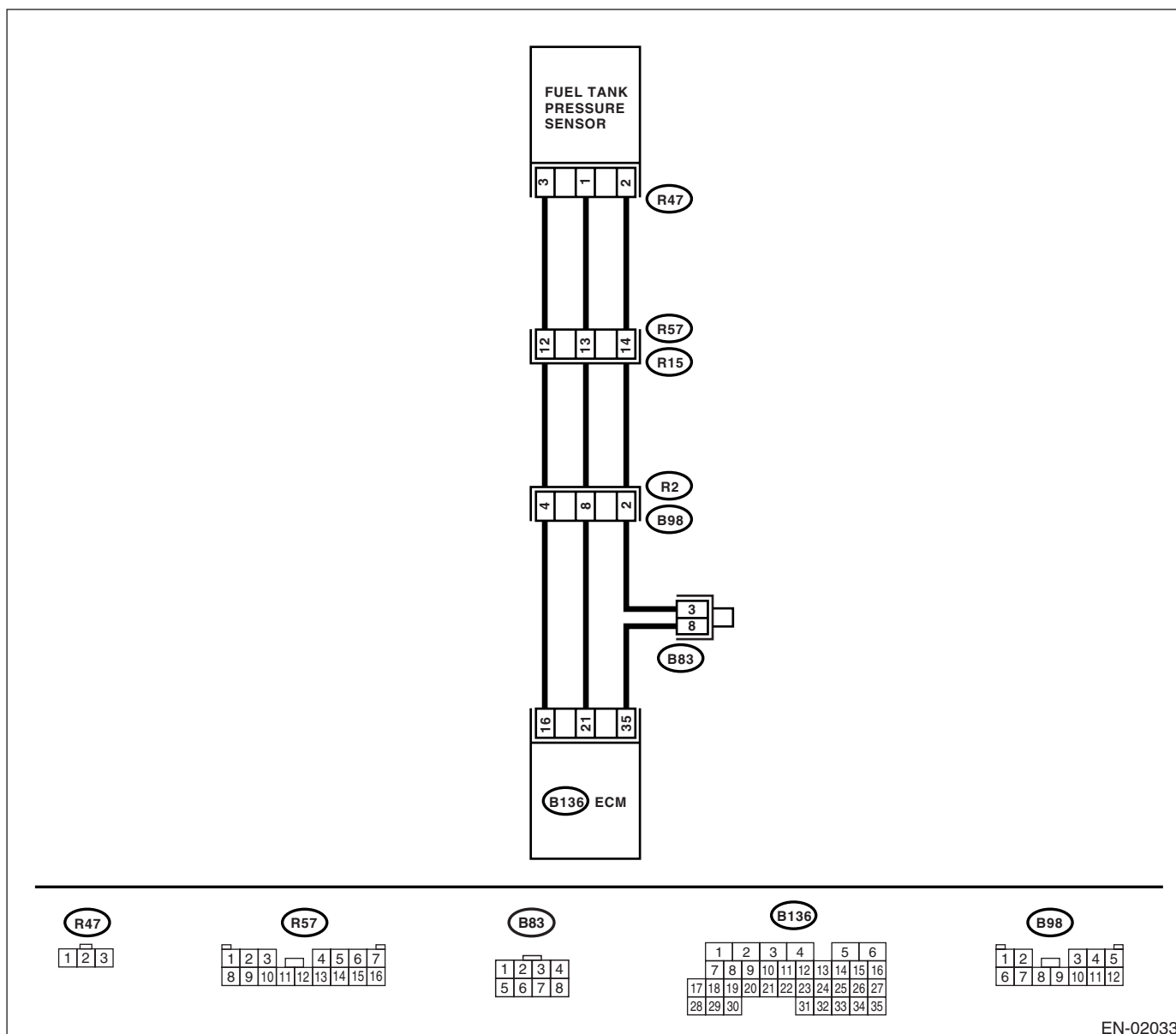
**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-150, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02033

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Check                                                                                                       | Yes                                   | No                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK CURRENT DATA.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the fuel filler cap.<br>3) Install the fuel filler cap.<br>4) Turn ignition switch to ON.<br>5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)                                             | Go to step 11.                        | Go to step 2.                                                                                                                                                                                               |
| <b>2</b><br><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                     | Is the voltage more than 4.5 V?                                                                             | Go to step 4.                         | Go to step 3.                                                                                                                                                                                               |
| <b>3</b><br><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                     | Does the measured value exceed the specified value by shaking the ECM harness and connector?                | Repair poor contact in ECM connector. | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                                                                      |
| <b>4</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 21 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                                    | Is the voltage less than 0.2 V?                                                                             | Go to step 6.                         | Go to step 5.                                                                                                                                                                                               |
| <b>5</b><br><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b><br>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.>                                                                                                                                                                                                                                                                     | Does the measured value exceed -2.8 kPa (-21.0 mmHg, -0.827 inHg) by shaking the ECM harness and connector? | Repair poor contact in ECM connector. | Go to step 6.                                                                                                                                                                                               |
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the rear seat cushion.<br>3) Separate rear wiring harness and fuel tank cord.<br>4) Turn ignition switch to ON.<br>5) Measure the voltage between rear wiring harness connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R15) No. 12 (+) — Chassis ground (-):</b>                                                                                                                                                                           | Is the voltage more than 4.5 V?                                                                             | Go to step 7.                         | Repair harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and rear wiring harness connector<br>• Poor contact in coupling connector |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Check                                                            | Yes                                                                                             | No                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and rear wiring harness connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 21 — (R15) No. 13:</b><br><b>(B136) No. 35 — (R15) No. 14:</b>                                                                                                                                                                                                                                                                       | Is the resistance less than 1 $\Omega$ ?                         | Go to step 8.                                                                                   | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and rear wiring harness connector<br>• Poor contact in coupling connector |
| <b>8 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel tank pressure sensor.<br>2) Measure the resistance of fuel tank cord.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 13 — (R47) No. 1:</b>                                                                                                                                                                                                                                                                                                                                                                                                                        | Is the resistance less than 1 $\Omega$ ?                         | Go to step 9.                                                                                   | Repair open circuit in fuel tank cord.                                                                                                                                                                  |
| <b>9 CHECK FUEL TANK CORD.</b><br>Measure the resistance of fuel tank cord.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 14 — (R47) No. 2:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Is the resistance less than 1 $\Omega$ ?                         | Go to step 10.                                                                                  | Repair open circuit in fuel tank cord.                                                                                                                                                                  |
| <b>10 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank pressure sensor connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Is there poor contact in fuel tank pressure sensor connector?    | Repair poor contact in fuel tank pressure sensor connector.                                     | Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>                                                                                                              |
| <b>11 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from fuel tank pressure sensor.<br>3) Turn ignition switch to ON.<br>4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)? | Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector. | Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>                                                                                                              |

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

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-152, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**TROUBLE SYMPTOM:**

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

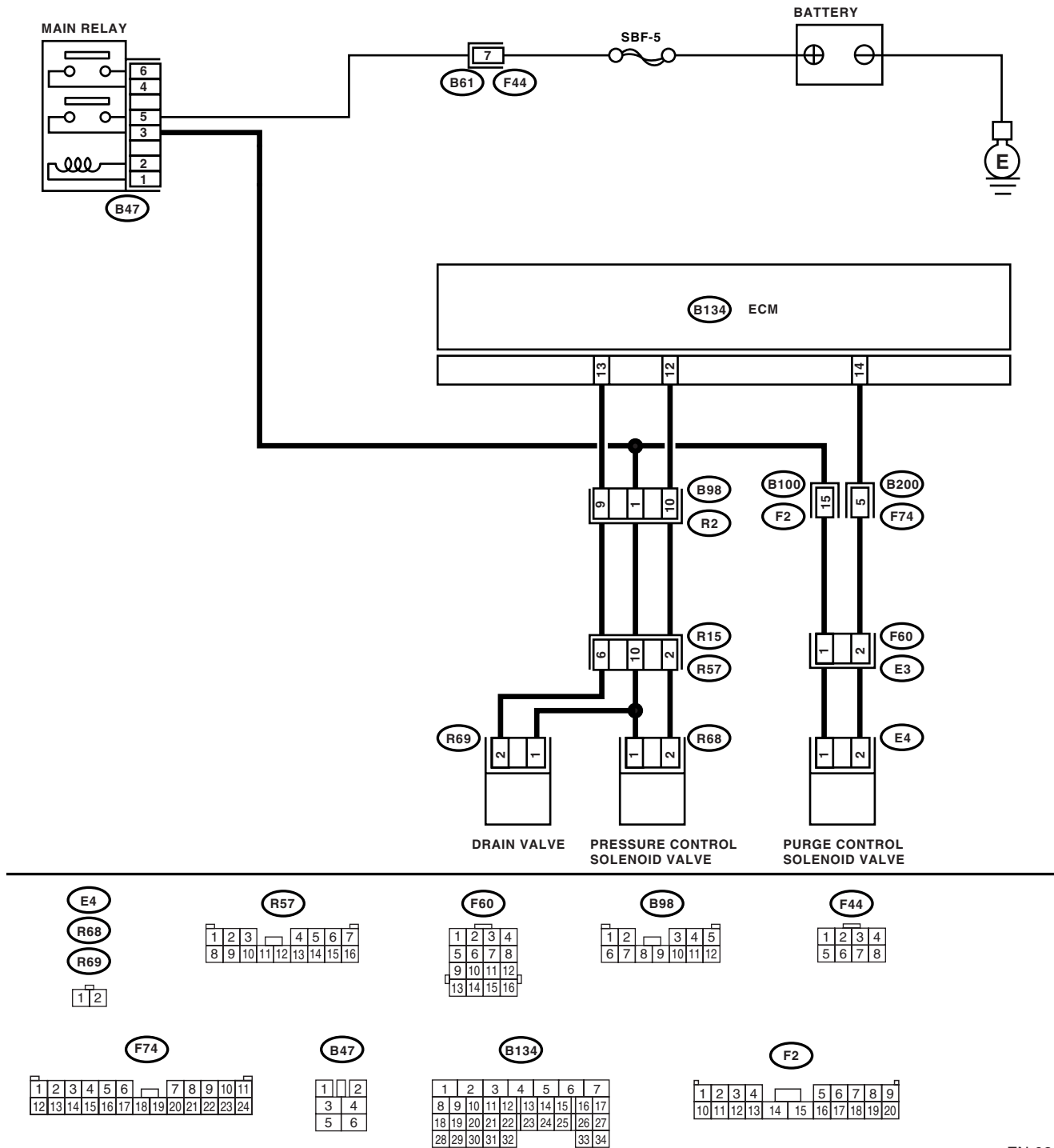
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02031

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                          | Check                                                                         | Yes                                                                                                                                     | No                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK FOR OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                            | Is any other DTC displayed?                                                   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                                      |
| <b>2</b><br><b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><b>NOTE:</b><br>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.                                                                  |
| <b>3</b><br><b>CHECK FUEL FILLER CAP.</b>                                                                                                                                                                                                                                                                                                                                     | Is the fuel filler cap SUBARU genuine?                                        | Go to step 4.                                                                                                                           | Replace with a SUBARU genuine fuel filler cap.                                                     |
| <b>4</b><br><b>CHECK FUEL FILLER PIPE PACKING.</b>                                                                                                                                                                                                                                                                                                                            | 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)-50, Fuel Filler Pipe.>                                  | Go to step 5.                                                                                      |
| <b>5</b><br><b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><b>NOTE:</b><br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?                                                 | Go to step 6.                                                                                                                           | Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>                                     |
| <b>6</b><br><b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><b>NOTE:</b><br>Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.                                                                                                                           | Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>    |
| <b>7</b><br><b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><b>NOTE:</b><br>Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.                                                                                                                           | Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                               | Check                                                                                                                                                                   | Yes                                                                                                           | No                                                                                                                                                |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>8</b><br><b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b><br>Turn ignition switch to OFF. | Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?                                                                                                | Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-63, Fuel Delivery, Return and Evaporation Lines.> | Go to step <b>9</b> .                                                                                                                             |
| <b>9</b><br><b>CHECK CANISTER.</b>                                                                 | 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)-6, Canister.>                                             | Go to step <b>10</b> .                                                                                                                            |
| <b>10</b><br><b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4DOTC)-47, Fuel Tank.>  | Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?                                                                                  | Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-47, Fuel Tank.>                                          | Go to step <b>11</b> .                                                                                                                            |
| <b>11</b><br><b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>     | Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.                                                                         | Contact with SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |

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

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-152, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

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

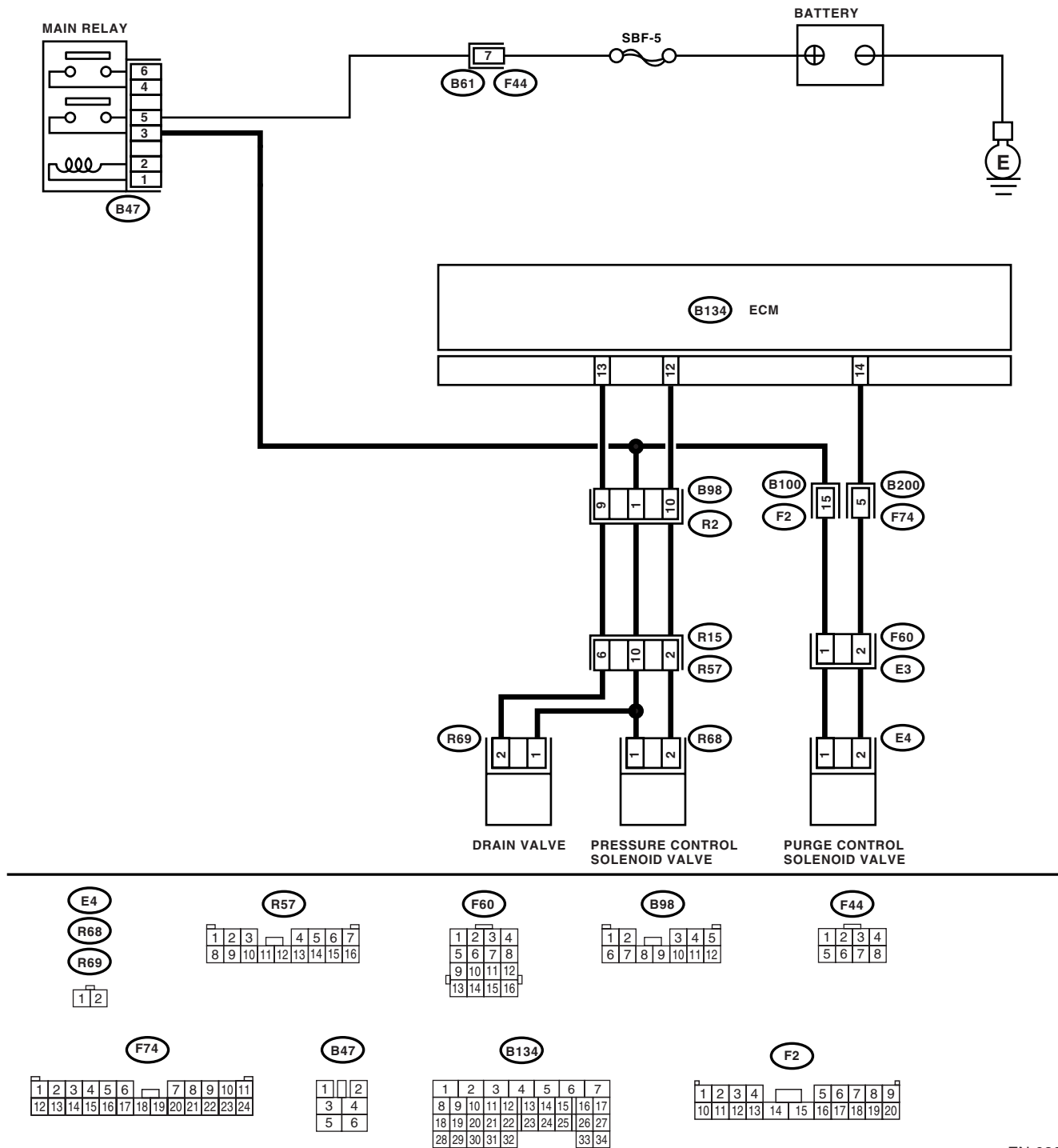
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02031

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                          | Check                                                                         | Yes                                                                                                                                     | No                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK FOR OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                            | Is any other DTC displayed?                                                   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                                      |
| <b>2</b><br><b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><b>NOTE:</b><br>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.                                                                  |
| <b>3</b><br><b>CHECK FUEL FILLER CAP.</b>                                                                                                                                                                                                                                                                                                                                     | Is the fuel filler cap SUBARU genuine?                                        | Go to step 4.                                                                                                                           | Replace with a SUBARU genuine fuel filler cap.                                                     |
| <b>4</b><br><b>CHECK FUEL FILLER PIPE PACKING.</b>                                                                                                                                                                                                                                                                                                                            | 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)-50, Fuel Filler Pipe.>                                  | Go to step 5.                                                                                      |
| <b>5</b><br><b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><b>NOTE:</b><br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?                                                 | Go to step 6.                                                                                                                           | Replace the drain valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>                     |
| <b>6</b><br><b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><b>NOTE:</b><br>Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>                          | Does the purge control solenoid valve operate?                                | Go to step 7.                                                                                                                           | Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>    |
| <b>7</b><br><b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><b>NOTE:</b><br>Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.                                                                                                                           | Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.> |
| <b>8</b><br><b>CHECK CANISTER.</b>                                                                                                                                                                                                                                                                                                                                            | Is the canister damaged?                                                      | Repair or replace the canister. <Ref. to EC(H4DOTC)-6, Canister.>                                                                       | Go to step 9.                                                                                      |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                             | Check                                                                                                                                                             | Yes                                                                  | No                                                                                                                                            |
|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>9</b><br><b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4DOTC)-47, Fuel Tank.> | Is the fuel tank damaged?                                                                                                                                         | Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-47, Fuel Tank.> | Go to step <b>10</b> .                                                                                                                        |
| <b>10</b><br><b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>   | 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.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |

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

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-153, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

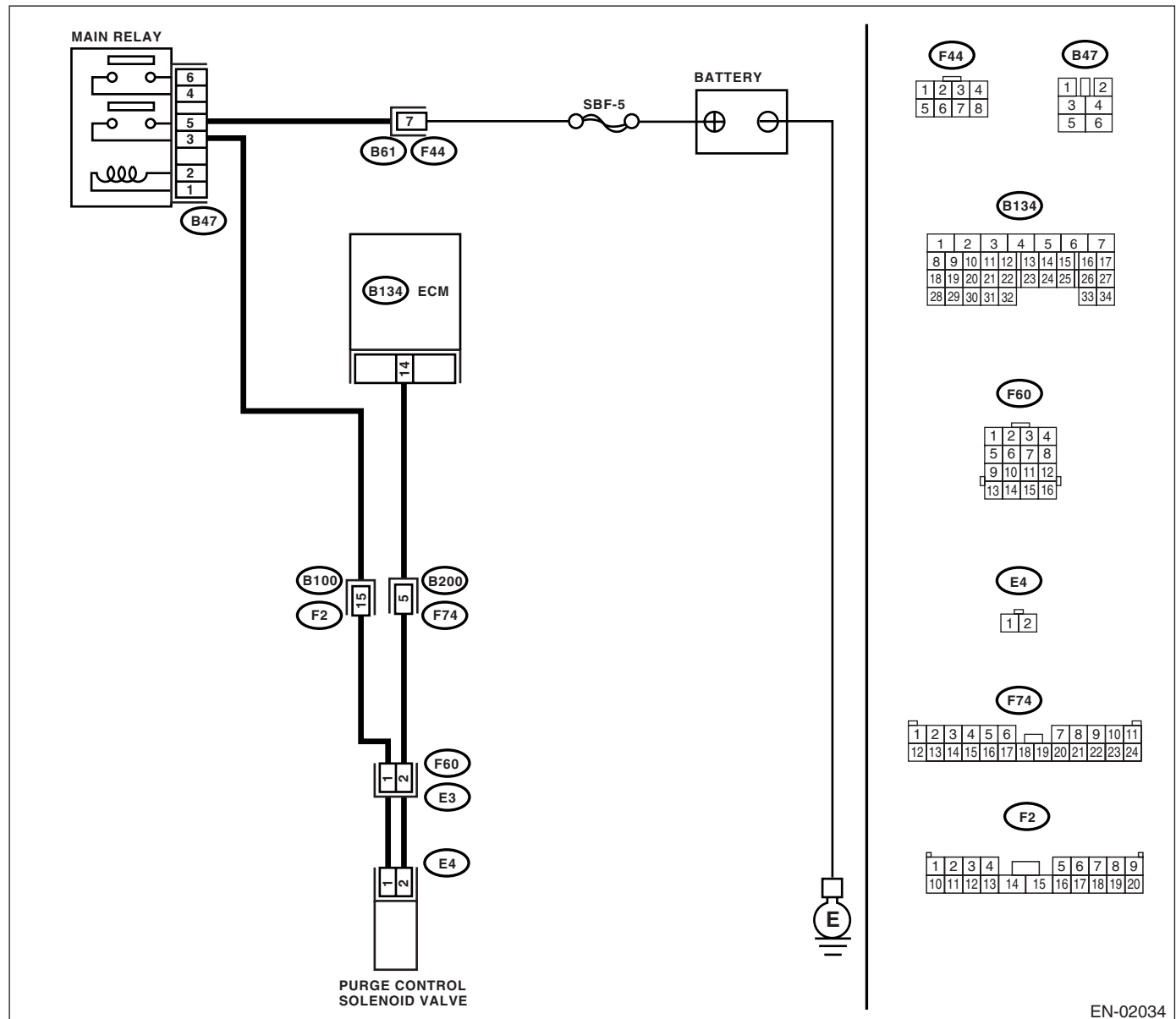
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02034

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                | Check                                                            | Yes                                                                                                         | No                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 14 (+) — Chassis ground (-):</b>                                                                                                                                                         | Is the voltage more than 10 V?                                   | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. | Go to step 2.                                                                                                                                                                                                                                                                                                                          |
| <b>2 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from purge control solenoid valve and ECM.<br>3) Measure the resistance of harness between purge control solenoid valve connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E4) No. 2 — Engine ground:</b> | Is the resistance more than 1 MΩ?                                | Go to step 3.                                                                                               | Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.                                                                                                                                                                                                                                     |
| <b>3 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and purge control solenoid valve of harness connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 14 — (E4) No. 2:</b>                                                                                                                     | Is the resistance less than 1 Ω?                                 | Go to step 4.                                                                                               | Repair the open circuit in harness between ECM and purge control solenoid valve connector.<br><br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and purge control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>4 CHECK PURGE CONTROL SOLENOID VALVE.</b><br>1) Remove the purge control solenoid valve.<br>2) Measure the resistance between purge control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                               | Is the resistance 10 — 100 Ω?                                    | Go to step 5.                                                                                               | Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>                                                                                                                                                                                                                                        |
| <b>5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between purge control solenoid valve and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E4) No. 1 (+) — Engine ground (-):</b>                                                                                                               | Is the voltage more than 10 V?                                   | Go to step 6.                                                                                               | Repair the open circuit in harness between main relay and purge control solenoid valve connector.                                                                                                                                                                                                                                      |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in purge control solenoid valve connector.                                                                                                                                                                                                                                                                                       | Is there poor contact in purge control solenoid valve connector? | Repair the poor contact in purge control solenoid valve connector.                                          | Contact your SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                                                                                                                                                      |

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

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-155, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

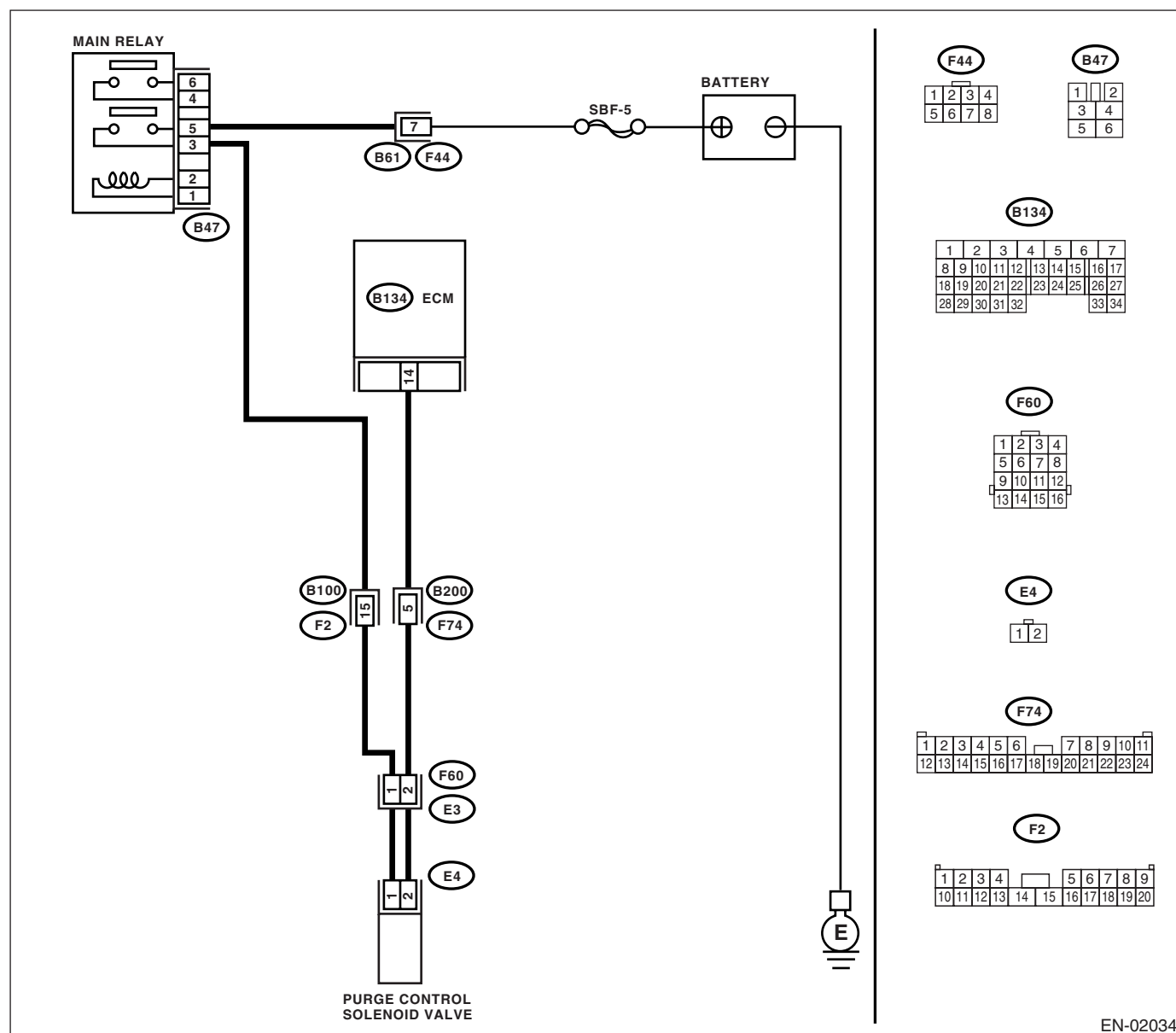
#### TROUBLE SYMPTOM:

Erroneous idling

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Check                                    | Yes                                                                                                                                                                                      | No                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn the ignition switch to ON.<br>4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground.<br><b>NOTE:</b><br>Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.><br><b>Connector &amp; terminal</b><br><b>(B134) No. 14 (+) — Chassis ground (-):</b> | Is the voltage 0 — 13 V?                 | Go to step 2.                                                                                                                                                                            | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector. |
| <b>2 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 14 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | Is the voltage more than 10 V?           | Go to step 4.                                                                                                                                                                            | Go to step 3.                                                                                                                                                       |
| <b>3 CHECK POOR CONTACT.</b><br>Check the poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.                                                                                                                                                | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                              |
| <b>4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from purge control solenoid valve.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 14 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                            | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Go to step 5.                                                                                                                                                       |
| <b>5 CHECK PURGE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between purge control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Is the resistance less than 1 $\Omega$ ? | Replace the purge control solenoid valve <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                             | Go to step 6.                                                                                                                                                       |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.                                                                                                                                                | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                              |

**BK:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —  
DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

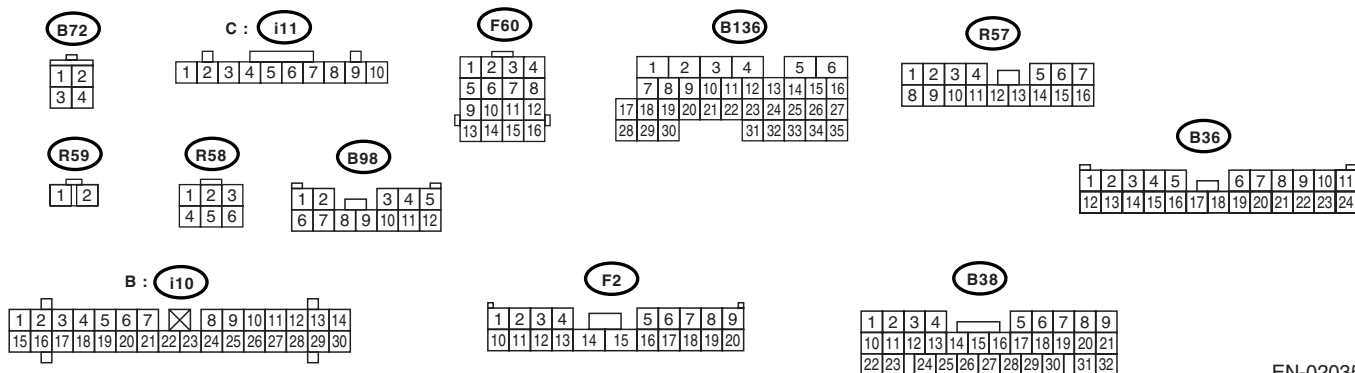
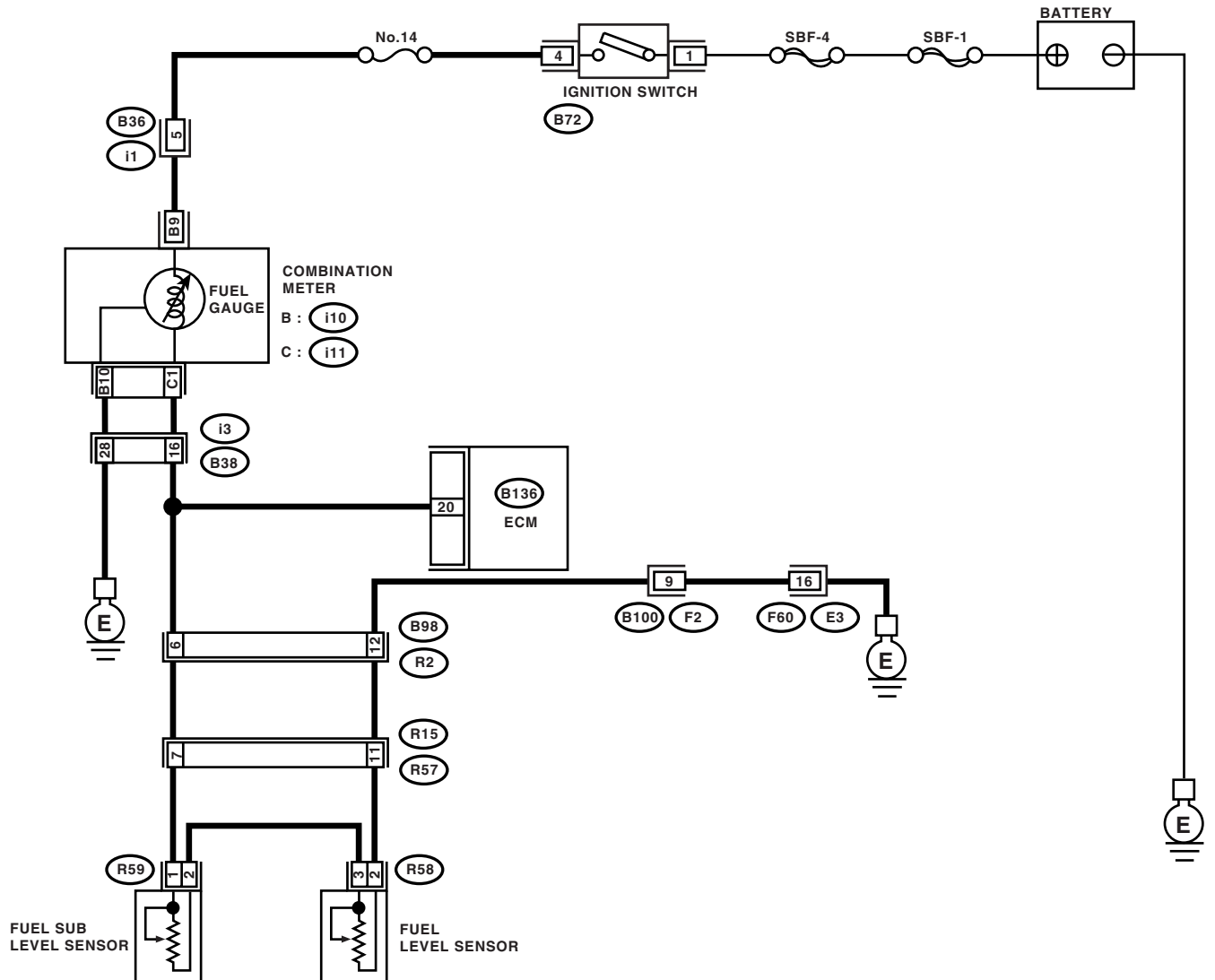
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02035

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                        | Check                       | Yes                                                                                                                                                                                                             | No                                                                                                                                                  |
|---------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0461. | Replace the fuel level sensor. <Ref. to FU(H4DOTC)-57, Fuel Level Sensor.> and fuel sub level sensor<Ref. to FU(H4DOTC)-58, Fuel Sub Level Sensor.> |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

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### **BL:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-159, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

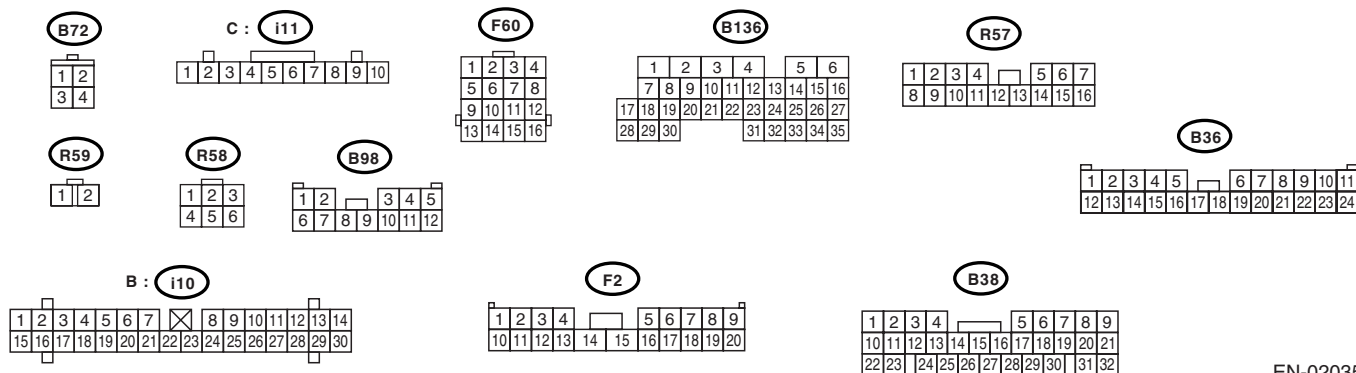
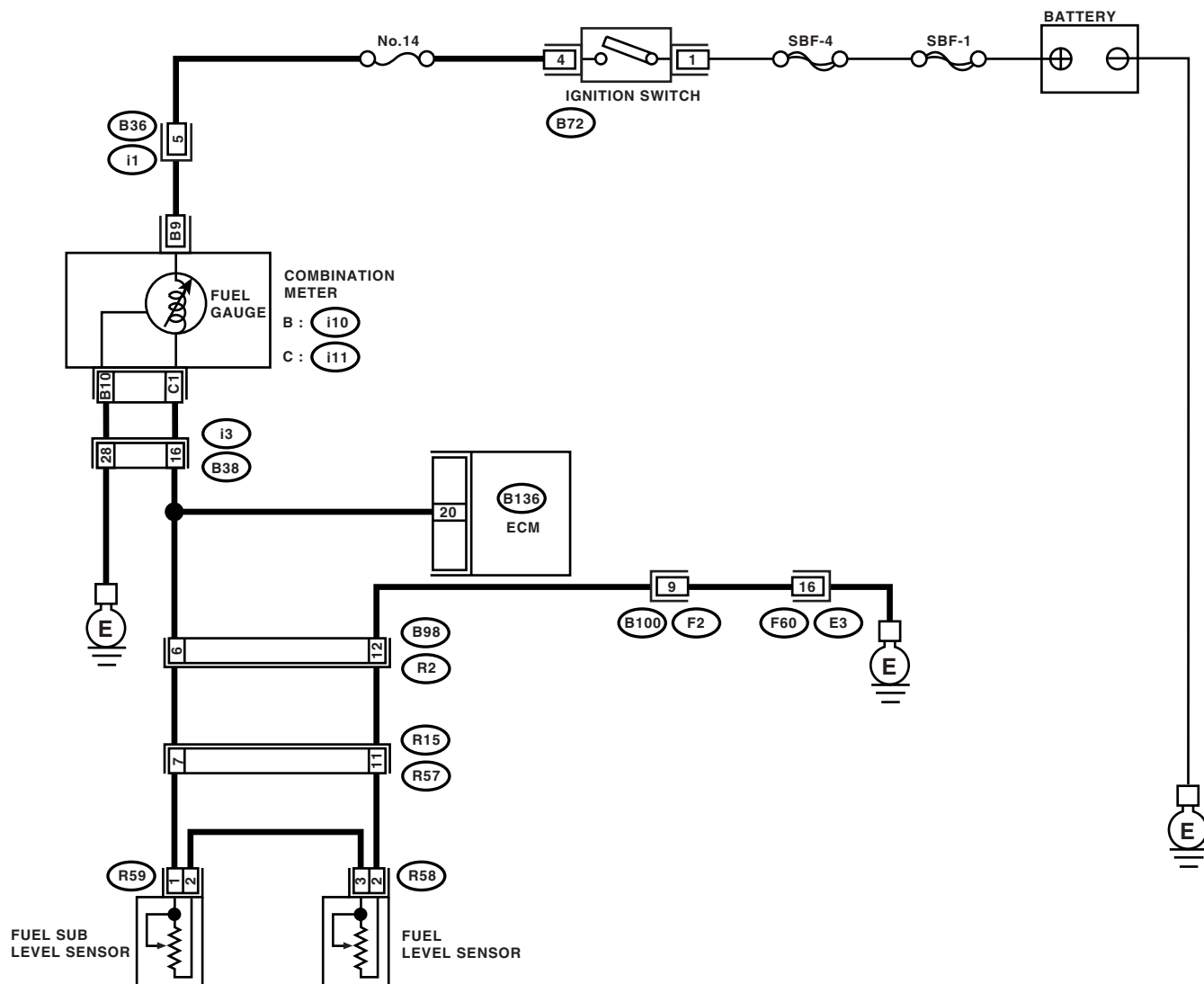
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02035

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step | Check                                                                                                                                                                                                                                                                                                                                                                          | Yes                                                                   | No                                        |                                                                                                                                                                                                                                                                                                                                                             |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <b>CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.</b>                                                                                                                                                                                                                                                                                                        | Does the speedometer and tachometer operate normally?                 | Go to step 2.                             | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>                                                                                                                                                                                                                                                                         |
| 2    | <b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 (+) — Chassis ground (-):</b>                                                                                                                                 | Is the voltage less than 0.12 V?                                      | Go to step 4.                             | Go to step 3.                                                                                                                                                                                                                                                                                                                                               |
| 3    | <b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Read the data of fuel level sensor signal using Subaru Select Monitor.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.>                                                        | Does the voltage change, while shaking the ECM harness and connector? | Repair the poor contact in ECM connector. | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in combination meter connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connectors |
| 4    | <b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15).<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 (+) — Chassis ground (-):</b> | Is the voltage more than 0.12 V?                                      | Go to step 5.                             | Go to step 6.                                                                                                                                                                                                                                                                                                                                               |
| 5    | <b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from connector (i11), (i12) and ECM connector.<br>3) Measure the resistance between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 — Chassis ground:</b>                                                         | Is the resistance more than 1 MΩ?                                     | Go to step 7.                             | Repair the ground short circuit in harness between ECM and combination meter connector.                                                                                                                                                                                                                                                                     |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                  | Check                                      | Yes                                                                                 | No                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b><br>Measure the resistance between ECM and combination meter connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 20 — (i11) No. 1:</b></i>                                                                                    | Is the resistance less than 10 $\Omega$ ?  | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.> | Repair the open circuit between ECM and combination meter connector.<br><br>NOTE:<br>In this case, repair the following:<br>Poor contact in coupling connector |
| <b>7</b><br><b>CHECK FUEL TANK CORD.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel sub level sensor.<br>3) Measure the resistance between fuel sub level sensor and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R59) No. 1 — Chassis ground:</b></i>    | Is the resistance more than 1 M $\Omega$ ? | Go to step 8.                                                                       | Repair the ground short circuit in fuel tank cord.                                                                                                             |
| <b>8</b><br><b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel pump assembly.<br>2) Measure the resistance between fuel pump assembly and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R59) No. 2 — Chassis ground:</b></i>                                                 | Is the resistance more than 1 M $\Omega$ ? | Go to step 9.                                                                       | Repair the ground short circuit in fuel tank cord.                                                                                                             |
| <b>9</b><br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-55, Fuel Pump.><br>2) Measure the resistance between fuel level sensor and terminals with its float set to the full position.<br><i><b>Terminals</b></i><br><i><b>No. 2 — No. 3:</b></i>                         | Is the resistance 0.5 — 2.5 $\Omega$ ?     | Go to step 10.                                                                      | Replace the fuel level sensor.                                                                                                                                 |
| <b>10</b><br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-58, Fuel Sub Level Sensor.><br>2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i> | Is the resistance 0.5 — 2.5 $\Omega$ ?     | Repair the poor contact in harness between ECM and combination meter connector.     | Replace the fuel sub level sensor.                                                                                                                             |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

---

### **BM:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

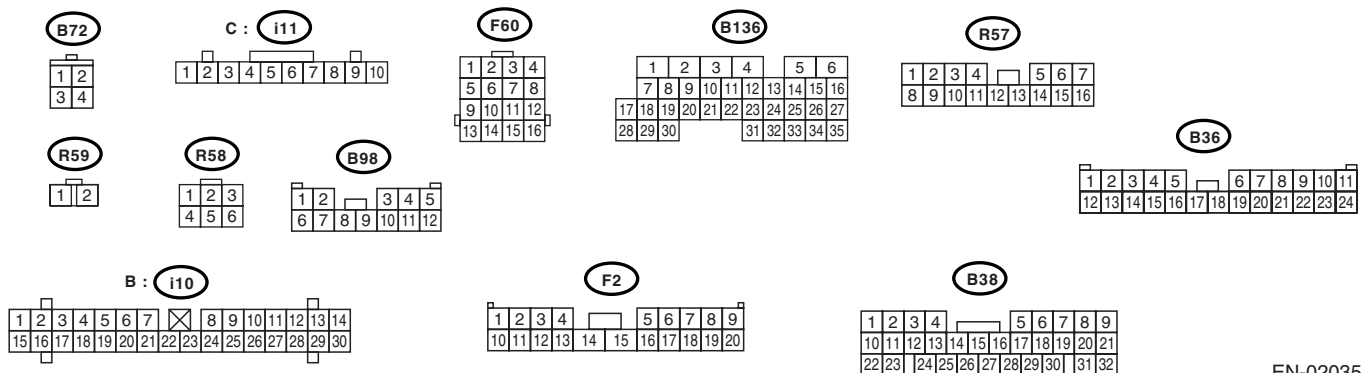
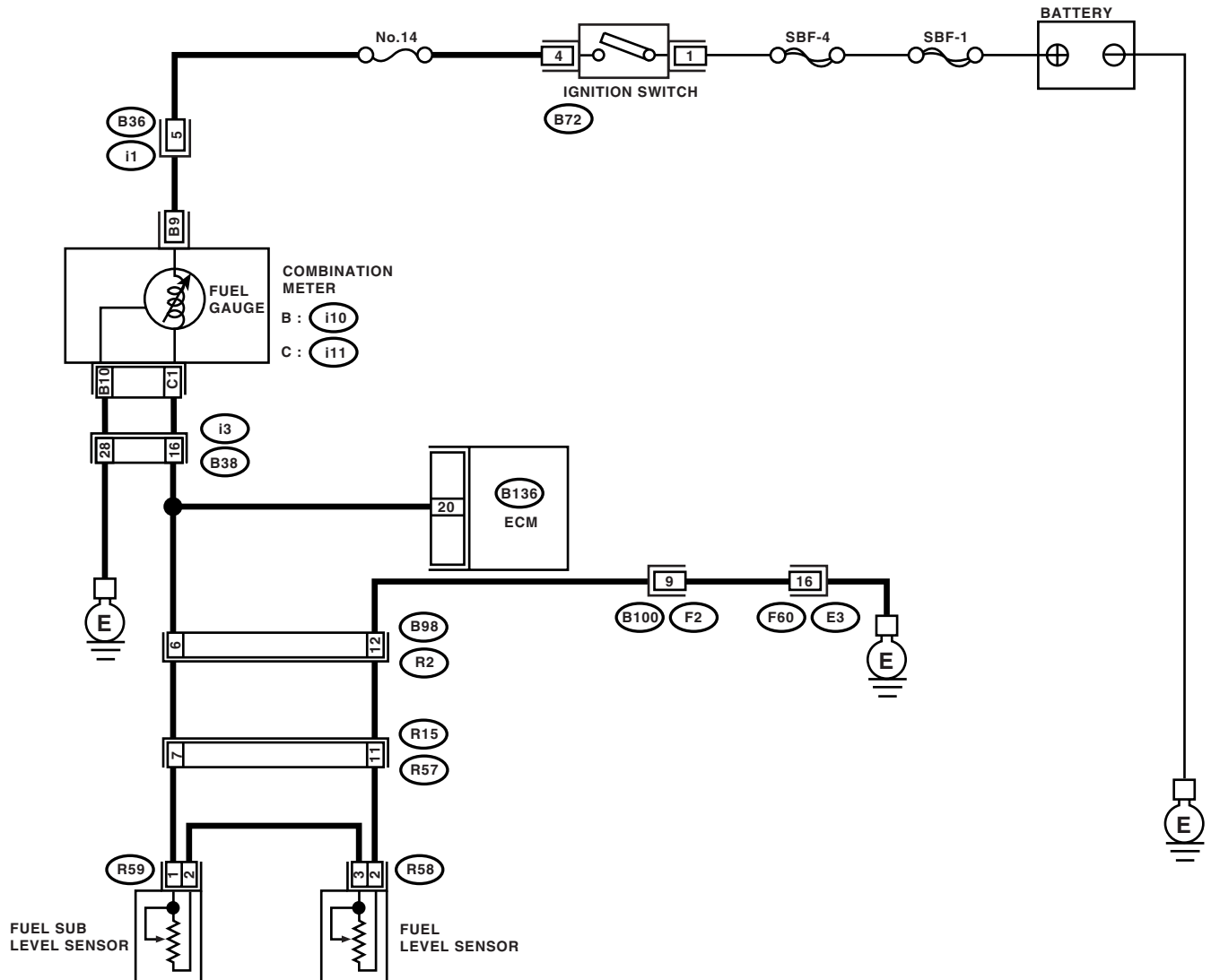
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02035

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                     | Check                                                 | Yes           | No                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.</b>                                                                                                                                                                                                                                                                             | Does the speedometer and tachometer operate normally? | Go to step 2. | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>                                                                                                                                                                                                                                                                                  |
| 2<br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 (+) — Chassis ground (-):</b>                                                                                                      | Is the voltage more than 4.75 V?                      | Go to step 3. | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in fuel pump connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| 3<br><b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the combination meter connector (i11) and ECM connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 (+) — Chassis ground (-):</b> | Is the voltage more than 4.75 V?                      | Go to step 4. | Repair the battery short circuit between ECM and combination meter connector.                                                                                                                                                                                                                                                                                        |
| 4<br><b>CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.</b><br>1) Turn the ignition switch to OFF.<br>2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15).<br>3) Measure the resistance between ECM and fuel tank cord.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 — (R15) No. 7:</b>                       | Is the resistance less than 5 $\Omega$ ?              | Go to step 5. | Repair the open circuit between ECM and fuel tank cord.                                                                                                                                                                                                                                                                                                              |
| 5<br><b>CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.</b><br>Measure the resistance between fuel tank cord and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R15) No. 11 — Chassis ground:</b>                                                                                                                                    | Is the resistance less than 5 $\Omega$ ?              | Go to step 6. | Repair the open circuit between fuel tank cord and chassis ground.<br><br>NOTE:<br>In this case, repair the following:<br>Poor contact in coupling connectors                                                                                                                                                                                                        |
| 6<br><b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel level sensor.<br>2) Measure the resistance between fuel level sensor and coupling connector.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 11 — (R58) No. 2:</b>                                                                                                         | Is the resistance less than 10 $\Omega$ ?             | Go to step 7. | Repair the open circuit between coupling connector and fuel level sensor.                                                                                                                                                                                                                                                                                            |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                  | Check                                     | Yes                                                                                | No                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>7</b><br><b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel sub level sensor.<br>2) Measure the resistance between fuel level sensor and fuel sub level sensor.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 3 — (R59) No. 2:</b>                                                         | Is the resistance less than 10 $\Omega$ ? | Go to step <b>8</b> .                                                              | Repair the open circuit between fuel level sensor and fuel sub level sensor.  |
| <b>8</b><br><b>CHECK FUEL TANK CORD.</b><br>Measure the resistance between fuel sub level sensor and coupling connector.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 7 — (R59) No. 1:</b>                                                                                                                      | Is the resistance less than 10 $\Omega$ ? | Go to step <b>9</b> .                                                              | Repair the open circuit between coupling connector and fuel sub level sensor. |
| <b>9</b><br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-55, Fuel Pump.><br>2) While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals.<br><b>Terminals</b><br><b>No. 2 — No. 3:</b>                             | Is the resistance more than 53 $\Omega$ ? | Replace the fuel level sensor. <Ref. to FU(H4DOTC)-57, Fuel Level Sensor.>         | Go to step <b>10</b> .                                                        |
| <b>10</b><br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-58, Fuel Sub Level Sensor.><br>2) While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance more than 45 $\Omega$ ? | Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-58, Fuel Sub Level Sensor.> | Replace the combination meter. <Ref. to IDI-10, Combination Meter Assembly.>  |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

---

### **BN:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-163, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

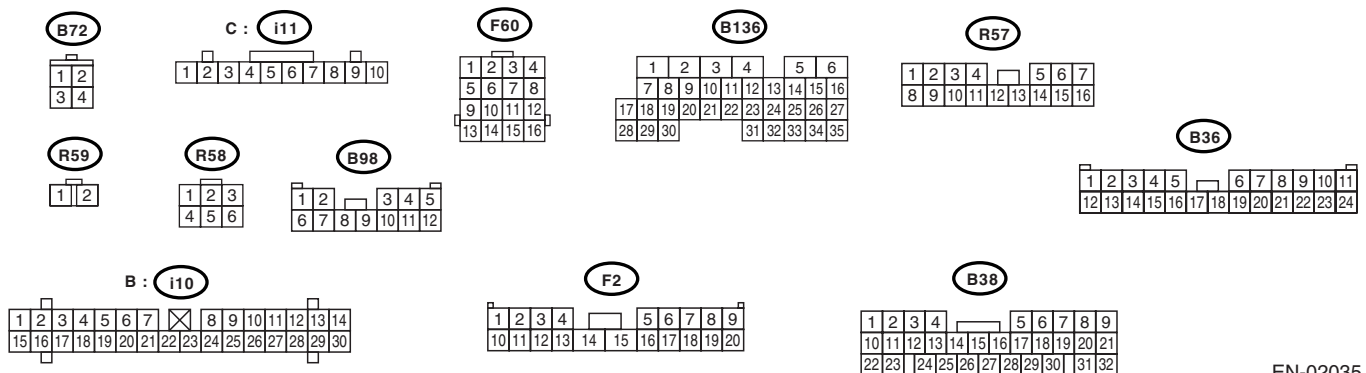
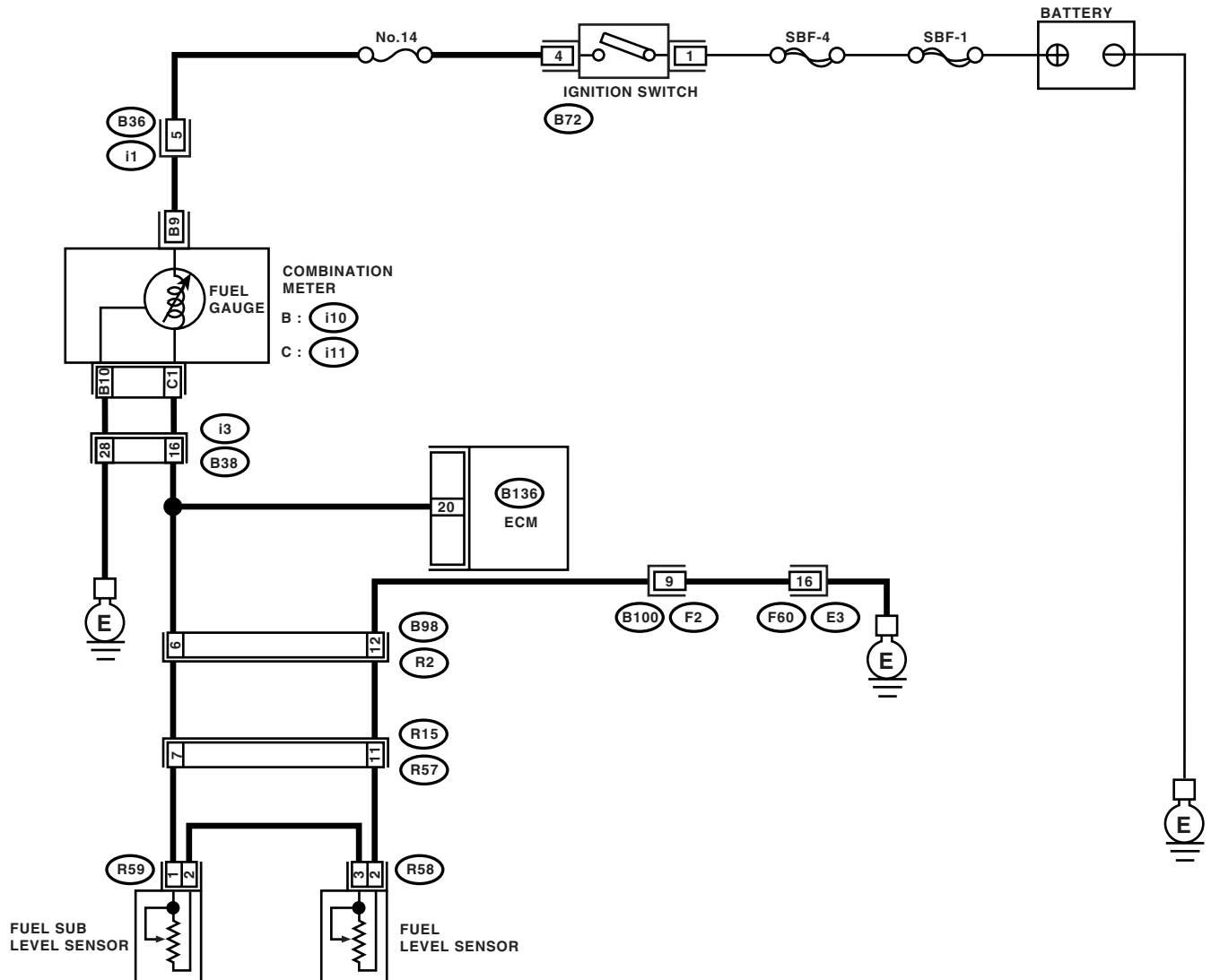
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02035

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                     | Check                                | Yes                                                                                                                                     | No                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                       | Is any other DTC displayed?          | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                      |
| <b>2</b><br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-55, Fuel Pump.><br>2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.<br><b>Terminals</b><br><b>No. 3 — No. 2:</b>                        | Does the resistance change smoothly? | Go to step 3.                                                                                                                           | Replace the fuel level sensor. <Ref. to FU(H4DOTC)-57, Fuel Level Sensor.>         |
| <b>3</b><br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-58, Fuel Sub Level Sensor.><br>2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Does the resistance change smoothly? | Repair the poor contact in ECM, combination meter and coupling connectors.                                                              | Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-58, Fuel Sub Level Sensor.> |

## **BO:DTC P0483 — COOLING FAN RATIONALITY CHECK —**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION<Ref. to GD(H4DOTC)-166, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Occurrence of noise
- Overheating

### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

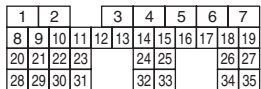
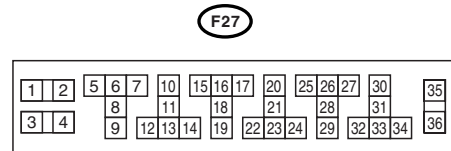
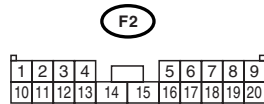
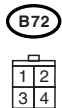
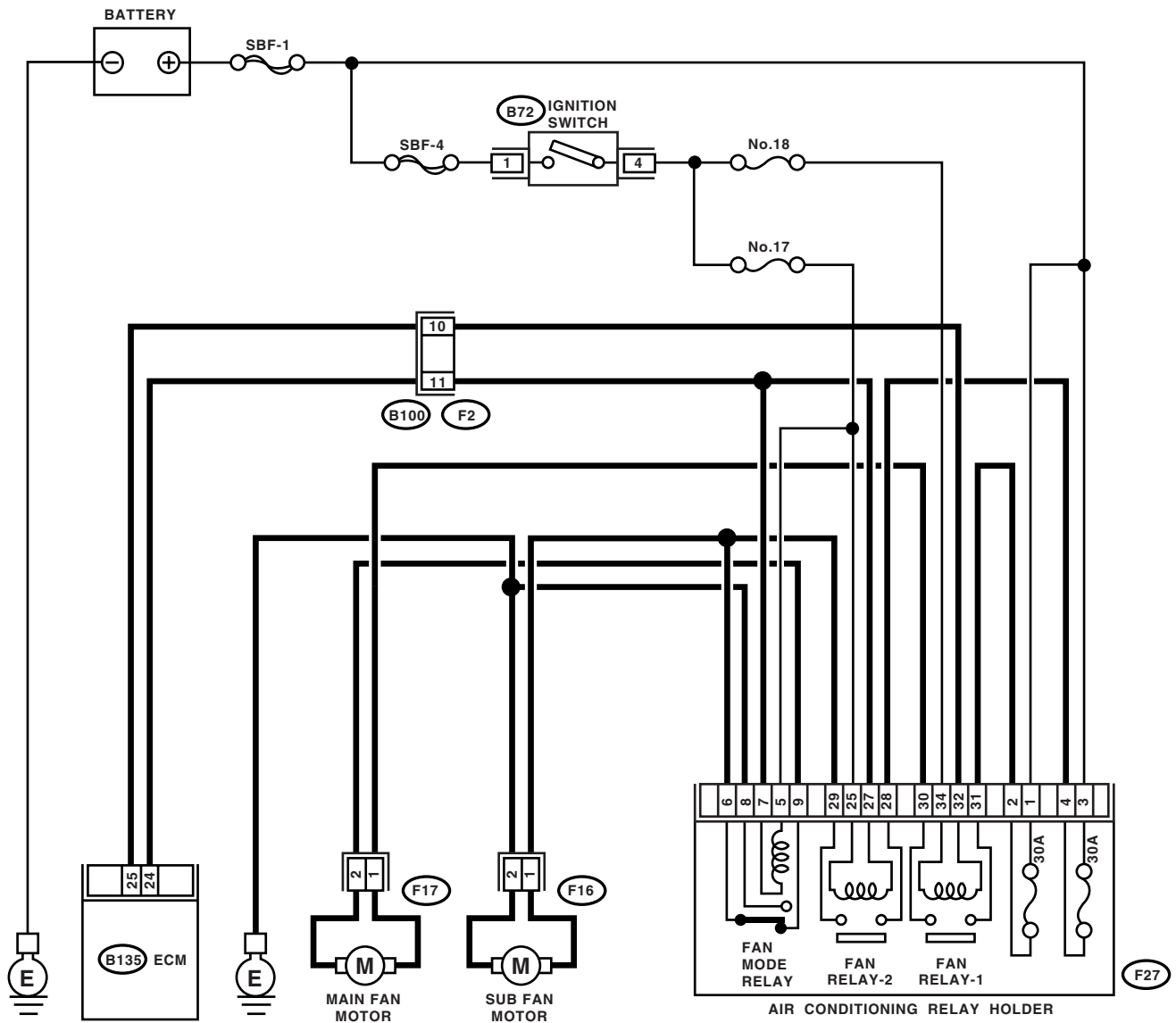
### **NOTE:**

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

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02036

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                        | Check                       | Yes                                                                                                                                     | No                                                                                                                                                                                                               |
|---------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Check the radiator fan, fan motor and thermostat. <Ref. to CO(H4SO)-33, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-39, Radiator Sub Fan and Fan Motor.> If thermostat is stuck, replace thermostat. |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

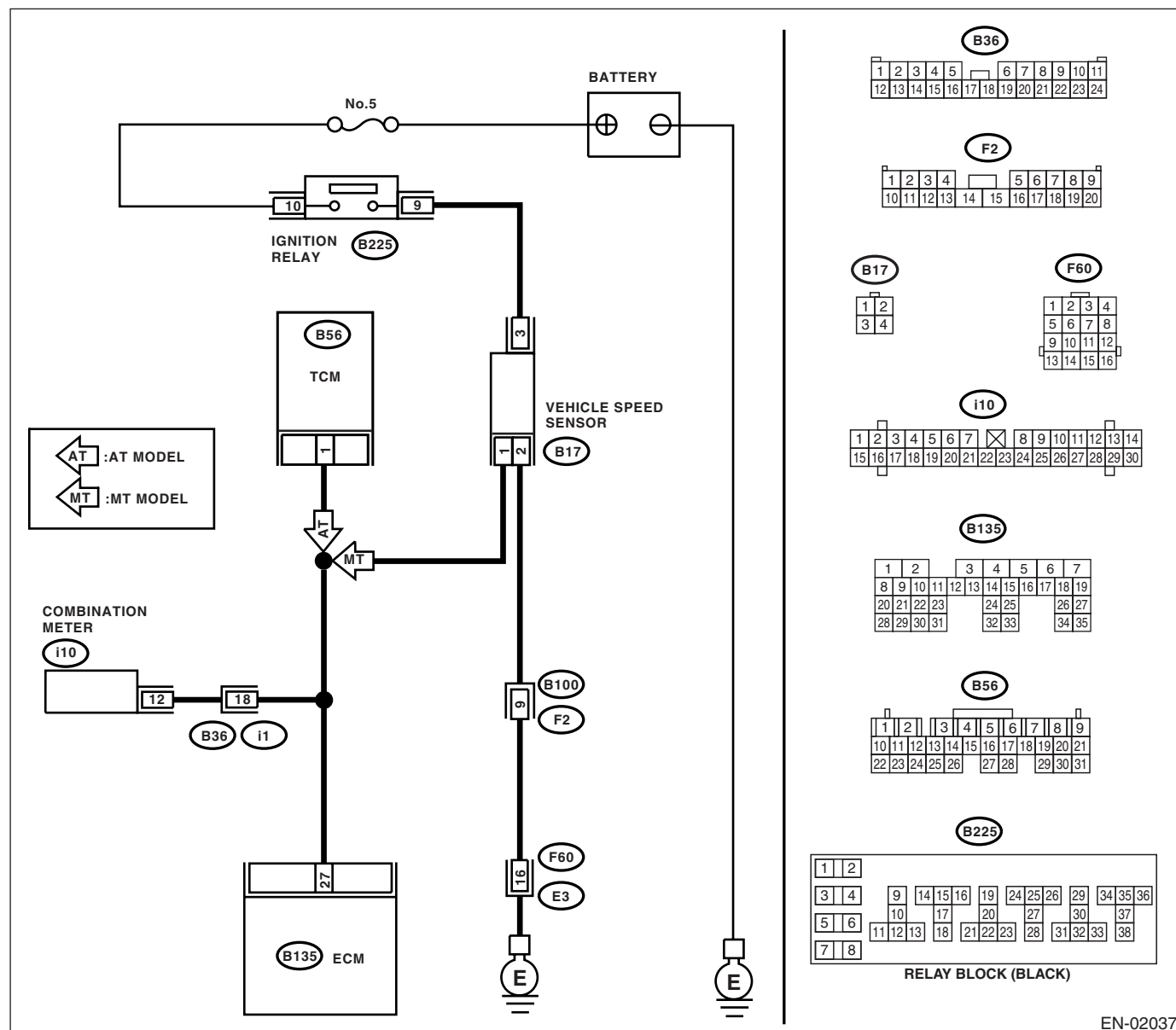
## BP:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-167, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02037

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                      | Check                                                        | Yes                                                        | No                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARENESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from vehicle speed sensor and ECM.<br>3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B17) No. 1 — Chassis ground:</b> | Is the resistance more than 1 MΩ?                            | Go to step 2.                                              | Repair the ground short circuit in harness between vehicle speed sensor and ECM connector. |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in the vehicle speed sensor connector.                                                                                                                                                                                                                                                                       | Is there poor contact in the vehicle speed sensor connector? | Repair poor contact in the vehicle speed sensor connector. | Replace the vehicle speed sensor.<br><Ref. to 5MT-40, Vehicle Speed Sensor.>               |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

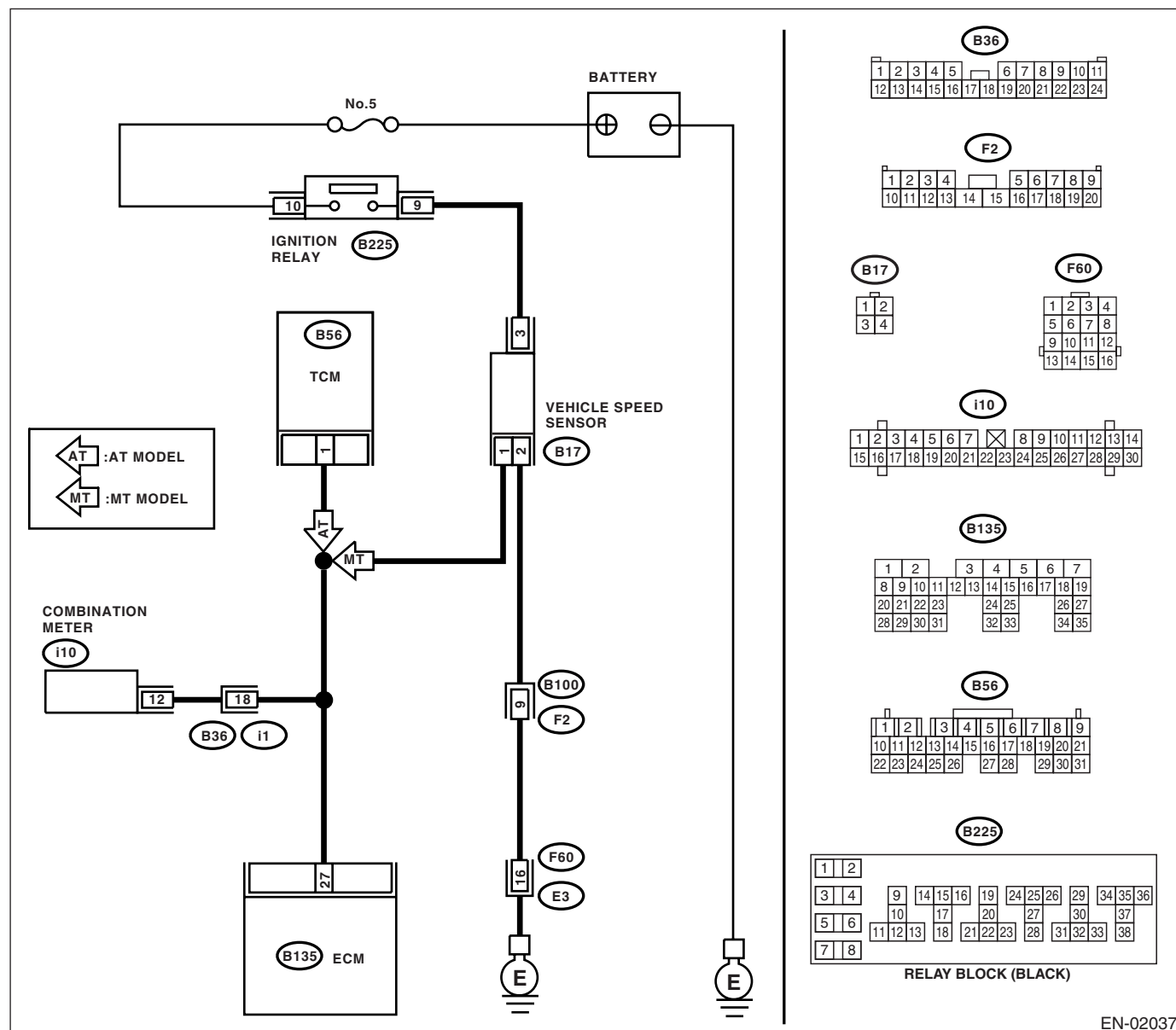
## BQ:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-169, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02037

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                            | Check                                     | Yes                                       | No                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK SPEEDOMETER OPERATION IN COMBINATION METER.</b>                                                                                                                                                                                                                                                   | Does the speedometer operate normally?    | Go to step 2.                             | Check the speedometer. <Ref. to IDI-12, Speedometer.>                                                                                                                                                                                                                                                                                                                 |
| 2<br><b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from combination meter.<br>3) Measure the resistance between ECM and combination meter.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 27 — (i10) No. 12:</b> | Is the resistance less than 10 $\Omega$ ? | Repair the poor contact in ECM connector. | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and combination meter connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in combination meter connector</li> <li>• Poor contact in coupling connector</li> </ul> |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

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### **BR:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED — DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-171, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

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

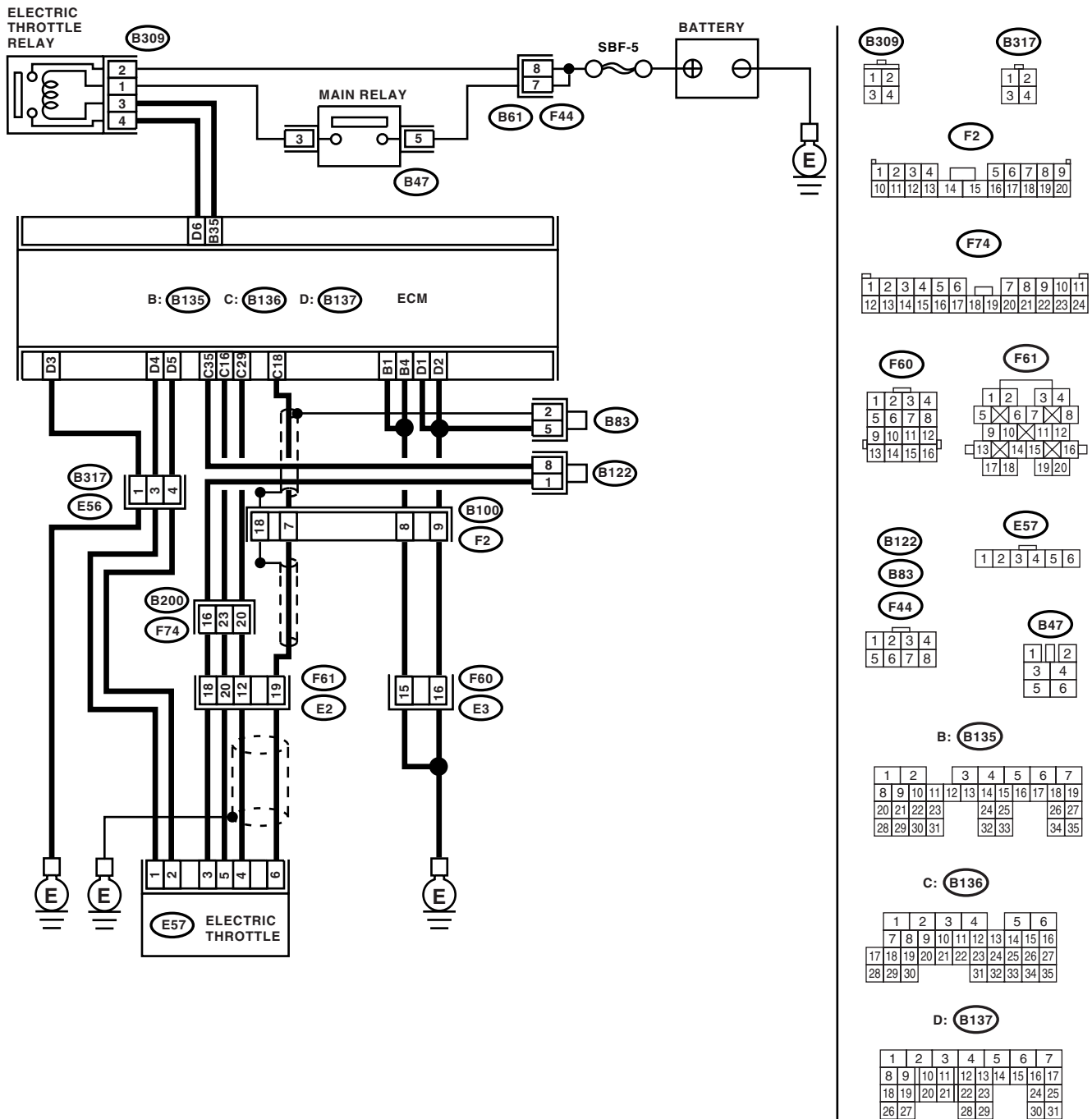
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                      | Check                                               | Yes                                                                                                                                                                                                                | No                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                        | Is any other DTC displayed?                         | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><b>NOTE:</b><br>In this case, it is not necessary to inspect DTC P0506. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR CLEANER ELEMENT.</b><br>1) Turn the ignition switch to OFF.<br>2) Check air cleaner element.                                     | Is there excessive clogging on air cleaner element. | Replace the air cleaner element.<Ref. to IN(H4DOTC)-7, Air Cleaner.>                                                                                                                                               | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electric throttle.<br>3) Check the electric throttle. | Are there foreign particles in electric throttle?   | Remove the foreign particles from electric throttle.                                                                                                                                                               | Perform the diagnosis of DTC P2101. |

## **BS:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED — DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-173, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

Engine keeps running at higher revolution than specified idling revolution.

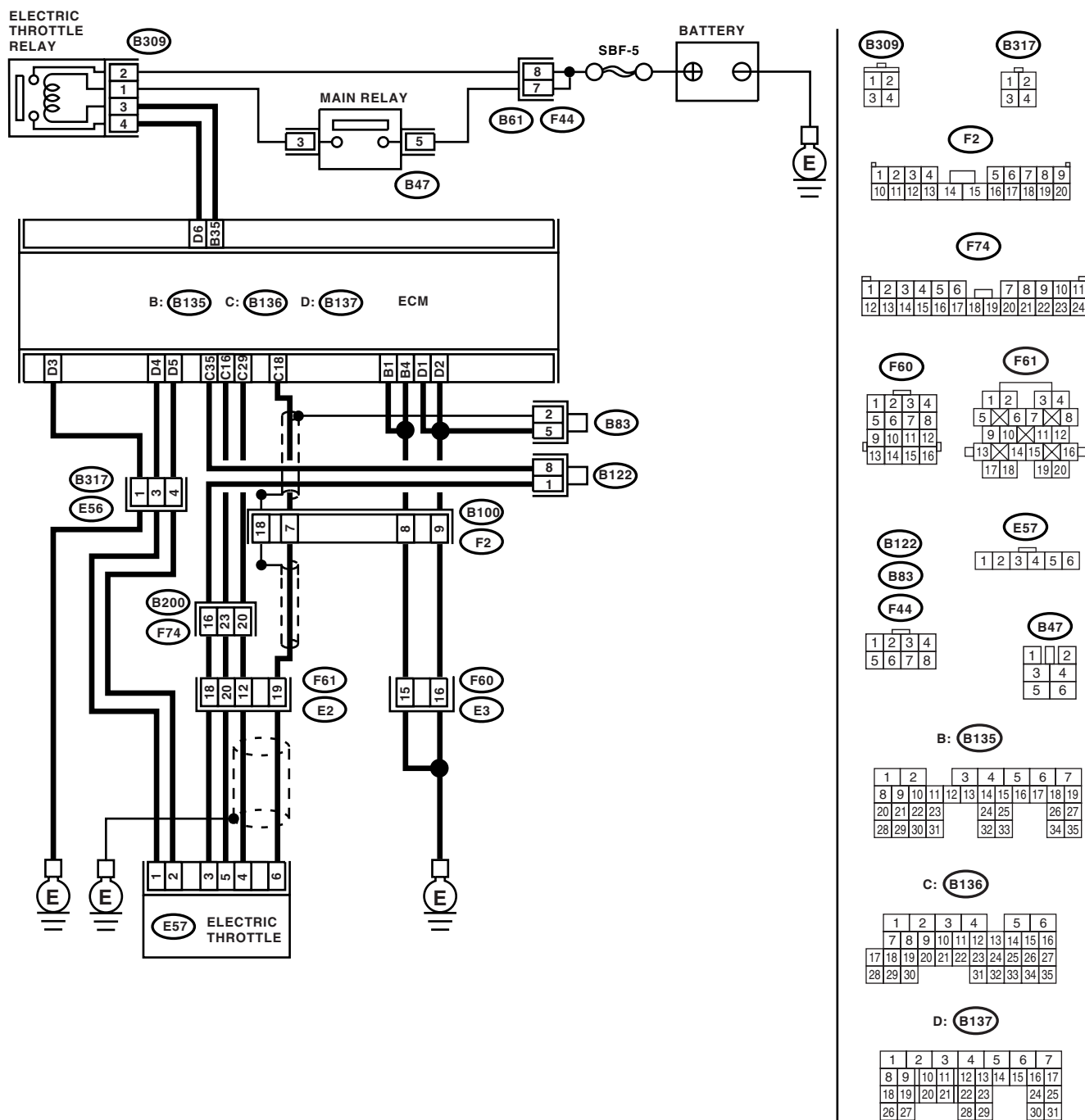
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                           | Check                                             | Yes                                                                                                                                                                                                                | No                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                             | Is any other DTC displayed?                       | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><b>NOTE:</b><br>In this case, it is not necessary to inspect DTC P0507. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR INTAKE SYSTEM.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine, and idle it.<br>3) Check the following items. <ul style="list-style-type: none"><li>• Loose installation of intake manifold and throttle body</li><li>• Cracks of intake manifold gasket and throttle body gasket</li><li>• Disconnections of vacuum hoses</li></ul> | Is there a fault in air intake system?            | Repair the air suction and leaks.                                                                                                                                                                                  | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electric throttle.<br>3) Check the electric throttle.                                                                                                                                                                                                                      | Are there foreign particles in electric throttle? | Remove the foreign particles from electric throttle.                                                                                                                                                               | Perform the diagnosis of DTC P2102. |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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### **BT:DTC P0512 — STARTER REQUEST CIRCUIT —**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-175, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

Failure of engine to start

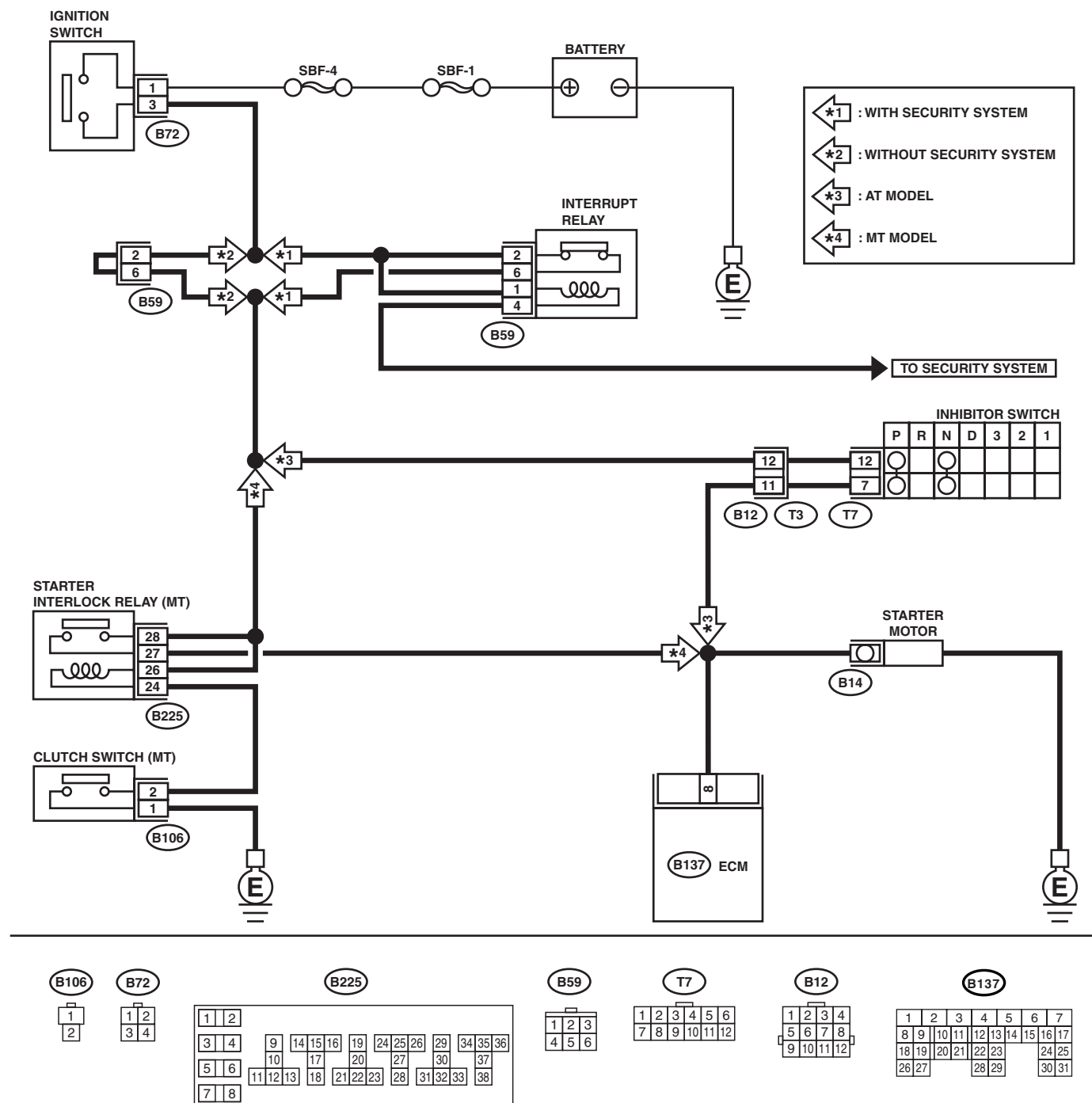
#### **CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02015

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                          | Check                                                                | Yes                                                                                                                                             | No                                                                                                                        |
|-----------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK OPERATION OF STARTER MOTOR.</b> | Does the starter motor operate when ignition switch is turned to ON? | Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Check the starter motor circuit. <Ref. to EN(H4DOTC)-57, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

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

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-176, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

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

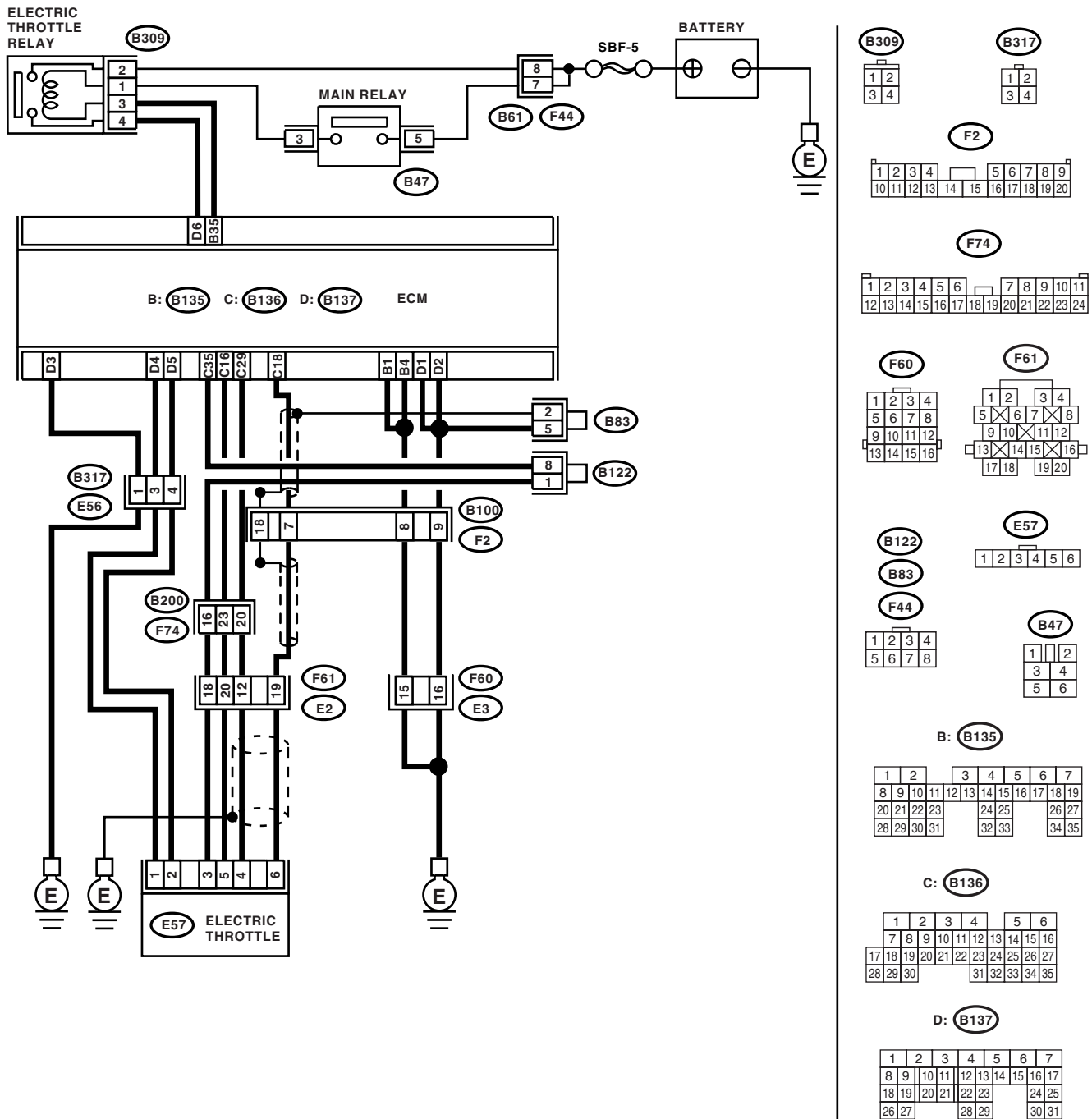
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                           | Check                                             | Yes                                                                                                                                                                                                                | No                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                             | Is any other DTC displayed?                       | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><b>NOTE:</b><br>In this case, it is not necessary to inspect DTC P0519. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR INTAKE SYSTEM.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine, and idle it.<br>3) Check the following items. <ul style="list-style-type: none"><li>• Loose installation of intake manifold and throttle body</li><li>• Cracks of intake manifold gasket and throttle body gasket</li><li>• Disconnections of vacuum hoses</li></ul> | Is there a fault in air intake system?            | Repair the air suction and leaks.                                                                                                                                                                                  | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electric throttle.<br>3) Check the electric throttle.                                                                                                                                                                                                                      | Are there foreign particles in electric throttle? | Remove the foreign particles from electric throttle.                                                                                                                                                               | Perform the diagnosis of DTC P2102. |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## BV:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-177, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

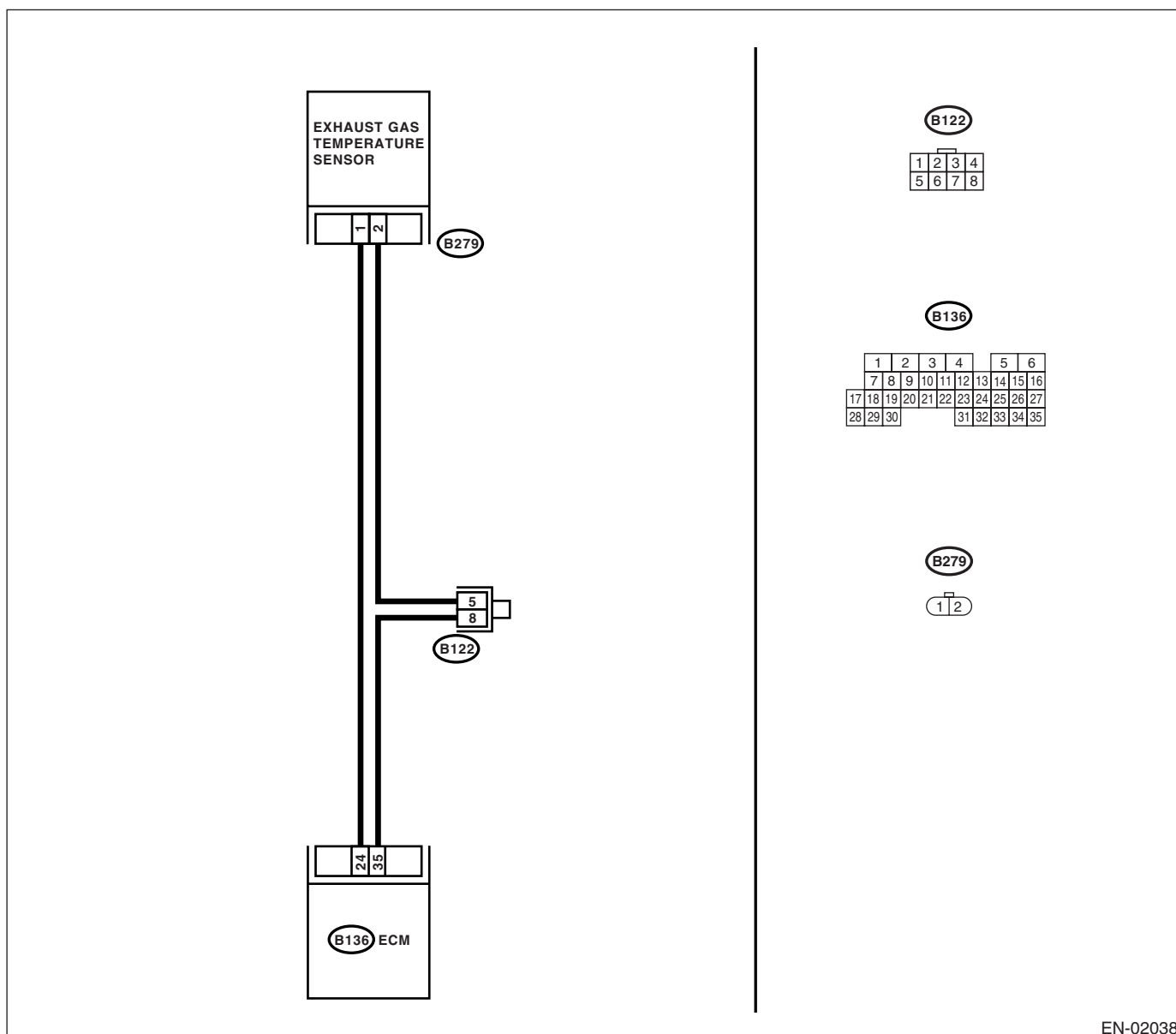
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Check                                         | Yes                                                                                              | No                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.                                                                                                                                                                              | Is the temperature more than 1200°C (2192°F)? | Go to step 2.                                                                                    | Repair the poor contact.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in exhaust gas temperature sensor<br>• Poor contact in ECM<br>• Poor contact in joint connector |
| <b>2 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from exhaust gas temperature sensor.<br>3) Turn the ignition switch to ON.<br>4) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the temperature less than 372°C (702°F)?   | Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-41, Exhaust Temperature Sensor.> | Repair the ground short circuit in harness between exhaust gas temperature sensor and ECM connector.                                                                                                  |

**BW:DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —**

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-179, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

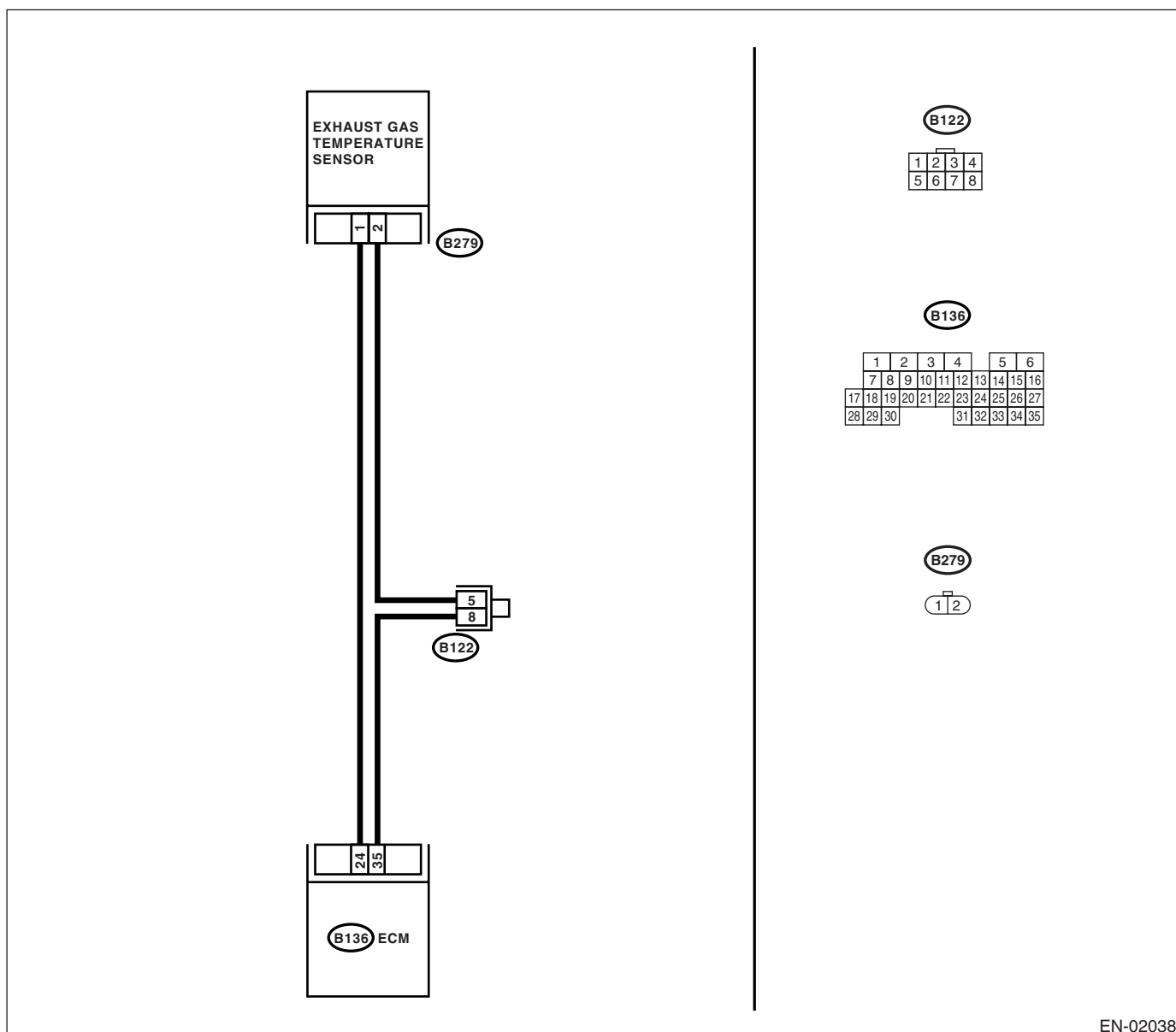
**TROUBLE SYMPTOM:**

- Hard to start
- Erroneous idling
- Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02038

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Check                                       | Yes                                                                                                   | No                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the temperature less than 372°C (702°F)? | Go to step 2.                                                                                         | Repair the poor contact.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in exhaust gas temperature sensor<br>• Poor contact in ECM<br>• Poor contact in joint connector                                                                                                                    |
| <b>2 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from exhaust gas temperature sensor.<br>3) Measure the voltage between exhaust gas temperature sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B279) No. 1 (+) — Engine ground (-):</b>                                                                                                          | Is the voltage more than 10 V?              | Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector. | Go to step 3.                                                                                                                                                                                                                                                                                                            |
| <b>3 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between exhaust gas temperature sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B279) No. 1 (+) — Engine ground (-):</b>                                                                                                                                                                               | Is the voltage more than 10 V?              | Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector. | Go to step 4.                                                                                                                                                                                                                                                                                                            |
| <b>4 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between exhaust gas temperature sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B279) No. 1 (+) — Engine ground (-):</b>                                                                                                                                                                                                                        | Is the voltage more than 4 V?               | Go to step 5.                                                                                         | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and exhaust gas temperature sensor connector<br>• Poor contact in exhaust gas temperature sensor connector<br>• Poor contact in ECM connector<br>• Poor contact in joint connector |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                     | Check                                    | Yes                                                                                                 | No                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>5</b><br><b>CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between exhaust gas temperature sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B279) No. 2 — Engine ground:</b> | Is the resistance less than 5 $\Omega$ ? | Replace the exhaust gas temperature sensor.<br><Ref. to FU(H4DOTC)-41, Exhaust Temperature Sensor.> | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and exhaust gas temperature sensor connector</li> <li>• Poor contact in exhaust gas temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in joint connector</li> </ul> |

**BX:DTC P0600 — IMPROPER CAN COMMUNICATION —**

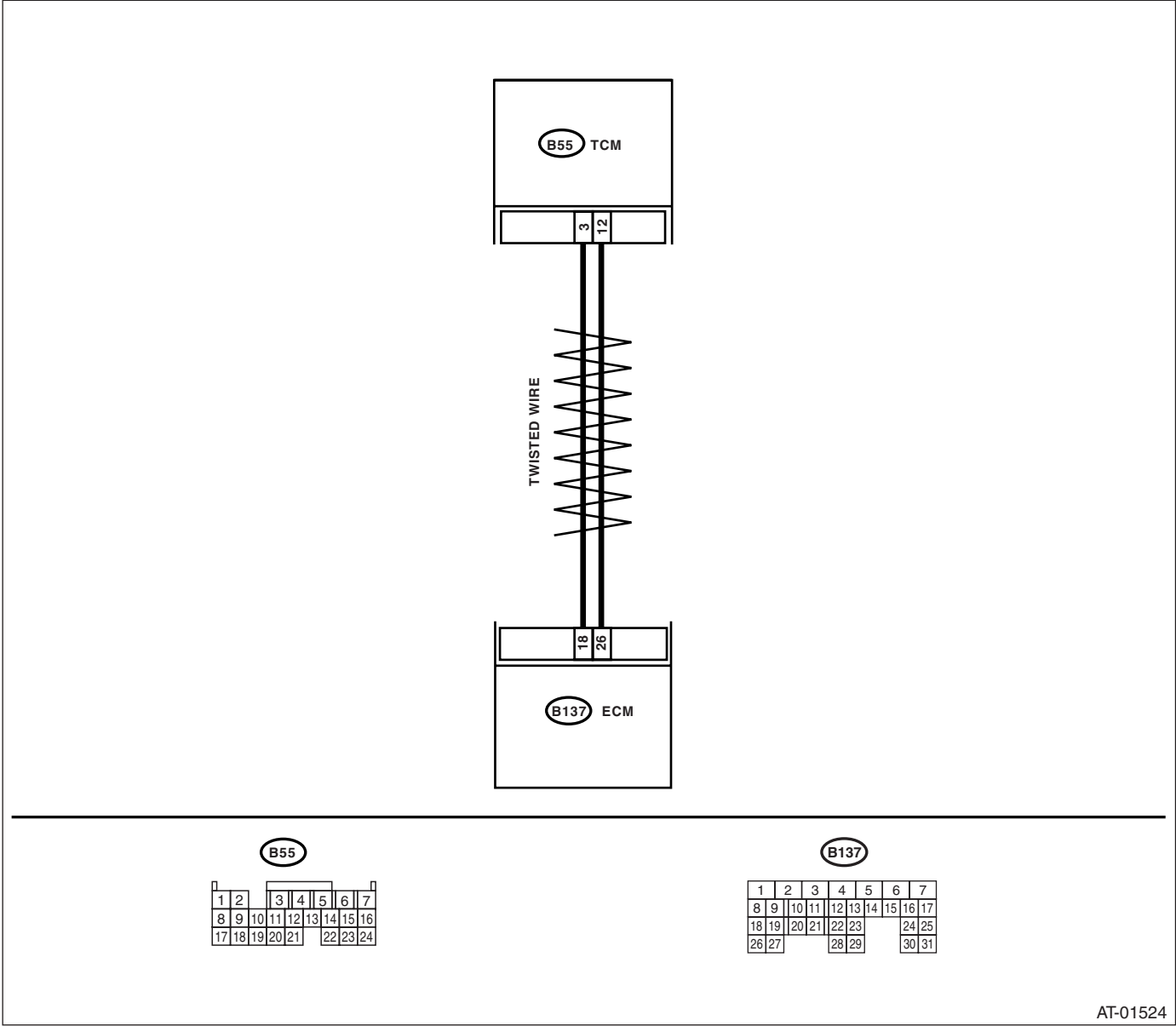
**DTC DETECTING CONDITION:**

Immediately at fault recognition

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, Inspection Mode.>.

**WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                             | Check                                             | Yes                    | No                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------|---------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from TCM.<br>4) Measure the resistance between connectors of ECM and TCM.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 18 — (B55) No. 3:</b><br><b>(B137) No. 26 — (B54) No. 12:</b> | Is the resistance less than 1 $\Omega$ ?          | Go to step 2.          | Repair the harness connector.                                             |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND TCM.</b><br>Measure the resistance between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 18 — Chassis ground:</b><br><b>(B137) No. 26 — Chassis ground:</b>                                                                                                                 | Is the resistance more than 1 M $\Omega$ ?        | Go to step 3.          | Repair the harness connector.                                             |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND TCM.</b><br>Measure the resistance of ECM connectors.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 18 — (B137) No. 26:</b>                                                                                                                                                                                   | Is the resistance more than 1 M $\Omega$ ?        | Go to step 4.          | Repair the harness connector.                                             |
| <b>4</b><br><b>CHECK AT SYSTEM STATUS.</b><br>Check the AT using Subaru Select Monitor.                                                                                                                                                                                                                                                                          | Does the Subaru Select Monitor display DTC P1718? | Inspect the AT system. | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |

**BY:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —****DTC DETECTING CONDITION:**

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

**TROUBLE SYMPTOM:**

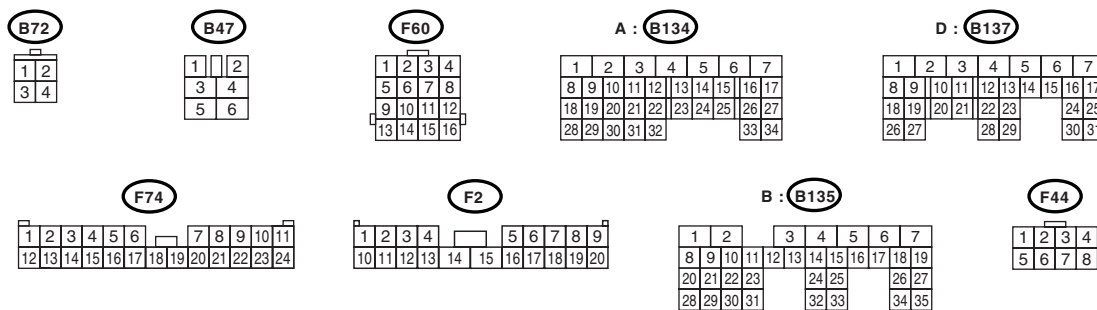
- Engine does not start.
- Engine stalls.

**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

## ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02016

| Step                                        | Check                                                                          | Yes                                                                       | No                        |
|---------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604? | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | A temporary poor contact. |

**BZ:DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM)  
ERROR —**

**NOTE:**

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)-260, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

---

### **CA:DTC P0607 — CONTROL MODULE PERFORMANCE —**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-183, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-184, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance

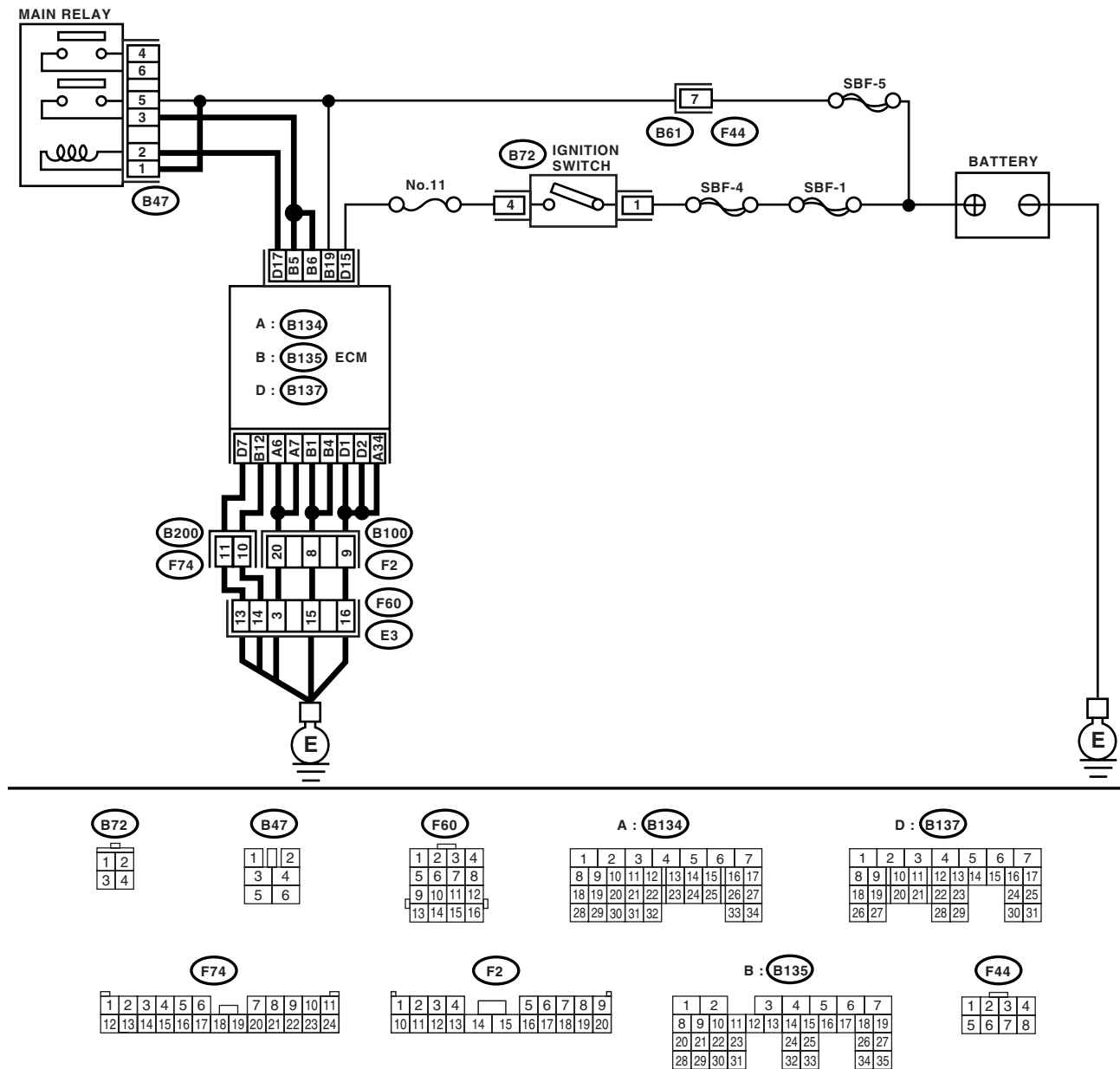
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02016

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                  | Check                         | Yes                                                                           | No                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>1</b><br><b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 5 (+) — Chassis ground (-):</b><br><b>(B135) No. 6 (+) — Chassis ground (-):</b> | Is the voltage 10 — 13 V?     | Go to step 2.                                                                 | Repair the open circuit or ground short of power supply circuit. |
| <b>2</b><br><b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Start the engine.<br>2) Measure the voltage between ECM connector and ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 5 (+) — Chassis ground (-):</b><br><b>(B135) No. 6 (+) — Chassis ground (-):</b>               | Is the voltage 13 — 15 V?     | Go to step 3.                                                                 | Repair the open circuit or ground short of power supply circuit. |
| <b>3</b><br><b>CHECK GROUND HARNESS OF ECM.</b><br>Measure the voltage between ECM connector and ground.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 1 (+) — Chassis ground (-):</b><br><b>(B137) No. 2 (+) — Chassis ground (-):</b>                                         | Is the voltage less than 1 V? | Repair poor contact of ECM connector. If poor contact occur, replace the ECM. | Retighten the engine ground terminal.                            |

**CB:DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE  
(BANK 1) —**

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)-348, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

---

### **CC:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-190, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Radiator fan does not operate properly.
- Overheating

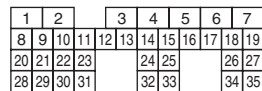
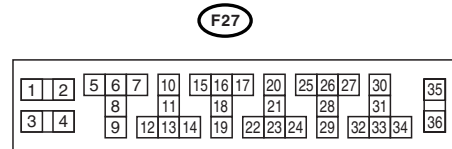
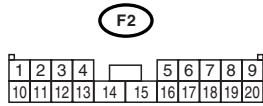
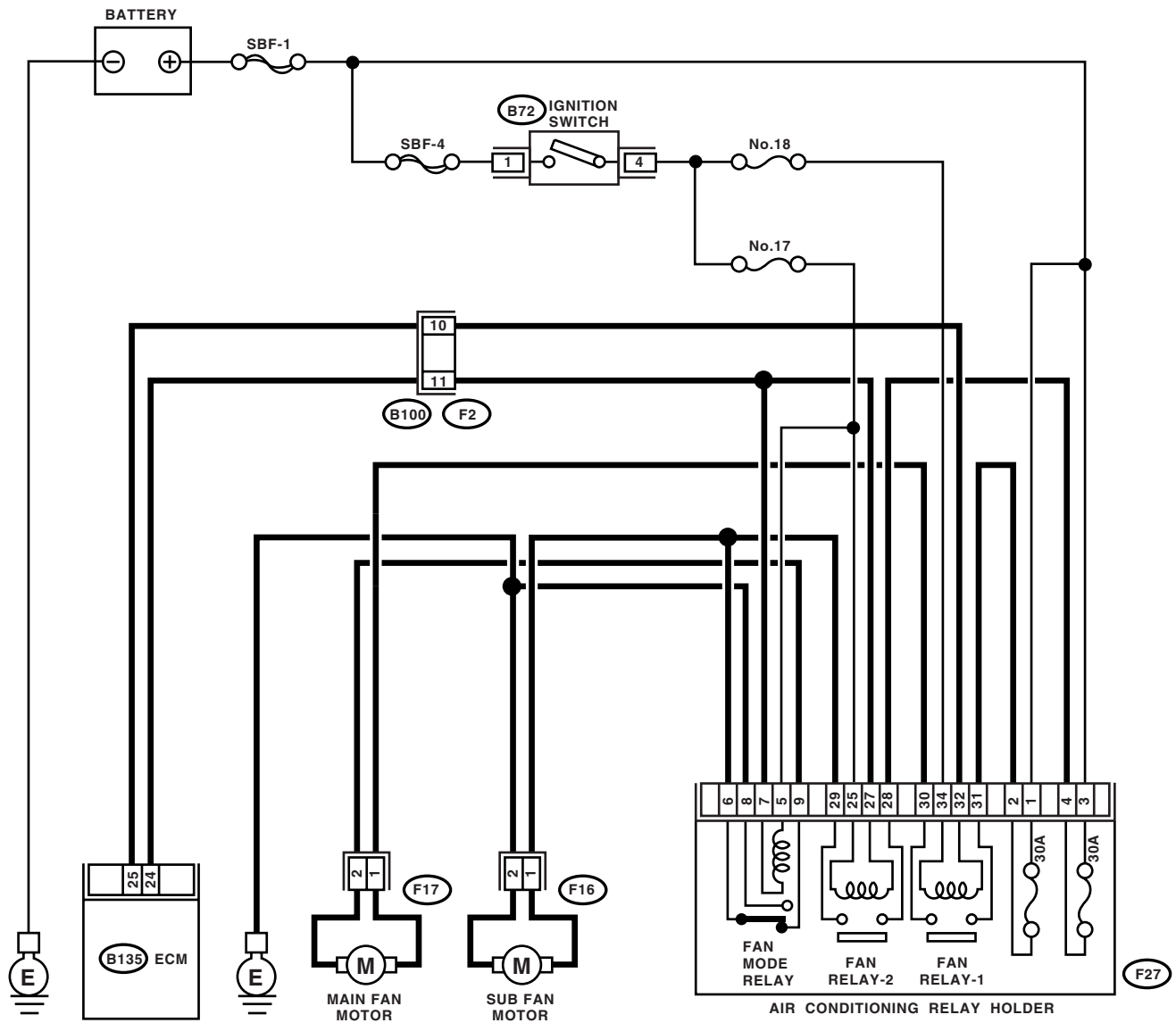
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02036

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Check                                                | Yes                                                | No                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the test mode connector.<br>3) Turn the ignition switch to ON.<br>4) While operating the radiator fan relay, measure voltage between ECM terminal and ground.<br><br><b>NOTE:</b><br>Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 25 (+) — Chassis ground (-):</b><br><b>(B135) No. 24 (+) — Chassis ground (-):</b> | Does the voltage change 0 — 10 V?                    | Repair poor contact in ECM connector.              | Go to step 2.                                                                                                                                                                                     |
| <b>2 CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 25 — Chassis ground:</b><br><b>(B135) No. 24 — Chassis ground:</b>                                                                                                                                                                                                                                               | Is the resistance more than 1 MΩ?                    | Go to step 3.                                      | Repair ground short circuit in radiator fan relay control circuit.                                                                                                                                |
| <b>3 CHECK POWER SUPPLY FOR RELAY.</b><br>1) Remove the fan relay 1 and fan relay 2 from A/C relay holder.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(F27) No. 27 (+) — Chassis ground (-):</b><br><b>(F27) No. 32 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                     | Is the voltage more than 10 V?                       | Go to step 4.                                      | Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.                                                                                                    |
| <b>4 CHECK FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between main fan relay terminals.<br><br><b>Terminals</b><br><b>No. 32 — No. 34: (Fan relay 1)</b><br><b>No. 25 — No. 27: (Fan relay 2)</b>                                                                                                                                                                                                                                                                                                                                                                              | Is the resistance 87 — 107 Ω?                        | Go to step 5.                                      | Replace the fan relay.                                                                                                                                                                            |
| <b>5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.</b><br>Measure the resistance of harness between ECM and fan relay connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 25 — (F27) No. 32:</b><br><b>(B135) No. 24 — (F27) No. 27:</b>                                                                                                                                                                                                                                                                                                                                                        | Is the resistance less than 1 Ω?                     | Go to step 6.                                      | Repair harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and fan relay connector<br>• Poor contact in coupling connector |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in ECM or fan relay connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Is there poor contact in ECM or fan relay connector? | Repair poor contact in ECM or fan relay connector. | Contact your SOA Service Center.                                                                                                                                                                  |

## **CD:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-191, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Radiator fan does not operate properly.
- Overheating

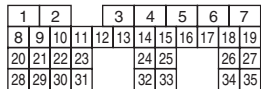
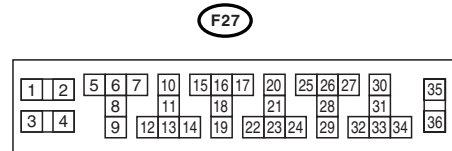
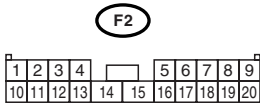
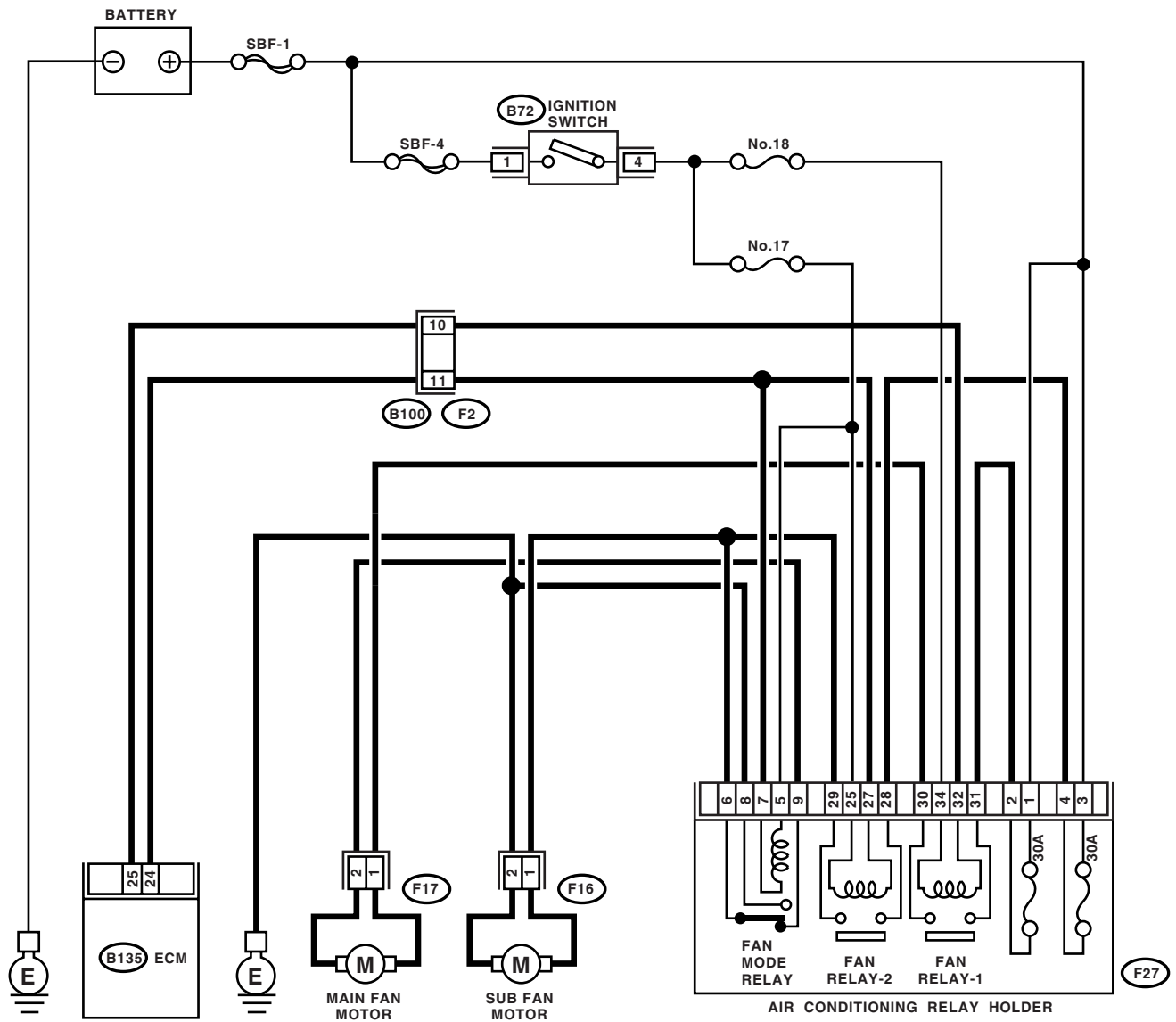
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02036

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Check                                    | Yes                                                                                                                                                                 | No                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the test mode connector.<br>3) Turn the ignition switch to ON.<br>4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground.<br><br><b>NOTE:</b><br>Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.><br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 25 (+) — Chassis ground (-):</b><br><b>(B135) No. 24 (+) — Chassis ground (-):</b> | Does the voltage change 0 — 10 V?        | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector. | Go to step 2.                                                          |
| <b>2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fan relay 1, fan relay 2 and fan mode relay.<br>3) Disconnect the test mode connector.<br>4) Turn the ignition switch to ON.<br>5) Measure the voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 25 (+) — Chassis ground (-):</b><br><b>(B135) No. 24 (+) — Chassis ground (-):</b>                                                                                                                                                                                 | Is the voltage more than 10 V?           | Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>        | Go to step 3.                                                          |
| <b>3 CHECK FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fan relay.<br>3) Measure the resistance between fan relay terminals.<br><br><b>Terminals</b><br><b>No. 30 — No. 31: (Fan relay 1)</b><br><b>No. 28 — No. 29: (Fan relay 2)</b>                                                                                                                                                                                                                                                                                                                                                                              | Is the resistance less than 1 $\Omega$ ? | Replace the fan relay and ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                | Go to step 4.                                                          |
| <b>4 CHECK FAN MODE RELAY.</b><br>1) Remove the fan mode relay.<br>2) Measure the resistance between fan mode relay terminals.<br><br><b>Terminals</b><br><b>No. 8 — No. 9: (Fan mode relay)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                              | Is the resistance less than 1 $\Omega$ ? | Replace the fan mode relay and ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                           | Go to step 5.                                                          |
| <b>5 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.                                                                                                                           | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

---

### **CE:DTC P0700 — REQUEST AT MIL ON —**

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-192, DTC P0700 — REQUEST AT MIL ON —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**NOTE:**

Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-2, PROCEDURE, Basic Diagnostic Procedure.>

## CF:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

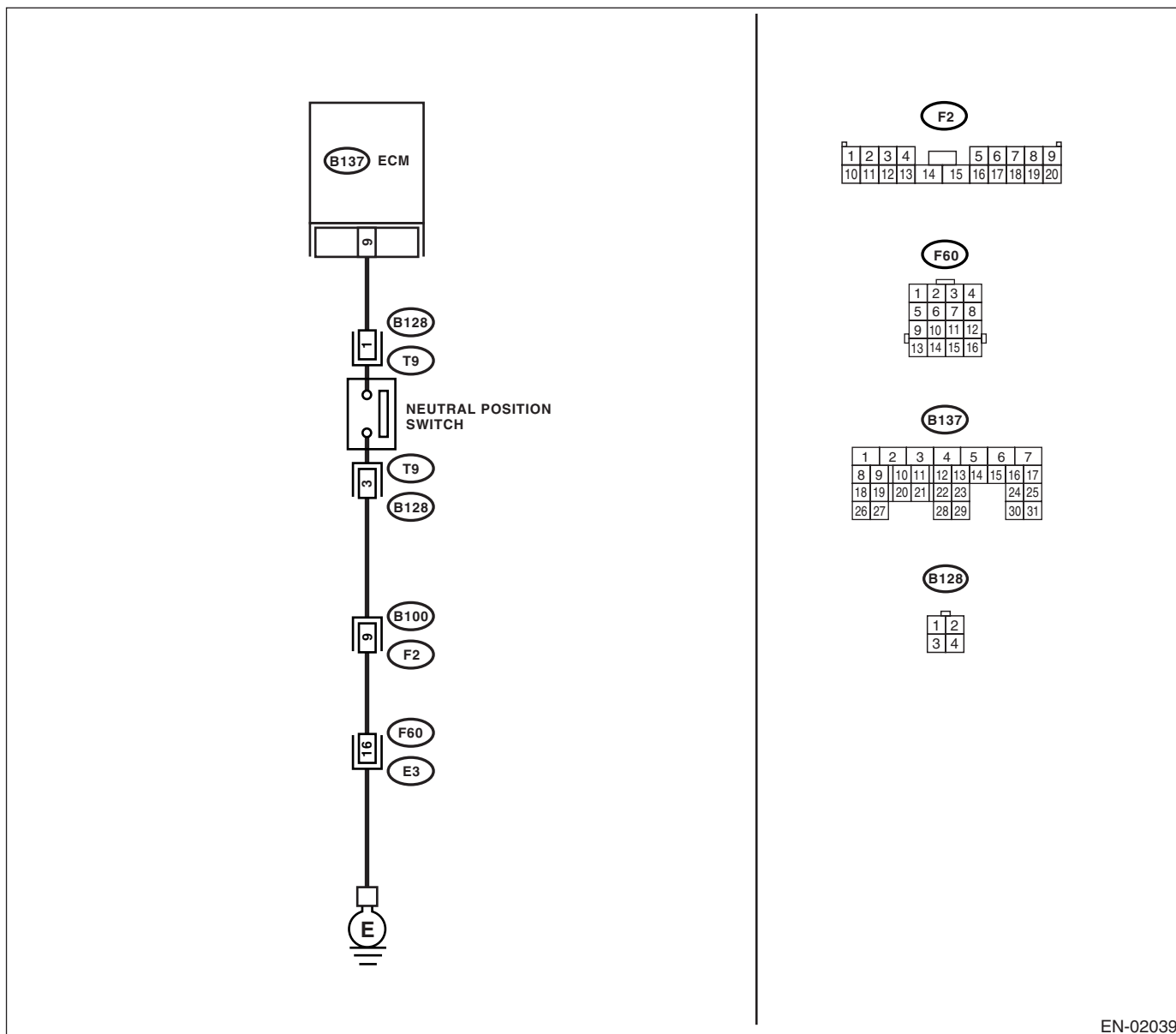
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02039

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

## CG:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —

### DTC DETECTING CONDITION:

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

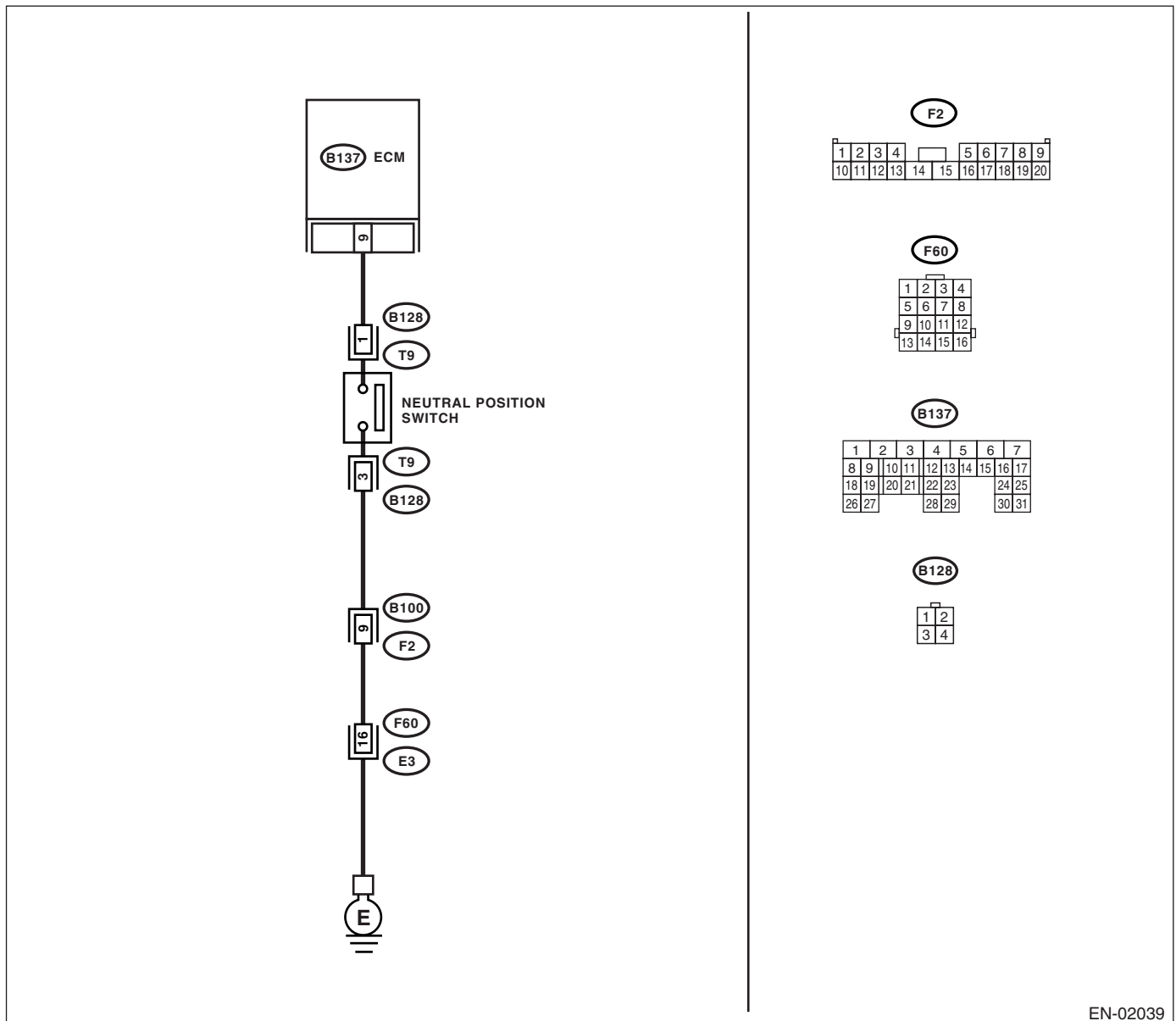
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02039

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                        | Check                                                        | Yes                                                                                 | No                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Set the shift lever to except neutral position.<br>3) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 9 (+) — Chassis ground (-):</b>                                                                              | Is the voltage less than 1 V?                                | Go to step 2.                                                                       | Go to step 4.                                                                                                                                                                                                                                                                                                    |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Set the shift lever to neutral position.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 9 (+) — Chassis ground (-):</b>                                                                                                                           | Is the voltage more than 10 V?                               | Go to step 3.                                                                       | Go to step 4.                                                                                                                                                                                                                                                                                                    |
| <b>3 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                                                        | Is there poor contact in ECM connector?                      | Repair the poor contact in ECM connector.                                           | Contact your SOA Service Center.                                                                                                                                                                                                                                                                                 |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Disconnect ECM connector from ECM.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 9 (+) — Chassis ground (-):</b>                                                                                                                                 | Is the voltage more than 10 V?                               | Repair the battery short circuit in harness between ECM and transmission connector. | Go to step 5.                                                                                                                                                                                                                                                                                                    |
| <b>5 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and transmission harness connector (T9).<br>3) Measure the resistance of harness between ECM and neutral switch connector.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 9 — (B128) No. 1:</b> | Is the resistance less than 1 $\Omega$ ?                     | Go to step 6.                                                                       | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and transmission harness</li> <li>• Poor contact in transmission harness connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <b>6 CHECK NEUTRAL POSITION SWITCH GROUND LINE.</b><br>Measure the resistance of harness between transmission harness connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B128) No. 3 — Engine ground:</b>                                                                                                                               | Is the resistance less than 5 $\Omega$ ?                     | Go to step 7.                                                                       | Repair the open circuit in harness of neutral position switch ground line.                                                                                                                                                                                                                                       |
| <b>7 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Set the shift lever to except neutral position.<br>2) Measure the resistance between transmission harness connector receptacle's terminals.<br><b>Terminals</b><br><b>No. 1 — No. 3:</b>                                                                                                                      | Is the resistance less than 1 $\Omega$ ?                     | Go to step 8.                                                                       | Replace the neutral position switch.                                                                                                                                                                                                                                                                             |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact in the transmission harness connector.                                                                                                                                                                                                                                                                   | Is there poor contact in the transmission harness connector? | Repair poor contact in transmission harness connector.                              | Contact your SOA Service Center.                                                                                                                                                                                                                                                                                 |

### CH: DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-197, DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

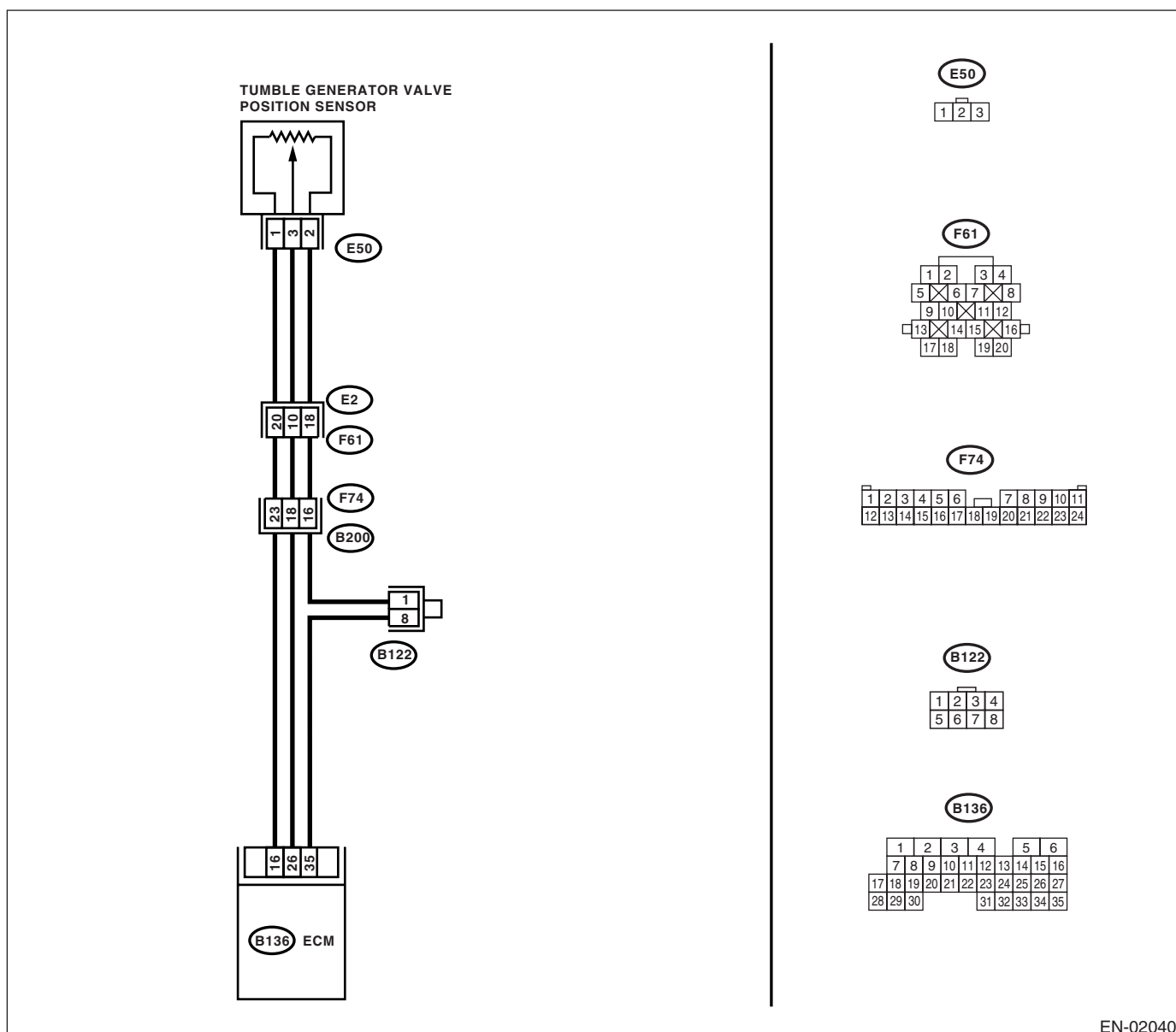
#### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02040

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Check                                                                                                          | Yes                                       | No                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the voltage less than 0.1 V?                                                                                | Go to step 2.                             | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in throttle position sensor connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground while tumble generator valve is fully closed.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                         | Is the voltage more than 4.5 V?                                                                                | Go to step 4.                             | Go to step 3.                                                                                                                                                                                                                                                                                                                                                     |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                      | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?         | Repair the poor contact in ECM connector. | Contact your SOA Service Center.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                                                                                                                                                                                     |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 26 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                      | Is the voltage less than 0.1 V?                                                                                | Go to step 6.                             | Go to step 5.                                                                                                                                                                                                                                                                                                                                                     |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Measure the voltage between ECM connector and chassis ground.                                                                                                                                                                                                                                                                                                                                             | Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change? | Repair the poor contact in ECM connector. | Go to step 6.                                                                                                                                                                                                                                                                                                                                                     |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Check                                                                      | Yes                                                                          | No                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from tumble generator valve position sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between tumble generator valve position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E50) No. 1 (+) — Engine ground (-):</b> | Is the voltage more than 4.5 V?                                            | Go to step 7.                                                                | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <b>7</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 26 — (E50) No. 3:</b>                                                                                                              | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 8.                                                                | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>                                            |
| <b>8</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b><br>Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E50) No. 3 — Engine ground:</b>                                                                                                                                                        | Is the resistance more than 1 M $\Omega$ ?                                 | Go to step 9.                                                                | Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.                                                                                                                                                                                                                                                                                                                                        |
| <b>9</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in tumble generator valve position sensor connector.                                                                                                                                                                                                                                                                                                                                    | Is there poor contact in tumble generator valve position sensor connector? | Repair the poor contact in tumble generator valve position sensor connector. | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                                                                                                                                                                                                                                                                                                                              |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## CI: DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-199, DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

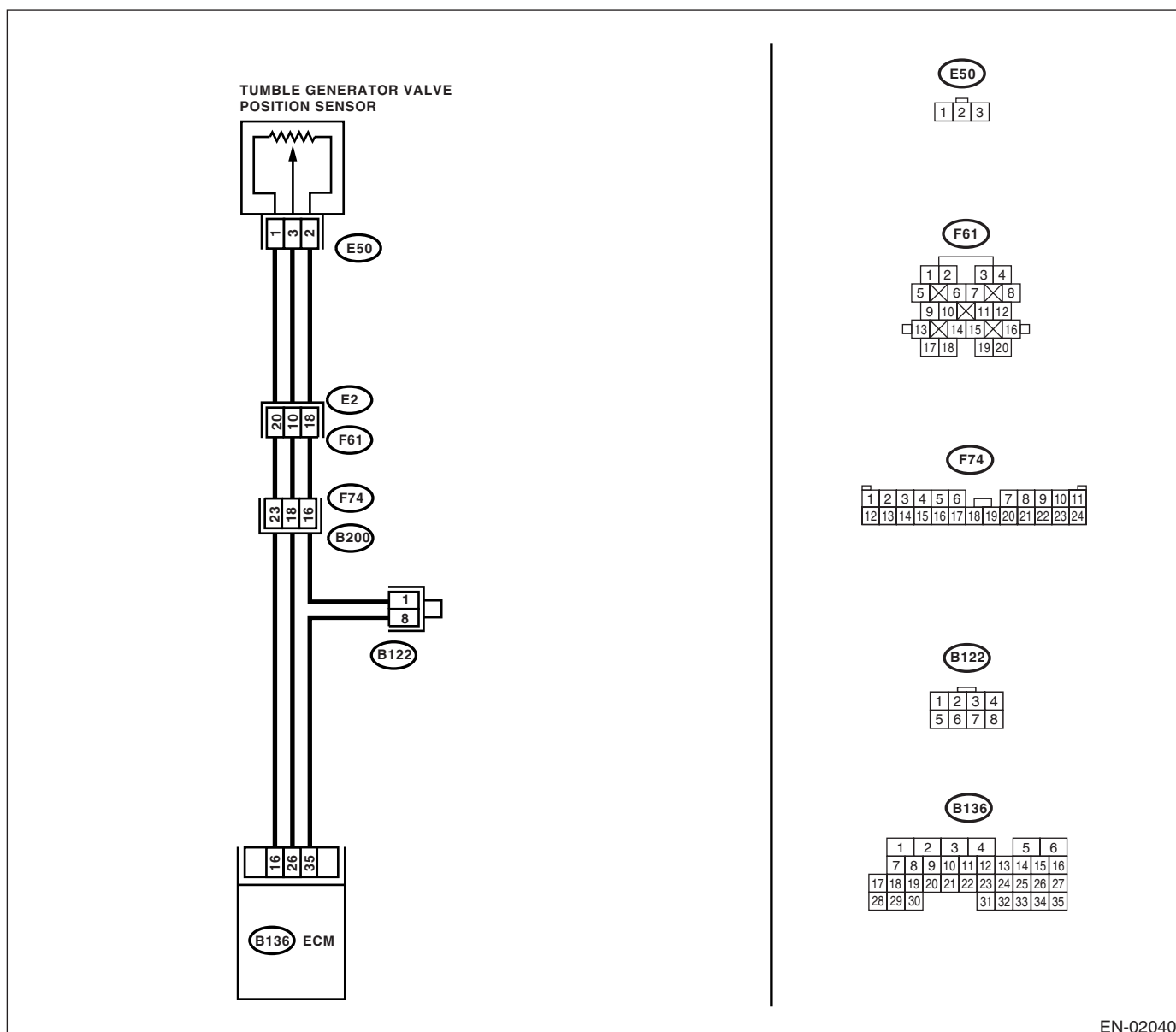
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02040

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Check                                    | Yes                                                                                                                                                                                                | No                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>OBD-II general scan tool</li> </ul> For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the voltage more than 4.9 V?          | Go to step 2.                                                                                                                                                                                      | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>Poor contact in tumble generator valve position sensor connector</li> <li>Poor contact in ECM connector</li> <li>Poor contact in coupling connector</li> </ul> |
| <b>2</b><br><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from throttle position sensor.<br>3) Measure the resistance of harness between throttle position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E50) No. 2 — Engine ground:</b>                                                                                                                                                                                             | Is the resistance less than 5 $\Omega$ ? | Go to step 3.                                                                                                                                                                                      | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>Poor contact in coupling connector</li> <li>Poor contact in joint connector</li> </ul>                                                                                                             |
| <b>3</b><br><b>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between throttle position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E50) No. 3 (+) — Engine ground (-):</b>                                                                                                                                                                                                                                                                                | Is the voltage more than 4.9 V?          | Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                                                                                                                                                                                                                                                                                                                  |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### CJ: DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-201, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

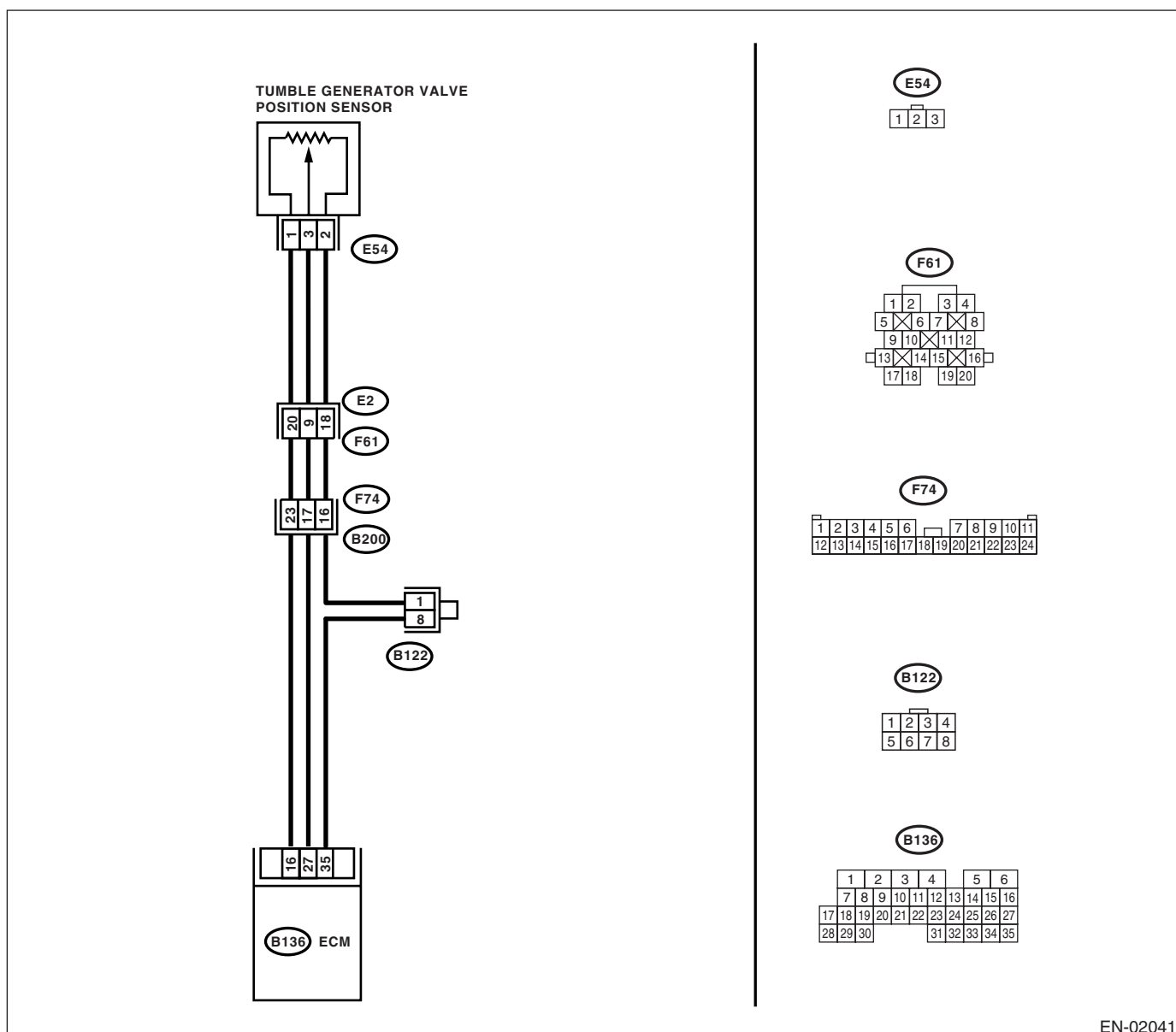
#### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02041

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Check                                                                                                          | Yes                                       | No                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the voltage less than 0.1 V?                                                                                | Go to step 2.                             | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in tumble generator valve position sensor connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                               | Is the voltage more than 4.5 V?                                                                                | Go to step 4.                             | Go to step 3.                                                                                                                                                                                                                                                                                                                                                                       |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                    | Shake the ECM harness and connector, while monitoring value of voltage meter.<br>Does the voltage change?      | Repair the poor contact in ECM connector. | Contact your SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                                                                                                                                                                                                   |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 27 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                    | Is the voltage less than 0.1 V?                                                                                | Go to step 6.                             | Go to step 5.                                                                                                                                                                                                                                                                                                                                                                       |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Measure the voltage between ECM connector and chassis ground.                                                                                                                                                                                                                                                                                                                                                               | Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change? | Repair the poor contact in ECM connector. | Go to step 6.                                                                                                                                                                                                                                                                                                                                                                       |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                     | Check                                                                      | Yes                                                                          | No                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from throttle position sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between throttle position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E54) No. 1 (+) — Engine ground (-):</b> | Is the voltage more than 4.5 V?                                            | Go to step 7.                                                                | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in throttle position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <b>7</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between ECM connector and throttle position sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 27 — (E54) No. 3:</b>                                                                                                | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 8.                                                                | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>                              |
| <b>8</b><br><b>CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</b><br>Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E54) No. 3 — Engine ground:</b>                                                                                                                                          | Is the resistance more than 1 M $\Omega$ ?                                 | Go to step 9.                                                                | Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.                                                                                                                                                                                                                                                                                                                          |
| <b>9</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in tumble generator valve position sensor connector.                                                                                                                                                                                                                                                                                                        | Is there poor contact in tumble generator valve position sensor connector? | Repair the poor contact in tumble generator valve position sensor connector. | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                                                                                                                                                                                                                                                                                                                |

### CK:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-203, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

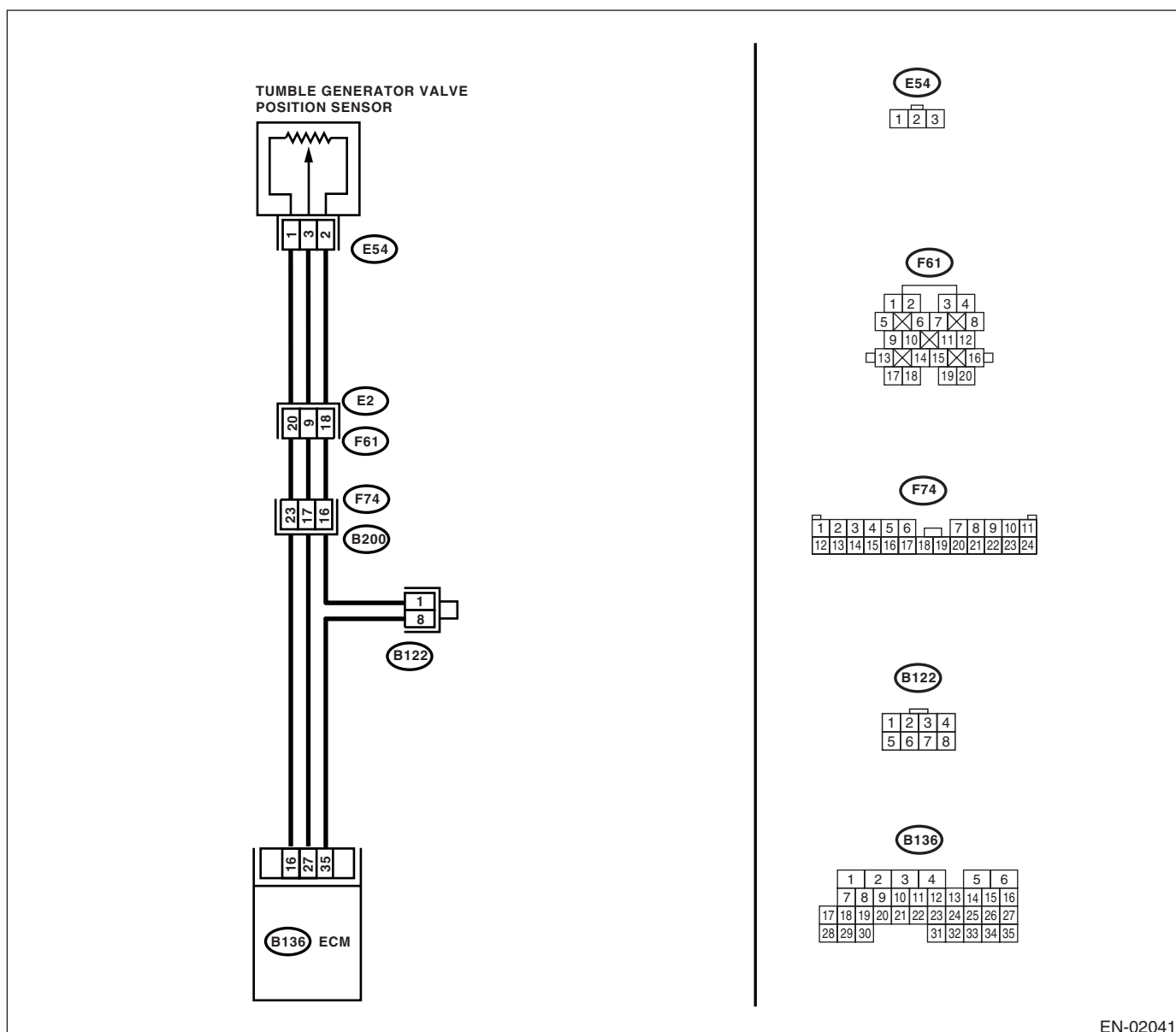
#### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02041

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Check                                    | Yes                                                                                                                                                                                                | No                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the voltage more than 4.9 V?          | Go to step 2.                                                                                                                                                                                      | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in tumble generator valve position sensor connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <b>2</b><br><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from throttle position sensor.<br>3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E54) No. 2 — Engine ground:</b>                                                                                                       | Is the resistance less than 5 $\Omega$ ? | Go to step 3.                                                                                                                                                                                      | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between tumble generator valve position sensor and ECM connector<br>• Poor contact in coupling connector<br>• Poor contact in joint connector                                                                                                             |
| <b>3</b><br><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between throttle position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E54) No. 3 (+) — Engine ground (-):</b>                                                                                                                                                                                          | Is the voltage more than 4.9 V?          | Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                                                                                                                                                                                                                                                              |

### CL:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION<Ref. to GD(H4DOTC)-205, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                                                                                                                            | Check                                                                                 | Yes                                                                                                                                     | No                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>1</b> <b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                 | Is any other DTC displayed?                                                           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| <b>2</b> <b>CHECK TUMBLE GENERATOR VALVE RH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                  | Clean the tumble generator valve. |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

### CM:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                                                                                                                               | Check                                                                                 | Yes                                                                                                                                    | No                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                 | Is any other DTC displayed?                                                           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| <b>2</b><br><b>CHECK TUMBLE GENERATOR VALVE RH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                 | Clean the tumble generator valve. |

**CN:DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —**

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-207, DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

| Step                                                                                                                                            | Check                                                                                 | Yes                                                                                                                                     | No                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>1</b> <b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                 | Is any other DTC displayed?                                                           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| <b>2</b> <b>CHECK TUMBLE GENERATOR VALVE RH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                  | Clean the tumble generator valve. |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

### CO:DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                                                                                                                               | Check                                                                                 | Yes                                                                                                                                     | No                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                 | Is any other DTC displayed?                                                           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| <b>2</b><br><b>CHECK TUMBLE GENERATOR VALVE RH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                  | Clean the tumble generator valve. |

### CP:DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

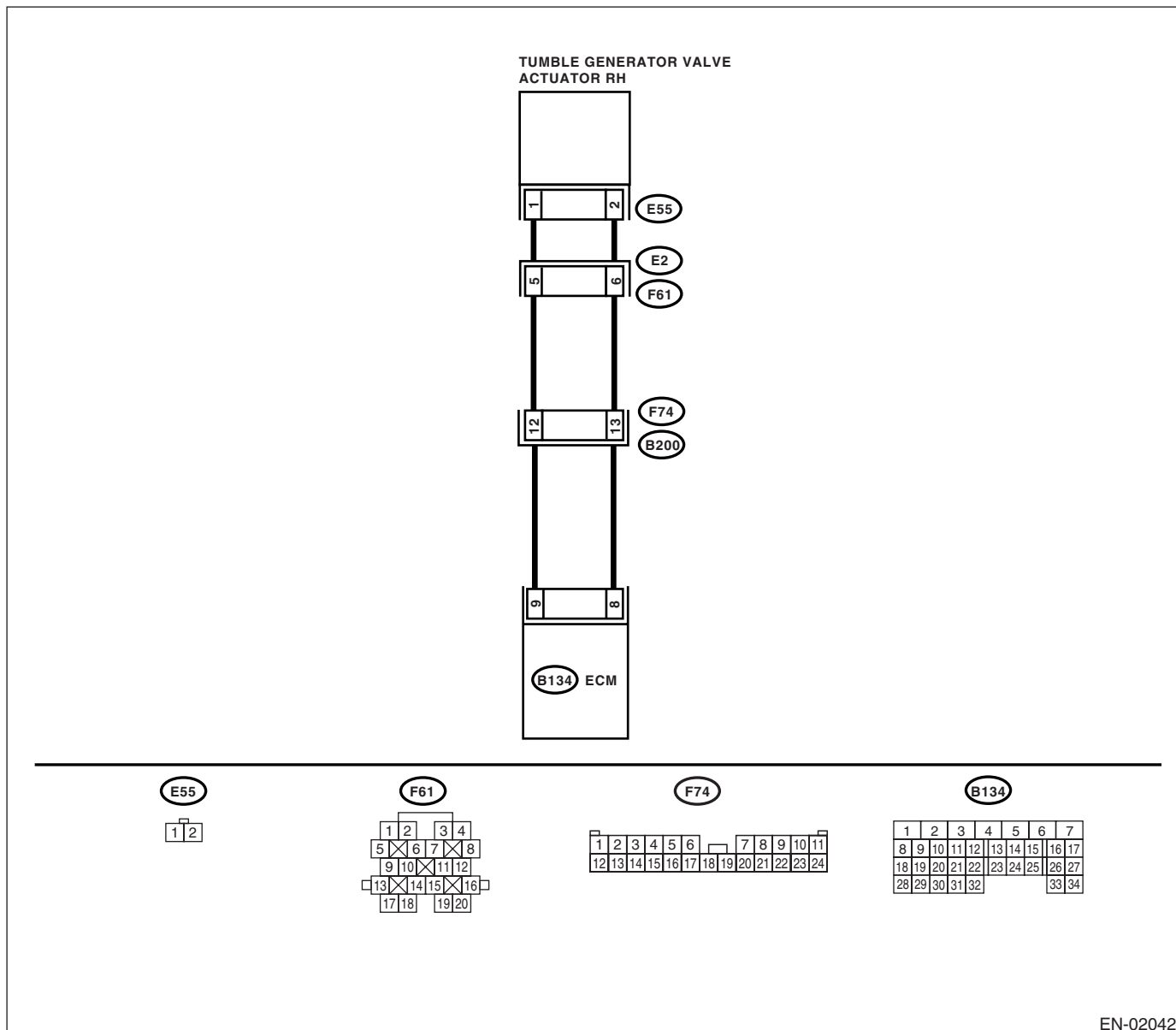
#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-209, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                    | Check                                                               | Yes                                                                   | No                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from tumble generator valve and ECM connector.<br>3) Measure the resistance between tumble generator valve actuator and ECM connector.<br><b>Connector &amp; terminal</b><br><b>(E55) No. 1 — (B134) No. 9:</b><br><b>(E55) No. 2 — (B134) No. 8:</b> | Is the resistance less than 1 $\Omega$ ?                            | Go to step 2.                                                         | Repair the open circuit between ECM and tumble generator valve connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and tumble generator valve actuator connector.</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in tumble generator valve actuator connector.                                                                                                                                                                                                                                                                                                              | Is there poor contact in tumble generator valve actuator connector? | Repair the poor contact in tumble generator valve actuator connector. | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                                                                                                                                                                                                        |

## CQ:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

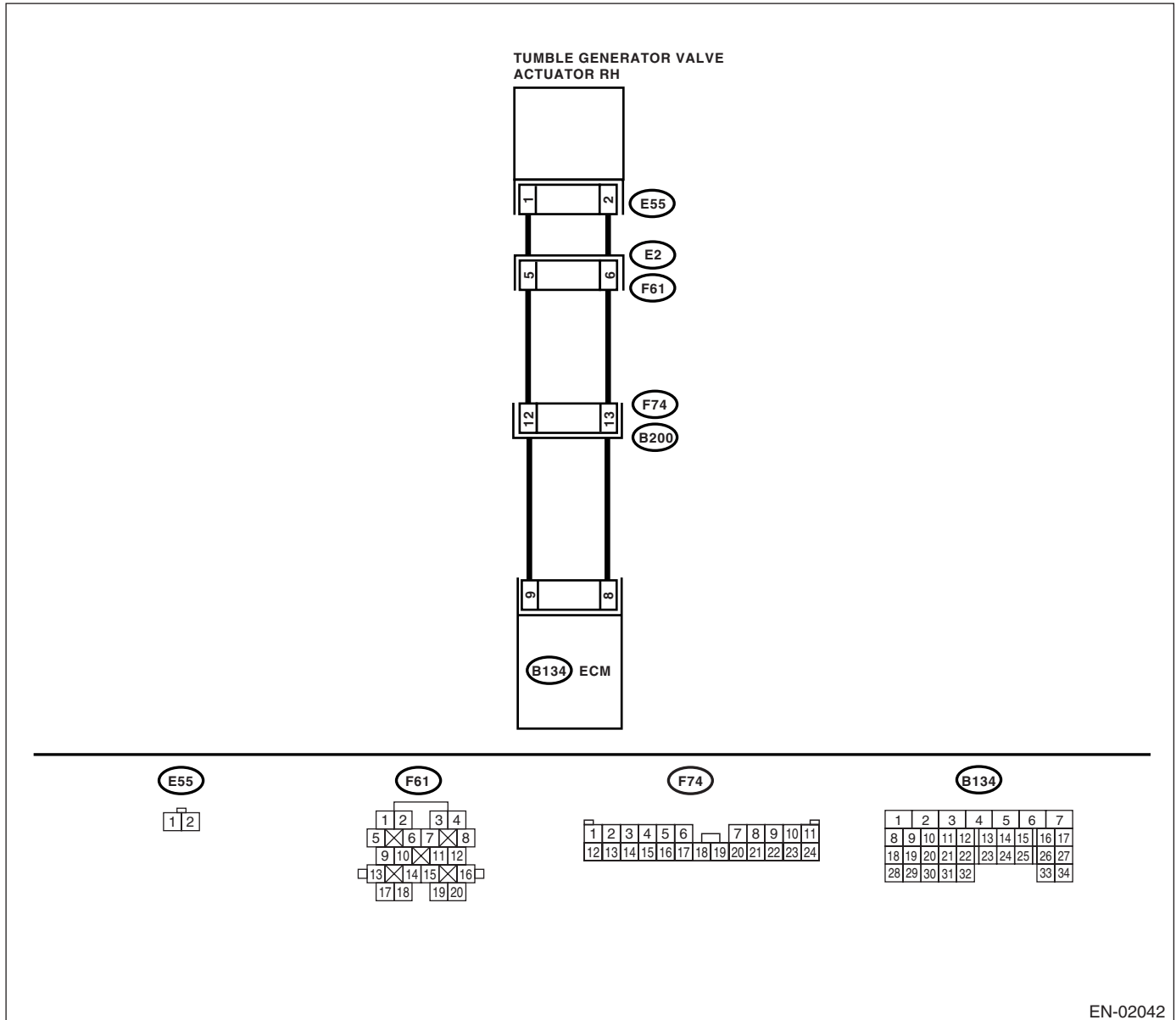
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-211, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                              | Check                         | Yes                                                                                                    | No                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from tumble generator valve connector.<br>3) Measure the voltage between tumble generator valve actuator and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(E55) No. 1 (+) — Chassis ground (-):</b><br><b>(E55) No. 2 (+) — Chassis ground (-):</b> | Is the voltage less than 5 V? | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.> | Repair the battery short circuit between ECM and tumble generator valve actuator. |

### CR:DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —

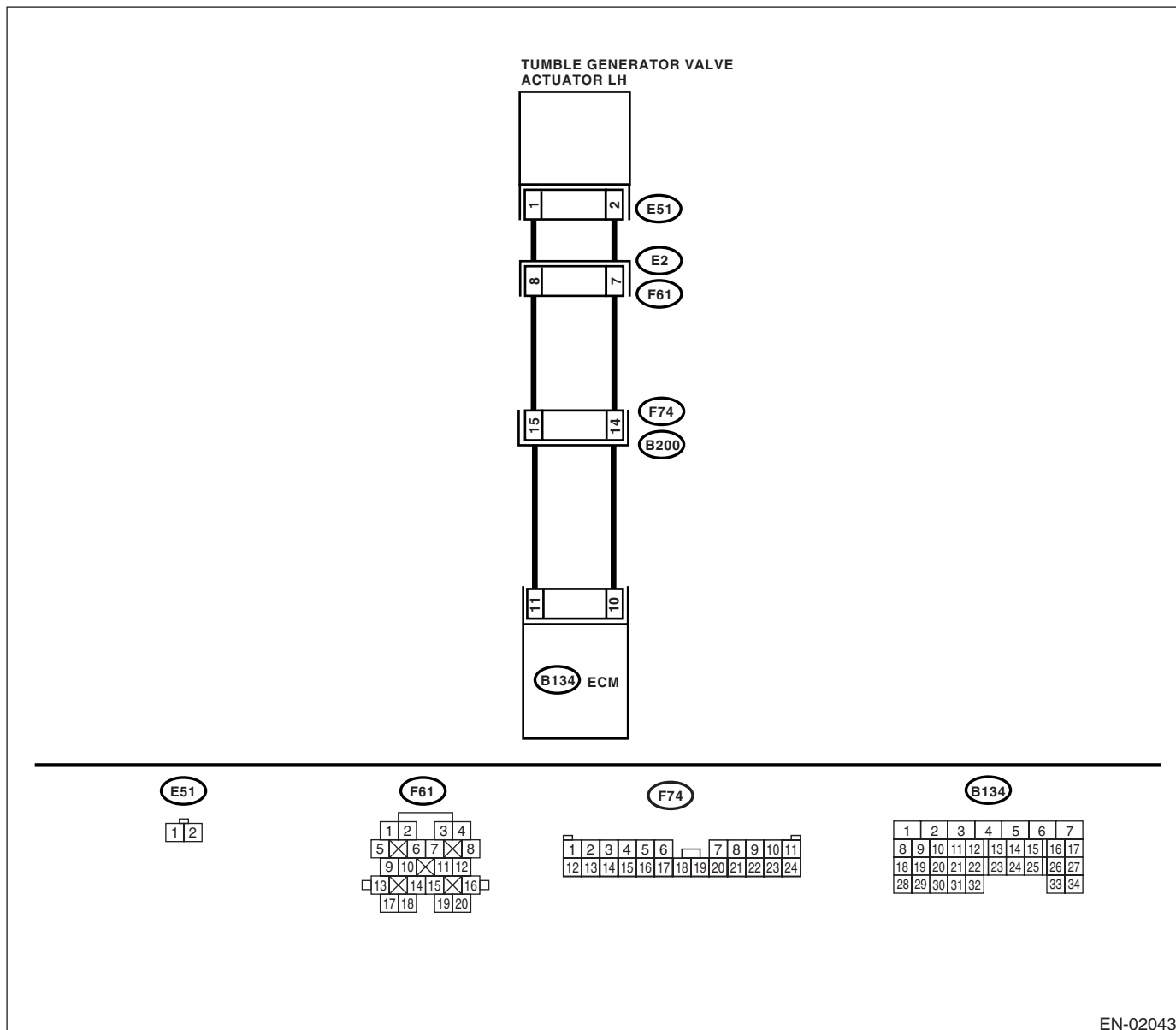
#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-213, DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02043

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                      | Check                                                               | Yes                                                                   | No                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from tumble generator valve and ECM connector.<br>3) Measure the resistance between tumble generator valve actuator and ECM connector.<br><b>Connector &amp; terminal</b><br><b>(E51) No. 1 — (B134) No. 11:</b><br><b>(E51) No. 2 — (B134) No. 10:</b> | Is the resistance less than 1 $\Omega$ ?                            | Go to step 2.                                                         | Repair the open circuit between ECM and tumble generator valve connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and tumble generator valve actuator connector.</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in tumble generator valve actuator connector.                                                                                                                                                                                                                                                                                                                | Is there poor contact in tumble generator valve actuator connector? | Repair the poor contact in tumble generator valve actuator connector. | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>                                                                                                                                                                                                                        |

### CS:DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —

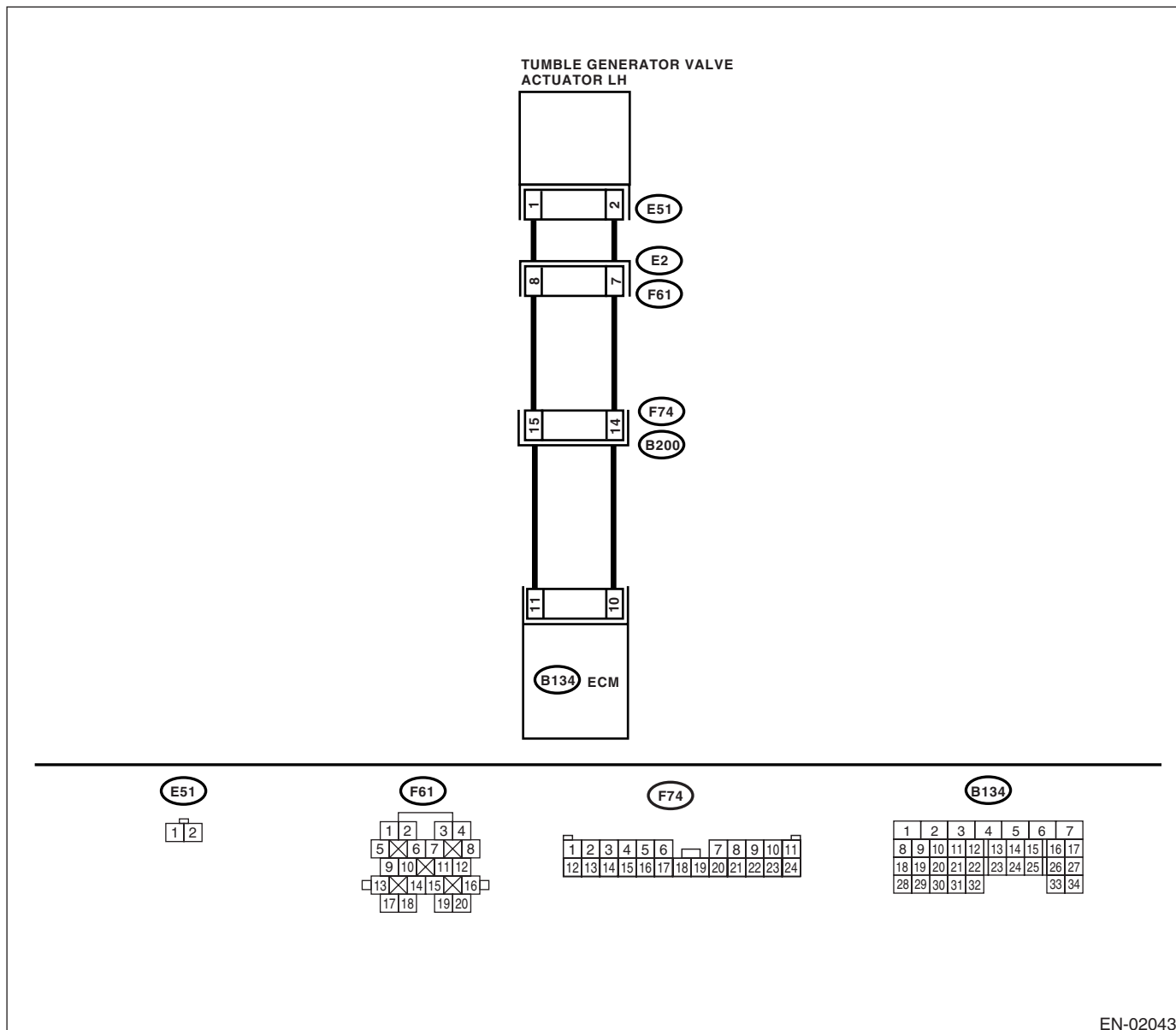
#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-215, DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                              | Check                         | Yes                                                                                                    | No                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from tumble generator valve connector.<br>3) Measure the voltage between tumble generator valve actuator and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(E51) No. 1 (+) — Chassis ground (-):</b><br><b>(E51) No. 2 (+) — Chassis ground (-):</b> | Is the voltage less than 5 V? | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.> | Repair the battery short circuit between ECM and tumble generator valve actuator. |

## CT:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-217, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                 | Check                                                                          | Yes                                                                                                                                      | No                        |
|--------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110? | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).><br><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. | A temporary poor contact. |

## CU:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-218, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

| Step                                 | Check                                                                          | Yes                                                                                                                                      | No                        |
|--------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111? | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).><br><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. | A temporary poor contact. |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

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### **CV:DTC P1152 — O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —**

**NOTE:**

For the diagnostic procedure, refer to DTC P1153. <Ref. to EN(H4DOTC)-299, DTC P1153 — O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### CW: DTC P1153 — O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

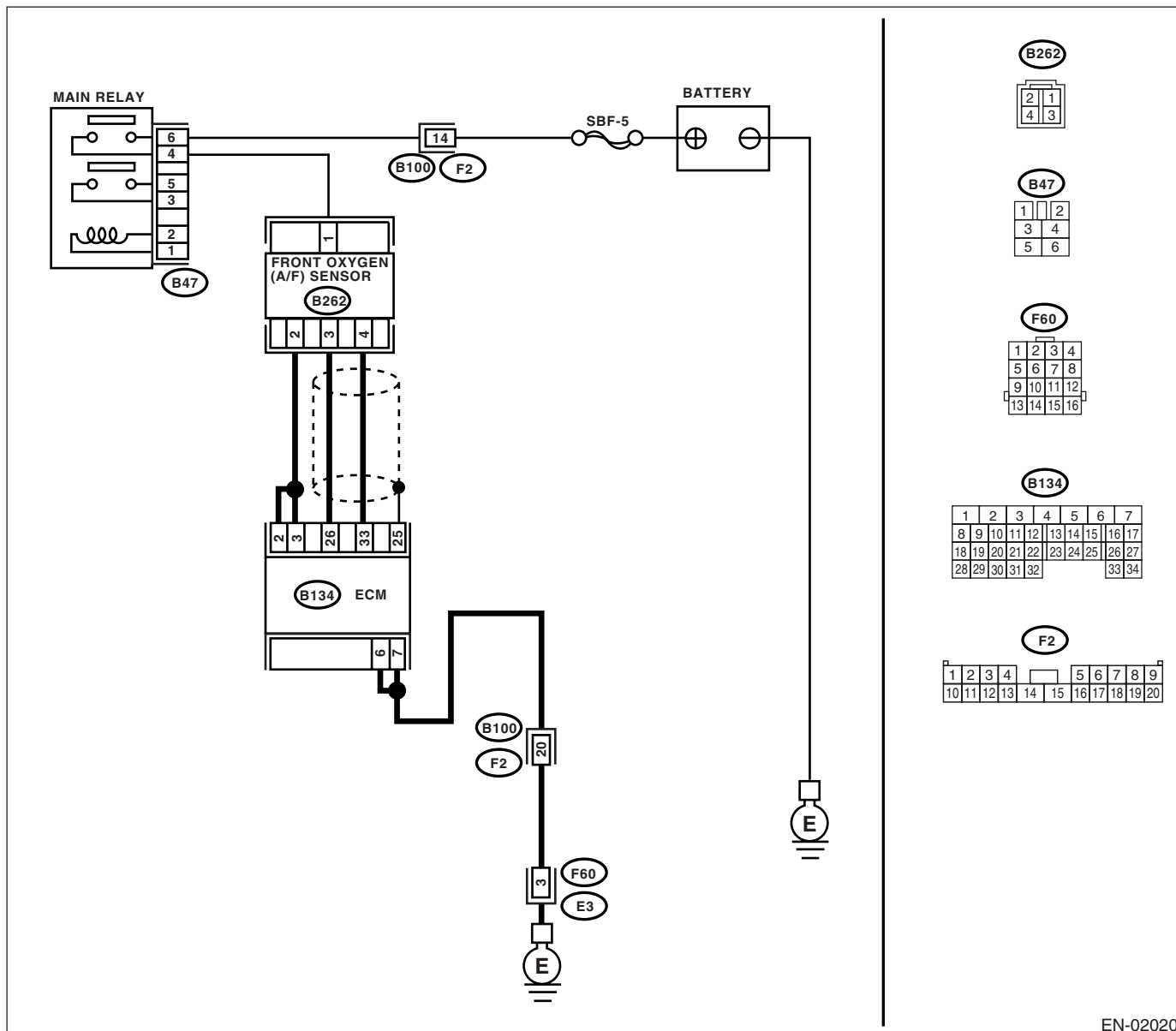
#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-222, DTC P1153 — O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Check                                                    | Yes                                                                                                                                     | No                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Is any other DTC displayed?                              | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                             |
| <b>2</b><br><b>CHECK FRONT (A/F) OXYGEN SENSOR DATA.</b><br>1) Start engine.<br>2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F).<br>If the engine is already warmed-up, operate at idle speed for at least 1 minute.<br>3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the measured value within 0.86 — 1.15 at idle?        | Go to step 3.                                                                                                                           | Go to step 4.                                                                             |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR SIGNAL.</b><br>1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles.<br><b>NOTE:</b><br>To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.<br>2) Operate the LED operation mode for engine.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.>                                                                                                                                                                                     | Does the LED of {Rear O <sub>2</sub> Rich Signal} blink? | Check front oxygen (A/F) sensor circuit.                                                                                                | Check rear oxygen sensor circuit.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.>         |
| <b>4</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check exhaust system parts.<br><b>NOTE:</b><br>Check the following items.<br>• Loose installation of portions<br>• Damage (crack, hole etc.) of parts<br>• Looseness of front oxygen (A/F) sensor<br>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor                                                                                                                                                                                                                                                                                                                                                                                                   | Is there a fault in exhaust system?                      | Repair or replace faulty parts.                                                                                                         | Replace front oxygen (A/F) sensor.<br><Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> |

## **CX:DTC P1160 — RETURN SPRING FAILURE —**

### **NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)-348, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## CY:DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-227, DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

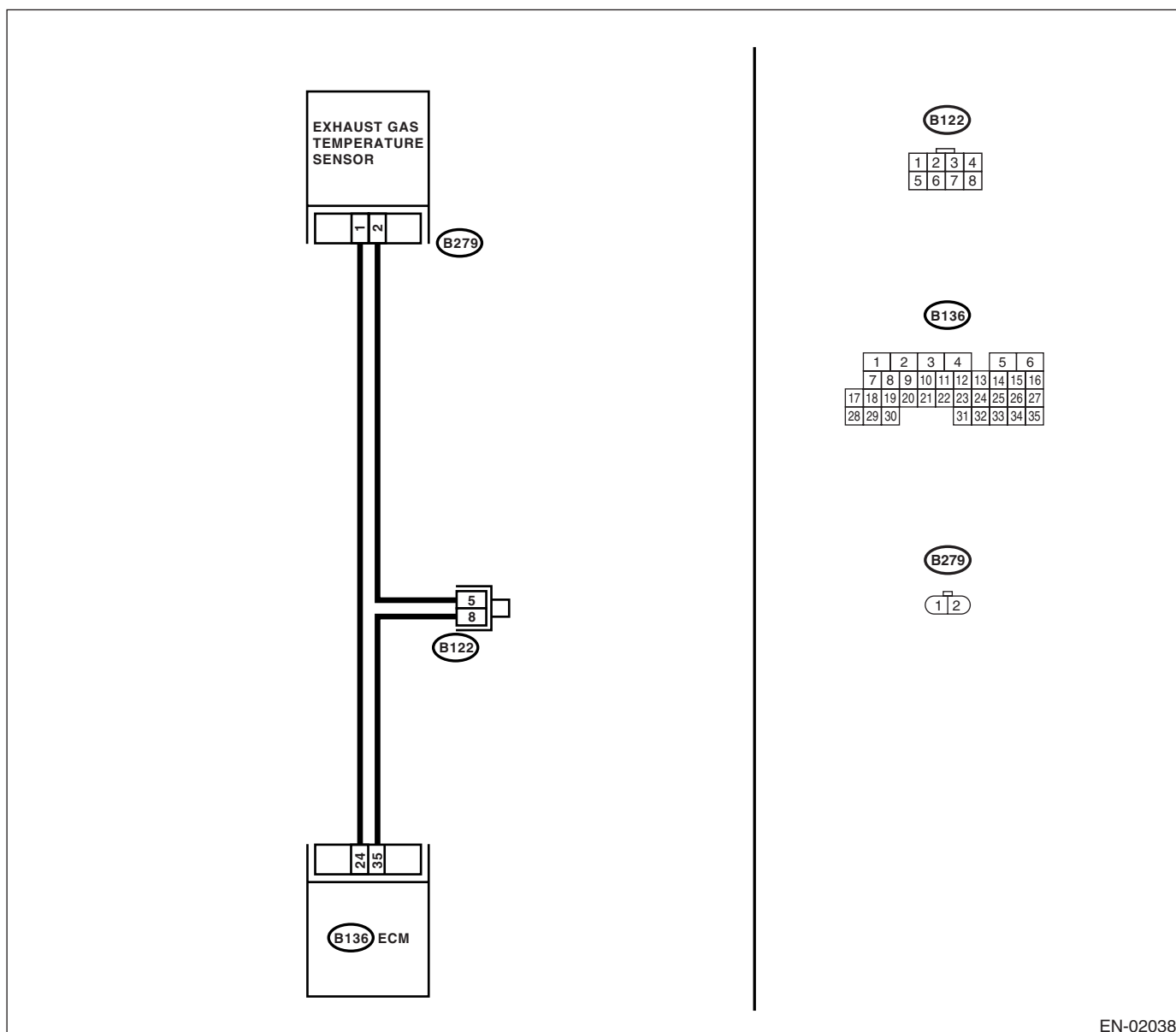
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02038

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                              | Check                                         | Yes                                                                      | No                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC.</b><br>Conduct the troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Does failure for repair or replacement exist? | Repair or replace the failure, then replace precat-<br>alytic converter. | Contact your SOA Service Center.<br><br><b>NOTE:</b><br>Inspection by DTM is required, be-<br>cause probable cause is deteriora-<br>tion of multiple parts. |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

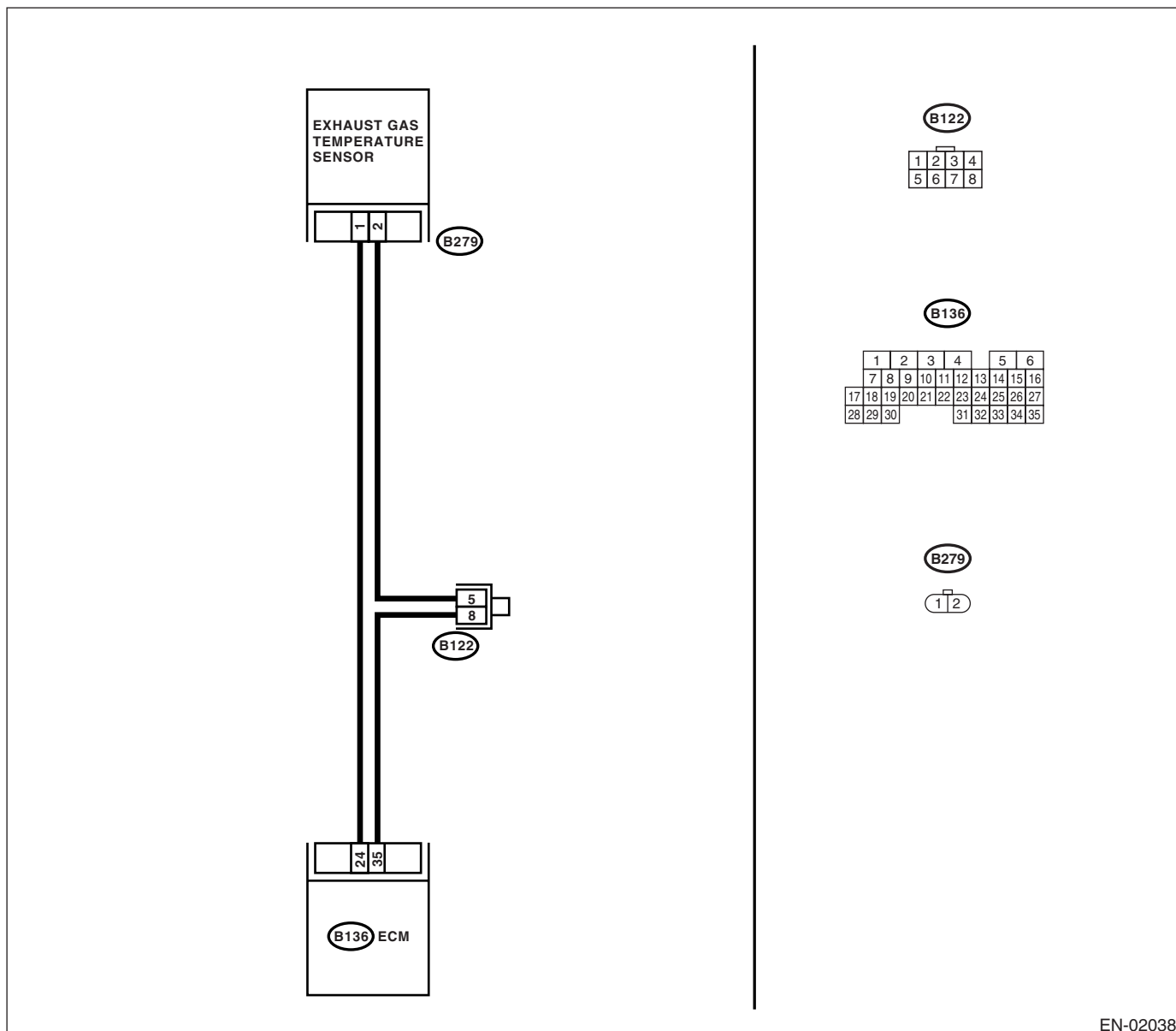
## CZ:DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-229, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02038

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                        | Check                       | Yes                                                                                                                                                                                                             | No                                                                                               |
|---------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P1312. | Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-41, Exhaust Temperature Sensor.> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## DA:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

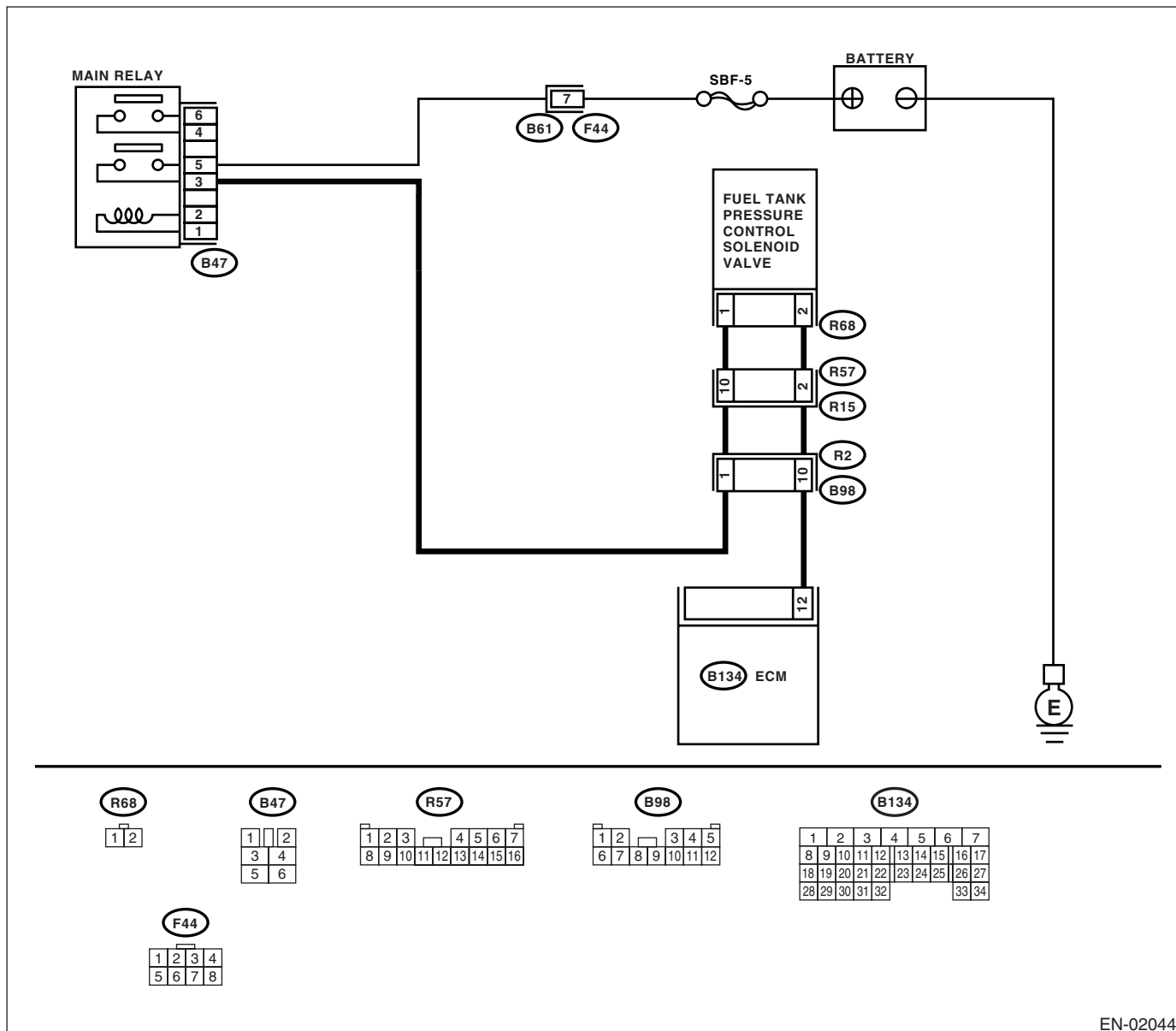
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-230, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02044

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                | Check                                   | Yes                                   | No                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 12 (+) — Chassis ground (-):</b>                                                                                                                                                                                                   | Is the voltage more than 10 V?          | Go to step 2.                         | Go to step 3.                                                                                                                                                                                                                                                                      |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                              | Is there poor contact in ECM connector? | Repair poor contact in ECM connector. | Contact with SOA Service Center.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                                                                                                      |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from fuel tank pressure control solenoid valve and ECM.<br>3) Measure the resistance of harness between fuel tank pressure control solenoid valve connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R68) No. 2 — Chassis ground:</b> | Is the resistance more than 1 MΩ?       | Go to step 4.                         | Repair short circuit to ground in harness between ECM and fuel tank pressure control solenoid valve connector.                                                                                                                                                                     |
| <b>4</b><br><b>CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and fuel tank pressure control solenoid valve connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 12 — (R68) No. 2:</b>                                                                                                                                           | Is the resistance less than 1 Ω?        | Go to step 5.                         | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and fuel tank pressure control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>5</b><br><b>CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.</b><br>Measure the resistance between fuel tank pressure control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                             | Is the resistance 10 — 100 Ω?           | Go to step 6.                         | Replace the fuel tank pressure control solenoid valve.<Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>                                                                                                                                                                        |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                     | Check                                                                         | Yes                                                                         | No                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE CONTROL SOLENOID VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between fuel tank pressure control solenoid valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R68) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                                                | Go to step 7.                                                               | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel tank pressure control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |
| <b>7</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank pressure control solenoid valve connector.                                                                                                                                                                             | Is there poor contact in fuel tank pressure control solenoid valve connector? | Repair poor contact in fuel tank pressure control solenoid valve connector. | Contact with SOA Service Center.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                                                                                                                                                             |

### DB:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

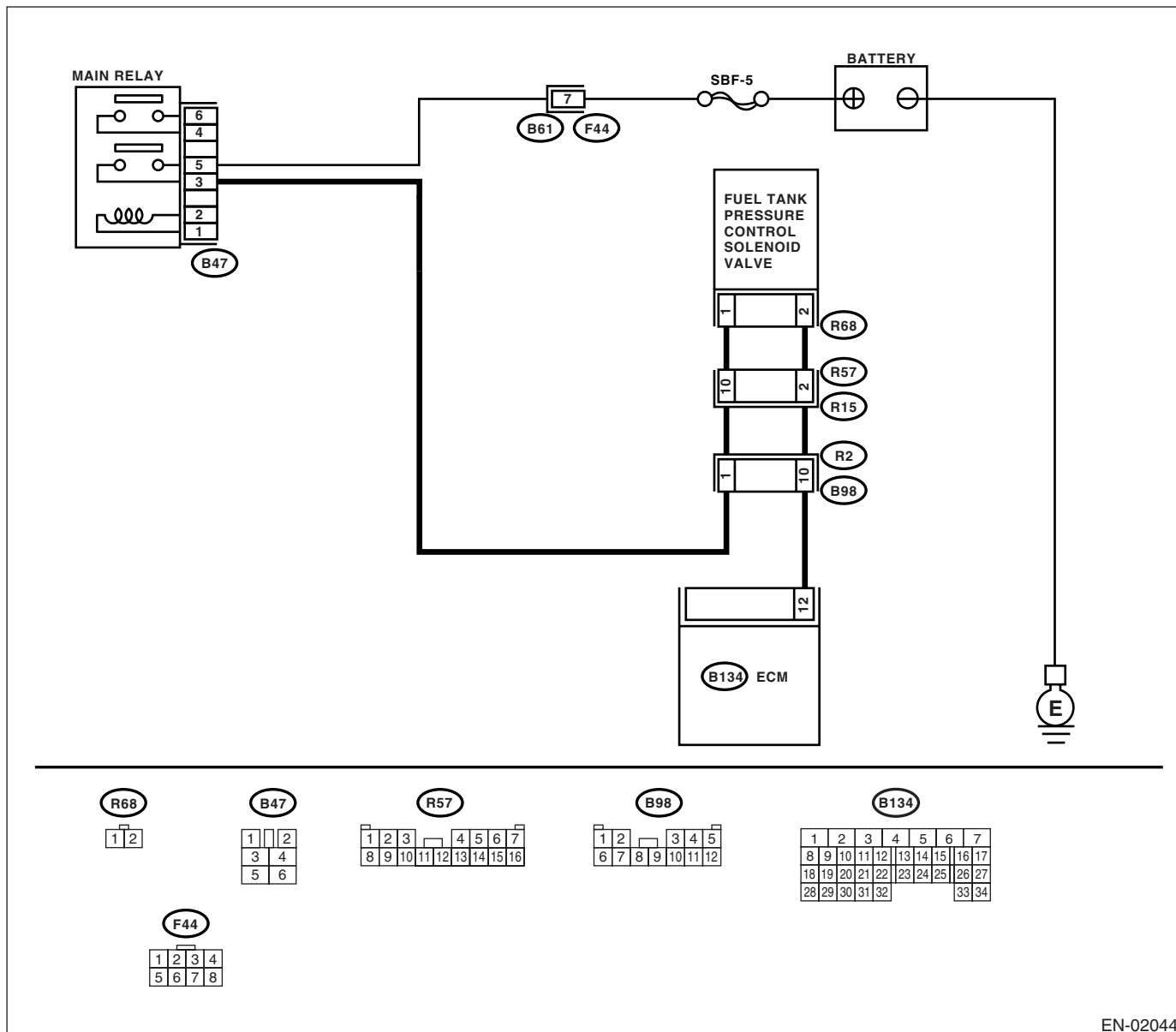
#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-232, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02044

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Check                                    | Yes                                                                                                                                                                                                  | No                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) While operating the fuel tank pressure control solenoid valve, measure voltage between ECM and chassis ground.<br><b>NOTE:</b><br>Fuel tank pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.><br><b>Connector &amp; terminal</b><br><b>(B134) No. 12 (+) — Chassis ground (-):</b> | Does the voltage change 0 — 10 V?        | Go to step 2.                                                                                                                                                                                        | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector. |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 12 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Is the voltage more than 10 V?           | Go to step 4.                                                                                                                                                                                        | Go to step 3.                                                                                                                                                          |
| <b>3 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.                                                                                                                                                                | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                                 |
| <b>4 CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from fuel tank pressure control solenoid valve.<br>3) Turn ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 12 (+) — Chassis ground (-):</b>                                                                                                                                                                                                                                                                                      | Is the voltage more than 10 V?           | Repair short circuit to battery in harness between ECM and fuel tank pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Go to step 5.                                                                                                                                                          |
| <b>5 CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.</b><br>1) Turn ignition switch to OFF.<br>2) Measure the resistance between fuel tank pressure control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Is the resistance less than 1 $\Omega$ ? | Replace the fuel tank pressure control solenoid valve <Ref. to EC(H4DOTC)-13, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>.                   | Go to step 6.                                                                                                                                                          |
| <b>6 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.                                                                                                                                                                | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                                 |

### DC:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM — DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-234, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

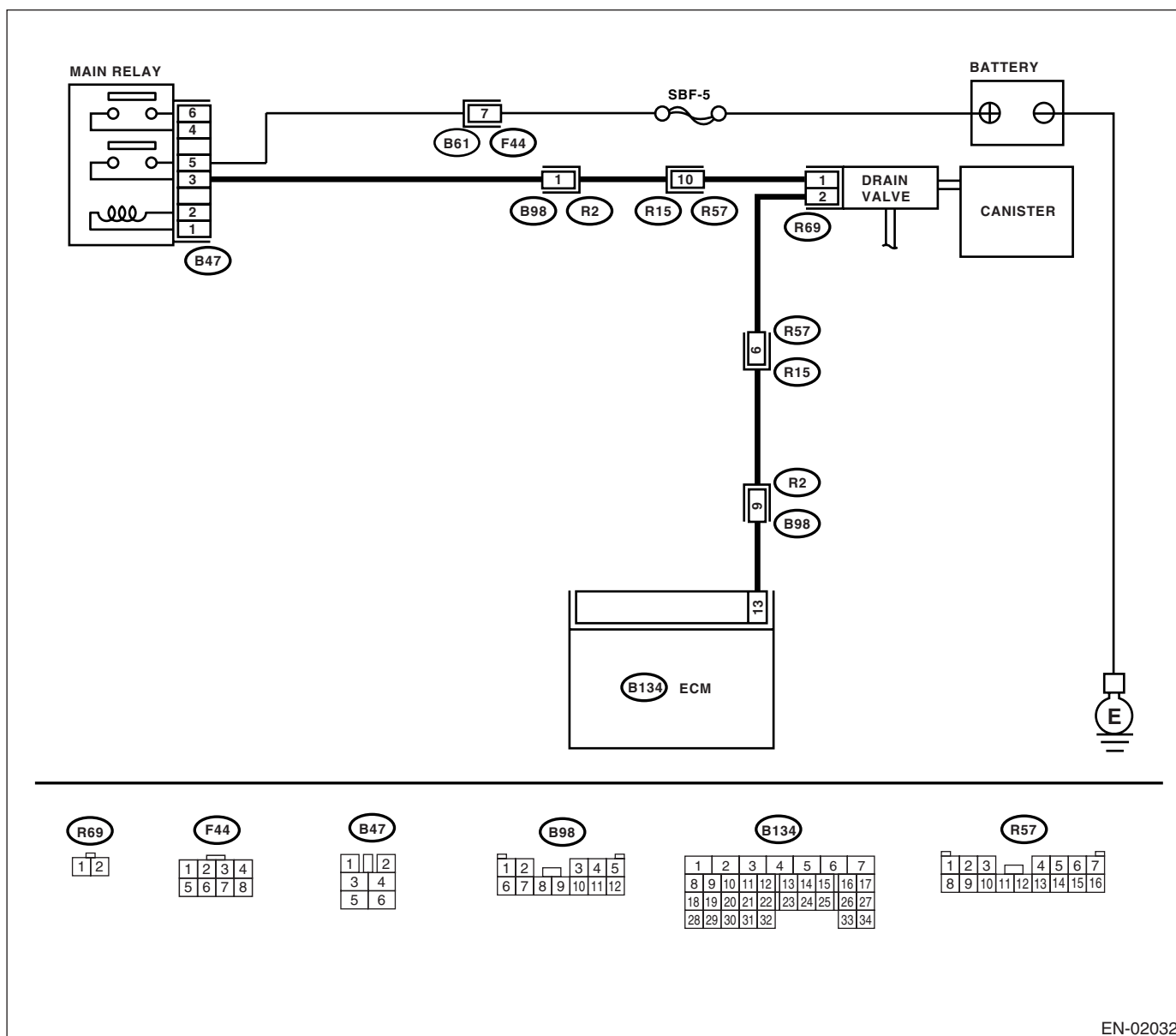
### TROUBLE SYMPTOM:

Improper fuel supply

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02032

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Check                          | Yes                                                                                                                                           | No                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| <b>1 CHECK FOR OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | Is any other DTC displayed?    | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>       | Go to step 2.                                                  |
| <b>2 CHECK VENT LINE HOSES.</b><br>Check the following items. <ul style="list-style-type: none"> <li>• Clogging of vent hoses between canister and drain valve</li> <li>• Clogging of vent hose between drain valve and air filter</li> <li>• Clogging of drain filter</li> </ul>                                                                                                                                                                                                | Is there a fault in vent line? | Repair or replace faulty parts.                                                                                                               | Go to step 3.                                                  |
| <b>3 CHECK DRAIN VALVE OPERATION.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) Operate the drain valve.<br><b>NOTE:</b><br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-45, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?  | Contact with SOA Service Center.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. | Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.> |

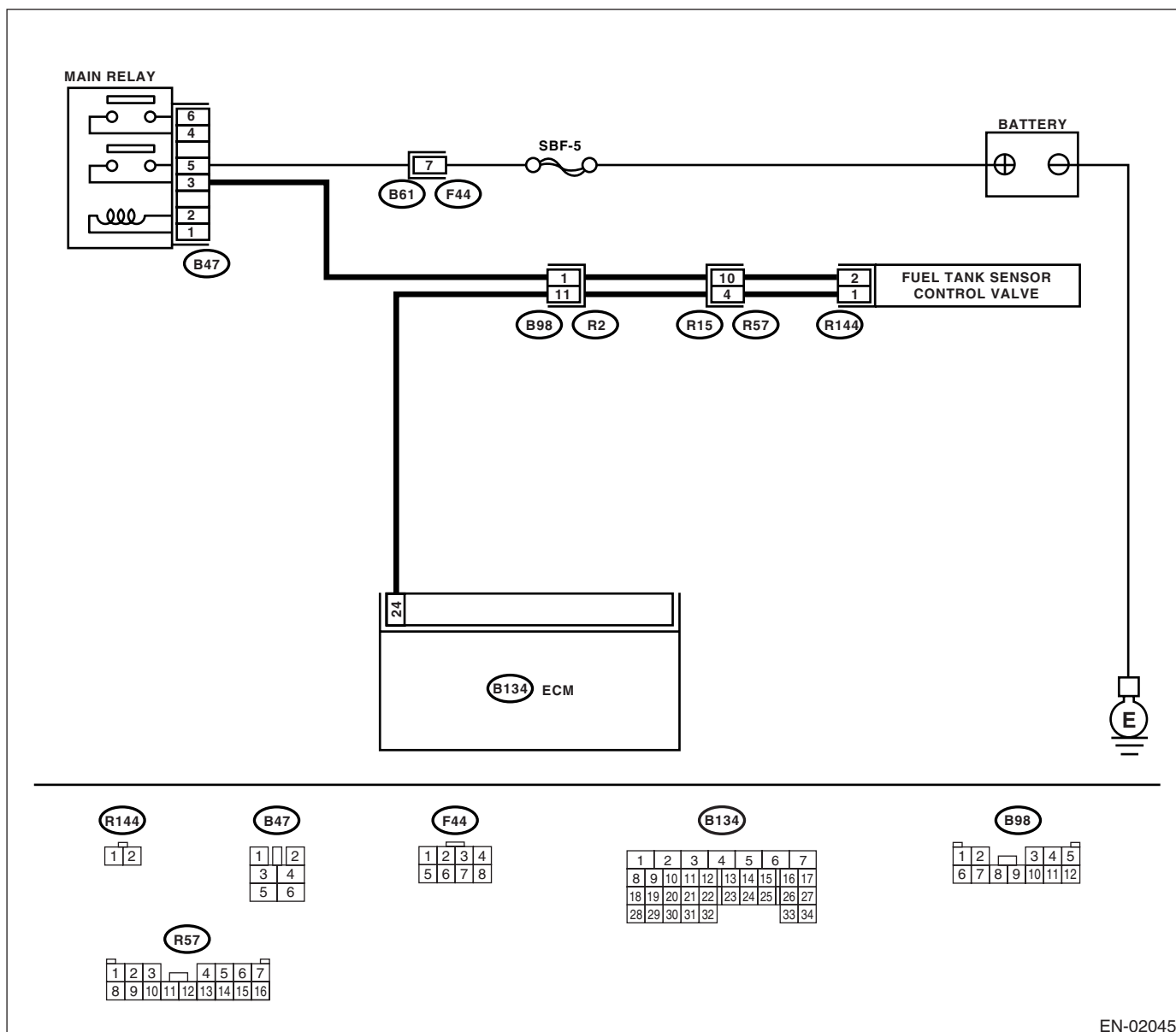
### DD:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW — DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION<Ref. to GD(H4DOTC)-235, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02045

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                | Check                                   | Yes                                   | No                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 24 (+) — Chassis ground (-):</b>                                                                                                                                                                   | Is the voltage more than 10 V?          | Go to step 2.                         | Go to step 3.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                                                                              | Is there poor contact in ECM connector? | Repair poor contact in ECM connector. | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.<br>(However, the possibility of poor contact still remains.)<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in fuel tank sensor control valve connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from fuel tank sensor control valve and ECM.<br>3) Measure the resistance of harness between fuel tank sensor control valve connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R144) No. 2 — Chassis ground:</b> | Is the resistance more than 1 MΩ?       | Go to step 4.                         | Repair short circuit to ground in harness between ECM and fuel tank sensor control valve connector.                                                                                                                                                                                                                                                                                                                                        |
| <b>4</b><br><b>CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and fuel tank sensor control valve connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 24 — (R144) No. 2:</b>                                                                                                                                | Is the resistance less than 1 Ω?        | Go to step 5.                         | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and fuel tank sensor control valve connector</li> <li>• Poor contact in coupling connector</li> </ul>                                                                                                                                                                    |
| <b>5</b><br><b>CHECK FUEL TANK SENSOR CONTROL VALVE.</b><br>Measure the resistance between fuel tank sensor control valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                   | Is the resistance 10 — 100 Ω?           | Go to step 6.                         | Replace the fuel tank sensor control valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>                                                                                                                                                                                                                                                                                                                                                          |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                | Check                                                              | Yes                                                              | No                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between fuel tank sensor control valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R144) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                                     | Go to step 7.                                                    | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel tank sensor control valve</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |
| <b>7</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank sensor control valve connector.                                                                                                                                                                   | Is there poor contact in fuel tank sensor control valve connector? | Repair poor contact in fuel tank sensor control valve connector. | Contact with SOA Service Center.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts.                                                                                                                                                                        |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

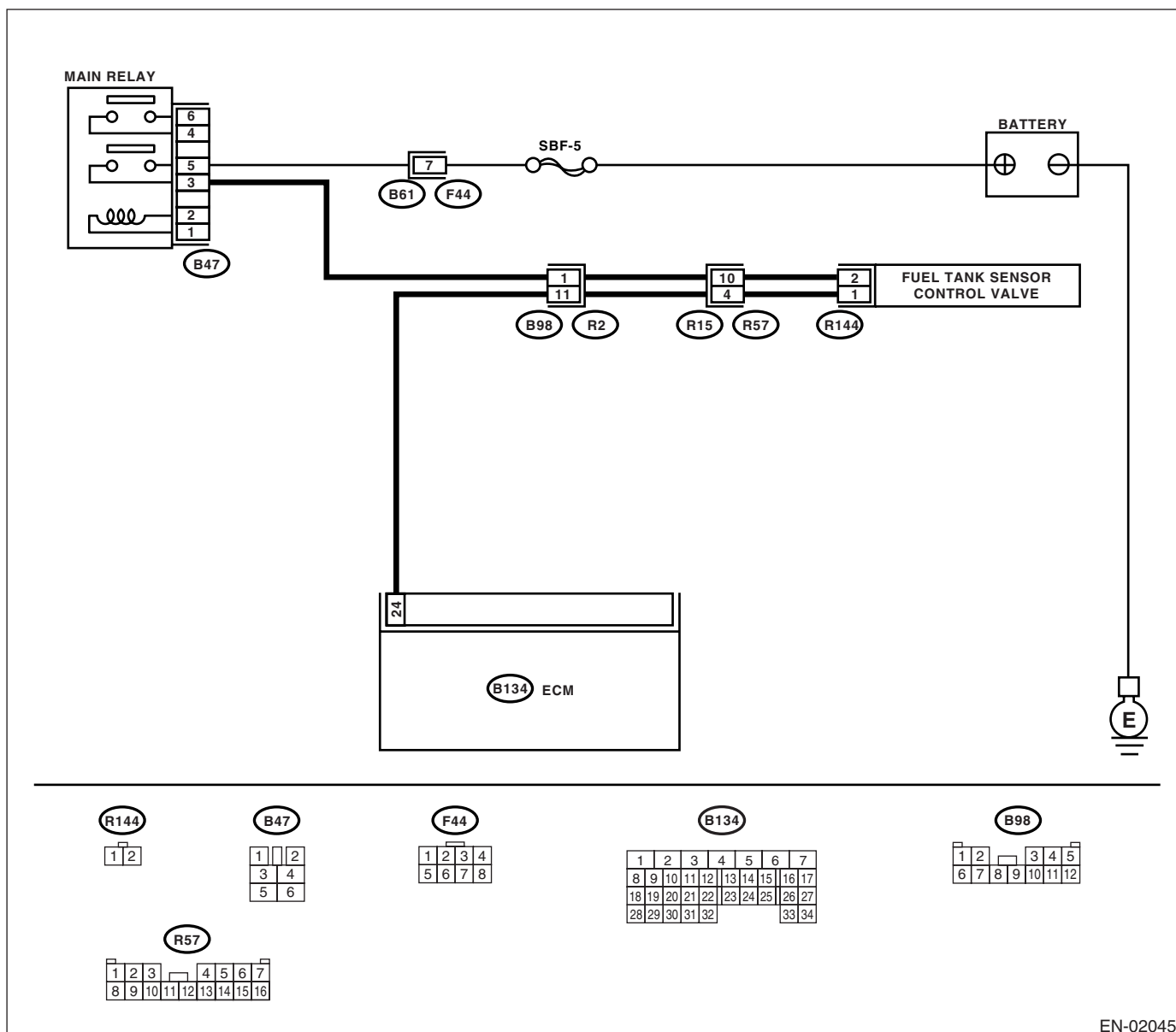
## DE:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH — DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-237, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02045

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                               | Check                                    | Yes                                                                                                                                                                                          | No                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 24 (+) — Chassis ground (-):</b>                                                                                                                                                  | Is the voltage more than 10 V?           | Go to step 3.                                                                                                                                                                                | Go to step 2.                                                             |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                                                             | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.                                                                                                                                                        | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from fuel tank sensor control valve.<br>3) Turn ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 24 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?           | Repair short circuit to battery in harness between ECM and fuel tank sensor control valve connector. After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Go to step 4.                                                             |
| <b>4</b><br><b>CHECK FUEL TANK SENSOR CONTROL VALVE.</b><br>1) Turn ignition switch to OFF.<br>2) Measure the resistance between fuel tank sensor control valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                            | Is the resistance less than 1 $\Omega$ ? | Replace the fuel tank sensor control valve<Ref. to EC(H4DOTC)-12, Fuel Tank Sensor Control Valve.>and the ECM <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>.                         | Go to step 5.                                                             |
| <b>5</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.                                                                                                                                                                                                                                                                                             | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.                                                                                                                                                        | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## DF:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —

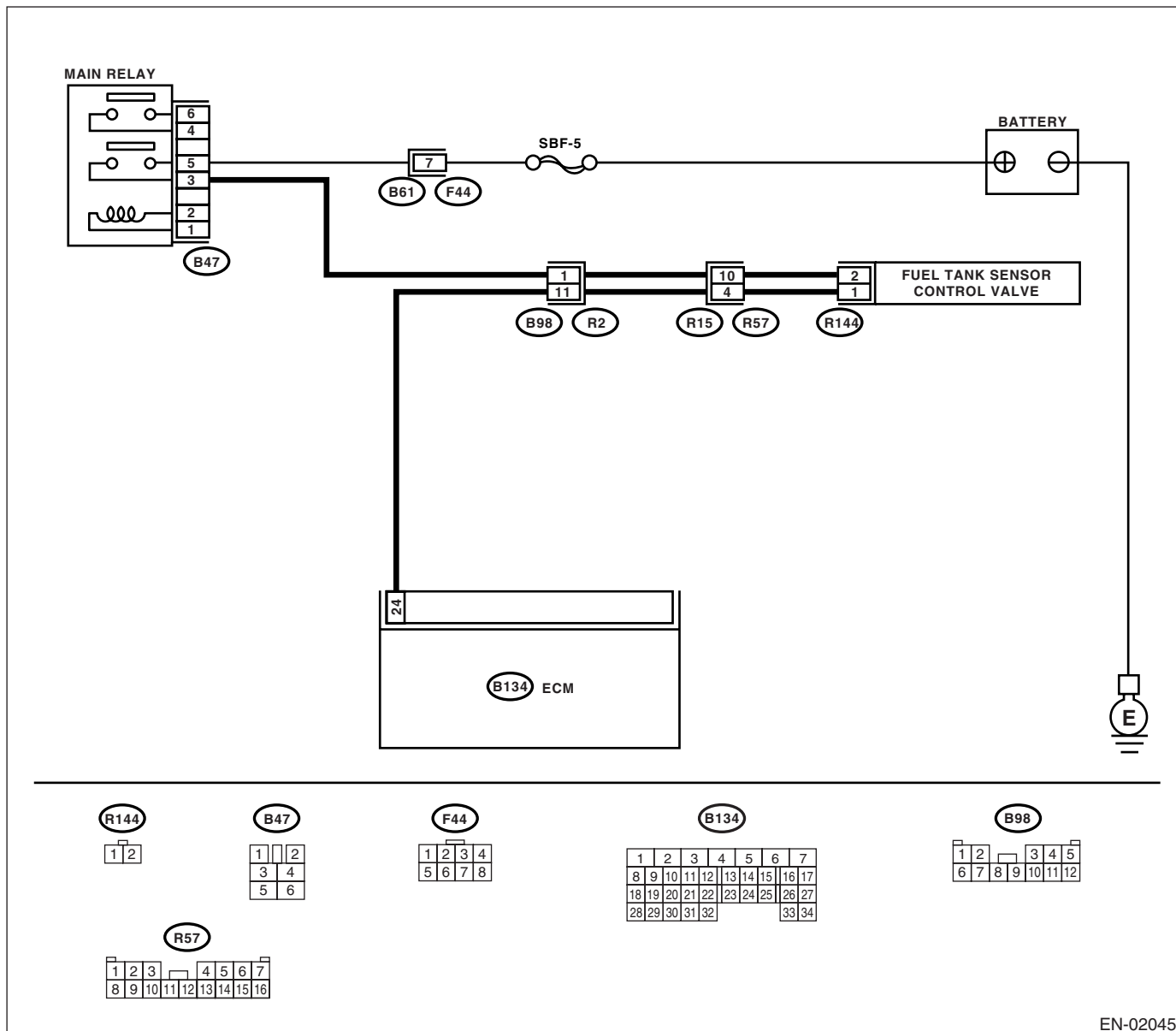
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-239, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02045

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                | Check                                              | Yes                                                                                                                                             | No                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| <b>1</b><br><b>CHECK FOR OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                  | Is any other DTC displayed?                        | Inspect the relevant DTC using the "List of Diagnostic Trouble Codes (DTC)".<br><Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step <b>2</b> .                  |
| <b>2</b><br><b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Open the fuel flap.                                                                                                                                                                                                                                              | Is the fuel filler cap tightened securely?         | Go to step <b>3</b> .                                                                                                                           | Tighten fuel filler cap securely.      |
| <b>3</b><br><b>CHECK EVAPORATIVE EMISSION LINE.</b><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Disconnection, leakage and clogging of hoses between fuel tank pressure sensor and fuel tank.</li><li>• Disconnection, leakage and clogging of hoses and pipes between fuel filler pipe and fuel tank.</li></ul> | Is there any trouble in evaporative emission line? | Repair the hoses and pipes.                                                                                                                     | Replace the fuel tank pressure sensor. |

**DG:DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —**

**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-243, DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

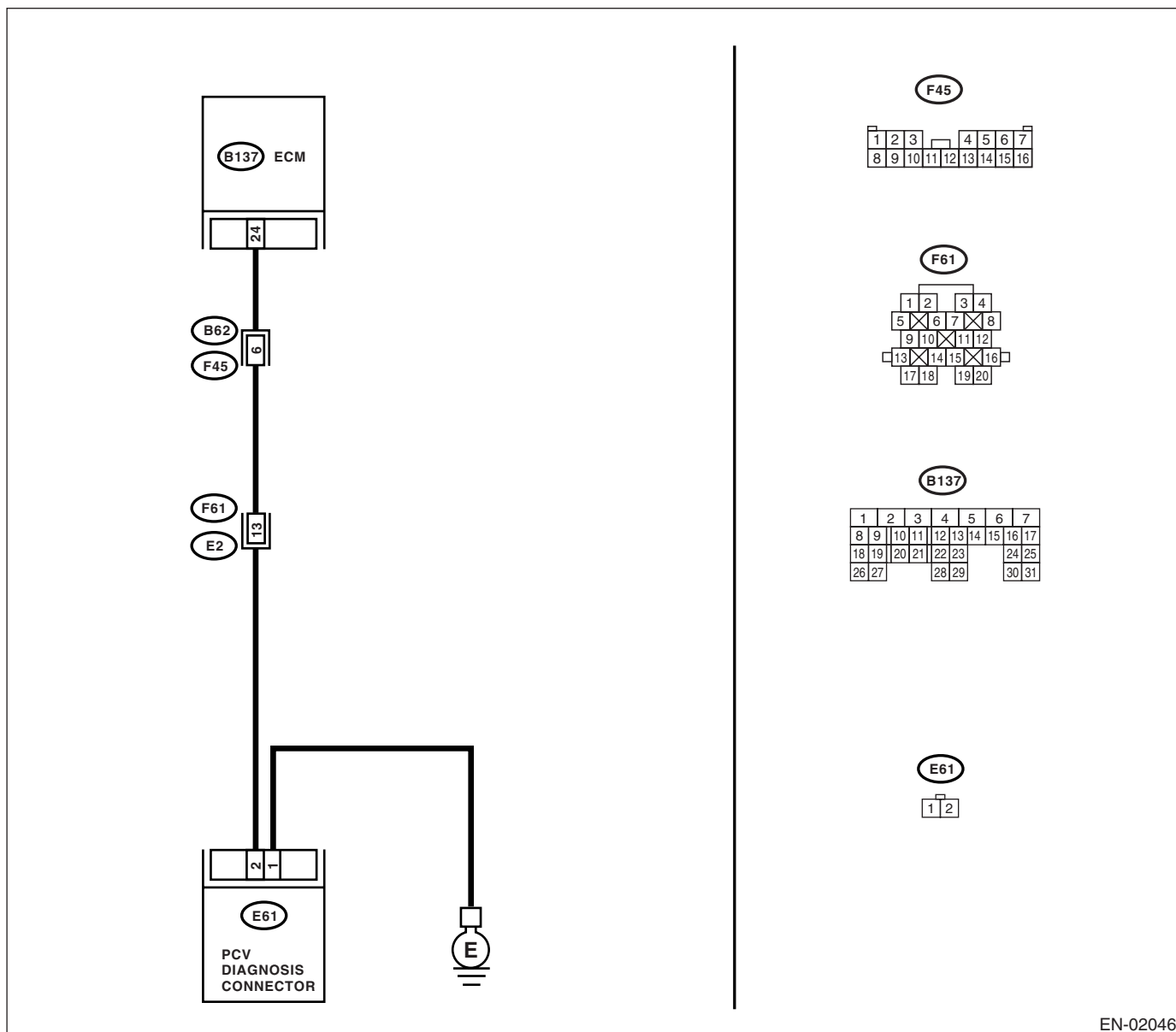
**TROUBLE SYMPTOM:**

Erroneous idling

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02046

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

---

### **DH:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-245, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

Failure of engine to start

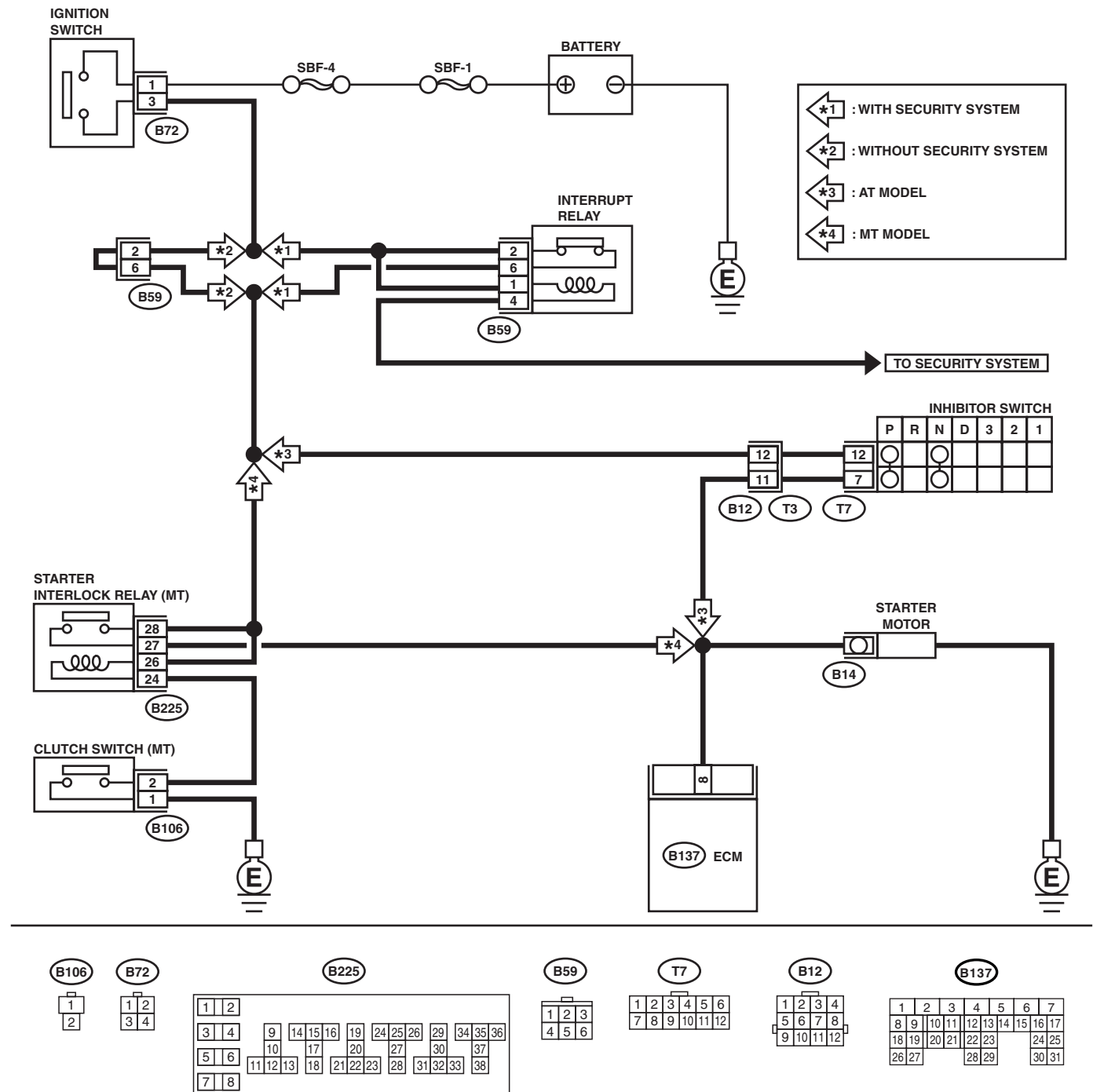
#### **CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02015

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                          | Check                                                                   | Yes                                                                                                                                                                                                                                                         | No                                                                                                                        |
|-----------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 1<br><b>CHECK OPERATION OF STARTER MOTOR.</b> | Does the starter motor operate when ignition switch is turned to START? | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open or ground short circuit in harness between ECM and starter motor connector</li><li>• Poor contact in ECM connector</li></ul> | Check the starter motor circuit. <Ref. to EN(H4DOTC)-57, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

**DI: DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —**

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION<Ref. to GD(H4DOTC)-246, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

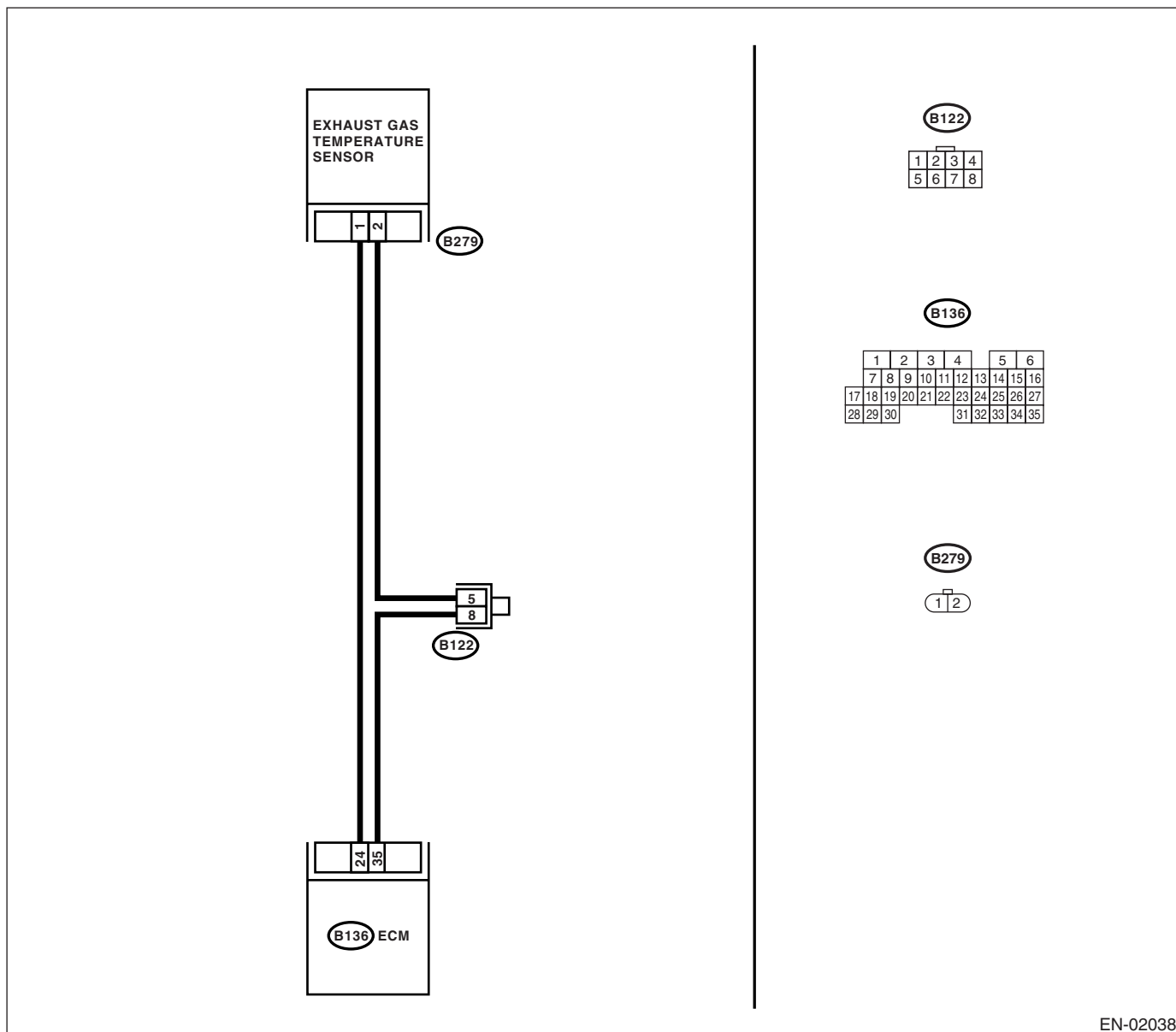
**TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02038

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                      | Check                               | Yes                                                                                                                                                                                                                | No                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                        | Is any other DTC displayed?         | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).><br><b>NOTE:</b><br>In this case, it is not necessary to inspect DTC P1544. | Go to step 2.                                                                                                                                 |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check the exhaust system parts.<br><b>NOTE:</b><br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of exhaust manifold</li><li>• Cracks or hole of exhaust manifold</li><li>• Loose installation of front oxygen (A/F) sensor</li></ul> | Is there a fault in exhaust system? | Repair or replace the failure, then replace pre-catalytic converter.                                                                                                                                               | Contact your SOA Service Center.<br><b>NOTE:</b><br>Inspection by DTM is required, because probable cause is deterioration of multiple parts. |

**DJ:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —**

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-247, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

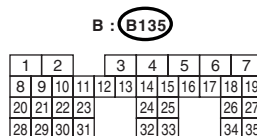
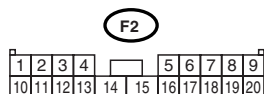
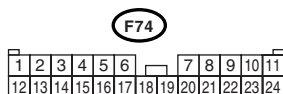
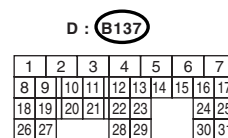
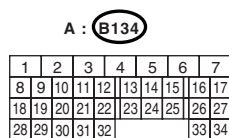
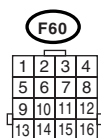
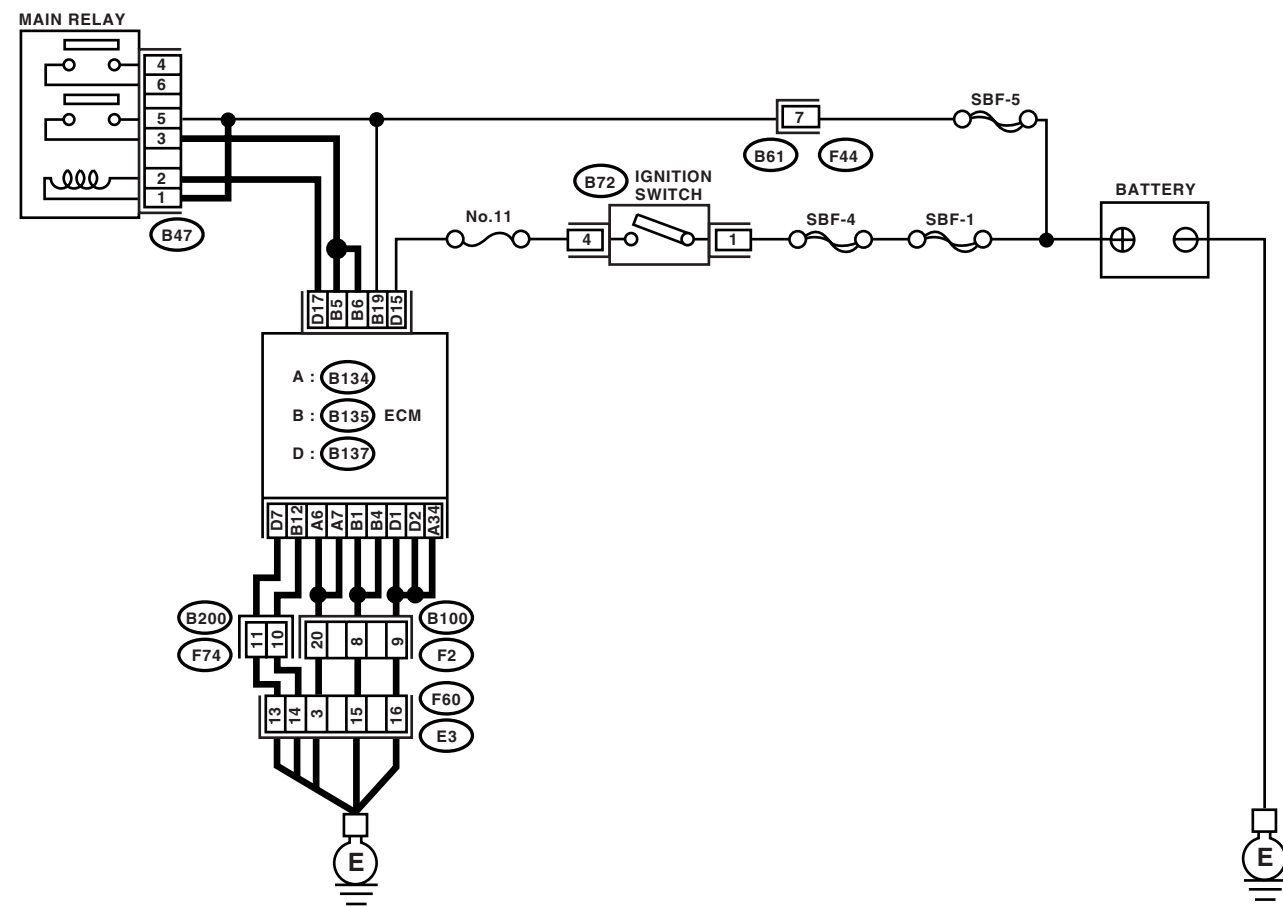
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02016

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                    | Check                                     | Yes                                                                                    | No                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 19 (+) — Chassis ground (-):</b>                                    | Is the voltage more than 10 V?            | Repair the poor contact in ECM connector.                                              | Go to step 2.                                                                                                                                                                                                                                                                         |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 19 — Chassis ground:</b> | Is the resistance less than 10 $\Omega$ ? | Repair the ground short circuit in harness between ECM connector and battery terminal. | Go to step 3.                                                                                                                                                                                                                                                                         |
| <b>3</b><br><b>CHECK FUSE SBF-5.</b>                                                                                                                                                                                                                                    | Is the fuse blown?                        | Replace the fuse.                                                                      | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and battery</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in battery terminal</li> </ul> |

**DK: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)-248, DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

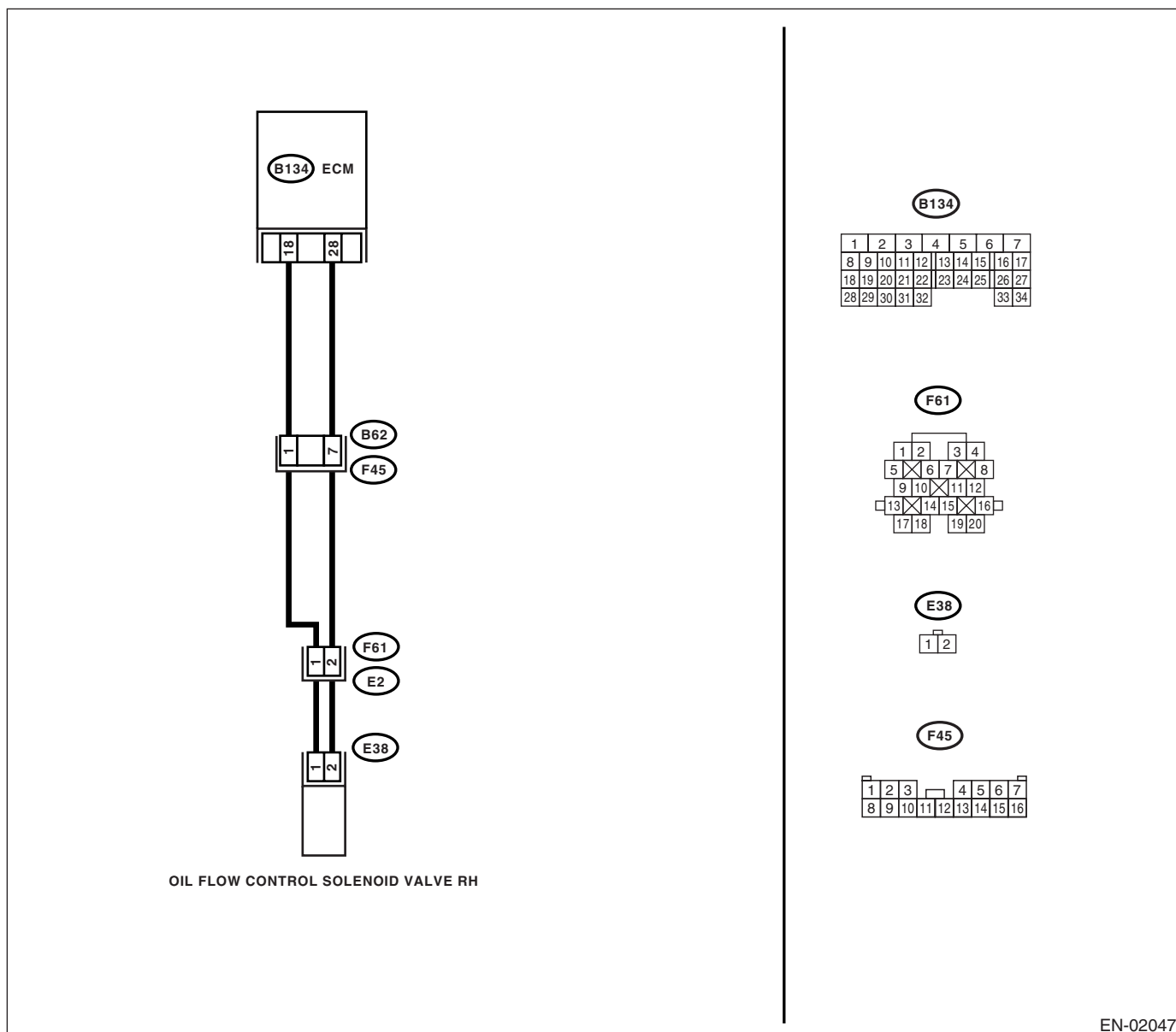
**TROUBLE SYMPTOM:**

Erroneous idling

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02047

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                 | Check                                      | Yes                                                                 | No                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br>3) Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — (E38) No. 1:</b><br><b>(B134) No. 28 — (E38) No. 2:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.                                                       | Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(E38) No. 1 — Engine ground:</b><br><b>(E38) No. 2 — Engine ground:</b>                                                                                                                        | Is the resistance more than 1 M $\Omega$ ? | Go to step 3.                                                       | Repair the short circuit between ECM and oil flow control solenoid valve connector.                                                                                                                                                                                                                                                              |
| <b>3</b><br><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Remove the oil flow control solenoid valve.<br>2) Measure the resistance between oil flow control solenoid valve terminal.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                              | Is the resistance 6 — 12 $\Omega$ ?        | Repair the poor contact in ECM and oil flow control solenoid valve. | Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-61, Camshaft.>                                                                                                                                                                                                                                                                  |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## DL: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)-250, DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

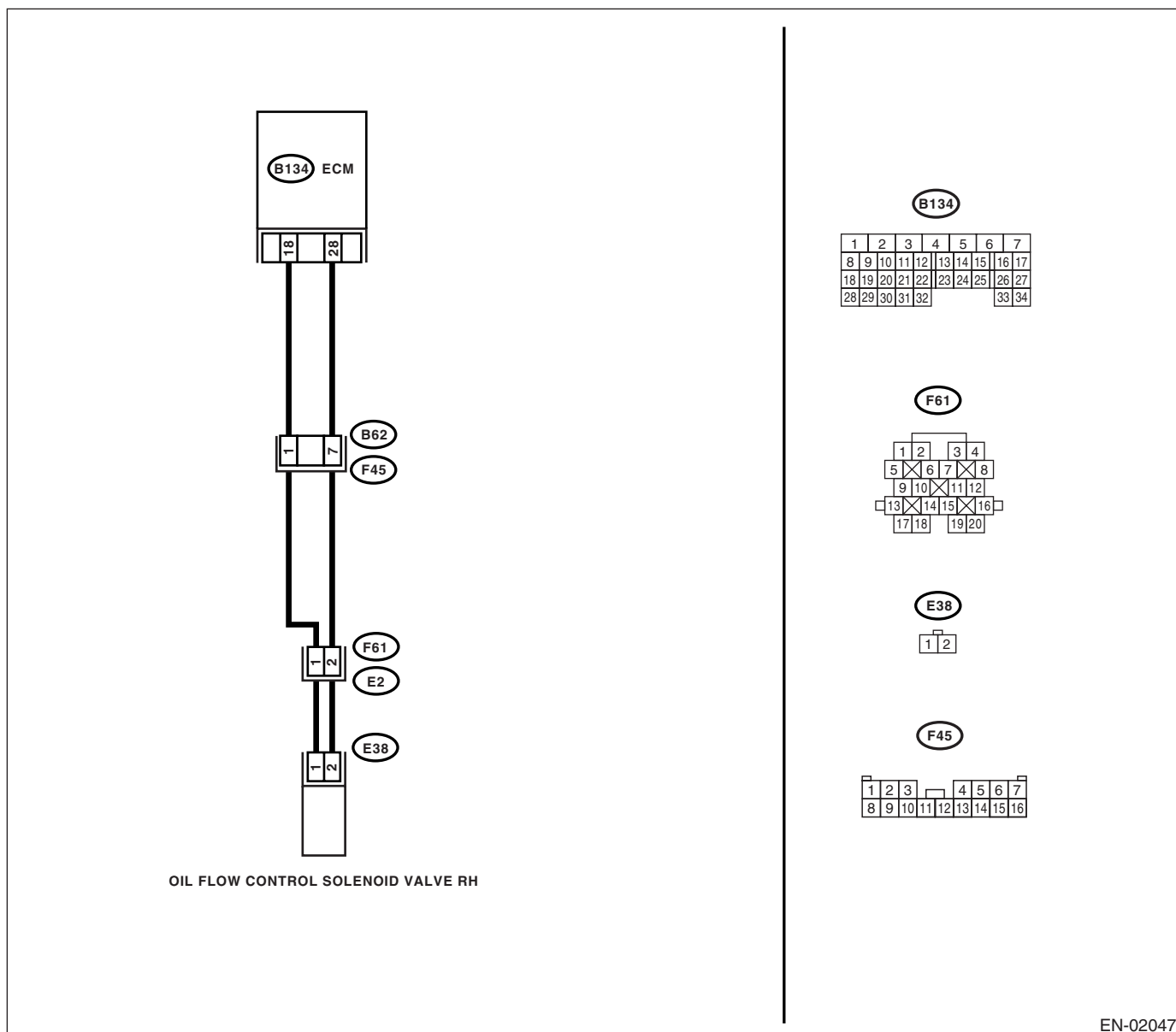
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02047

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                 | Check                                      | Yes                                                                 | No                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br>3) Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — (E38) No. 1:</b><br><b>(B134) No. 28 — (E38) No. 2:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.                                                       | Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and oil flow control solenoid valve connector<br>• Poor contact in coupling connector. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br>3) Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(E38) No. 1 — Engine ground:</b><br><b>(E38) No. 2 — Engine ground:</b> | Is the resistance more than 1 M $\Omega$ ? | Go to step 3.                                                       | Repair the short circuit between ECM and oil flow control solenoid valve connector.                                                                                                                                                                                                      |
| <b>3</b><br><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Remove the oil flow control solenoid valve.<br>2) Measure the resistance between oil flow control solenoid valve terminal.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                              | Is the resistance 6 — 12 $\Omega$ ?        | Repair the poor contact in ECM and oil flow control solenoid valve. | Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-61, Camshaft.>                                                                                                                                                                                                          |

**DM: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)-252, DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

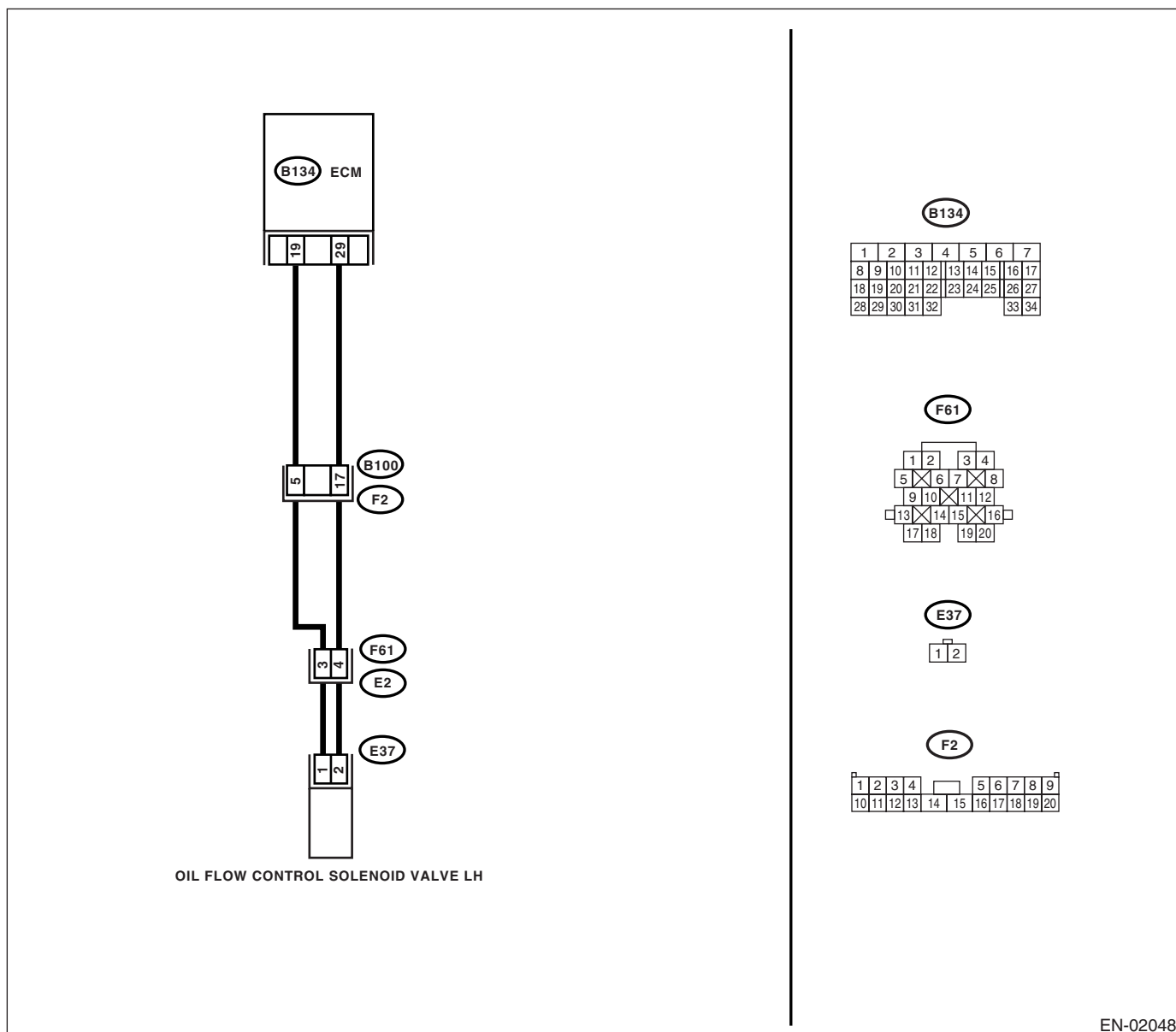
**TROUBLE SYMPTOM:**

Erroneous idling

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

**WIRING DIAGRAM:**



EN-02048

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                 | Check                                      | Yes                                                                 | No                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br>3) Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 19 — (E37) No. 1:</b><br><b>(B134) No. 29 — (E37) No. 2:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.                                                       | Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and oil flow control solenoid valve connector<br>• Poor contact in coupling connector. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(E37) No. 1 — Engine ground:</b><br><b>(E37) No. 2 — Engine ground:</b>                                                                                                                        | Is the resistance more than 1 M $\Omega$ ? | Go to step 3.                                                       | Repair the short circuit between ECM and oil flow control solenoid valve connector.                                                                                                                                                                                                      |
| <b>3</b><br><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Remove the oil flow control solenoid valve.<br>2) Measure the resistance between oil flow control solenoid valve terminal.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                              | Is the resistance 6 — 12 $\Omega$ ?        | Repair the poor contact in ECM and oil flow control solenoid valve. | Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-61, Camshaft.>                                                                                                                                                                                                          |

## DN:DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-254, DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

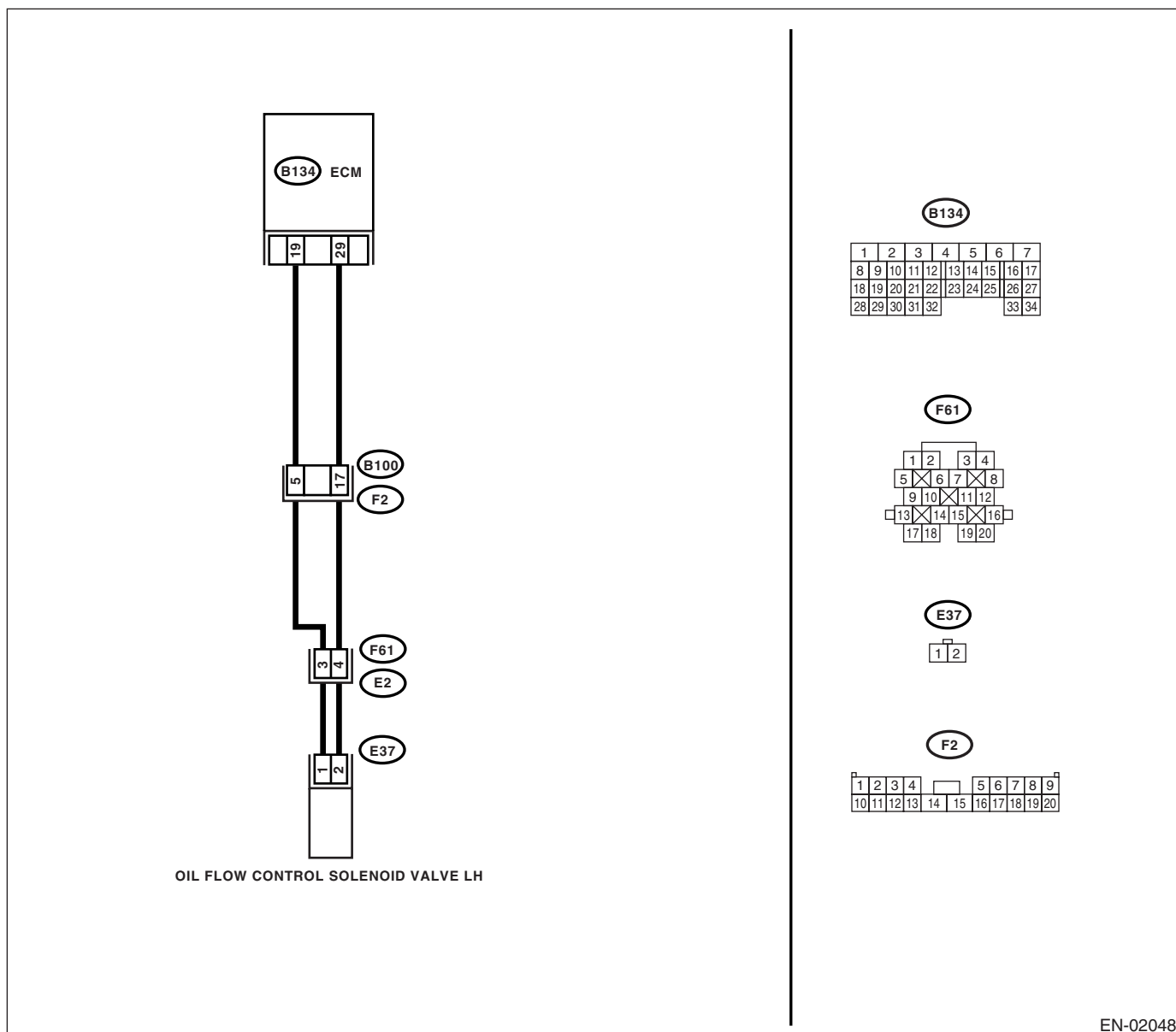
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02048

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                 | Check                                      | Yes                                                                 | No                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br>3) Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 19 — (E37) No. 1:</b><br><b>(B134) No. 29 — (E37) No. 2:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.                                                       | Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and oil flow control solenoid valve connector<br>• Poor contact in coupling connector. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br>3) Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(E37) No. 1 — Engine ground:</b><br><b>(E37) No. 2 — Engine ground:</b> | Is the resistance more than 1 M $\Omega$ ? | Go to step 3.                                                       | Repair the short circuit between ECM and oil flow control solenoid valve connector.                                                                                                                                                                                                      |
| <b>3</b><br><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Remove the oil flow control solenoid valve.<br>2) Measure the resistance between oil flow control solenoid valve terminal.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                              | Is the resistance 6 — 12 $\Omega$ ?        | Repair the poor contact in ECM and oil flow control solenoid valve. | Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-61, Camshaft.>                                                                                                                                                                                                          |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

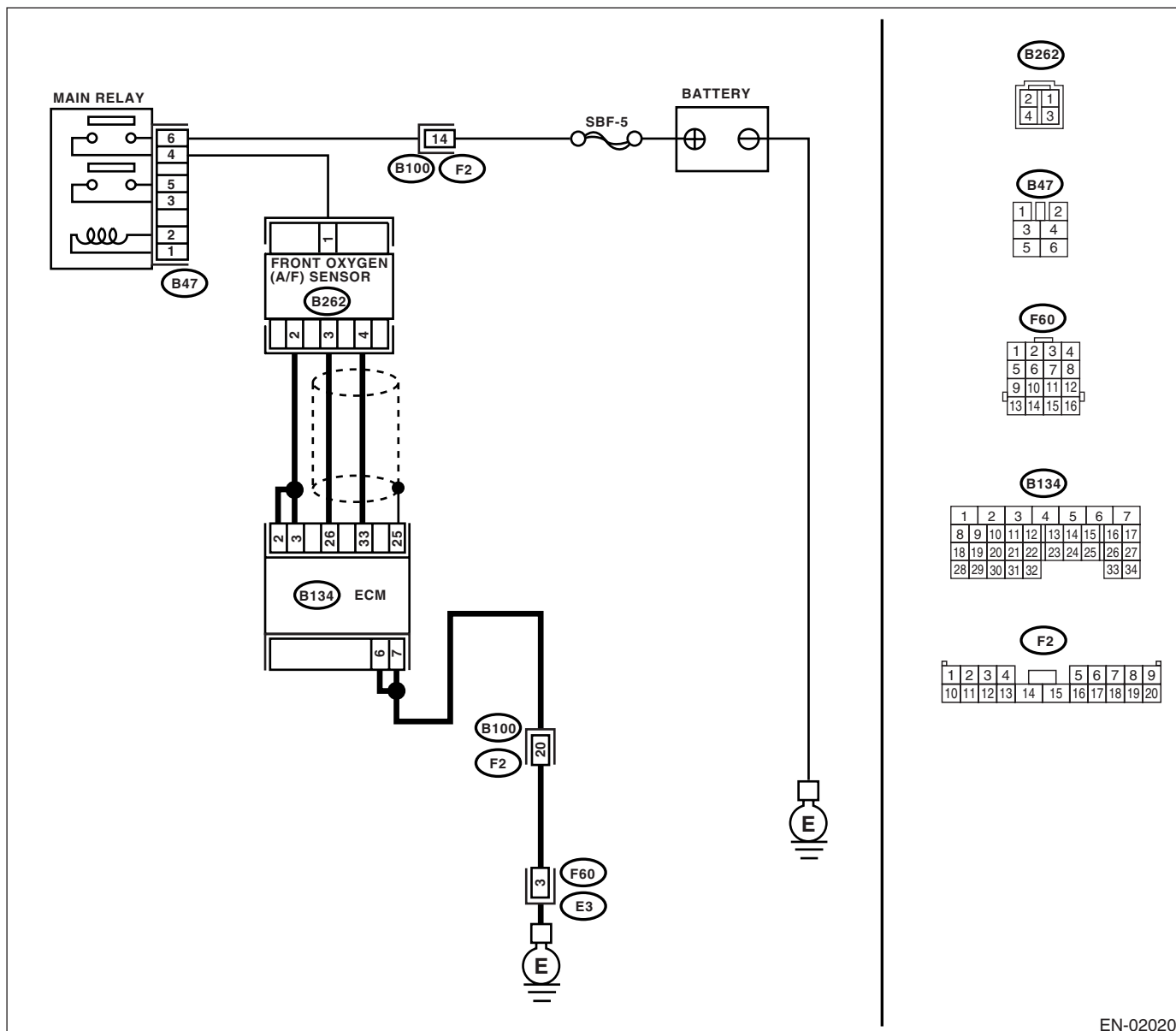
## DO:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 — DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-256, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Check                                                                       | Yes                                                                                                                                     | No                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Is any other DTC displayed?                                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                     |
| <b>2</b><br><b>CHECK FRONT (A/F) OXYGEN SENSOR DATA.</b><br>1) Start engine.<br>2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F).<br>If the engine is already warmed-up, operate at idle speed for at least 1 minute.<br>3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the measured value within 0.86 — 1.15 at idle?                           | Go to step 3.                                                                                                                           | Go to step 4.                                                                     |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR SIGNAL.</b><br>1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles.<br><b>NOTE:</b><br>To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.<br>2) Operate the LED operation mode for engine.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.>                                                                                                                                                                                     | Does the LED of {Rear O <sub>2</sub> Rich Signal} blink?                    | Check front oxygen (A/F) sensor circuit.                                                                                                | Check rear oxygen sensor circuit.<br><Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.> |
| <b>4</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check exhaust system parts.<br><b>NOTE:</b><br>Check the following items.<br>• Loose installation of portions<br>• Damage (crack, hole etc.) of parts<br>• Looseness of front oxygen (A/F) sensor<br>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor                                                                                                                                                                                                                                                                                                                                                                                                   | Is there a fault in exhaust system?                                         | Repair or replace faulty parts.                                                                                                         | Go to step 5.                                                                     |
| <b>5</b><br><b>CHECK AIR INTAKE SYSTEM.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Are there holes, loose bolts or disconnection of hose on air intake system? | Repair the air intake system.                                                                                                           | Go to step 6.                                                                     |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Check                                                                             | Yes           | No                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>Place “NO FIRE” signs near the working area.</li> <li>Be careful not to spill fuel on the floor.</li> </ul> <ol style="list-style-type: none"> <li>Release the fuel pressure.               <ol style="list-style-type: none"> <li>Disconnect the connector from fuel pump relay.</li> <li>Start the engine and run it until it stalls.</li> <li>After the engine stalls, crank it for 5 more seconds.</li> <li>Turn the ignition switch to OFF.</li> </ol> </li> <li>Connect the connector to fuel pump relay.</li> <li>Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge.</li> <li>Install the fuel filler cap.</li> <li>Start the engine and idle while gear position is neutral.</li> <li>Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.</li> </ol> <b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br><b>NOTE:</b><br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. | Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm <sup>2</sup> , 41 — 46 psi)? | Go to step 7. | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>Improper fuel pump discharge</li> <li>Clogged fuel supply line</li> </ul>                                                                       |
| <b>7</b><br><b>CHECK FUEL PRESSURE.</b><br>After connecting the pressure regulator vacuum hose, measure fuel pressure.<br><b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br><b>NOTE:</b> <ul style="list-style-type: none"> <li>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm <sup>2</sup> , 30 — 34 psi)? | Go to step 8. | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>Faulty pressure regulator</li> <li>Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>Faulty pressure regulator</li> <li>Improper fuel pump discharge</li> <li>Clogged fuel supply line</li> </ul> |
| <b>8</b><br><b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b> <ol style="list-style-type: none"> <li>Start the engine and warm-up completely.</li> <li>Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</li> </ol> <b>NOTE:</b> <ul style="list-style-type: none"> <li>Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> <li>OBD-II general scan tool</li> </ul> For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Is the temperature more than 60°C (140°F)?                                        | Go to step 9. | Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>                                                                                                                                                                                                                                                   |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Check                                                                                                                                                                             | Yes            | No                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>9 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b><br>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br>2) Place the shift lever in neutral position.<br>3) Turn the A/C switch to OFF.<br>4) Turn all accessory switches to OFF.<br>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.                                                                           | Is the measured value within the followings? Ignition ON:<br>73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)<br>Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg) | Go to step 10. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.> |
| <b>10 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b><br>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br>2) Place the shift lever in neutral position.<br>3) Turn the A/C switch to OFF.<br>4) Turn all accessory switches to OFF.<br>5) Open the front hood.<br>6) Measure the ambient temperature.<br>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. | Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (14 — 122°F)?                                                                          | Go to step 11. | Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>   |
| <b>11 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — Chassis ground:</b><br><b>(B134) No. 33 — Chassis ground:</b>                                                                                                                                                                                                                                                                                                                                                                                          | Is the resistance more than 1 MΩ?                                                                                                                                                 | Go to step 12. | Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.                                            |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                            | Check                                    | Yes                                                                                        | No                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <b>12</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from front oxygen (A/F) sensor.<br>3) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 (+) — Chassis ground (-):</b><br><b>(B134) No. 33 (+) — Chassis ground (-):</b>             | Is the voltage more than 8 V?            | Go to step 13.                                                                             | Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. |
| <b>13</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — (B262) No. 3:</b><br><b>(B134) No. 33 — (B262) No. 4:</b> | Is the resistance less than 1 $\Omega$ ? | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> | Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.          |

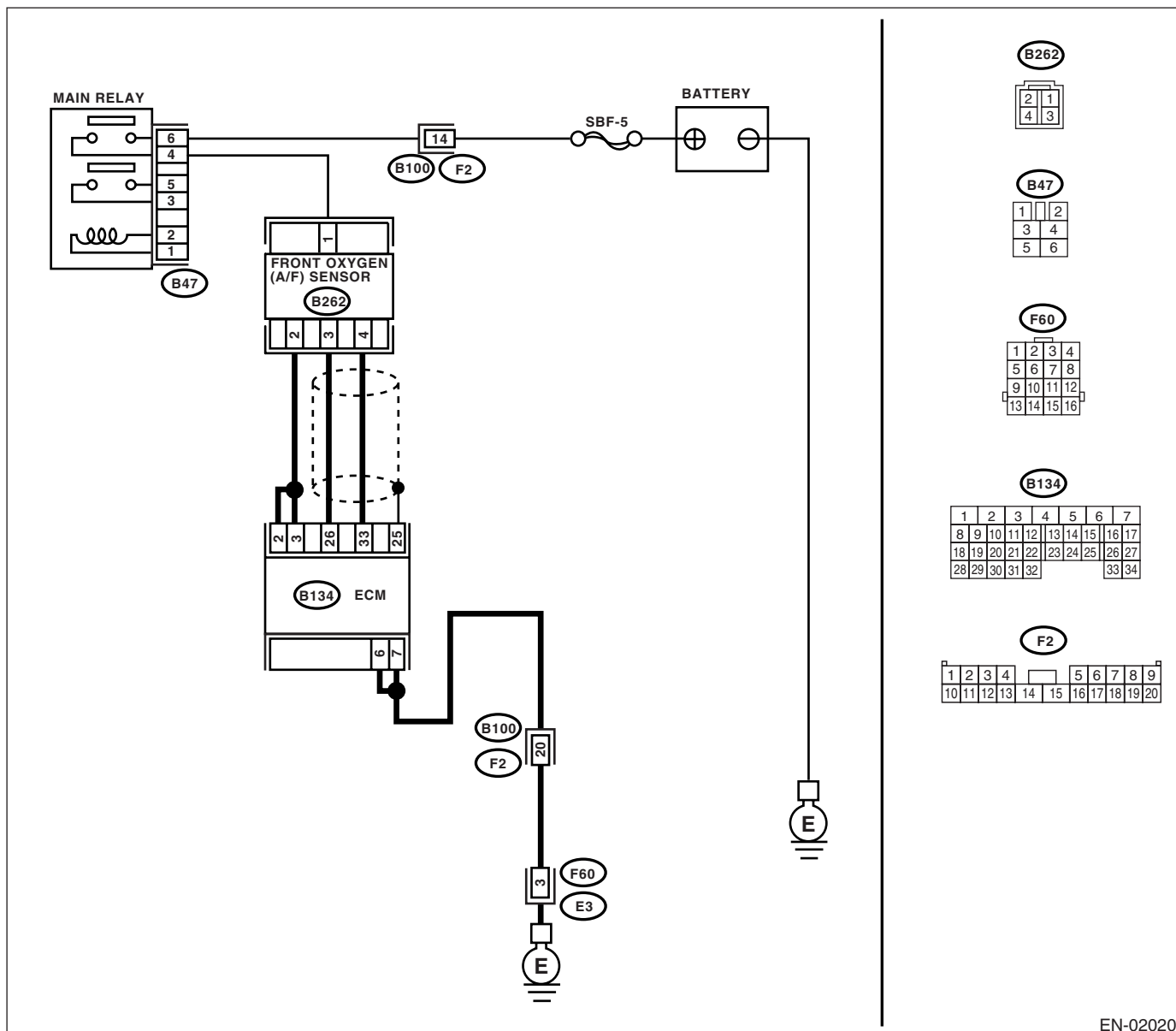
### DP:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 — DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-258, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02020

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Check                                                                       | Yes                                                                                                                                     | No                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Is any other DTC displayed?                                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                                                                  |
| <b>2</b><br><b>CHECK FRONT (A/F) OXYGEN SENSOR DATA.</b><br>1) Start engine.<br>2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F).<br>If the engine is already warmed-up, operate at idle speed for at least 1 minute.<br>3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. | Is the measured value within 0.86 — 1.15 at idle?                           | Go to step 3.                                                                                                                           | Go to step 4.                                                                  |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR SIGNAL.</b><br>1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles.<br><b>NOTE:</b><br>To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.<br>2) Operate the LED operation mode for engine.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.>                                                                                                                                                                                     | Does the LED of {Rear O <sub>2</sub> Rich Signal} blink?                    | Check front oxygen (A/F) sensor circuit.                                                                                                | Check rear oxygen sensor circuit. <Ref. to FU(H4DOTC)-39, Rear Oxygen Sensor.> |
| <b>4</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check exhaust system parts.<br><b>NOTE:</b><br>Check the following items.<br>• Loose installation of portions<br>• Damage (crack, hole etc.) of parts<br>• Looseness of front oxygen (A/F) sensor<br>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor                                                                                                                                                                                                                                                                                                                                                                                                   | Is there a fault in exhaust system?                                         | Repair or replace faulty parts.                                                                                                         | Go to step 5.                                                                  |
| <b>5</b><br><b>CHECK AIR INTAKE SYSTEM.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Are there holes, loose bolts or disconnection of hose on air intake system? | Repair the air intake system.                                                                                                           | Go to step 6.                                                                  |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Check                                                                             | Yes           | No                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6</b><br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>Place “NO FIRE” signs near the working area.</li> <li>Be careful not to spill fuel on the floor.</li> </ul> <ol style="list-style-type: none"> <li>Release the fuel pressure.               <ol style="list-style-type: none"> <li>Disconnect the connector from fuel pump relay.</li> <li>Start the engine and run it until it stalls.</li> <li>After the engine stalls, crank it for 5 more seconds.</li> <li>Turn the ignition switch to OFF.</li> </ol> </li> <li>Connect the connector to fuel pump relay.</li> <li>Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge.</li> <li>Install the fuel filler cap.</li> <li>Start the engine and idle while gear position is neutral.</li> <li>Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.</li> </ol> <b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br><b>NOTE:</b><br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. | Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm <sup>2</sup> , 41 — 46 psi)? | Go to step 7. | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>Improper fuel pump discharge</li> <li>Clogged fuel supply line</li> </ul>                                                                       |
| <b>7</b><br><b>CHECK FUEL PRESSURE.</b><br>After connecting the pressure regulator vacuum hose, measure fuel pressure.<br><b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br><b>NOTE:</b> <ul style="list-style-type: none"> <li>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm <sup>2</sup> , 30 — 34 psi)? | Go to step 8. | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>Faulty pressure regulator</li> <li>Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>Faulty pressure regulator</li> <li>Improper fuel pump discharge</li> <li>Clogged fuel supply line</li> </ul> |
| <b>8</b><br><b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b> <ol style="list-style-type: none"> <li>Start the engine and warm-up completely.</li> <li>Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</li> </ol> <b>NOTE:</b> <ul style="list-style-type: none"> <li>Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> <li>OBD-II general scan tool</li> </ul> For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Is the temperature more than 60°C (140°F)?                                        | Go to step 9. | Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>                                                                                                                                                                                                                                                   |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Check                                                                                                                                                                             | Yes            | No                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>9 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b><br>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br>2) Place the shift lever in neutral position.<br>3) Turn the A/C switch to OFF.<br>4) Turn all accessory switches to OFF.<br>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.                                                                           | Is the measured value within the followings? Ignition ON:<br>73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)<br>Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg) | Go to step 10. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.> |
| <b>10 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b><br>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br>2) Place the shift lever in neutral position.<br>3) Turn the A/C switch to OFF.<br>4) Turn all accessory switches to OFF.<br>5) Open the front hood.<br>6) Measure the ambient temperature.<br>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-29, Subaru Select Monitor.><br>• OBD-II general scan tool<br>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. | Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (14 — 122°F)?                                                                          | Go to step 11. | Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>   |
| <b>11 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — Chassis ground:</b><br><b>(B134) No. 33 — Chassis ground:</b>                                                                                                                                                                                                                                                                                                                                                                                          | Is the resistance more than 1 MΩ?                                                                                                                                                 | Go to step 12. | Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.                                            |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                            | Check                                    | Yes                                                                                        | No                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <b>12</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from front oxygen (A/F) sensor.<br>3) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 (+) — Chassis ground (-):</b><br><b>(B134) No. 33 (+) — Chassis ground (-):</b>             | Is the voltage more than 8 V?            | Go to step 13.                                                                             | Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. |
| <b>13</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — (B262) No. 3:</b><br><b>(B134) No. 33 — (B262) No. 4:</b> | Is the resistance less than 1 $\Omega$ ? | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, Front Oxygen (A/F) Sensor.> | Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.          |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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### **DQ:DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-187, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-225, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-260, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

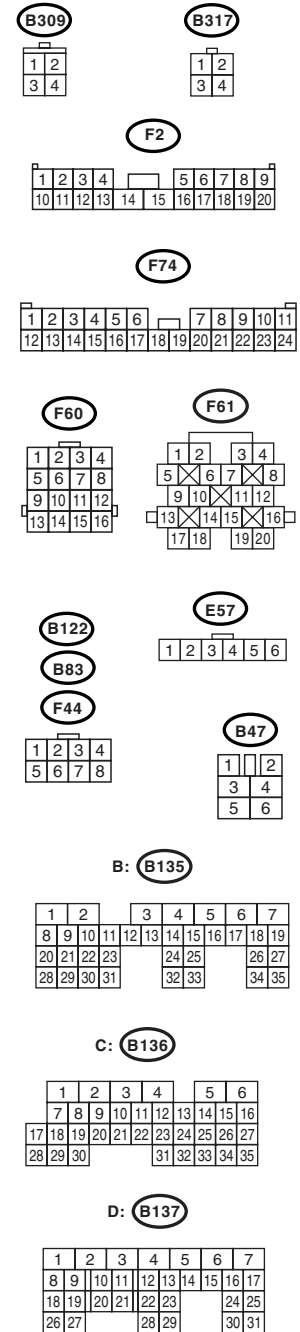
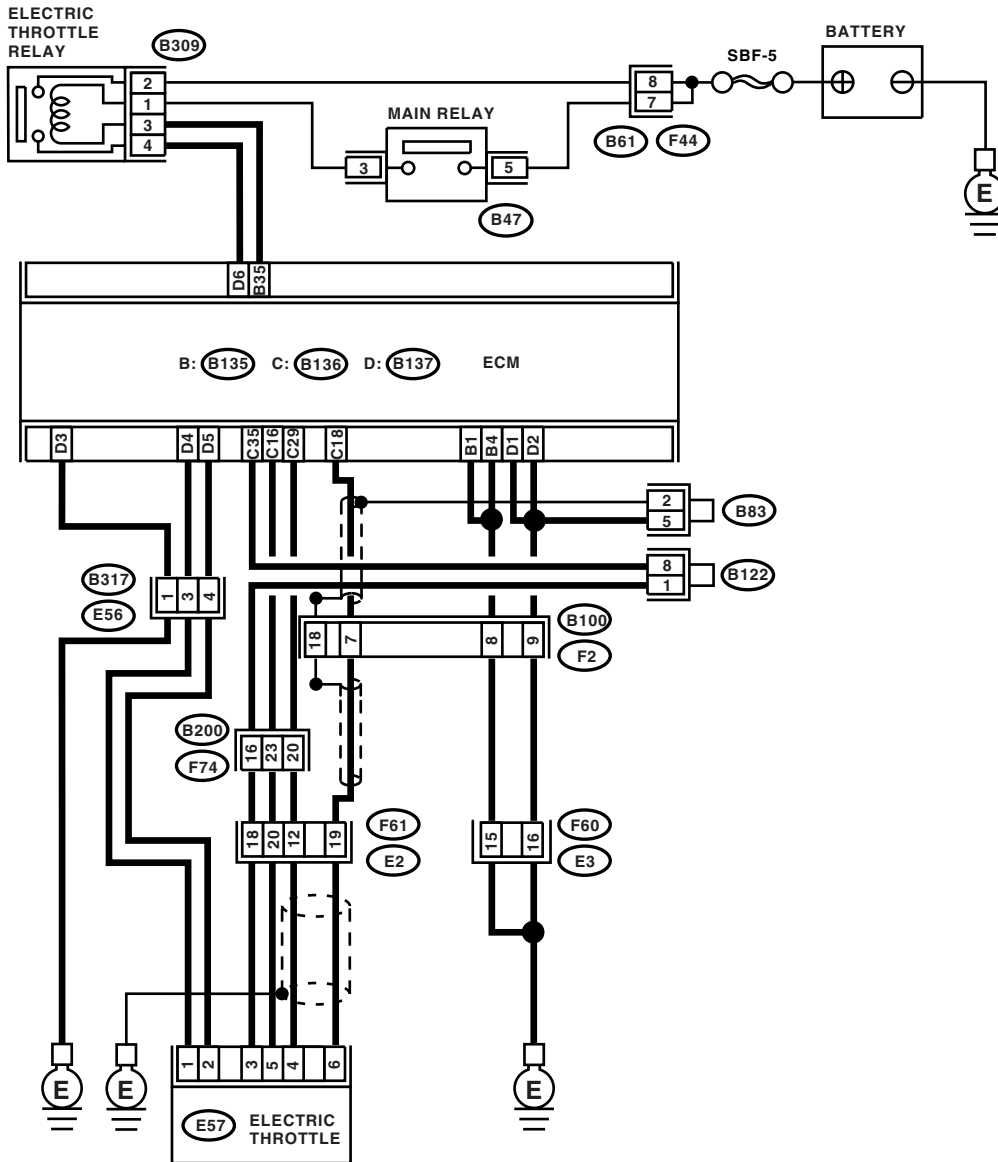
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                           | Check                                      | Yes           | No                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------|-----------------------------------------------------------------------------|
| <b>1 CHECK ELECTRIC THROTTLE RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electric throttle relay.<br>3) Connect the battery to electric throttle relay terminal No. 1 and No. 3.<br>4) Measure the resistance between electric throttle relay terminals.<br><b>Terminals</b><br><b>No. 2 — No. 4:</b>                                                                                                   | Is the resistance less than 1 $\Omega$ ?   | Go to step 2. | Replace the electric throttle relay.                                        |
| <b>2 CHECK POWER SUPPLY TO ELECTRIC THROTTLE RELAY.</b><br>Measure the voltage between electric throttle relay connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B309) No. 1 (+) — Engine ground (-):</b><br><b>(B309) No. 2 (+) — Engine ground (-):</b>                                                                                                                                                 | Is the voltage more than 5 V?              | Go to step 3. | Repair the open power supply circuit or ground short.                       |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Disconnect the connector from ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electric throttle relay connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B309) No. 3 (+) — Engine ground (-):</b>                                                                                                             | Is the voltage less than 5 V?              | Go to step 4. | Repair short of the power supply circuit between ECM and electric throttle. |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electric throttle relay connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B309) No. 3 — Engine ground:</b><br><b>(B309) No. 4 — Engine ground:</b>                                                                                                                 | Is the resistance more than 1 M $\Omega$ ? | Go to step 5. | Repair the ground short of harness between ECM and electric throttle relay. |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electric throttle connector and electric throttle relay connector.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 35 — (B309) No. 3:</b><br><b>(B137) No. 6 — (B309) No. 4:</b>                                                                                               | Is the resistance less than 1 $\Omega$ ?   | Go to step 6. | Repair the open circuit of harness between ECM and electric throttle relay. |
| <b>6 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 18 (+) — (B136) No. 35 (-):</b><br>4) Shake the ECM harness and connector, engine harness connectors (B136, F61), electric throttle connector harness while monitoring value of voltage meter. | Is the voltage more than 0.4 V?            | Go to step 7. | Go to step 9.                                                               |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                               | Check                                                                        | Yes                      | No                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>7 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 29 (+) — (B136) No. 35 (-):</b><br>4) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter. | Is the voltage more than 0.8 V?                                              | Go to step 8.            | Go to step 9.                                                                                                                            |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact between ECM connector and electric throttle connector.                                                                                                                                                                                                                                                                                                          | Is there poor contact between ECM connector and electric throttle connector? | Repair the poor contact. | Go to step 13.                                                                                                                           |
| <b>9 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electric throttle.<br>4) Measure the resistance between ECM connector and electric throttle connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 — (E57) No. 5:</b>                                                     | Is the resistance less than 1 $\Omega$ ?                                     | Go to step 10.           | Repair the open harness connector.                                                                                                       |
| <b>10 CHECK THE HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>Measure the resistance between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 — Chassis ground:</b><br><b>(B136) No. 18 — Chassis ground:</b><br><b>(B136) No. 29 — Chassis ground:</b>                                                                                                                | Is the resistance more than 1 M $\Omega$ ?                                   | Go to step 11.           | Repair the ground short of harness.                                                                                                      |
| <b>11 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the resistance between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No.5 (+) — Engine ground (-):</b><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                 | Is the voltage 4.5 — 5.5 V?                                                  | Go to step 12.           | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>12 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 — Engine ground:</b><br><b>(E57) No. 4 — Engine ground:</b>                                                                                                                                          | Is the resistance more than 10 $\Omega$ ?                                    | Go to step 13.           | Repair the poor contact in ECM connector. If problem persists, replace the ECM.                                                          |
| <b>13 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signal, using the Subaru Select Monitor.<br>4) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.                                                          | Is the voltage 4.63 V?                                                       | Go to step 14.           | Go to step 16.                                                                                                                           |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                        | Check                                      | Yes            | No                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------|
| <b>21 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all the connectors except electric throttle replay.<br>3) Turn the ignition switch to ON.<br>4) Read the data of main throttle sensor signals, using Subaru Select Monitor.                                                                                                                                  | Is the voltage 0.81 — 0.87 V?              | Go to step 22. | Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle. |
| <b>22 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>Read the data of sub throttle sensor signals, using Subaru Select Monitor.                                                                                                                                                                                                                                                                                     | Is the voltage 1.64 — 1.70 V?              | Go to step 23. | Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle. |
| <b>23 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connectors from electric throttle.<br>4) Measure the resistance between ECM connector and electric throttle connector.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 5 — (E57) No. 2:</b><br><b>(B137) No. 4 — (E57) No. 1:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 24. | Repair the open harness connector.                                                                          |
| <b>24 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.</b><br>1) Connect the connectors to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 2 (+) — Engine ground (-):</b><br><b>(E57) No. 1 (+) — Engine ground (-):</b>                                               | Is the voltage less than 5 V?              | Go to step 25. | Repair the short of harness to power supply circuit between ECM and electric throttle.                      |
| <b>25 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 2 — Engine ground:</b><br><b>(E57) No. 1 — Engine ground:</b>                                                       | Is the resistance more than 1 M $\Omega$ ? | Go to step 26. | Repair the short of harness.                                                                                |
| <b>26 CHECK ELECTRIC THROTTLE MOTOR HARNESS.</b><br>Measure the resistance between electric throttle connector terminals.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 2 — (E57) No. 1:</b>                                                                                                                                                                                                           | Is the resistance more than 1 M $\Omega$ ? | Go to step 27. | Repair the short of harness.                                                                                |
| <b>27 CHECK ELECTRIC THROTTLE GROUND CIRCUIT.</b><br>Measure the resistance between ECM connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 3 — Engine ground:</b>                                                                                                                                                                                                             | Is the resistance less than 10 $\Omega$ ?  | Go to step 28. | Repair the open circuit harness.                                                                            |
| <b>28 CHECK ELECTRIC THROTTLE.</b><br>Measure the resistance between electric throttle terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>                                                                                                                                                                                                                                                              | Is the resistance less than 5 $\Omega$ ?   | Go to step 29. | Replace the electric throttle.                                                                              |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

### ENGINE (DIAGNOSTICS)

| Step                                                                                                             | Check                                                                                                           | Yes                                                                                                                                      | No                             |
|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>29</b><br><b>CHECK ELECTRIC THROTTLE.</b><br>Open and close the throttle valve to its full width with finger. | Does it return to specified position (3 mm (0.12 in) open from fully closed position.) when finger is released? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Replace the electric throttle. |

## **DR:DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW — DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-262, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

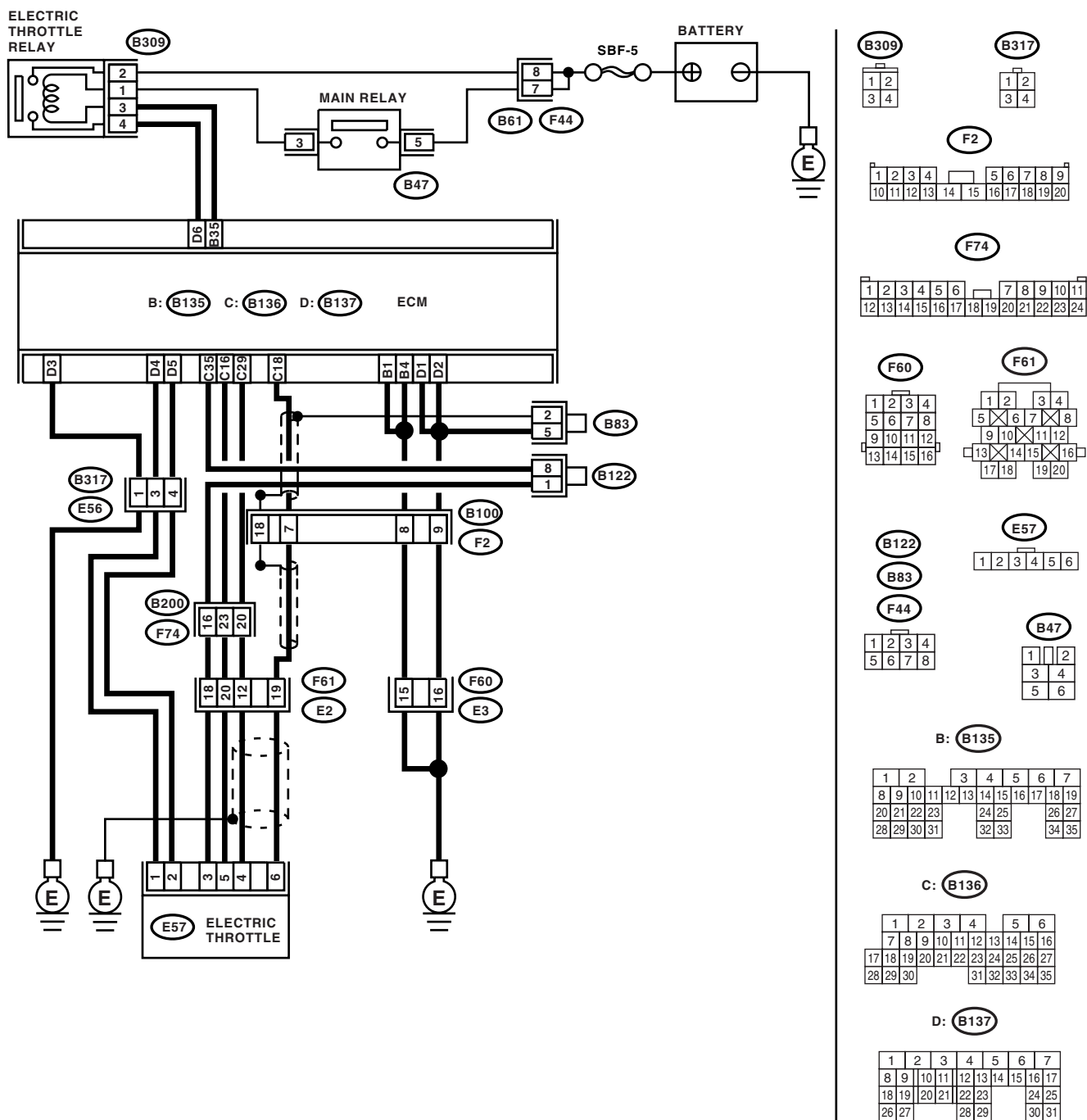
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                | Check                                      | Yes                                                                             | No                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>1 CHECK ELECTRIC THROTTLE RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electric throttle relay.<br>3) Connect the battery to electric throttle relay terminal No. 1 and No. 3.<br>4) Measure the resistance between electric throttle terminals.<br><b>Connector &amp; terminal</b><br><b>(B309) No. 2 — (B309) No. 4:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.                                                                   | Replace the electric throttle relay.                                        |
| <b>2 CHECK POWER TO ELECTRIC THROTTLE RELAY</b><br>Measure the voltage between electric throttle relay connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B309) No. 1 (+) — Engine ground (-):</b><br><b>(B309) No. 2 (+) — Engine ground (-):</b>                                                                              | Is the voltage more than 5 V?              | Go to step 3.                                                                   | Repair the open power supply circuit or ground short.                       |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Disconnect the connector from ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electric throttle relay connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B309) No. 3 (+) — Engine ground (-):</b>                                  | Is the voltage less than 5 V?              | Go to step 4.                                                                   | Repair the short of power supply circuit between ECM and electric throttle. |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electric throttle relay connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B309) No. 3 — Engine ground:</b><br><b>(B309) No. 4 — Engine ground:</b>                                | Is the resistance more than 1 M $\Omega$ ? | Go to step 5.                                                                   | Repair the ground short of harness between ECM and electric throttle relay. |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.</b><br>Measure the resistance between ECM connector and electric throttle relay connector.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 35 — (B309) No. 3:</b><br><b>(B137) No. 6 — (B309) No. 4:</b>                                                                            | Is the resistance less than 1 $\Omega$ ?   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. | Repair the open harness between ECM and electric throttle relay.            |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

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### **DS:DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH — DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-264, DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

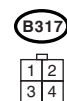
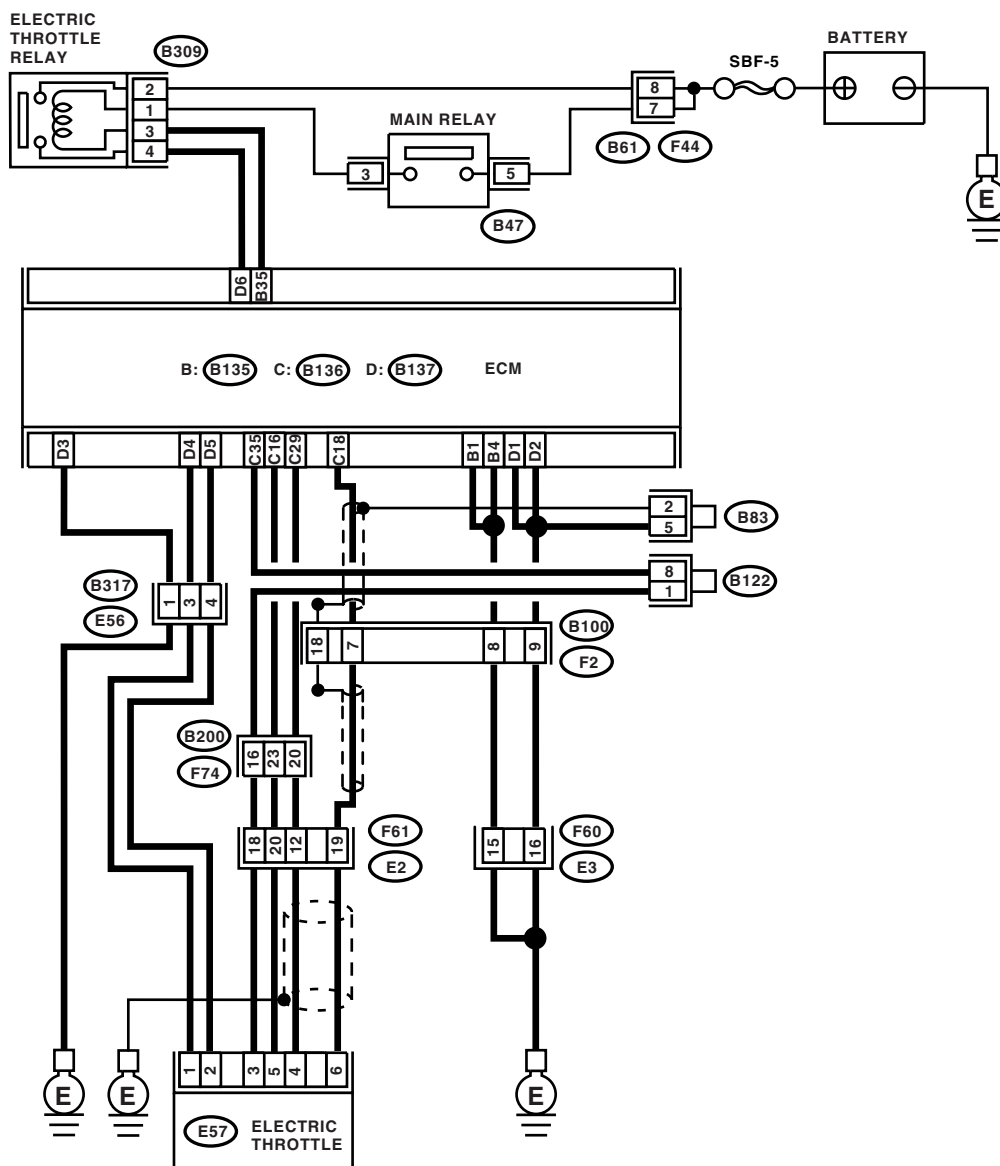
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

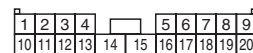
# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

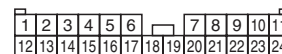
## WIRING DIAGRAM:



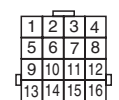
F2



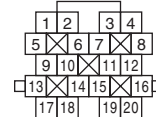
F74



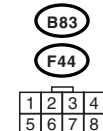
F60



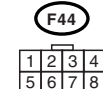
F61



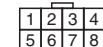
B122



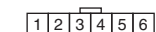
B83



F44



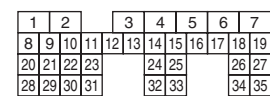
E57



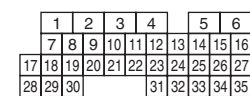
B47



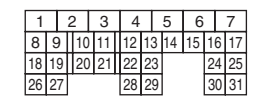
B: B135



C: B136



D: B137



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

**DT:DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP  
PERFORMANCE —****NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)-348, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## DU:DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-268, DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

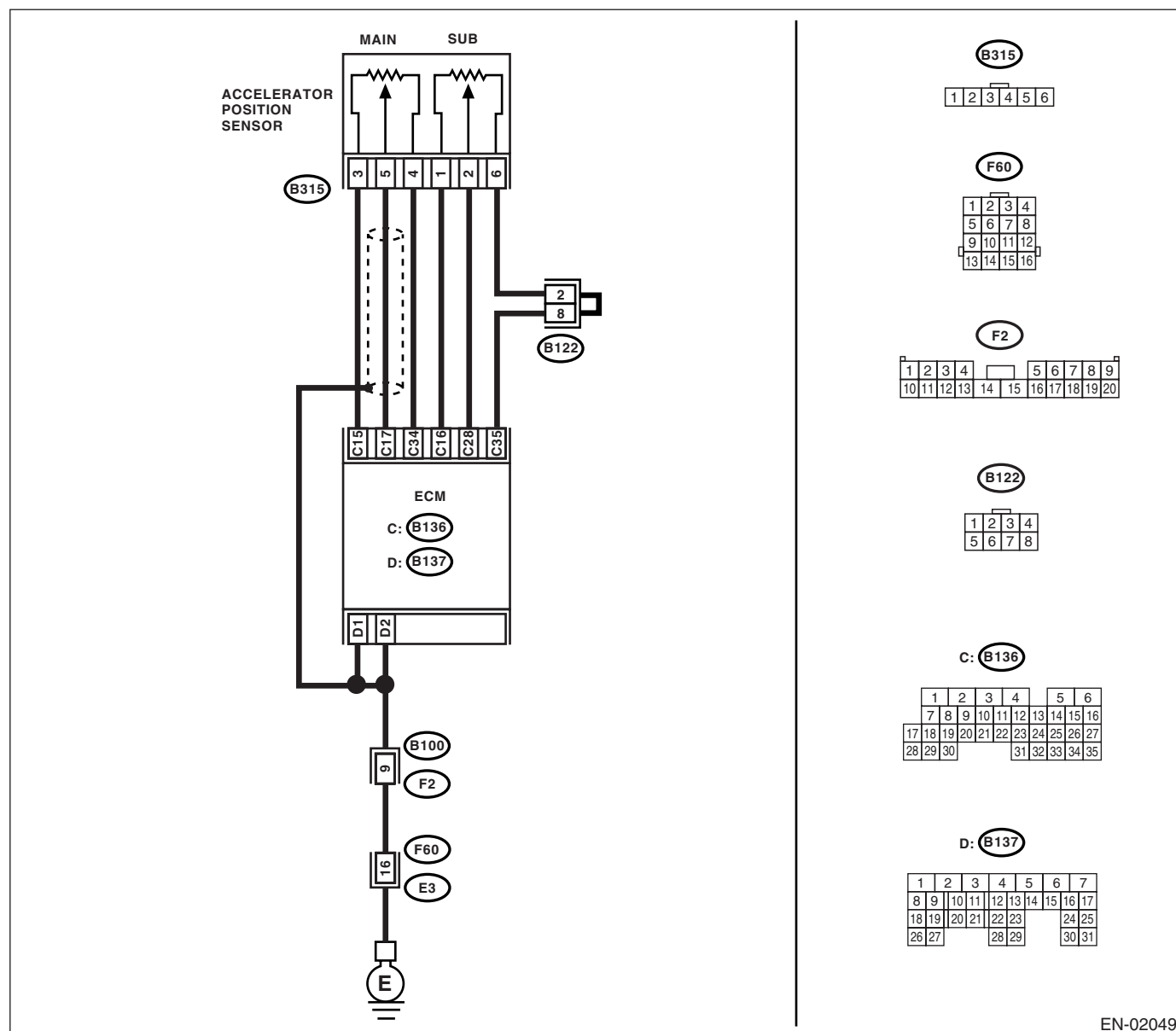
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:



EN-02049

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                  | Check                                                                            | Yes                                    | No                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 (+) — (B136) No. 34 (-):</i><br>3) Shake the ECM harness and connector, accelerator position sensor.                                                                                                  | Is the voltage more than 0.4 V?                                                  | Go to step 2.                          | Go to step 3.                                                                                                                            |
| <b>2</b><br><b>CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator position sensor.                                                                                                                                                                                                                                                                                                 | Is there poor contact in connectors between ECM and accelerator position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.                 |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator position sensor.<br>4) Measure the resistance between ECM connector and accelerator position sensor.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 — (B315) No. 5:</i><br><i>(B136) No. 15 — (B315) No. 3:</i> | Is the resistance less than 1 $\Omega$ ?                                         | Go to step 4.                          | Repair the open harness connector.                                                                                                       |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 — Chassis ground:</i><br><i>(B136) No. 15 — Chassis ground:</i>                                                                                                                                                              | Is the resistance more than 1 M $\Omega$ ?                                       | Go to step 5.                          | Repair the open harness connector.                                                                                                       |
| <b>5</b><br><b>CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 3 (+) — Engine ground (-):</i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter.                            | Is the voltage 4.5 — 5.5 V?                                                      | Go to step 6.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>6</b><br><b>CHECK ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance of accelerator position sensor.<br><i>Terminals</i><br><i>No. 3 — No. 4:</i>                                                                                                                                                                                                                                                                          | Is the resistance 1.2 — 4.8 k $\Omega$ ?                                         | Go to step 7.                          | Replace the accelerator position sensor.                                                                                                 |
| <b>7</b><br><b>CHECK ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance of accelerator position sensor when accelerator pedal is released.<br><i>Terminals</i><br><i>No. 5 — No. 4:</i>                                                                                                                                                                                                                                       | Is the resistance 0.2 — 1.0 k $\Omega$ ?                                         | Go to step 8.                          | Replace the accelerator position sensor.                                                                                                 |

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                    | Check                                    | Yes                                                                             | No                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------|
| <b>8</b><br><b>CHECK ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance of accelerator position sensor when acceleration pedal is being depressed.<br><i>Terminals</i><br><i>No. 5 — No. 4:</i> | Is the resistance 0.5 — 2.5 k $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. | Replace the accelerator position sensor. |

### DV:DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-270, DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

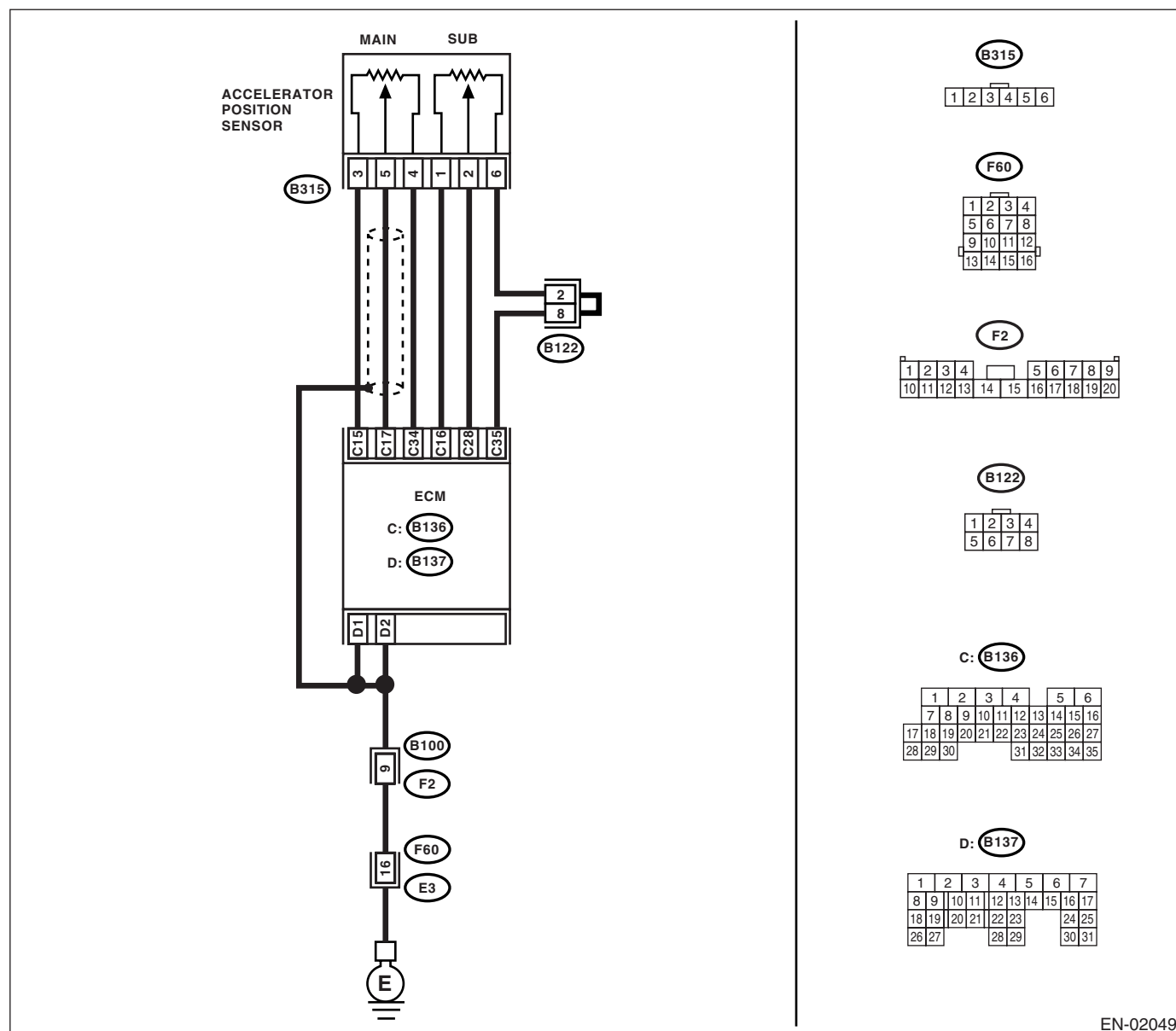
#### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02049

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                       | Check                                                                                | Yes                                    | No                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main accelerator position sensor signals, using Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connector, accelerator position sensor connector harness while monitoring value of voltage meter.                                                              | Is the voltage less than 4.8 V?                                                      | Go to step 2.                          | Go to step 3.                                                                                                                         |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator position sensor.                                                                                                                                                                                                                                                                                                | Is there any poor contact in connectors between ECM and accelerator position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.     |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator position sensor.<br>4) Measure the resistance between ECM connector and accelerator position sensor.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 34 — (B315) No. 4:</b></i>                          | Is the resistance less than 1 $\Omega$ ?                                             | Go to step 4.                          | Repair the open harness connector.                                                                                                    |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B315) No. 4 — Engine ground:</b></i>                                                                                                                                          | Is the resistance less than 5 $\Omega$ ?                                             | Go to step 5.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B315) No. 3 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter. | Is the voltage more than 6 V?                                                        | Go to step 6.                          | Repair the battery short of harness between ECM connector and accelerator position sensor.                                            |
| <b>6 CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.</b><br>1) Measure the voltage between accelerator position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B315) No. 5 (+) — Engine ground (-):</b></i><br>2) Shake the ECM harness and connector, while monitoring value of voltage meter.                                                                                | Is the voltage less than 4.8 V?                                                      | Go to step 7.                          | Repair the short of harness between ECM connector and accelerator position sensor connector.                                          |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                         | Check                 | Yes                                                                                                                                      | No                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>7</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 17 (+) — Chassis ground (-):</b> | Is the voltage 4.8 V? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle. |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

### DW:DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-272, DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

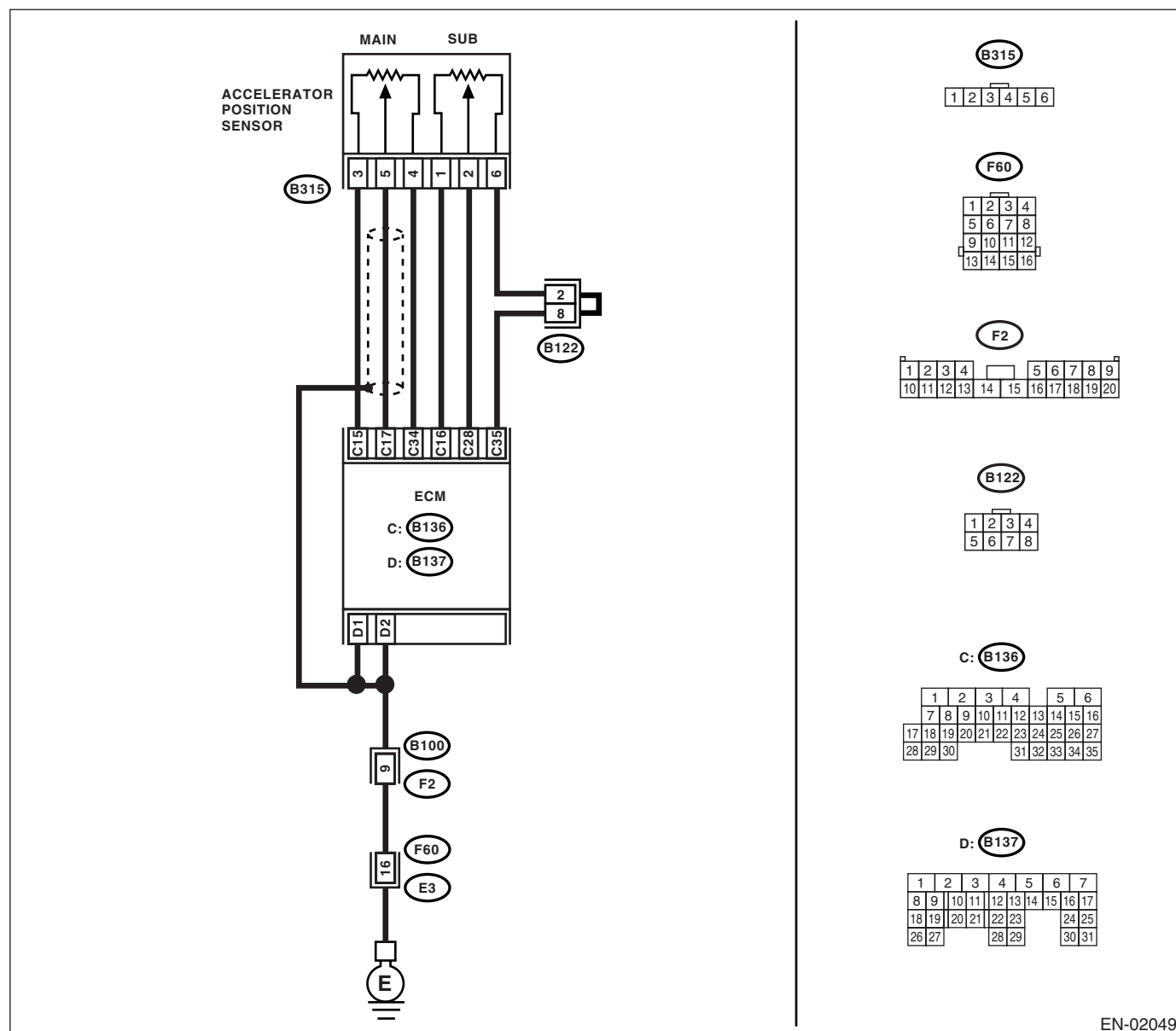
#### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02049

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                  | Check                                                                                | Yes                                    | No                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 28 (+) — (B136) No. 35 (-):</i><br>3) Shake the ECM harness and connector, accelerator position sensor.                                                                                                  | Is the voltage more than 0.4 V?                                                      | Go to step 2.                          | Go to step 3.                                                                                                                         |
| <b>2</b><br><b>CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator position sensor.                                                                                                                                                                                                                                                                                                 | Is there any poor contact in connectors between ECM and accelerator position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.     |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator position sensor.<br>4) Measure the resistance between ECM connector and accelerator position sensor.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 28 — (B315) No. 2:</i><br><i>(B136) No. 16 — (B315) No. 1:</i> | Is the resistance less than 1 $\Omega$ ?                                             | Go to step 4.                          | Repair the open harness connector.                                                                                                    |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 28 — Chassis ground:</i><br><i>(B136) No. 16 — Chassis ground:</i>                                                                                                                                                              | Is the resistance more than 1 M $\Omega$ ?                                           | Go to step 5.                          | Repair the ground short of harness.                                                                                                   |
| <b>5</b><br><b>CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 1 (+) — Engine ground (-):</i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter.                        | Is the voltage 4.5 — 5.5 V?                                                          | Go to step 6.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>6</b><br><b>CHECK ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance of accelerator position sensor.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>                                                                                                                                                                                                                                                                          | Is the resistance 0.75 — 3.15 k $\Omega$ ?                                           | Go to step 7.                          | Replace the accelerator position sensor.                                                                                              |
| <b>7</b><br><b>CHECK ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance of accelerator position sensor when accelerator pedal is released.<br><i>Terminals</i><br><i>No. 2 — No. 6:</i>                                                                                                                                                                                                                                       | Is the resistance 0.15 — 0.63 k $\Omega$ ?                                           | Go to step 8.                          | Replace the accelerator position sensor.                                                                                              |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                    | Check                                      | Yes                                                                             | No                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------|
| <b>8</b><br><b>CHECK ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance of accelerator position sensor when acceleration pedal is being depressed.<br><i>Terminals</i><br><i>No. 2 — No. 6:</i> | Is the resistance 0.28 — 1.68 k $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. | Replace the accelerator position sensor. |

### DX:DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-274, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

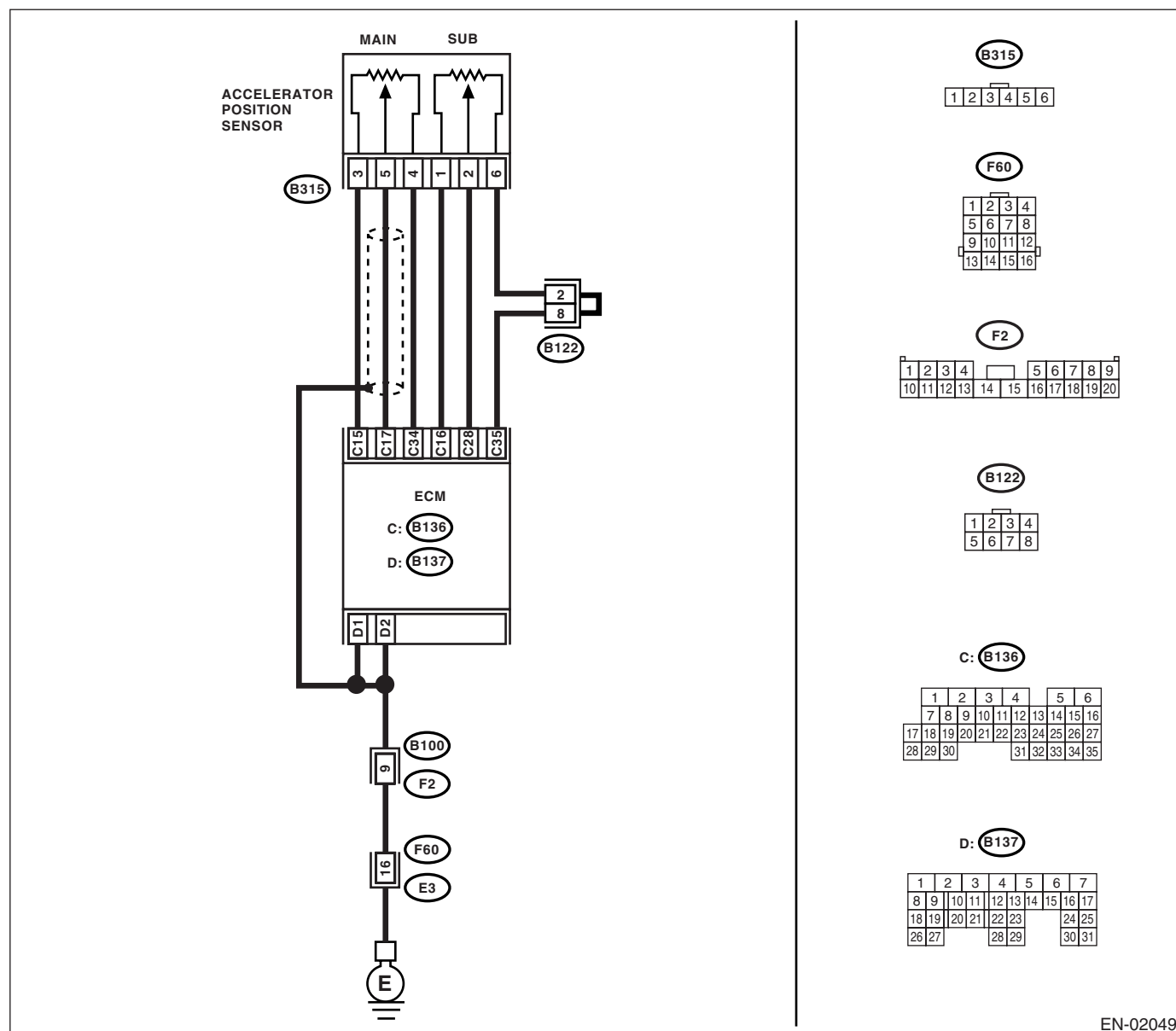
#### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02049

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                         | Check                 | Yes                                                                                                                                      | No                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>7</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b> | Is the voltage 4.8 V? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> | Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle. |

## **DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)**

ENGINE (DIAGNOSTICS)

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### **DY:DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY —**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION<Ref. to GD(H4DOTC)-276, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance

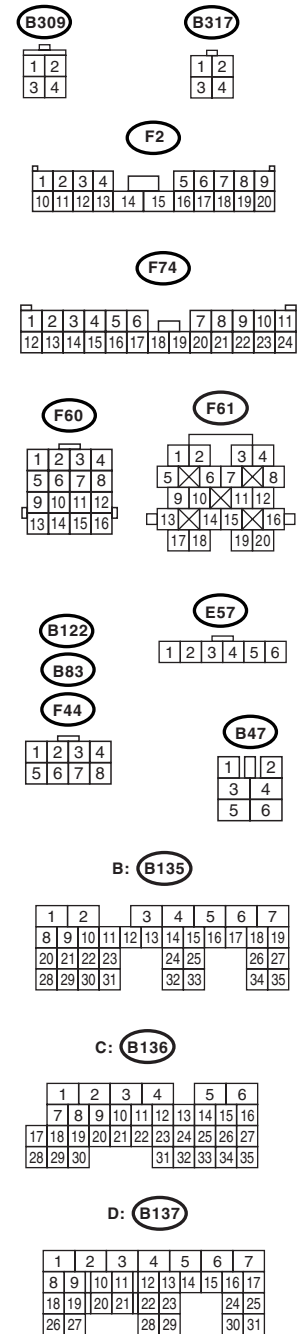
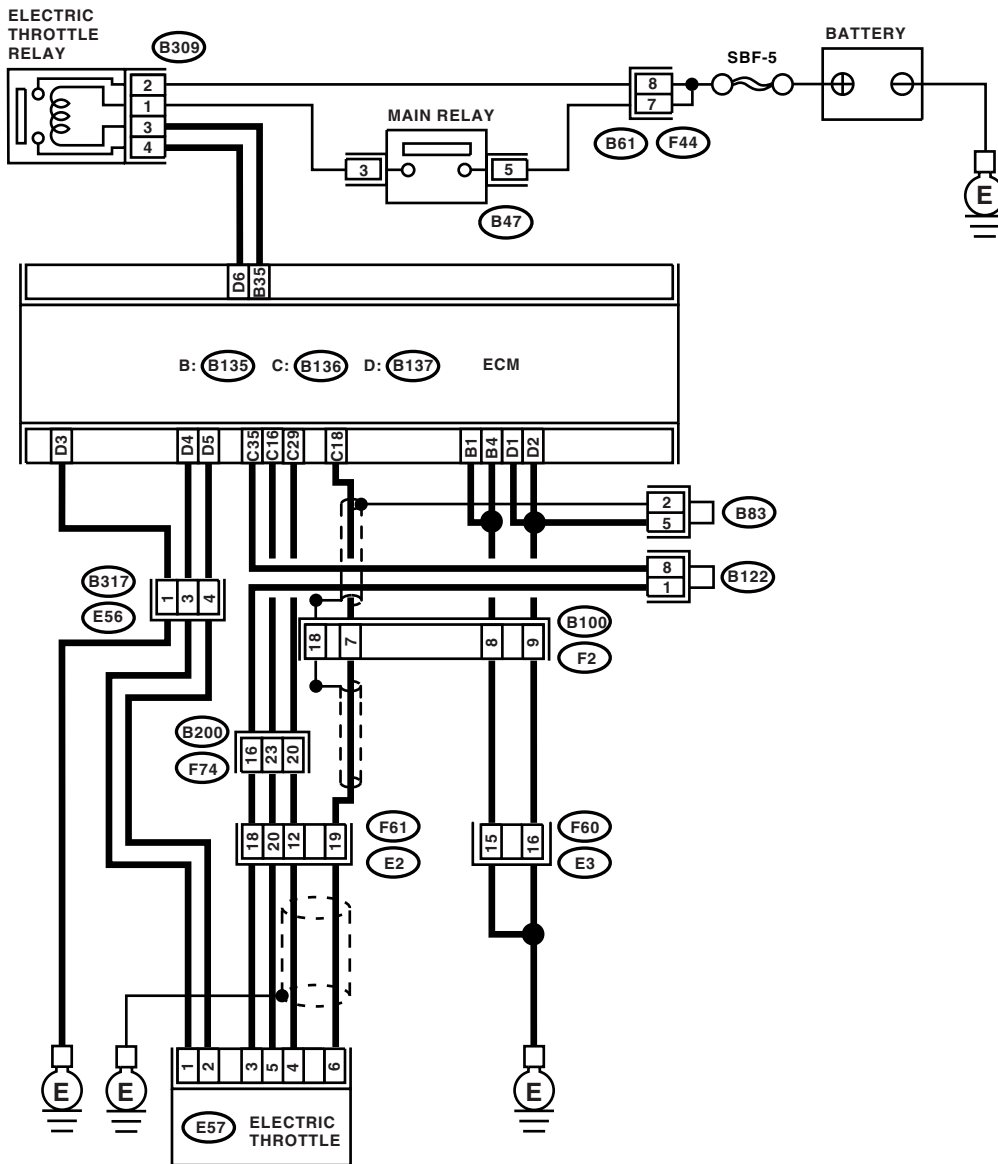
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-02025

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                          | Check                                                                      | Yes                                    | No                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>7 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 — Engine ground:</b><br><b>(E57) No. 4 — Engine ground:</b>                                                                                                                                                                      | Is the resistance more than 10 $\Omega$ ?                                  | Go to step 8.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |
| <b>8 CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signals, using Subaru Select Monitors.<br>4) Shake the ECM harness and connector, engine harness connector, electric throttle connector harness while monitoring value of voltage meter.                                                                    | Is the voltage less than 4.63 V?                                           | Go to step 9.                          | Go to step 11.                                                                                                                        |
| <b>9 CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.</b><br>1) Read the data of sub throttle sensor signals, using Subaru Select Monitors.<br>2) Shake the ECM harness and connector, engine harness connector, electric throttle connector harness while monitoring value of voltage meter.                                                                                                                                             | Is the voltage less than 4.73 V?                                           | Go to step 10.                         | Go to step 11.                                                                                                                        |
| <b>10 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electric throttle.                                                                                                                                                                                                                                                                                                                            | Is there any poor contact in connectors between ECM and electric throttle? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.       |
| <b>11 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electric throttle.<br>4) Measure the resistance between ECM connector and electric throttle connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 35 — (E57) No. 3:</b><br><b>(B136) No. 18 — (E57) No. 6:</b><br><b>(B136) No. 29 — (E57) No. 4:</b> | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 12.                         | Repair the open harness connector.                                                                                                    |
| <b>12 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 3 — Engine ground:</b>                                                                                                                                                                                     | Is the resistance less than 5 $\Omega$ ?                                   | Go to step 13.                         | Repair the poor contact in ECM connector. If problem persists, replace the ECM.                                                       |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                | Check                             | Yes                                                                             | No                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>13 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage more than 10 V?    | Go to step 14.                                                                  | Repair the battery short of harness between ECM connector and electric throttle connector. |
| <b>14 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Measure the voltage between electric throttle connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 (+) — Engine ground (-):</b><br><b>(E57) No. 4 (+) — Engine ground (-):</b><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                         | Is the voltage less than 10 V?    | Go to step 15.                                                                  | Repair the short of harness between ECM connector and electric throttle connector.         |
| <b>15 CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the electric throttle connector.<br>3) Measure the resistance between ECM connectors.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 18 — (B136) No. 35:</b><br><b>(B136) No. 29 — (B136) No. 35:</b>                                                                                       | Is the resistance more than 1 MΩ? | Go to step 16.                                                                  | Repair the short of power supply sensor.                                                   |
| <b>16 CHECK ELECTRIC THROTTLE HARNESS.</b><br>1) Disconnect the connector from ECM.<br>2) Disconnect the connector from electric throttle.<br>3) Measure the resistance between electric throttle connector terminals.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 — (E57) No. 4:</b>                                                                                                                      | Is the resistance more than 1 MΩ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. | Repair the short of harness.                                                               |

### DZ:DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY —

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-278, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

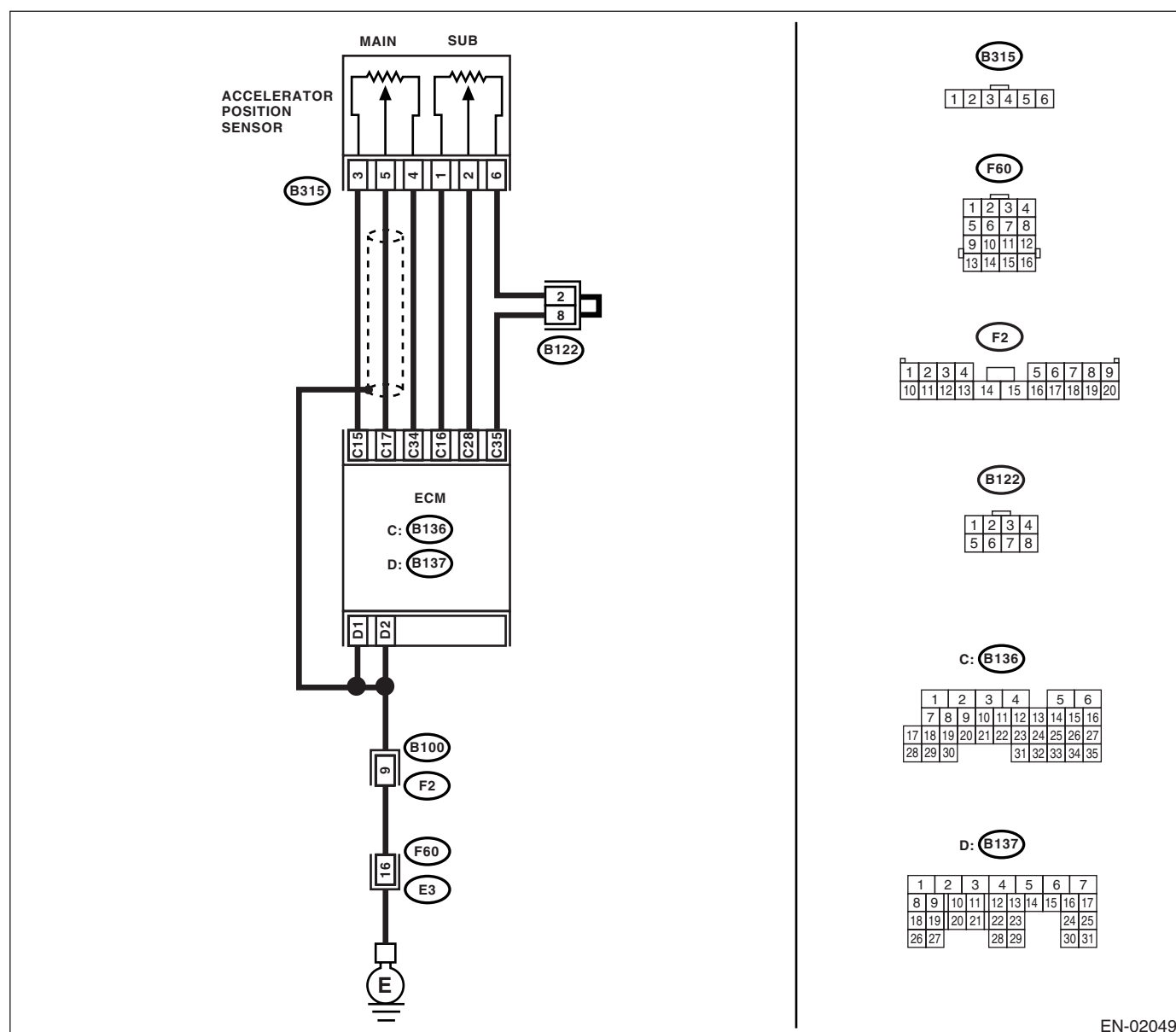
#### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-02049

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Check                                                                      | Yes                                    | No                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 (+) — (B136) No. 34 (-):</i><br><i>(B136) No. 28 (+) — (B136) No. 35 (-):</i><br>3) Shake the ECM harness and connector, accelerator position sensor connector and harness.                                                                                                                     | Is the voltage more than 0.4 V?                                            | Go to step 2.                          | Go to step 3.                                                                   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electric throttle.                                                                                                                                                                                                                                                                                                                                                                                                     | Is there any poor contact in connectors between ECM and electric throttle? | Repair the poor contact in connectors. | Go to step 9.                                                                   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator position sensor.<br>4) Measure the resistance between ECM connector and accelerator position sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 — (B315) No. 5:</i><br><i>(B136) No. 15 — (B315) No. 3:</i><br><i>(B136) No. 28 — (B315) No. 2:</i><br><i>(B136) No. 16 — (B315) No. 1:</i> | Is the resistance less than 1 $\Omega$ ?                                   | Go to step 4.                          | Repair the open harness connector.                                              |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 — Chassis ground:</i><br><i>(B136) No. 15 — Chassis ground:</i><br><i>(B136) No. 28 — Chassis ground:</i><br><i>(B136) No. 16 — Chassis ground:</i>                                                                                                                                                                    | Is the resistance more than 1 M $\Omega$ ?                                 | Go to step 5.                          | Repair the ground short of harness.                                             |
| <b>5 CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 3 (+) — Engine ground (-):</i><br><i>(B315) No. 1 (+) — Engine ground (-):</i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter.                                                                  | Is the voltage 4.5 — 5.5 V?                                                | Go to step 6.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. |
| <b>6 CHECK ACCELERATOR POSITION SENSOR.</b><br>Measure the resistance of accelerator position sensor.<br><i>Terminals</i><br><i>No. 3 — No. 4:</i>                                                                                                                                                                                                                                                                                                                                                                    | Is the resistance 1.2 — 4.8 k $\Omega$ ?                                   | Go to step 7.                          | Replace the accelerator position sensor.                                        |

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

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

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                               | Check                                      | Yes                                                                             | No                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>19</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator position sensor.<br>4) Measure the resistance between terminals of accelerator position sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B315) No. 5 — (B315) No. 2:</b> | Is the resistance less than 1 M $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. | Repair the short of harness between accelerator position sensor connector and accelerator position sensor connector. |

## **16.Diagnostics for Engine Starting Failure**

### **A: PROCEDURE**

1. Check the fuel level.







# DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

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## C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.>.

### WIRING DIAGRAM:

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

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## D: IGNITION CONTROL SYSTEM

CAUTION:











## 12. Drive Cycle

### A: OPERATION

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

#### 1. PREPARATION FOR THE DRIVE CYCLE

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

2) Separate the test mode connector.

NOTE:

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

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

| DTC    | Item                                                                   | Condition                                                             |
|--------|------------------------------------------------------------------------|-----------------------------------------------------------------------|
| *P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control          | Engine coolant temperature is less than 20°C (68°F) at engine start.  |
| *P0128 | Coolant Thermostat                                                     | Engine coolant temperature is less than 55°C (131°F) at engine start. |
| *P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)          | —                                                                     |
| *P0181 | Fuel Temperature Sensor A Performance Problem                          | —                                                                     |
| *P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                    | —                                                                     |
| *P0442 | Evaporative Emission Control System Leak Detected (small leak)         | —                                                                     |
| *P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance  | —                                                                     |
| *P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | —                                                                     |
| *P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off) | —                                                                     |
| P0459  | Evaporative Emission Control System Purge Control Valve Circuit High   | —                                                                     |
| P0461  | Fuel Level Sensor Circuit Range/Performance                            | —                                                                     |
| P0545  | Exhaust Gas Temperature Sensor Circuit Low-Bank1                       | —                                                                     |
| P0546  | Exhaust Gas Temperature Sensor Circuit High-Bank1                      | —                                                                     |
| P0692  | Cooling Fan 1 Control Circuit High                                     | —                                                                     |
| P1312  | Exhaust Gas Temperature Sensor Malfunction                             | Engine coolant temperature is less than 30°C (86°F) at engine start.  |
| P1443  | Vent Control Solenoid Valve Function Problem                           | —                                                                     |
| *P1448 | Fuel Tank Sensor Control Valve Range/Performance                       | —                                                                     |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                         | —                                                                     |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                         | —                                                                     |

# DRIVE CYCLE

## ENGINE (DIAGNOSTICS)

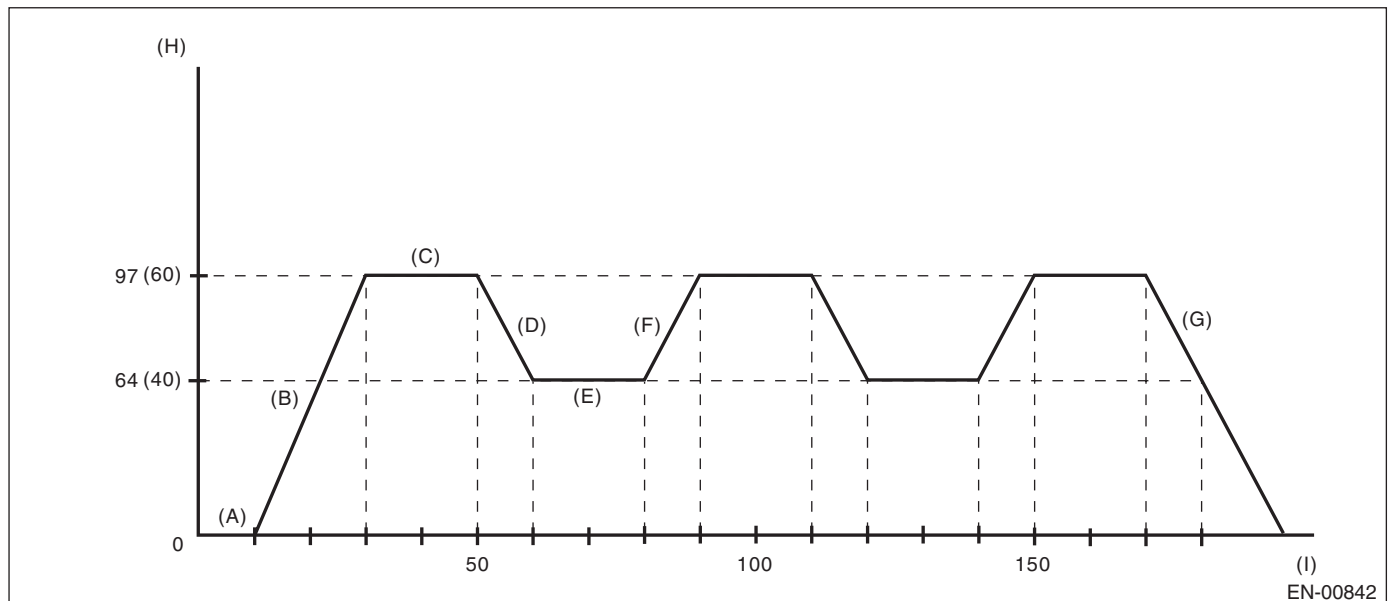
### 3. IDLE FOR 10 MINUTES

#### NOTE:

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

| DTC    | Item                                                    | Condition                                                            |
|--------|---------------------------------------------------------|----------------------------------------------------------------------|
| *P0111 | Intake Air Temperature Sensor Range/Performance Problem | Engine coolant temperature is less than 30°C (86°F) at engine start. |
| P0171  | System too Lean (Bank 1)                                | —                                                                    |
| P0172  | System too Rich (Bank 1)                                | —                                                                    |
| *P0464 | Fuel Level Sensor Circuit Intermittent                  | —                                                                    |
| *P0483 | Cooling Fan Rationality Check                           | —                                                                    |
| *P0506 | Idle Control System RPM Lower Than Expected             | —                                                                    |
| *P0507 | Idle Control System RPM Higher Than Expected            | —                                                                    |

### 4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



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

## DRIVE CYCLE

## ENGINE (DIAGNOSTICS)

| DTC    | Item                                                                     | Condition                                      |
|--------|--------------------------------------------------------------------------|------------------------------------------------|
| P0068  | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance | —                                              |
| *P0101 | Mass or Volume Air Flow Circuit Range/Performance                        | —                                              |
| *P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)            | —                                              |
| P0244  | Turbo/Supercharger Wastegate Solenoid "A" Range/Performance              | —                                              |
| P0246  | Turbo/Supercharger Wastegate Solenoid "A" High                           | —                                              |
| *P0301 | Cylinder 1 Misfire Detected                                              | In some cases, diagnosis may complete at once. |
| *P0302 | Cylinder 2 Misfire Detected                                              | In some cases, diagnosis may complete at once. |
| *P0303 | Cylinder 3 Misfire Detected                                              | In some cases, diagnosis may complete at once. |
| *P0304 | Cylinder 4 Misfire Detected                                              | In some cases, diagnosis may complete at once. |
| P1090  | Tumble Generated Valve System 1 (Valve Open)                             | —                                              |
| P1092  | Tumble Generated Valve System 2 (Valve Open)                             | —                                              |
| P1301  | Misfire Detected (High Temperature Exhaust Gas)                          | —                                              |
| P1544  | Exhaust Gas Temperature Too High                                         | —                                              |

# ELECTRICAL COMPONENTS LOCATION

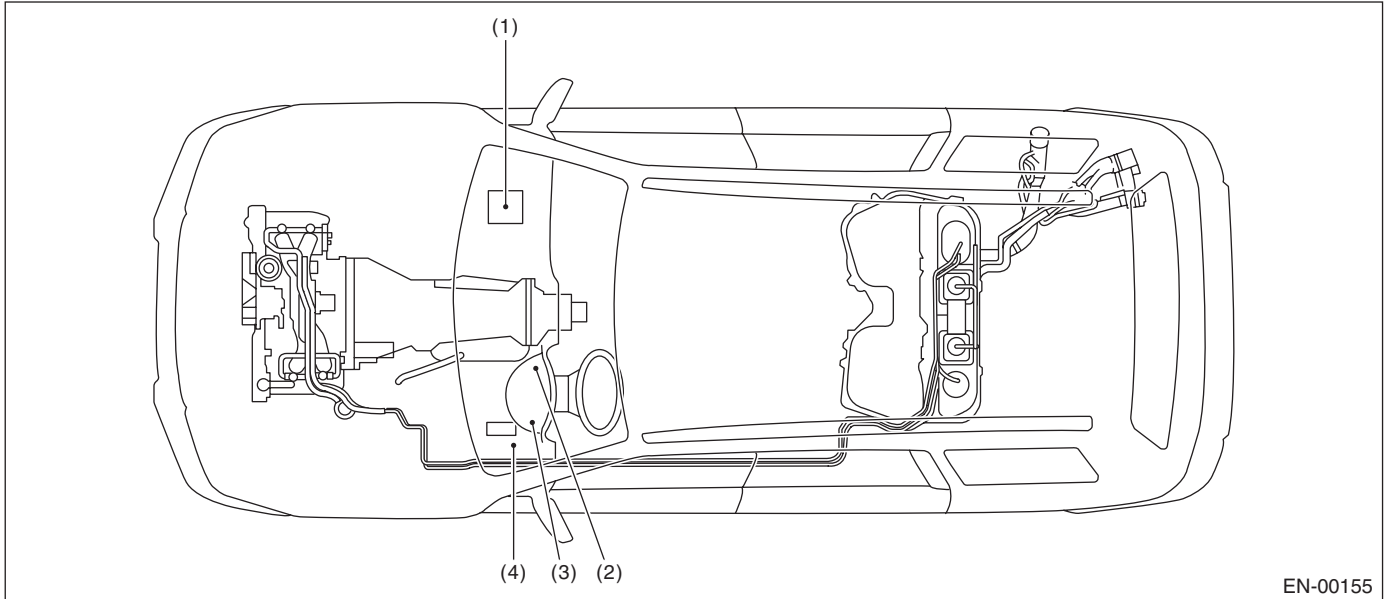
ENGINE (DIAGNOSTICS)

## 4. Electrical Components Location

### A: LOCATION

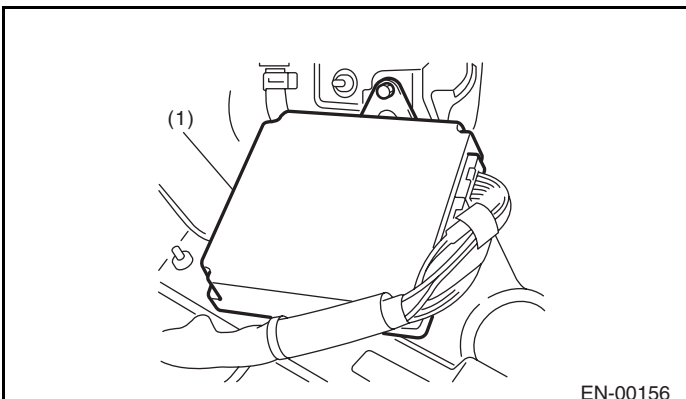
#### 1. ENGINE

##### • MODULE

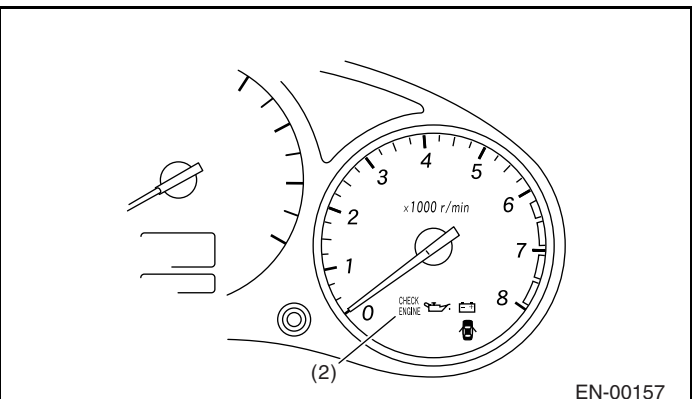


EN-00155

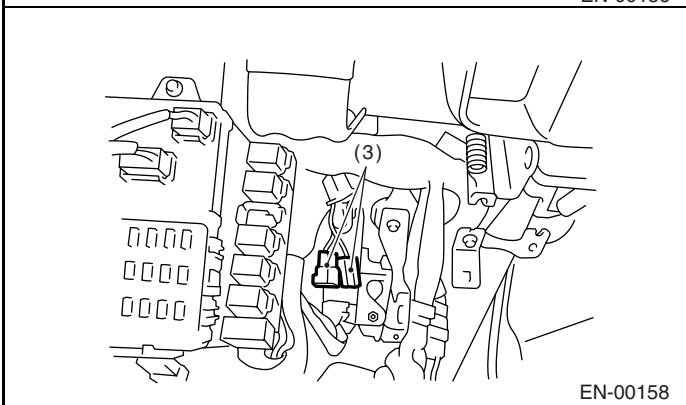
- (1) Engine control module (ECM) (3) Test mode connector (4) Data link connector  
(2) Malfunction indicator light



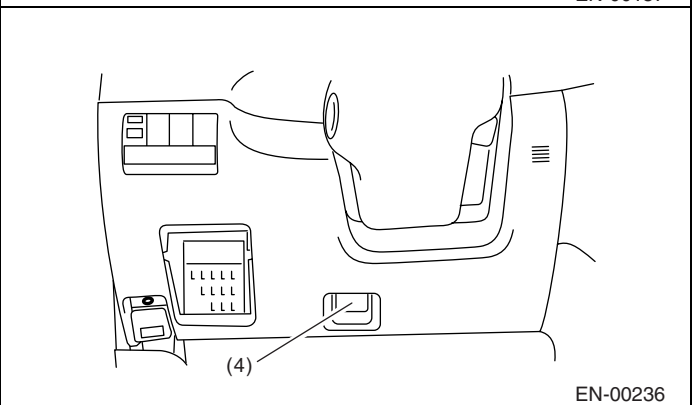
EN-00156



EN-00157



EN-00158

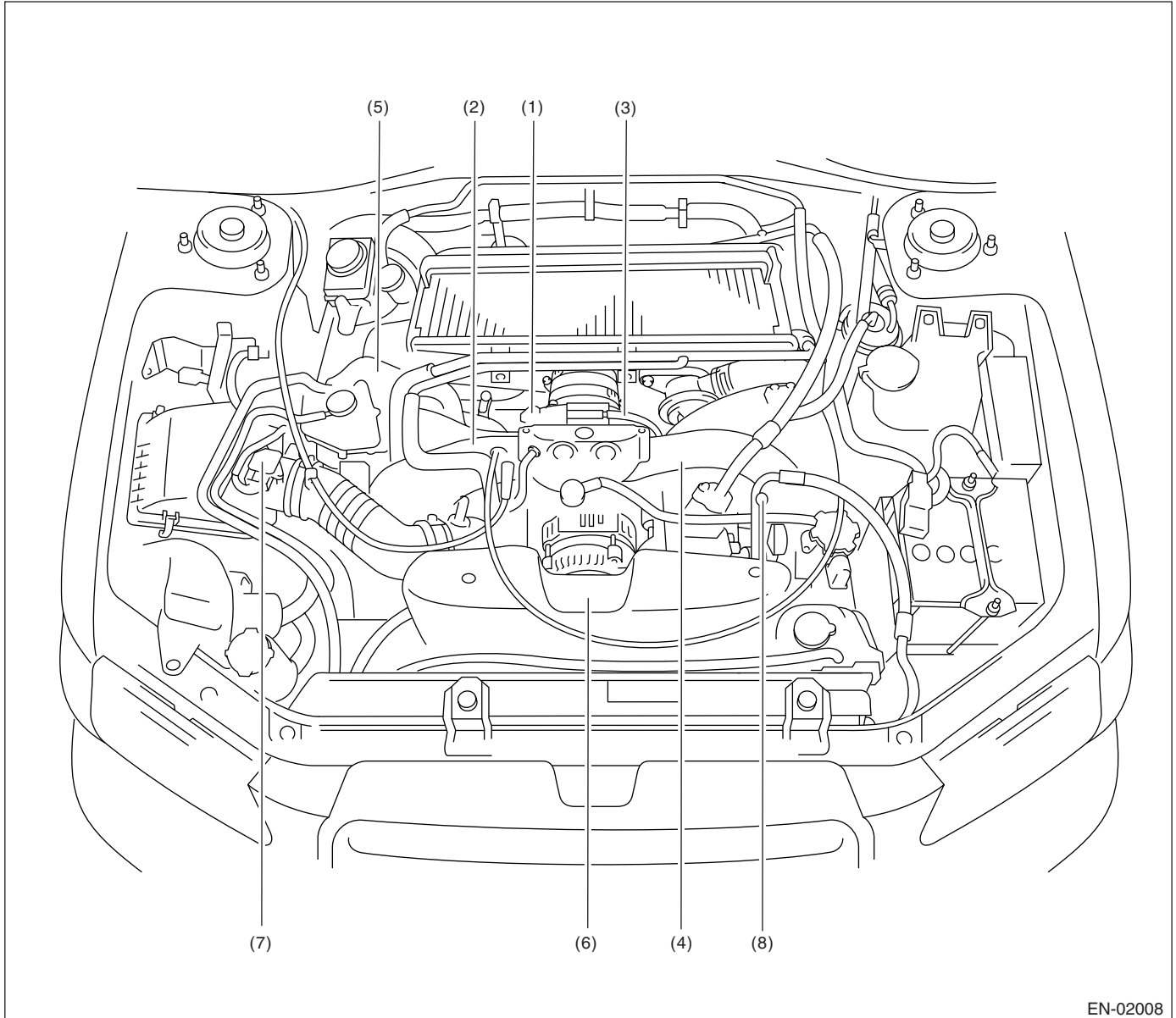


EN-00236

# ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

## • SENSOR

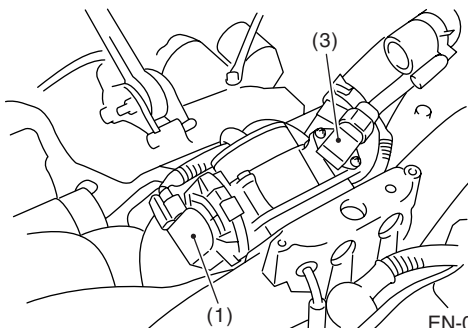


EN-02008

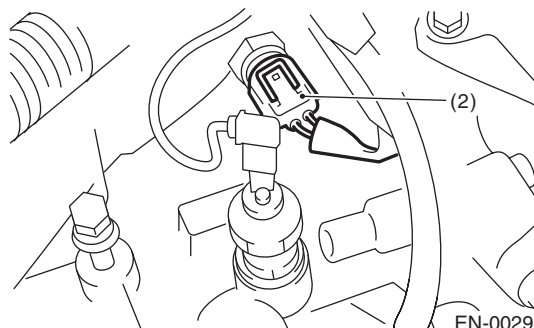
- |                                       |                                |                                                     |
|---------------------------------------|--------------------------------|-----------------------------------------------------|
| (1) Manifold absolute pressure sensor |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

# ELECTRICAL COMPONENTS LOCATION

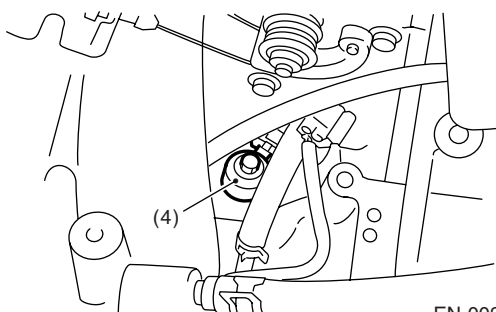
## ENGINE (DIAGNOSTICS)



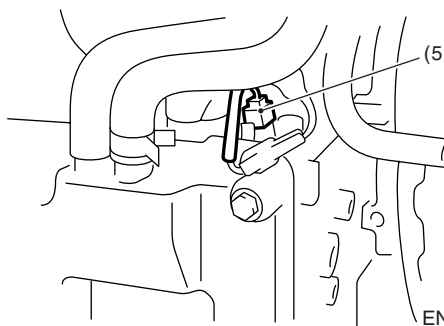
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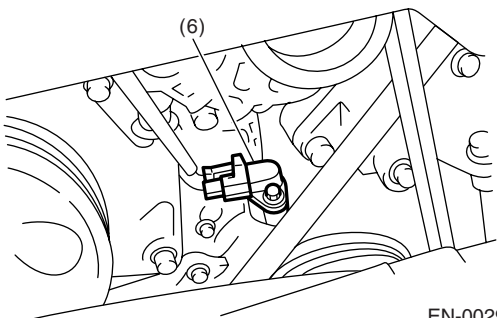
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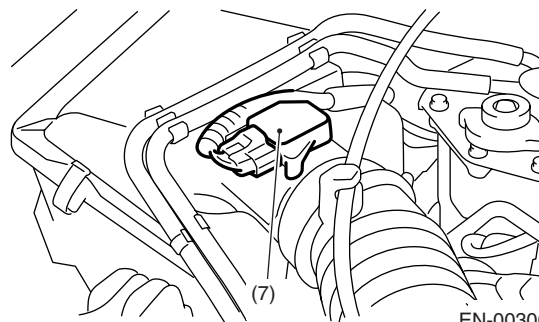
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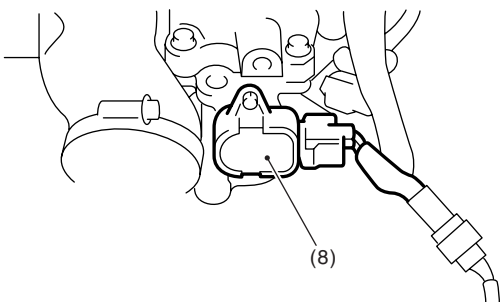
EN-01798



EN-00299



EN-00300

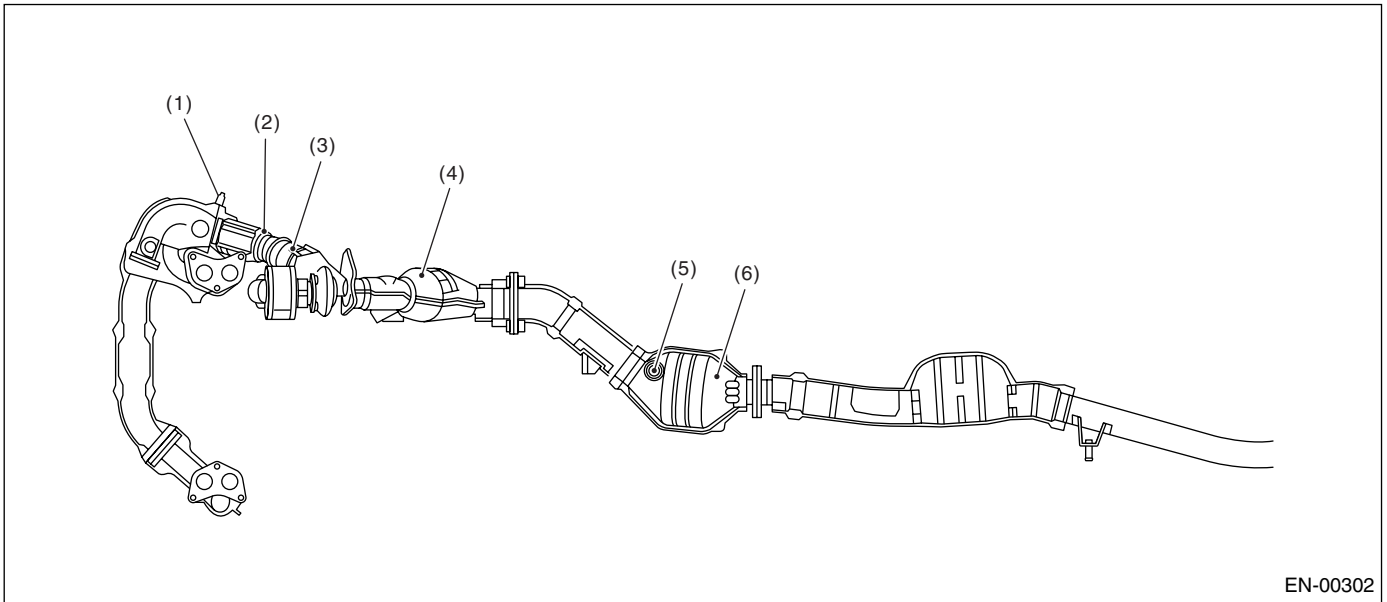


EN-00301

SUBARU.

# ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



EN-00302

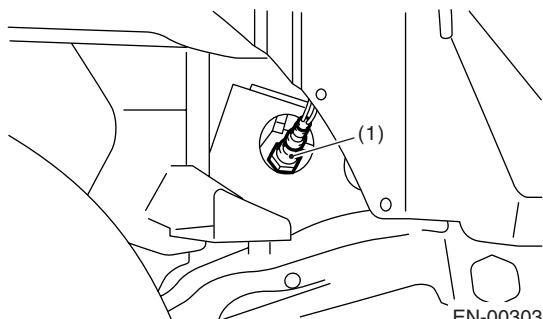
- (1) Front oxygen (A/F) sensor
- (2) Precatytic converter

- (3) Exhaust temperature sensor
- (4) Front catalytic converter

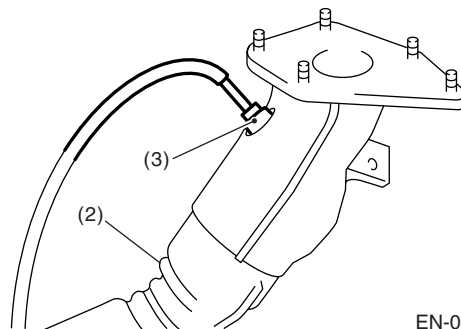
- (5) Rear oxygen sensor
- (6) Rear catalytic converter

# ELECTRICAL COMPONENTS LOCATION

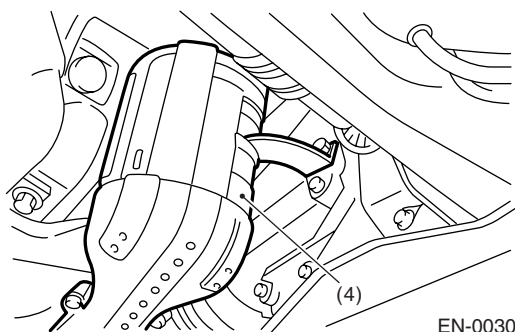
## ENGINE (DIAGNOSTICS)



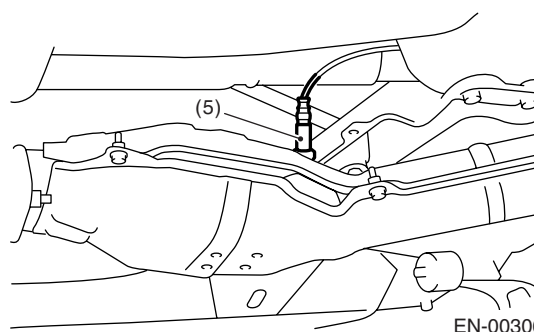
EN-00303



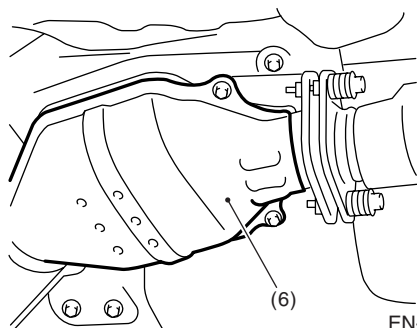
EN-00304



EN-00305



EN-00306

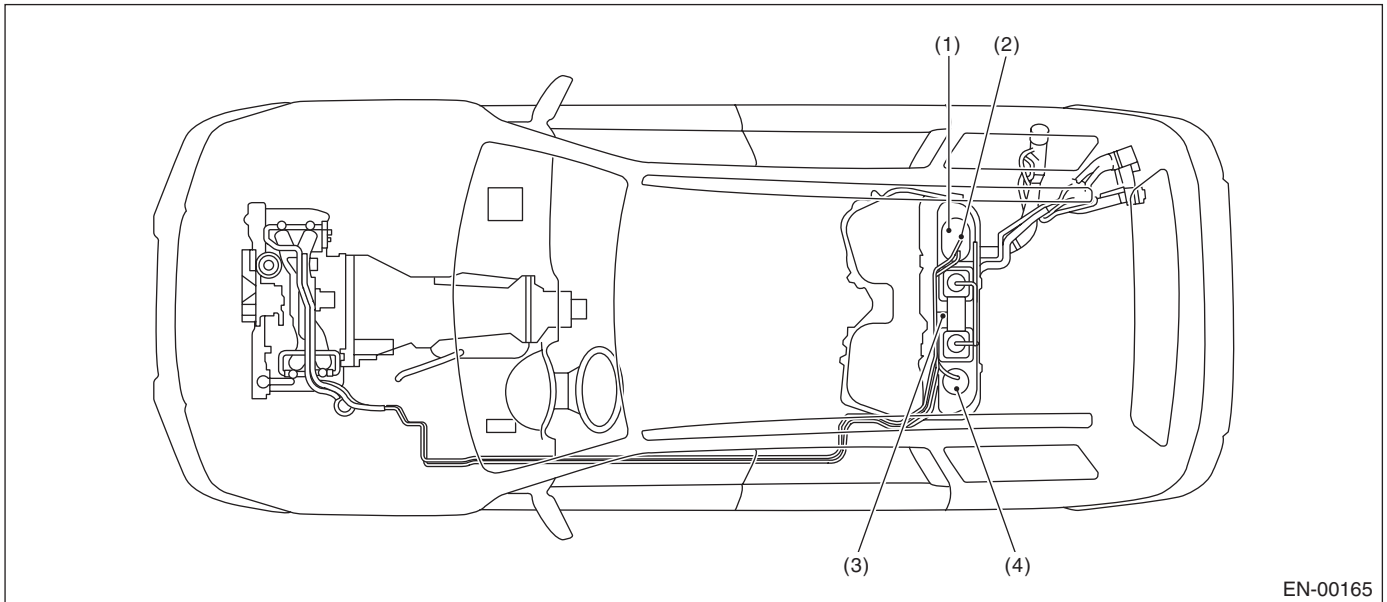


EN-00307

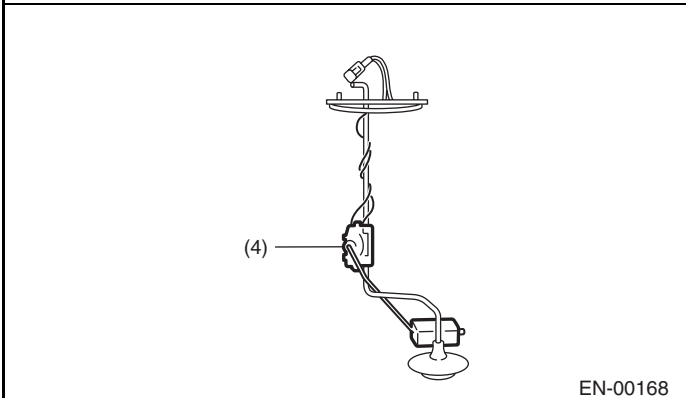
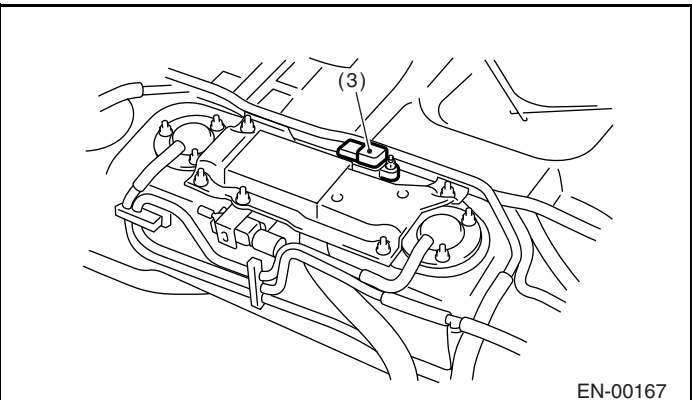
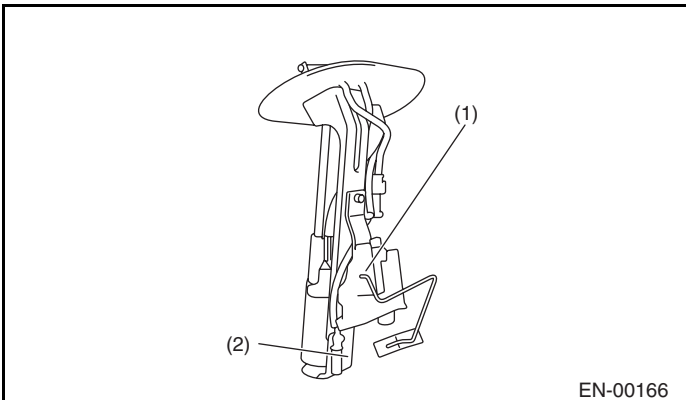
SUBARU.

# ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



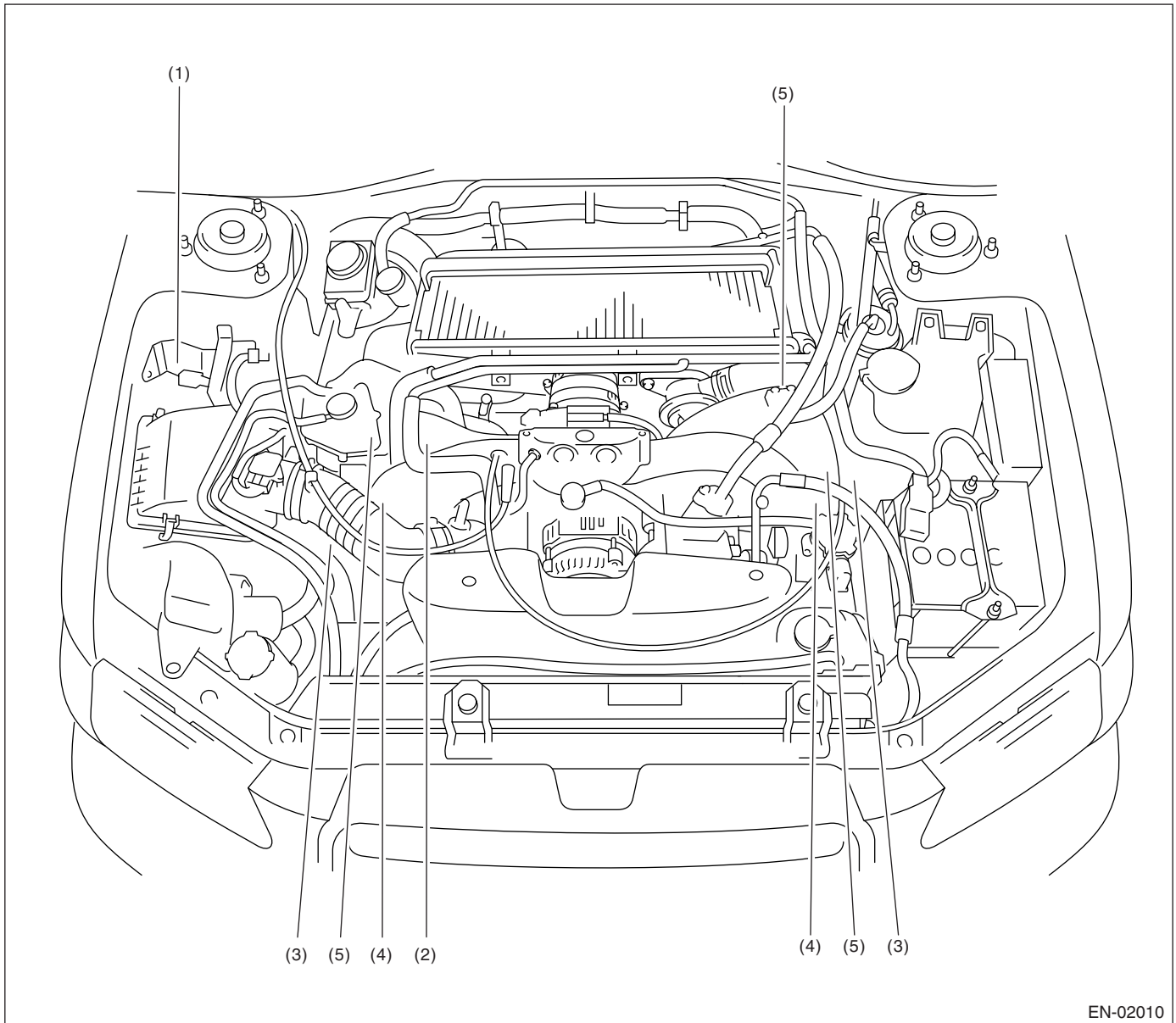
- (1) Fuel level sensor
- (2) Fuel temperature sensor
- (3) Fuel tank pressure sensor
- (4) Fuel sub level sensor



# ELECTRICAL COMPONENTS LOCATION

## ENGINE (DIAGNOSTICS)

### • SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



EN-02010

(1) Wastegate control solenoid valve

(2) Purge control solenoid valve

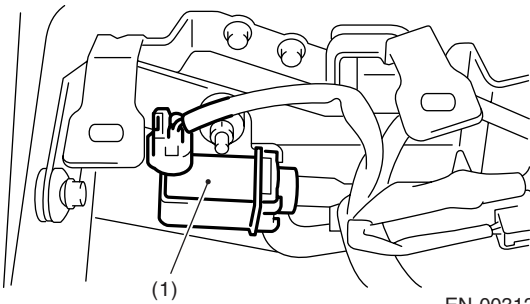
(3) Ignition coil

(4) Tumble generator valve actuator

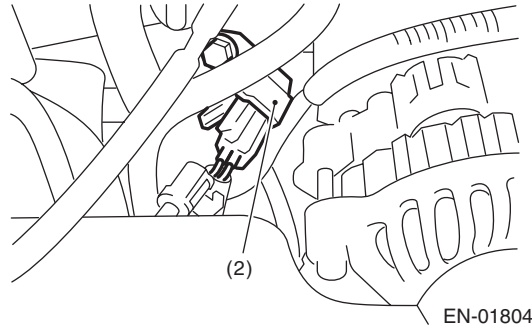
(5) Oil flow control solenoid valve

# ELECTRICAL COMPONENTS LOCATION

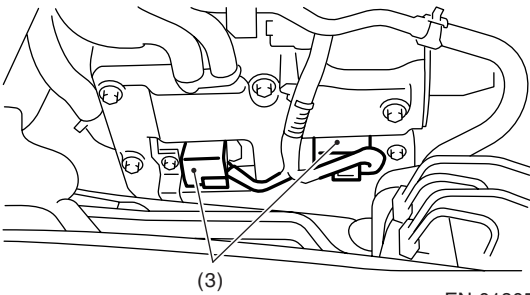
ENGINE (DIAGNOSTICS)



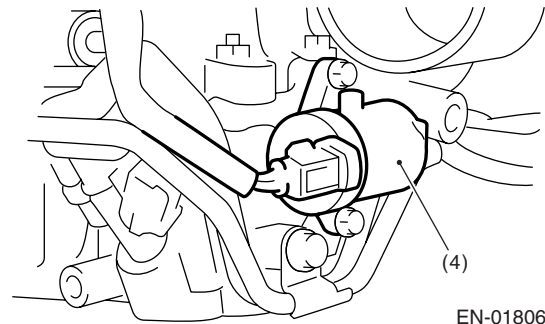
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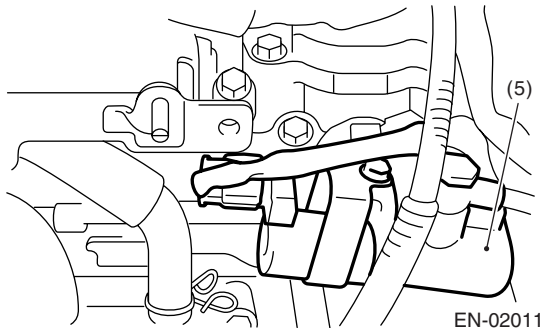
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EN-01805



EN-01806

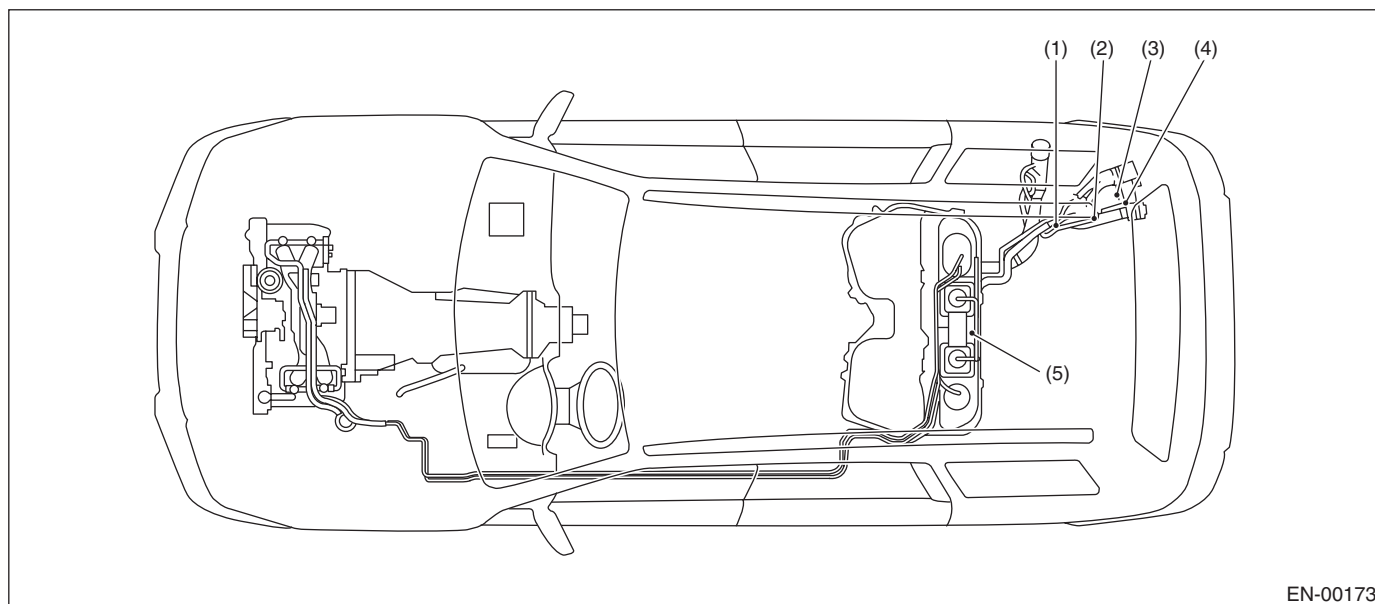


EN-02011

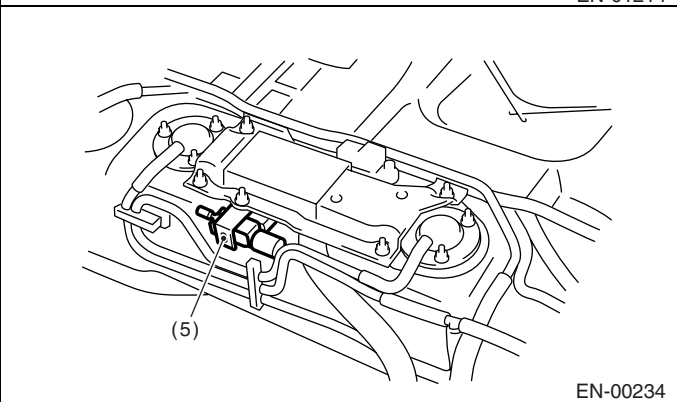
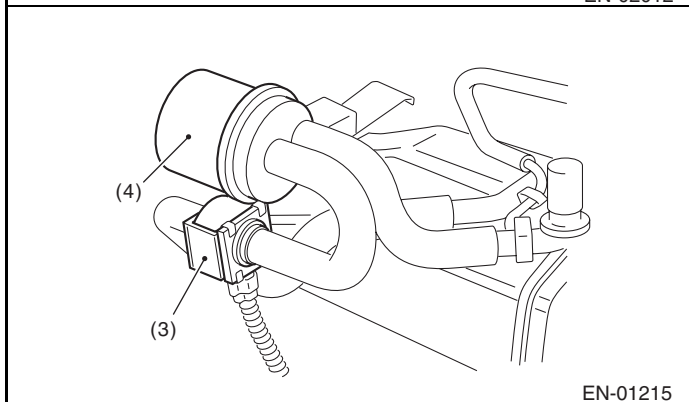
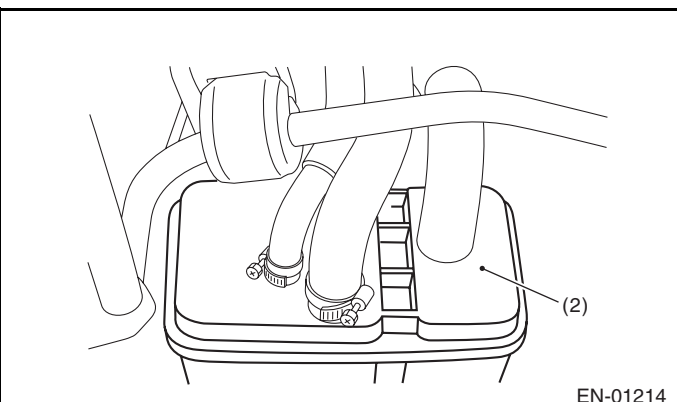
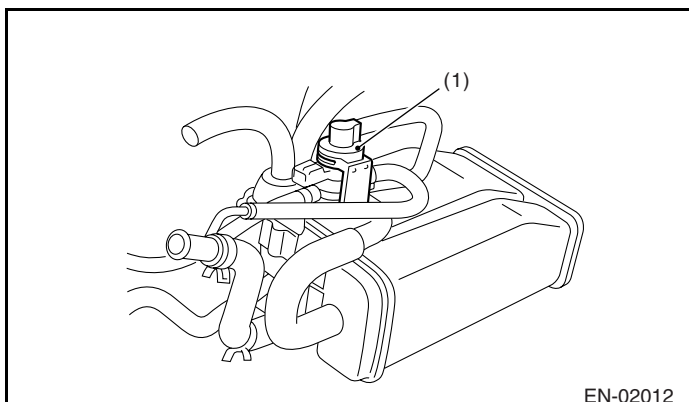
SUBARU.

# ELECTRICAL COMPONENTS LOCATION

## ENGINE (DIAGNOSTICS)

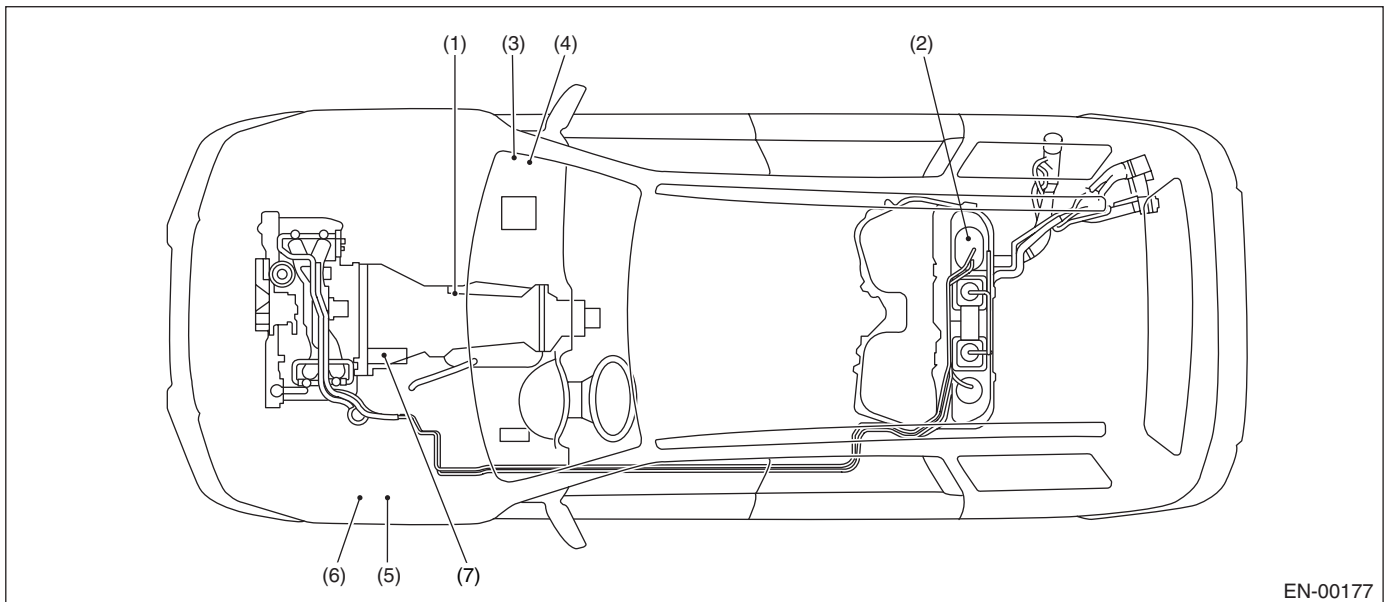


- |                                     |                  |                                    |
|-------------------------------------|------------------|------------------------------------|
| (1) Pressure control solenoid valve | (3) Drain valve  | (5) Fuel tank sensor control valve |
| (2) Canister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



# ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

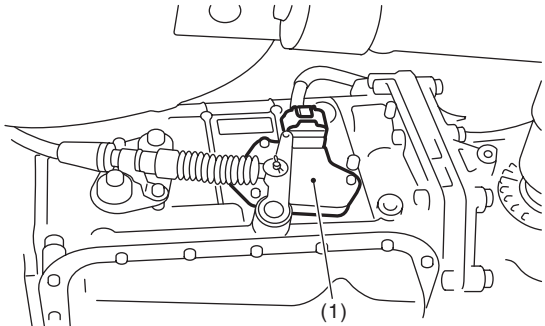
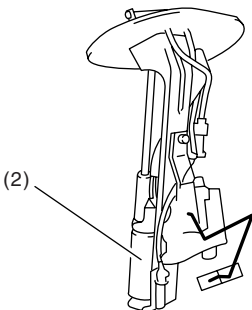
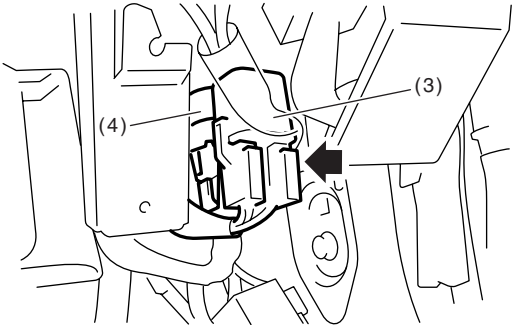
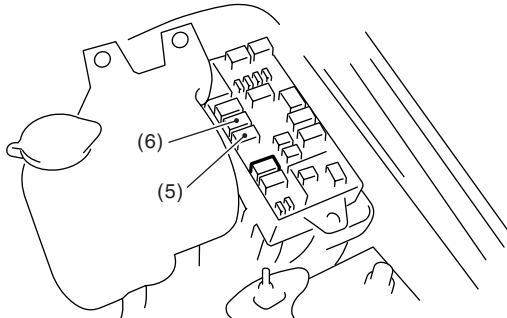
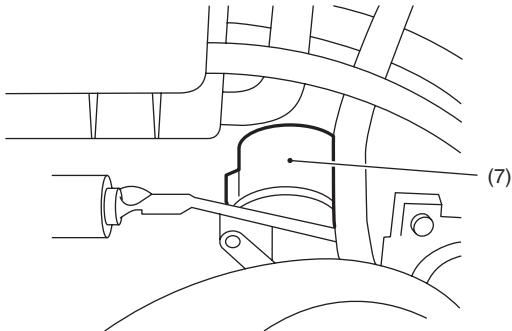


EN-00177

- |                      |                             |             |
|----------------------|-----------------------------|-------------|
| (1) Inhibitor switch | (4) Fuel pump relay         | (7) Starter |
| (2) Fuel pump        | (5) Radiator main fan relay |             |
| (3) Main relay       | (6) Radiator sub fan relay  |             |

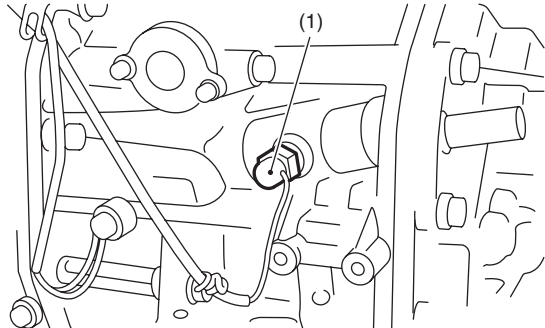
# ELECTRICAL COMPONENTS LOCATION

## ENGINE (DIAGNOSTICS)

|                                                                                                     |                                                                                                     |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|  <p>EN-00178</p>   |  <p>EN-00179</p> |
|  <p>EN-00237</p>   |  <p>EN-00180</p>  |
|  <p>EN-00181</p> | <p>SUBARU.</p>                                                                                      |

## 2. TRANSMISSION

### • SOLENOID VALVE AND SWITCH (MT MODEL)

|                                                                                                     |                |
|-----------------------------------------------------------------------------------------------------|----------------|
|  <p>EN-00192</p> | <p>SUBARU.</p> |
|-----------------------------------------------------------------------------------------------------|----------------|

(1) Neutral position switch

## ENGINE CONDITION DATA

ENGINE (DIAGNOSTICS)

---

### 6. Engine Condition Data

#### A: ELECTRICAL SPECIFICATION

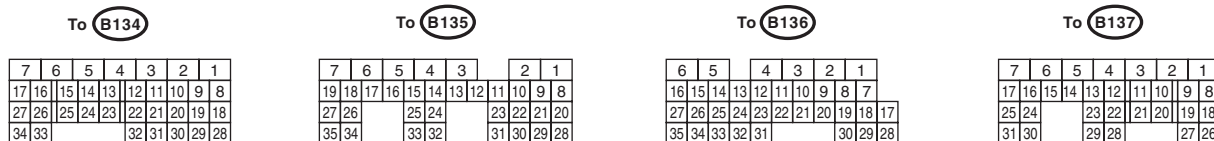
| Content     | Specified data                   |
|-------------|----------------------------------|
| Engine load | 1.2 — 2.9 (%): Idling            |
|             | 4.7 — 12.8 (%): 2,500 rpm racing |

Measuring condition:

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

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

## A: ELECTRICAL SPECIFICATION



EN-01812

| Content                                           |                 | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)                     |                    | Note                                                              |
|---------------------------------------------------|-----------------|-----------------------|-------------------|--------------------------------|--------------------|-------------------------------------------------------------------|
|                                                   |                 |                       |                   | Ignition SW ON<br>(Engine OFF) | Engine ON (Idling) |                                                                   |
| Crank-<br>shaft posi-<br>tion sensor              | Signal (+)      | B135                  | 10                | 0                              | -7 — +7            | Sensor output waveform                                            |
|                                                   | Signal (-)      | B135                  | 22                | 0                              | 0                  | —                                                                 |
|                                                   | Shield          | B135                  | 31                | 0                              | 0                  | —                                                                 |
| Rear oxy-<br>gen sen-<br>sor                      | Signal          | B137                  | 25                | 0                              | 0 — 0.9            | —                                                                 |
|                                                   | Shield          | B137                  | 31                | 0                              | 0                  | —                                                                 |
|                                                   | GND<br>(sensor) | B136                  | 35                | 0                              | 0                  | —                                                                 |
| Front oxy-<br>gen (A/F)<br>sensor<br>heater       | Signal 1        | B134                  | 3                 | 0 — 1.0                        | —                  | Sensor output waveform                                            |
|                                                   | Signal 2        | B134                  | 2                 | 0 — 1.0                        | —                  | Sensor output waveform                                            |
| Rear oxygen sensor<br>heater signal               |                 | B135                  | 2                 | 0 — 1.0                        | —                  | Sensor output waveform                                            |
| Engine<br>coolant<br>tempera-<br>ture sen-<br>sor | Signal          | B136                  | 14                | 1.0 — 1.4                      | 1.0 — 1.4          | After warm-up the engine.                                         |
|                                                   | GND<br>(sensor) | B136                  | 35                | 0                              | 0                  | After warm-up the engine.                                         |
| Vehicle speed signal                              |                 | B135                  | 27                | 0 or 5                         | 0 or 5             | “5” and “0” are repeatedly dis-<br>played when vehicle is driven. |
| Mass air<br>flow sen-<br>sor                      | Signal          | B136                  | 23                | —                              | 0.3 — 4.5          | —                                                                 |
|                                                   | Shield          | B136                  | 32                | 0                              | 0                  | —                                                                 |
|                                                   | GND             | B136                  | 31                | 0                              | 0                  | —                                                                 |
| Intake air temperature<br>sensor signal           |                 | B136                  | 13                | 0.3 — 4.6                      | 0.3 — 4.6          | —                                                                 |
| Exhaust<br>tempera-<br>ture sen-<br>sor           | Signal          | B136                  | 24                | —                              | —                  | —                                                                 |
|                                                   | GND<br>(sensor) | B136                  | 35                | 0                              | 0                  | —                                                                 |

# ENGINE CONTROL MODULE (ECM) I/O SIGNAL

## ENGINE (DIAGNOSTICS)

| Content                                            |              | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)                                         |                                 | Note                           |
|----------------------------------------------------|--------------|-----------------------|-------------------|----------------------------------------------------|---------------------------------|--------------------------------|
|                                                    |              |                       |                   | Ignition SW ON<br>(Engine OFF)                     | Engine ON (Idling)              |                                |
| Tumble<br>generator<br>valve position sensor<br>RH | Signal       | B136                  | 27                | Fully closed: 3.8 — 4.9<br>Fully opened: 0.2 — 0.9 |                                 | —                              |
|                                                    | Power supply | B136                  | 16                | 5                                                  | 5                               | —                              |
|                                                    | GND (sensor) | B136                  | 35                | 0                                                  | 0                               | —                              |
| Tumble<br>generator<br>valve position sensor<br>LH | Signal       | B136                  | 26                | Fully closed: 3.8 — 4.9<br>Fully opened: 0.2 — 0.9 |                                 | —                              |
|                                                    | Power supply | B136                  | 16                | 5                                                  | 5                               | —                              |
|                                                    | GND (sensor) | B136                  | 35                | 0                                                  | 0                               | —                              |
| Tumble generator valve RH (open)                   |              | B134                  | 9                 | 0 or 10 — 13                                       | 0 or 13 — 14                    | Sensor output waveform         |
| Tumble generator valve RH (close)                  |              | B134                  | 8                 | 0 or 10 — 13                                       | 0 or 13 — 14                    | Sensor output waveform         |
| Tumble generator valve LH (open)                   |              | B134                  | 11                | 0 or 10 — 13                                       | 0 or 13 — 14                    | Sensor output waveform         |
| Tumble generator valve LH (close)                  |              | B134                  | 10                | 0 or 10 — 13                                       | 0 or 13 — 14                    | Sensor output waveform         |
| Wastegate control sole-noid valve                  |              | B134                  | 32                | 0 or 10 — 13                                       | 0 or 13 — 14                    | Sensor output waveform         |
| Starter switch                                     |              | B137                  | 8                 | 0                                                  | 0                               | Cranking: 8 — 14               |
| A/C switch                                         |              | B137                  | 16                | ON: 10 — 13<br>OFF: 0                              | ON: 13 — 14<br>OFF: 0           | —                              |
| Ignition switch                                    |              | B137                  | 15                | 10 — 13                                            | 13 — 14                         | —                              |
| Neutral position switch                            |              | B137                  | 9                 | ON: 10 — 13<br>OFF: 0                              | ON: 13 — 14<br>OFF: 0           | —                              |
| Test mode connector                                |              | B137                  | 14                | 10 — 13                                            | 13 — 14                         | When connected: 0              |
| Knock sensor                                       | Signal       | B136                  | 25                | 2.8                                                | 2.8                             | —                              |
|                                                    | Shield       | B136                  | 33                | 0                                                  | 0                               | —                              |
| Back-up power supply                               |              | B135                  | 19                | 10 — 13                                            | 13 — 14                         | Ignition switch “OFF”: 10 — 13 |
| Control unit power supply                          |              | B135                  | 5                 | 10 — 13                                            | 13 — 14                         | —                              |
|                                                    |              | B135                  | 6                 | 10 — 13                                            | 13 — 14                         | —                              |
| Sensor power supply                                |              | B136                  | 16                | 5                                                  | 5                               | —                              |
| Ignition control                                   | #1           | B135                  | 18                | 0                                                  | 13 — 14                         | Waveform                       |
|                                                    | #2           | B135                  | 17                | 0                                                  | 13 — 14                         | Waveform                       |
|                                                    | #3           | B135                  | 16                | 0                                                  | 13 — 14                         | Waveform                       |
|                                                    | #4           | B135                  | 15                | 0                                                  | 13 — 14                         | Waveform                       |
| Fuel injector                                      | #1           | B136                  | 6                 | 10 — 13                                            | 1 — 14                          | Waveform                       |
|                                                    | #2           | B136                  | 5                 | 10 — 13                                            | 1 — 14                          | Waveform                       |
|                                                    | #3           | B136                  | 4                 | 10 — 13                                            | 1 — 14                          | Waveform                       |
|                                                    | #4           | B136                  | 3                 | 10 — 13                                            | 1 — 14                          | Waveform                       |
| Fuel pump control unit                             | Signal 1     | B135                  | 26                | 0 or 5                                             | 0 or 5                          | Sensor output waveform         |
|                                                    | Signal 2     | B137                  | 28                | 10 — 13                                            | 13 — 14                         | —                              |
| A/C relay control                                  |              | B133                  | 33                | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 13 — 14 | —                              |
| Radiator fan relay 1 control                       |              | B135                  | 25                | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 13 — 14 | —                              |
| Radiator fan relay 2 control                       |              | B135                  | 24                | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 13 — 14 | Model with A/C only            |

# ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

| Content                                   |              | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)                     |                               | Note                                                                |
|-------------------------------------------|--------------|-----------------------|-------------------|--------------------------------|-------------------------------|---------------------------------------------------------------------|
|                                           |              |                       |                   | Ignition SW ON<br>(Engine OFF) | Engine ON (Idling)            |                                                                     |
| Malfunction indicator lamp                |              | B134                  | 17                | —                              | —                             | Light "ON": 1 or less<br>Light "OFF": 10 — 14                       |
| Engine speed output                       |              | B134                  | 23                | —                              | 0 — 13, or more               | Waveform                                                            |
| Purge control solenoid valve              |              | B134                  | 14                | ON: 1 or less<br>OFF: 10 — 13  | ON: 1 or less<br>OFF: 13 — 14 | Sensor output waveform                                              |
| Manifold absolute pressure sensor         | Signal       | B136                  | 22                | 1.7 — 2.4                      | 1.1 — 1.6                     | —                                                                   |
|                                           | Power supply | B136                  | 16                | 5                              | 5                             |                                                                     |
|                                           | GND (sensor) | B136                  | 35                | 0                              | 0                             |                                                                     |
| Fuel tank pressure sensor                 | Signal       | B136                  | 21                | 2.3 — 2.7                      | 2.3 — 2.7                     | The valve operates when fuel filler cap is removed and reinstalled. |
|                                           | GND (sensor) | B136                  | 35                | 0                              | 0                             | —                                                                   |
| Fuel tank pressure control solenoid valve |              | B134                  | 12                | ON: 1 or less<br>OFF: 10 — 13  | ON: 1 or less<br>OFF: 13 — 14 | —                                                                   |
| Drain valve                               |              | B134                  | 13                | ON: 1 or less<br>OFF: 10 — 13  | ON: 1 or less<br>OFF: 13 — 14 | —                                                                   |
| Fuel tank sensor control valve            |              | B134                  | 24                | ON: 1 or less<br>OFF: 10 — 13  | ON: 1 or less<br>OFF: 13 — 14 | —                                                                   |
| Fuel level sensor                         |              | B136                  | 20                | 0.12 — 4.75                    | 0.12 — 4.75                   | —                                                                   |
| Fuel temperature sensor signal            |              | B136                  | 12                | 2.5 — 3.8                      | 2.5 — 3.8                     | Ambient temperature:<br>25°C (75°F)                                 |
| Blow-by leak diagnosis signal             |              | B137                  | 24                | 0                              | 0                             | When disconnection (malfunction): 5                                 |
| Small light switch                        |              | B137                  | 12                | ON: 0<br>OFF: 10 — 13          | ON: 0<br>OFF: 13 — 14         | —                                                                   |
| Blower fan switch                         |              | B137                  | 13                | ON: 0<br>OFF: 10 — 13          | ON: 0<br>OFF: 13 — 14         | —                                                                   |
| Rear defogger switch                      |              | B137                  | 11                | ON: 0<br>OFF: 10 — 13          | ON: 0<br>OFF: 13 — 14         | —                                                                   |
| Power steering oil pressure switch        |              | B137                  | 10                | 10 — 13                        | ON: 0<br>OFF: 13 — 14         | —                                                                   |
| Front oxygen (A/F) sensor signal (+)      |              | B134                  | 33                | 2.8 — 3.2                      | 2.8 — 3.2                     | —                                                                   |
| Front oxygen (A/F) sensor signal (–)      |              | B134                  | 26                | 2.4 — 2.7                      | 2.4 — 2.7                     | —                                                                   |
| Front oxygen (A/F) sensor shield          |              | B134                  | 25                | 0                              | 0                             | —                                                                   |
| SSM/GST communication line                |              | B137                  | 20                | 1 ← → 4                        | 1 ← → 4                       | —                                                                   |
| GND (injectors)                           |              | B137                  | 7                 | 0                              | 0                             | —                                                                   |
| GND (ignition system)                     |              | B135                  | 12                | 0                              | 0                             | —                                                                   |
| GND (power supply)                        | B135         | 4                     | 0                 | 0                              | 0                             | —                                                                   |
|                                           | B135         | 1                     | 0                 | 0                              | 0                             | —                                                                   |
| GND (control systems)                     | B137         | 1                     | 0                 | 0                              | 0                             | —                                                                   |
|                                           | B137         | 2                     | 0                 | 0                              | 0                             | —                                                                   |
| GND (front oxygen (A/F) sensor heater 1)  |              | B134                  | 7                 | 0                              | 0                             | —                                                                   |
| GND (front oxygen (A/F) sensor heater 2)  |              | B134                  | 6                 | 0                              | 0                             | —                                                                   |

# ENGINE CONTROL MODULE (ECM) I/O SIGNAL

## ENGINE (DIAGNOSTICS)

| Content                                       |                 | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)                                                                        |                                                                                   | Note                                     |
|-----------------------------------------------|-----------------|-----------------------|-------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------|
|                                               |                 |                       |                   | Ignition SW ON<br>(Engine OFF)                                                    | Engine ON (Idling)                                                                |                                          |
| Camshaft position sen-<br>sor (LH)            |                 | B135                  | 8                 | 0 — 0.9                                                                           | ON: 0<br>OFF: 4.7 — 5.3                                                           | Sensor output waveform                   |
| Camshaft position sen-<br>sor (RH)            |                 | B135                  | 9                 | 0 — 0.9                                                                           | ON: 0<br>OFF: 4.7 — 5.3                                                           | Sensor output waveform                   |
| Electric<br>throttle                          | Main            | B136                  | 18                | 0.64 — 0.72<br>Fully opened: 3.96                                                 | 0.64 — 0.72<br>(After engine warm-up)                                             | Fully closed: 0.6<br>Fully opened: 3.96  |
|                                               | Sub             | B136                  | 29                | 1.51 — 1.58<br>Fully opened: 4.17                                                 | 1.51 — 1.58<br>(After engine warm-up)                                             | Fully closed: 1.48<br>Fully opened: 4.17 |
|                                               | Power<br>supply | B136                  | 16                | 5                                                                                 | 5                                                                                 | —                                        |
|                                               | GND<br>(sensor) | B137                  | 3                 | 0                                                                                 | 0                                                                                 | —                                        |
| Electric throttle motor (+)                   |                 | B137                  | 5                 | Duty waveform                                                                     | Duty waveform                                                                     | Driving frequency: 500Hz                 |
| Electric throttle motor (–)                   |                 | B137                  | 4                 | Duty waveform                                                                     | Duty waveform                                                                     | Driving frequency: 500Hz                 |
| Electric throttle motor<br>power supply       |                 | B137                  | 6                 | 10 — 13                                                                           | 13 — 14                                                                           | —                                        |
| Electric throttle motor<br>relay              |                 | B135                  | 35                | ON: 0<br>OFF: 10 — 13                                                             | ON: 0<br>OFF: 13 — 14                                                             | When ignition switch is ON: ON           |
| Oil flow<br>control<br>solenoid<br>valve (LH) | Signal (+)      | B134                  | 19                | ON: 10 — 13<br>OFF: 0                                                             | ON: 13 — 14<br>OFF: 0                                                             | —                                        |
|                                               | Signal (–)      | B134                  | 29                | 0                                                                                 | 0                                                                                 | —                                        |
| Oil flow<br>control<br>solenoid<br>valve (RH) | Signal (+)      | B134                  | 18                | ON: 10 — 13<br>OFF: 0                                                             | ON: 13 — 14<br>OFF: 0                                                             | —                                        |
|                                               | Signal (–)      | B134                  | 28                | 0                                                                                 | 0                                                                                 | —                                        |
| Accelera-<br>tor position<br>sensor           | Main            | B136                  | 17                | Fully closed: 1<br>Fully opened: 3.5                                              | Fully closed: 1<br>Fully opened: 3.5                                              | —                                        |
|                                               | Power<br>supply | B136                  | 15                | 5                                                                                 | 5                                                                                 | —                                        |
|                                               | GND<br>(sensor) | B136                  | 34                | 0                                                                                 | 0                                                                                 | —                                        |
|                                               | Sub             | B136                  | 28                | Fully closed: 1<br>Fully opened: 3.5                                              | Fully closed: 1<br>Fully opened: 3.5                                              | —                                        |
| Main light                                    |                 | B134                  | 15                | ON: 0<br>OFF: 10 — 13                                                             | ON: 0<br>OFF: 13 — 14                                                             | —                                        |
| Clutch switch                                 |                 | B134                  | 1                 | When clutch pedal is<br>depressed: 0<br>When clutch pedal is<br>released: 10 — 13 | When clutch pedal is<br>depressed: 0<br>When clutch pedal is<br>released: 13 — 14 | —                                        |
| SET/COAST switch                              |                 | B136                  | 11                | ON: 10 — 13<br>OFF: 0                                                             | ON: 13 — 14<br>OFF: 0                                                             | —                                        |
| Brake switch 1                                |                 | B136                  | 9                 | When brake pedal is<br>depressed: 0<br>When brake pedal is<br>released: 10 — 13   | When brake pedal is<br>depressed: 0<br>When brake pedal is<br>released: 13 — 14   | —                                        |
| Brake switch 2                                |                 | B136                  | 8                 | When brake pedal is<br>depressed: 10 — 13<br>When brake pedal is<br>released: 0   | When brake pedal is<br>depressed: 13 — 14<br>When brake pedal is<br>released: 0   | —                                        |
| RESUME/ACCEL<br>switch                        |                 | B136                  | 10                | ON: 10 — 13<br>OFF: 0                                                             | ON: 13 — 14<br>OFF: 0                                                             | —                                        |
| Main switch                                   |                 | B136                  | 7                 | ON: 10 — 13<br>OFF: 0                                                             | ON: 13 — 14<br>OFF: 0                                                             | —                                        |

# ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

| Content                |            | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)                     |                    | Note |
|------------------------|------------|-----------------------|-------------------|--------------------------------|--------------------|------|
|                        |            |                       |                   | Ignition SW ON<br>(Engine OFF) | Engine ON (Idling) |      |
| CAN com-<br>munication | Signal (+) | B137                  | 18                | Pulse signal                   |                    | —    |
|                        | Signal (–) | B137                  | 26                | Pulse signal                   |                    | —    |

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

2) Never connect the battery in reverse polarity.

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

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

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

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

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

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

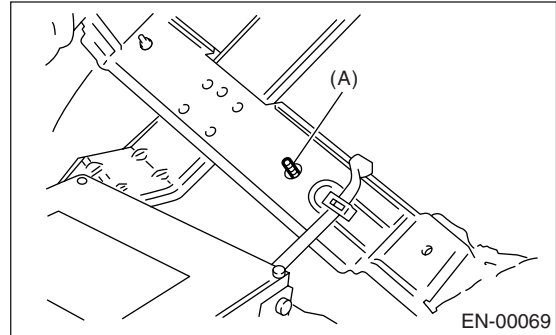
- Otherwise, the ECM may be damaged.

#### CAUTION:

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

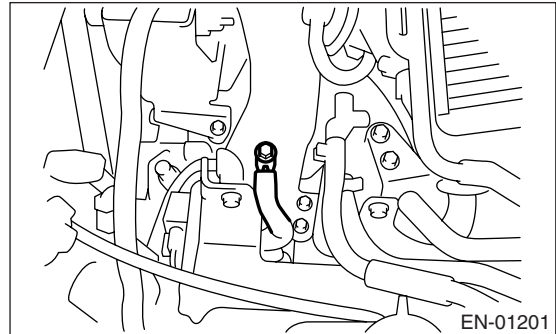
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on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

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



(A) Stud bolt

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



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

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

#### CAUTION:

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

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

- The antenna feeder must be placed as far as possible from ECM and MFI harness.
- Carefully adjust the antenna for correct matching.

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

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

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

## GENERAL DESCRIPTION

### ENGINE (DIAGNOSTICS)

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

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

### B: INSPECTION

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

#### 1. BATTERY

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

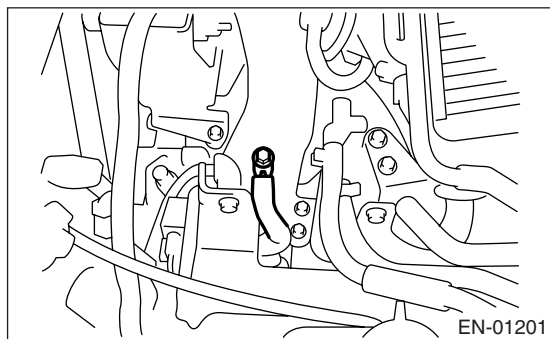
**Standard voltage: 12 V**

**Specific gravity: Above 1.260**

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

#### 2. ENGINE GROUNDING

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



### C: NOTE

#### 1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of complex electronic control. Malfunction indicator light in 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 Section 1968.1, California Code of Regulations (OBD-II regulation). 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 malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
- The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
- The OBD-II diagnostics procedure is different from usual diagnostics procedure. When troubleshooting model with OBD-II, connect the Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

### 2. ENGINE AND EMISSION CONTROL SYSTEM

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

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

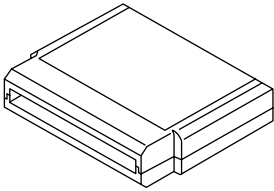
pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

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

The MFI system also has the following features:

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

### D: PREPARATION TOOL

| ILLUSTRATION                                                                                        | TOOL NUMBER | DESCRIPTION               | REMARKS                                 |
|-----------------------------------------------------------------------------------------------------|-------------|---------------------------|-----------------------------------------|
| <br>ST24082AA230  | 24082AA230  | CARTRIDGE                 | Troubleshooting for electrical systems. |
| <br>ST22771AA030 | 22771AA030  | SUBARU SELECT MONITOR KIT | Troubleshooting for electrical systems. |

# GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

## 19.General Diagnostic Table

### A: INSPECTION

#### 1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-98, Engine Trouble in General.>

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

# GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

| Symptom                            | Problem parts                                                                                                                                                                                                         |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7. Spark knock                     | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor<br>4) Knock sensor<br>5) Fuel injection parts (*4)<br>6) Fuel pump and fuel pump relay |
| 8. After-burning in exhaust system | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Fuel injection parts (*4)<br>5) Fuel pump and fuel pump relay               |

\*1: Check ignition coil & ignitor ASSY and spark plug.

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

\*3: Ensure the secure installation.

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

\*5: Inspect air leak in air intake system.

## GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

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# INSPECTION MODE

ENGINE (DIAGNOSTICS)

## 11. Inspection Mode

### A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.

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

<Ref. to EN(H4DOTC)-41, Drive Cycle.>

| DTC   | Item                                                                             | Condition |
|-------|----------------------------------------------------------------------------------|-----------|
| P0011 | "A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)        | —         |
| P0021 | "A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)        | —         |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                                    | —         |
| 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)                               | —         |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance                                | —         |
| P0102 | Mass or Volume Air Flow Circuit Low Input                                        | —         |
| P0103 | Mass or Volume Air Flow Circuit High Input                                       | —         |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input                 | —         |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input                | —         |
| P0112 | Intake Air Temperature Circuit Low Input                                         | —         |
| P0113 | Intake Air Temperature Circuit High Input                                        | —         |
| P0117 | Engine Coolant Temperature Circuit Low Input                                     | —         |
| P0118 | Engine Coolant Temperature Circuit High Input                                    | —         |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      | —         |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     | —         |
| P0129 | Atmospheric Pressure Sensor Circuit Range/Performance                            | —         |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | —         |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | —         |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | —         |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | —         |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | —         |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    | —         |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                   | —         |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input                      | —         |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input                     | —         |
| P0230 | Fuel Pump Primary Circuit                                                        | —         |
| P0245 | Turbo/Super Charger Wastegate Solenoid "A" Low                                   | —         |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)                       | —         |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)                      | —         |
| P0335 | Crankshaft Position Sensor "A" Circuit                                           | —         |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance                         | —         |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)                   | —         |
| P0341 | Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor) | —         |
| P0345 | Camshaft Position Sensor "A" Circuit (Bank 2)                                    | —         |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open                    | —         |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted                 | —         |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input                    | —         |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input                   | —         |

# INSPECTION MODE

ENGINE (DIAGNOSTICS)

| DTC   | Item                                                                   | Condition |
|-------|------------------------------------------------------------------------|-----------|
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | —         |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | —         |
| P0463 | Fuel Level Sensor Circuit High Input                                   | —         |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                 | —         |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                         | —         |
| P0512 | Starter Request Circuit                                                | —         |
| P0519 | Idle Control System Malfunction (Fail-Safe)                            | —         |
| P0604 | Internal Control Module Random Access Memory (RAM) Error               | —         |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                   | —         |
| P0607 | Control Module Performance                                             | —         |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                   | —         |
| P0691 | Cooling Fan 1 Control Circuit Low                                      | —         |
| P0851 | Neutral Switch Input Circuit Low                                       | —         |
| P0852 | Neutral Switch Input Circuit High                                      | —         |
| P1086 | Tumble Generated Valve Position Sensor 2 Circuit Low                   | —         |
| P1087 | Tumble Generated Valve Position Sensor 2 Circuit High                  | —         |
| P1088 | Tumble Generated Valve Position Sensor 1 Circuit Low                   | —         |
| P1089 | Tumble Generated Valve Position Sensor 1 Circuit High                  | —         |
| P1091 | Tumble Generated Valve System 1 (Valve Close)                          | —         |
| P1093 | Tumble Generated Valve System 2 (Valve Close)                          | —         |
| P1094 | Tumble Generated Valve Signal 1 Circuit Malfunction (Open)             | —         |
| P1095 | Tumble Generated Valve Signal 1 Circuit Malfunction (Short)            | —         |
| P1096 | Tumble Generated Valve Signal 2 Circuit Malfunction (Open)             | —         |
| P1097 | Tumble Generated Valve Signal 2 Circuit Malfunction (Short)            | —         |
| P1110 | Atmospheric Pressure sensor circuit malfunction (Low input)            | —         |
| P1111 | Atmospheric Pressure sensor circuit malfunction (High input)           | —         |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)  | —         |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank1 Sensor1) | —         |
| P1160 | Return Spring Failure                                                  | —         |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                  | —         |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High                     | —         |
| P1446 | Fuel Tank Sensor Control Valve Circuit Low                             | —         |
| P1447 | Fuel Tank Sensor Control Valve Circuit High                            | —         |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem              | —         |
| P1518 | Starter Switch Circuit Low Input                                       | —         |
| P1560 | Back-up Voltage Circuit Malfunction                                    | —         |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                      | —         |
| P2089 | OCV Solenoid Valve Signal A Circuit Short (Bank 1)                     | —         |
| P2092 | OCV Solenoid Valve Signal A Circuit Open (Bank 2)                      | —         |
| P2093 | OCV Solenoid Valve Signal A Circuit Short (Bank 2)                     | —         |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance              | —         |
| P2102 | Throttle Actuator Control Motor Circuit Low                            | —         |
| P2103 | Throttle Actuator Control Motor Circuit High                           | —         |
| P2109 | Throttle/Pedal Position Sensor A Minimum Stop Performance              | —         |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input            | —         |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input           | —         |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input            | —         |
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input           | —         |
| P2135 | Throttle/Pedal Position Sensor/Switch "A" / "B" Voltage Rationality    | —         |
| P2138 | Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Rationality    | —         |

# INSPECTION MODE

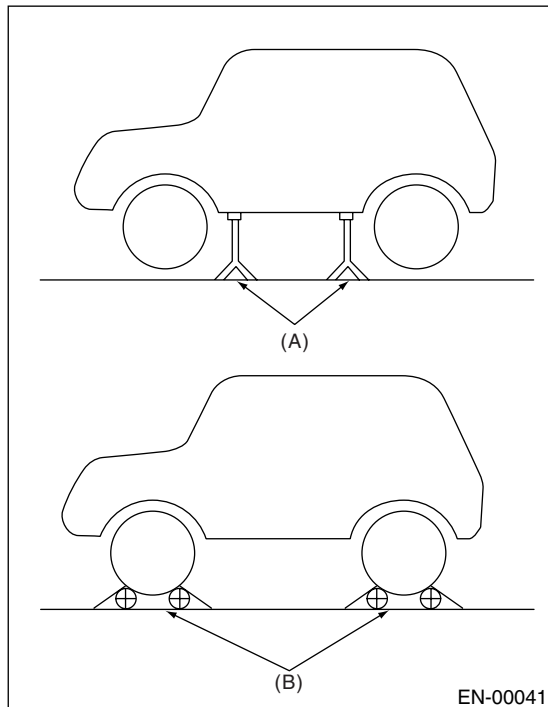
## ENGINE (DIAGNOSTICS)

### 1. PREPARATION FOR THE INSPECTION MODE

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

#### WARNING:

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

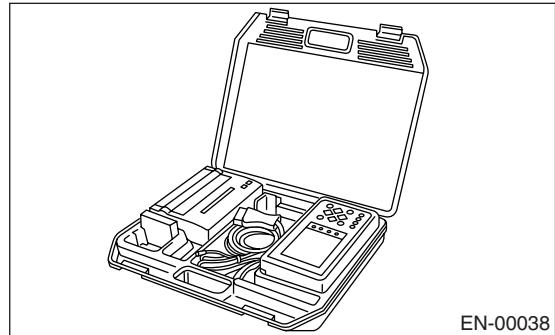


EN-00041

- (A) Safety stand  
(B) Free rollers

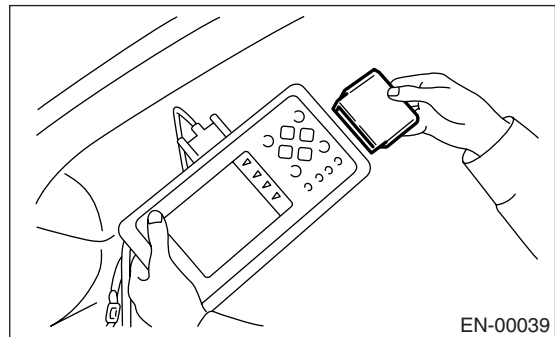
### 2. SUBARU SELECT MONITOR

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



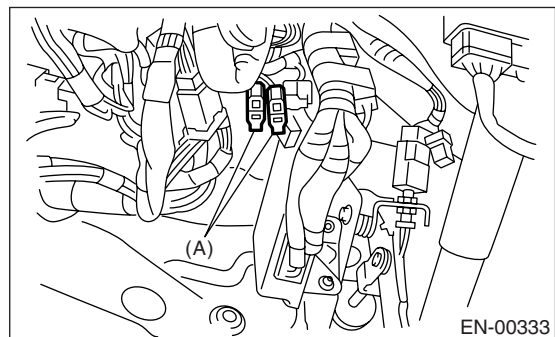
EN-00038

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



EN-00039

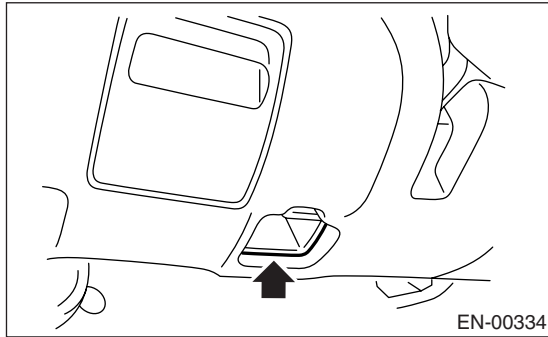
- 5) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



EN-00333

- (A) Test mode connector

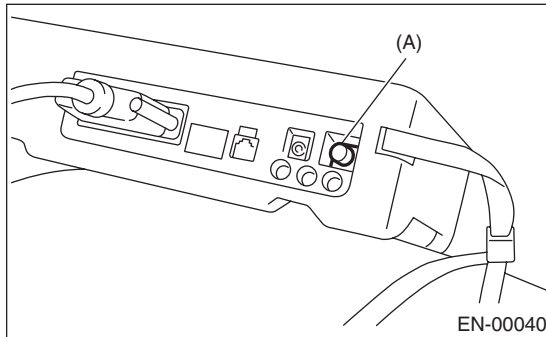
6) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



### CAUTION:

**Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.**

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



(A) Power switch

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

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

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

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

12) When the "Perform Inspection (Dealer Check Mode?)" is shown on the display 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 detailed concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>

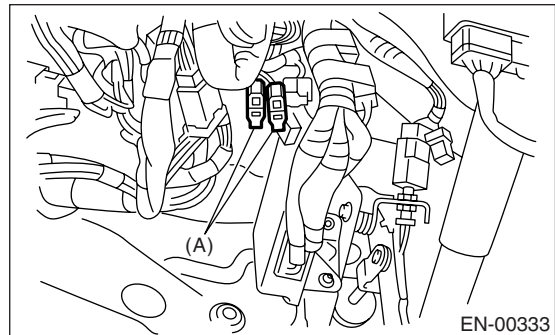
- Release the parking brake.

- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function. <Ref. to ABS-23, Clear Memory Mode.>

### 3. OBD-II GENERAL SCAN TOOL

1) Warm up the engine.

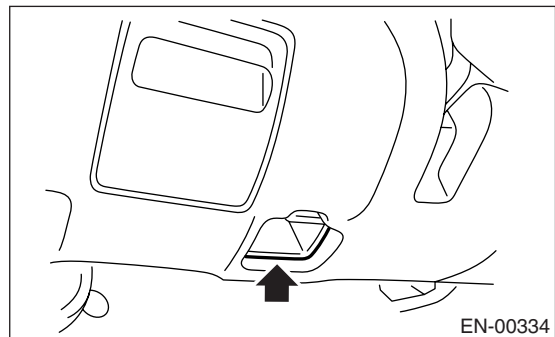
2) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



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

### CAUTION:

**Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.**



4) Start the engine.

### NOTE:

- Ensure the selector lever is placed in "P" position before starting. (AT model)

- Depress the clutch pedal when starting engine. (MT model)

5) Using the selector lever or shift lever, turn the "P" position switch and "N" position switch to 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 selector 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:**

- On AWD model, release the parking brake.
- The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function.  
<Ref. to ABS-23, Clear Memory Mode.>

9) Using the OBD-II general scan tool, check for DTC and record the result(s).

**NOTE:**

- For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).  
<Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

## 17.List of Diagnostic Trouble Code (DTC)

### A: LIST

| DTC   | Item                                                                     | Index                                                                                                                                                                      |
|-------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0011 | A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)  | <Ref. to EN(H4DOTC)-75, DTC P0011 — “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0021 | A Camshaft Position-Timing Over-advanced or System Performance (Bank 2)  | <Ref. to EN(H4DOTC)-76, DTC P0021 — “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                            | <Ref. to EN(H4DOTC)-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)-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)-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)-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)-87, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P0068 | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance | <Ref. to EN(H4DOTC)-89, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance                        | <Ref. to EN(H4DOTC)-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)-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)-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)-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)-100, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P0111 | Intake Air Temperature Circuit Range/Performance                         | <Ref. to EN(H4DOTC)-102, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0112 | Intake Air Temperature Circuit Low Input                                 | <Ref. to EN(H4DOTC)-104, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0113 | Intake Air Temperature Circuit High Input                                | <Ref. to EN(H4DOTC)-106, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
| P0117 | Engine Coolant Temperature Circuit Low Input                             | <Ref. to EN(H4DOTC)-109, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                             |
| P0118 | Engine Coolant Temperature Circuit High Input                            | <Ref. to EN(H4DOTC)-111, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item                                                                             | Index                                                                                                                                                                              |
|-------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      | <Ref. to EN(H4DOTC)-114, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     | <Ref. to EN(H4DOTC)-117, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control                    | <Ref. to EN(H4DOTC)-121, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | <Ref. to EN(H4DOTC)-123, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0129 | Atmospheric Pressure Sensor Circuit Range/Performance                            | <Ref. to EN(H4DOTC)-124, DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | <Ref. to EN(H4DOTC)-125, DTC P0131 — O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | <Ref. to EN(H4DOTC)-127, DTC P0132 — O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | <Ref. to EN(H4DOTC)-129, DTC P0133 — O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | <Ref. to EN(H4DOTC)-131, DTC P0134 — O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | <Ref. to EN(H4DOTC)-133, DTC P0137 — O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | <Ref. to EN(H4DOTC)-136, DTC P0138 — O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | <Ref. to EN(H4DOTC)-139, DTC P0139 — O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0171 | System too Lean (Bank 1)                                                         | <Ref. to EN(H4DOTC)-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)-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)-145, DTC P0181 — FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    | <Ref. to EN(H4DOTC)-147, DTC P0182 — FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                   | <Ref. to EN(H4DOTC)-149, DTC P0183 — FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input                      | <Ref. to EN(H4DOTC)-152, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input                     | <Ref. to EN(H4DOTC)-155, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

## ENGINE (DIAGNOSTICS)

| DTC   | Item                                                                  | Index                                                                                                                                                                   |
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| P0230 | Fuel Pump Primary Circuit                                             | <Ref. to EN(H4DOTC)-159, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                             |
| P0244 | Turbo/Super Charger Wastegate Solenoid “A” Range/Performance          | <Ref. to EN(H4DOTC)-162, DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P0245 | Turbo/Super Charger Wastegate Solenoid “A” Low                        | <Ref. to EN(H4DOTC)-164, DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P0246 | Turbo/Super Charger Wastegate Solenoid “A” High                       | <Ref. to EN(H4DOTC)-166, DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                       |
| P0301 | Cylinder 1 Misfire Detected                                           | <Ref. to EN(H4DOTC)-168, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                           |
| P0302 | Cylinder 2 Misfire Detected                                           | <Ref. to EN(H4DOTC)-168, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                           |
| P0303 | Cylinder 3 Misfire Detected                                           | <Ref. to EN(H4DOTC)-168, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                           |
| P0304 | Cylinder 4 Misfire Detected                                           | <Ref. to EN(H4DOTC)-169, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                           |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)            | <Ref. to EN(H4DOTC)-174, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>            |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)           | <Ref. to EN(H4DOTC)-176, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| P0335 | Crankshaft Position Sensor “A” Circuit                                | <Ref. to EN(H4DOTC)-178, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
| P0336 | Crankshaft Position Sensor “A” Circuit Range/Performance              | <Ref. to EN(H4DOTC)-180, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>              |
| P0340 | Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)        | <Ref. to EN(H4DOTC)-182, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P0345 | Camshaft Position Sensor “A” Circuit (Bank 2)                         | <Ref. to EN(H4DOTC)-184, DTC P0345 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                   | <Ref. to EN(H4DOTC)-186, 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)-188, 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)-192, 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)-195, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>      |
| P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance | <Ref. to EN(H4DOTC)-197, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input         | <Ref. to EN(H4DOTC)-199, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

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| P0453 | Evaporative Emission Control System Pressure Sensor High Input         | <Ref. to EN(H4DOTC)-202, 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)-205, 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)-209, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | <Ref. to EN(H4DOTC)-213, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | <Ref. to EN(H4DOTC)-215, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0461 | Fuel Level Sensor Circuit Range/Performance                            | <Ref. to EN(H4DOTC)-217, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | <Ref. to EN(H4DOTC)-220, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0463 | Fuel Level Sensor Circuit High Input                                   | <Ref. to EN(H4DOTC)-224, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0464 | Fuel Level Sensor Circuit Intermittent                                 | <Ref. to EN(H4DOTC)-228, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0483 | Cooling Fan Rationality Check                                          | <Ref. to EN(H4DOTC)-231, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                          |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                 | <Ref. to EN(H4DOTC)-234, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                         | <Ref. to EN(H4DOTC)-236, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0506 | Idle Control System RPM Lower Than Expected                            | <Ref. to EN(H4DOTC)-238, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0507 | Idle Control System RPM Higher Than Expected                           | <Ref. to EN(H4DOTC)-241, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P0512 | Starter Request Circuit                                                | <Ref. to EN(H4DOTC)-244, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                                |
| P0519 | Idle Control System Malfunction (Fail-Safe)                            | <Ref. to EN(H4DOTC)-247, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0545 | Exhaust Gas Temperature Sensor Circuit Low-Bank 1                      | <Ref. to EN(H4DOTC)-250, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0546 | Exhaust Gas Temperature Sensor Circuit High-Bank 1                     | <Ref. to EN(H4DOTC)-252, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0600 | Improper CAN communication                                             | <Ref. to EN(H4DOTC)-255, DTC P0600 — IMPROPER CAN COMMUNICATION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                             |
| P0604 | Internal Control Module Random Access Memory (RAM) Error               | <Ref. to EN(H4DOTC)-257, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |

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| P0605 | Internal Control Module Read Only Memory (ROM) Error        | <Ref. to EN(H4DOTC)-259, 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)-260, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)        | <Ref. to EN(H4DOTC)-263, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P0691 | Cooling Fan 1 Control Circuit Low                           | <Ref. to EN(H4DOTC)-264, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P0692 | Cooling Fan 1 Control Circuit High                          | <Ref. to EN(H4DOTC)-267, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                          |
| P0700 | Request AT MIL ON                                           | <Ref. to EN(H4DOTC)-270, DTC P0700 — REQUEST AT MIL ON —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                           |
| P0851 | Neutral Switch Input Circuit Low                            | <Ref. to EN(H4DOTC)-271, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0852 | Neutral Switch Input Circuit High                           | <Ref. to EN(H4DOTC)-273, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P1086 | Tumble Generated Valve Position Sensor 2 Circuit Low        | <Ref. to EN(H4DOTC)-275, DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P1087 | Tumble Generated Valve Position Sensor 2 Circuit High       | <Ref. to EN(H4DOTC)-278, DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P1088 | Tumble Generated Valve Position Sensor 1 Circuit Low        | <Ref. to EN(H4DOTC)-280, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P1089 | Tumble Generated Valve Position Sensor 1 Circuit High       | <Ref. to EN(H4DOTC)-283, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P1090 | Tumble Generated Valve System 1 (Valve Open)                | <Ref. to EN(H4DOTC)-285, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P1091 | Tumble Generated Valve System 1 (Valve Close)               | <Ref. to EN(H4DOTC)-286, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| P1092 | Tumble Generated Valve System 2 (Valve Open)                | <Ref. to EN(H4DOTC)-287, DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P1093 | Tumble Generated Valve System 2 (Valve Close)               | <Ref. to EN(H4DOTC)-288, DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| P1094 | Tumble Generated Valve Signal 1 Circuit Malfunction (Open)  | <Ref. to EN(H4DOTC)-289, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1095 | Tumble Generated Valve Signal 1 Circuit Malfunction (Short) | <Ref. to EN(H4DOTC)-291, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1096 | Tumble Generated Valve Signal 2 Circuit Malfunction (Open)  | <Ref. to EN(H4DOTC)-293, DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1097 | Tumble Generated Valve Signal 2 Circuit Malfunction (Short) | <Ref. to EN(H4DOTC)-295, DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |

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| P1110 | Atmospheric Pressure Sensor Circuit Malfunction (Low Input)            | <Ref. to EN(H4DOTC)-297, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P1111 | Atmospheric Pressure Sensor Circuit Malfunction (High Input)           | <Ref. to EN(H4DOTC)-297, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>            |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)  | <Ref. to EN(H4DOTC)-298, DTC P1152 — O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank1 Sensor1) | <Ref. to EN(H4DOTC)-299, DTC P1153 — O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1160 | Return Spring Failure                                                  | <Ref. to EN(H4DOTC)-301, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                                   |
| P1301 | Misfire Detected (High Temperature Exhaust Gas)                        | <Ref. to EN(H4DOTC)-302, DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P1312 | Exhaust Gas Temperature Sensor Malfunction                             | <Ref. to EN(H4DOTC)-304, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                              |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                  | <Ref. to EN(H4DOTC)-306, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High                     | <Ref. to EN(H4DOTC)-309, 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)-311, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P1446 | Fuel Tank Sensor Control Valve Circuit Low                             | <Ref. to EN(H4DOTC)-313, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                              |
| P1447 | Fuel Tank Sensor Control Valve Circuit High                            | <Ref. to EN(H4DOTC)-316, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                             |
| P1448 | Fuel Tank Sensor Control Valve Range/Performance                       | <Ref. to EN(H4DOTC)-318, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem              | <Ref. to EN(H4DOTC)-320, 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)-322, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                        |
| P1544 | Exhaust Gas Temperature Too High                                       | <Ref. to EN(H4DOTC)-325, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                        |
| P1560 | Back-Up Voltage Circuit Malfunction                                    | <Ref. to EN(H4DOTC)-327, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                     |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                      | <Ref. to EN(H4DOTC)-330, 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)-332, DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

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| P2092 | OCV Solenoid Valve Signal A Circuit Open (Bank 2)                 | <Ref. to EN(H4DOTC)-334, DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P2093 | OCV Solenoid Valve Signal A Circuit Short (Bank 2)                | <Ref. to EN(H4DOTC)-336, DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                    | <Ref. to EN(H4DOTC)-338, 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)-343, 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)-348, 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)-355, 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)-358, 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)-361, 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)-362, 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)-365, 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)-368, 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)-371, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGHT INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>     |
| P2135 | Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Rationality | <Ref. to EN(H4DOTC)-374, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2138 | Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Rationality | <Ref. to EN(H4DOTC)-379, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |

**15. Malfunction Indicator Light****A: PROCEDURE**

|                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Activation of check malfunction indicator light. <Ref. to EN(H4DOTC)-48, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>                                                       |
| ↓                                                                                                                                                                                                          |
| 2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)-49, 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)-51, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>                                         |
| ↓                                                                                                                                                                                                          |
| 4. Check that the malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4DOTC)-52, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 H Z., Malfunction Indicator Light.>    |
| ↓                                                                                                                                                                                                          |
| 5. Check that the malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4DOTC)-54, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.> |

# MALFUNCTION INDICATOR LIGHT

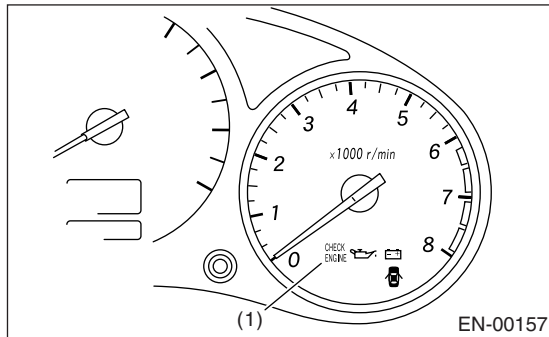
## ENGINE (DIAGNOSTICS)

### B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

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

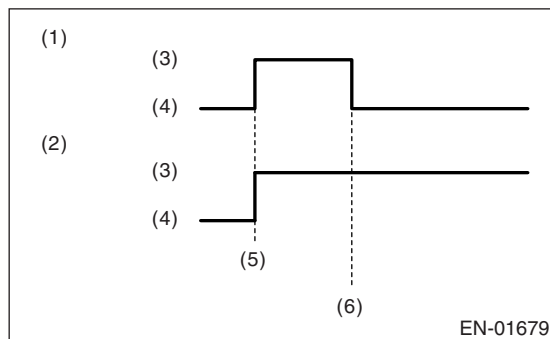
#### NOTE:

If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)-49, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>



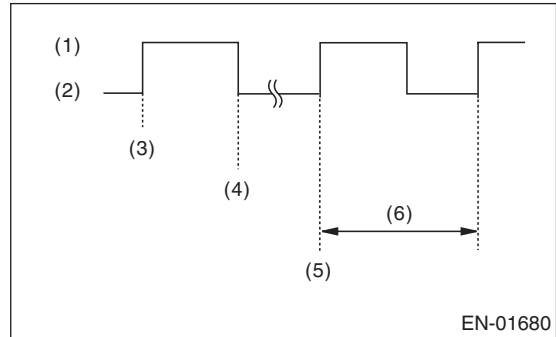
(1) Malfunction indicator light

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



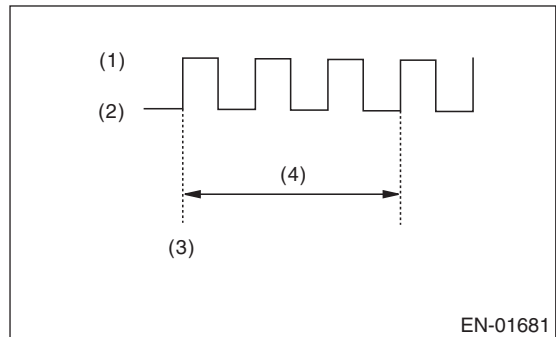
- (1) No trouble
- (2) Trouble occurs
- (3) ON
- (4) OFF
- (5) Ignition switch ON
- (6) Engine start

3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) Engine start
- (5) Misfire start
- (6) 1 second

4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



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

# MALFUNCTION INDICATOR LIGHT

ENGINE (DIAGNOSTICS)

## C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON.

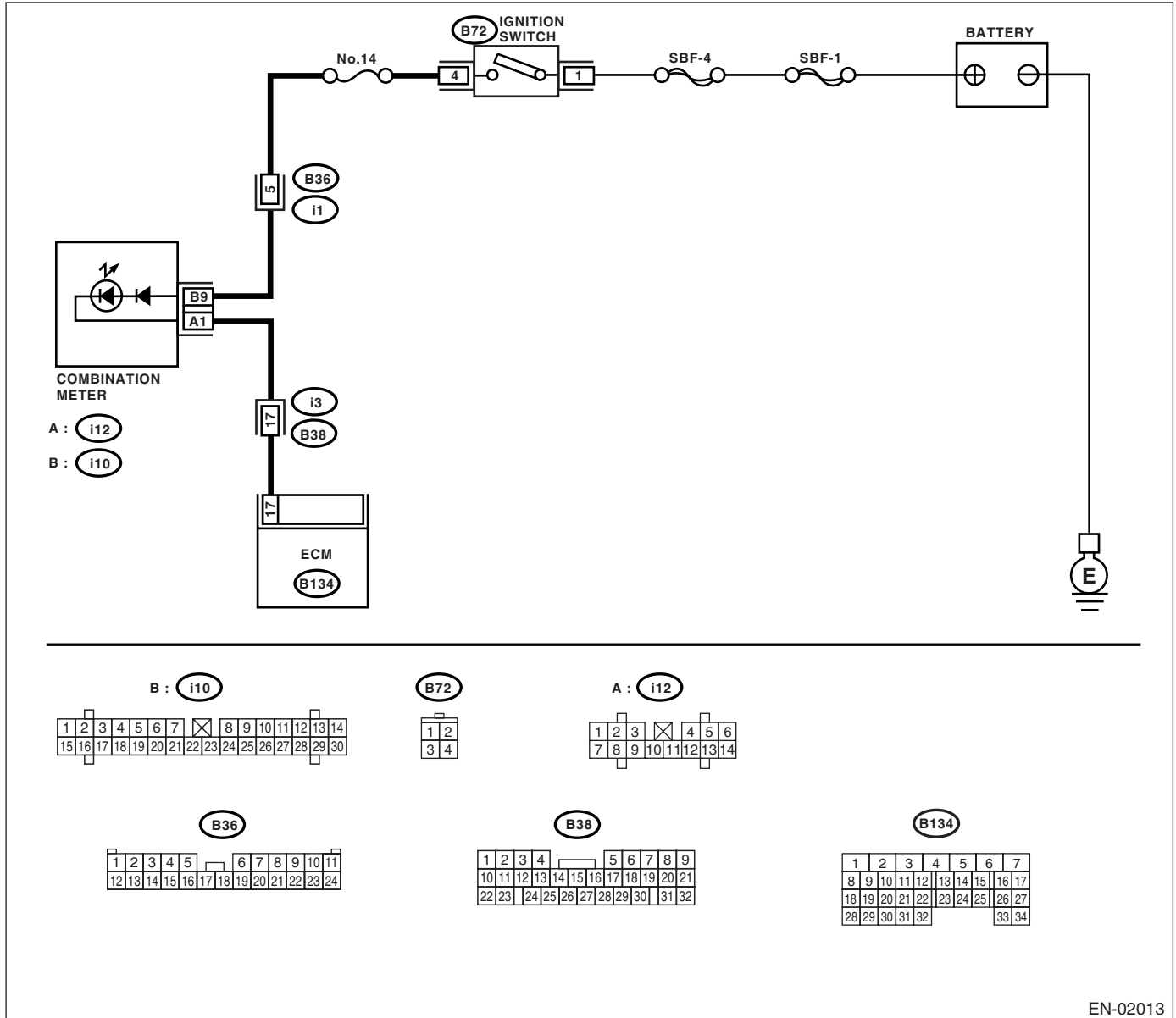
### DIAGNOSIS:

The malfunction indicator light circuit is shorted.

### TROUBLE SYMPTOM:

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

### WIRING DIAGRAM:



EN-02013

# MALFUNCTION INDICATOR LIGHT

## ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                                                                                                                       | Check                                                                                           | Yes                                                                                        | No                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 17 (+) — Chassis ground (-):</b>                                                                                                                                                                                      | Is the voltage less than 1 V?                                                                   | Go to step 4.                                                                              | Go to step 2.                                                                                                                                                                                                                                                                               |
| <b>2 CHECK POOR CONTACT.</b>                                                                                                                                                                                                                                                                                                                                                                                               | Does the malfunction indicator light come on when shaking or pulling ECM connector and harness? | Repair the poor contact in ECM connector.                                                  | Go to step 3.                                                                                                                                                                                                                                                                               |
| <b>3 CHECK ECM CONNECTOR.</b>                                                                                                                                                                                                                                                                                                                                                                                              | Is the ECM connector correctly connected?                                                       | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                  | Repair the connection of ECM connector.                                                                                                                                                                                                                                                     |
| <b>4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter. <Ref. to IDI-10, Combination Meter Assembly.><br>3) Disconnect the connector from ECM and combination meter.<br>4) Measure the resistance of harness between ECM and combination meter connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 17 — (i12) No. 1:</b> | Is the resistance less than 1 $\Omega$ ?                                                        | Go to step 5.                                                                              | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and combination meter connector</li> <li>• Poor contact in coupling connector</li> </ul>                       |
| <b>5 CHECK POOR CONTACT.</b><br>Check poor contact in combination meter connector.                                                                                                                                                                                                                                                                                                                                         | Is there poor contact in combination meter connector?                                           | Repair the poor contact in combination meter connector.                                    | Go to step 6.                                                                                                                                                                                                                                                                               |
| <b>6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(i10) No. 9 (+) — Chassis ground (-):</b>                                                                                                                                 | Is the voltage more than 10 V?                                                                  | Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter Assembly.> | Check the following and repair if necessary.<br><br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• Blown out fuse (No. 14)</li> <li>• Open or short circuit in harness between fuse (No. 14) and battery terminal</li> <li>• Poor contact in ignition switch connector</li> </ul> |

# MALFUNCTION INDICATOR LIGHT

ENGINE (DIAGNOSTICS)

## D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

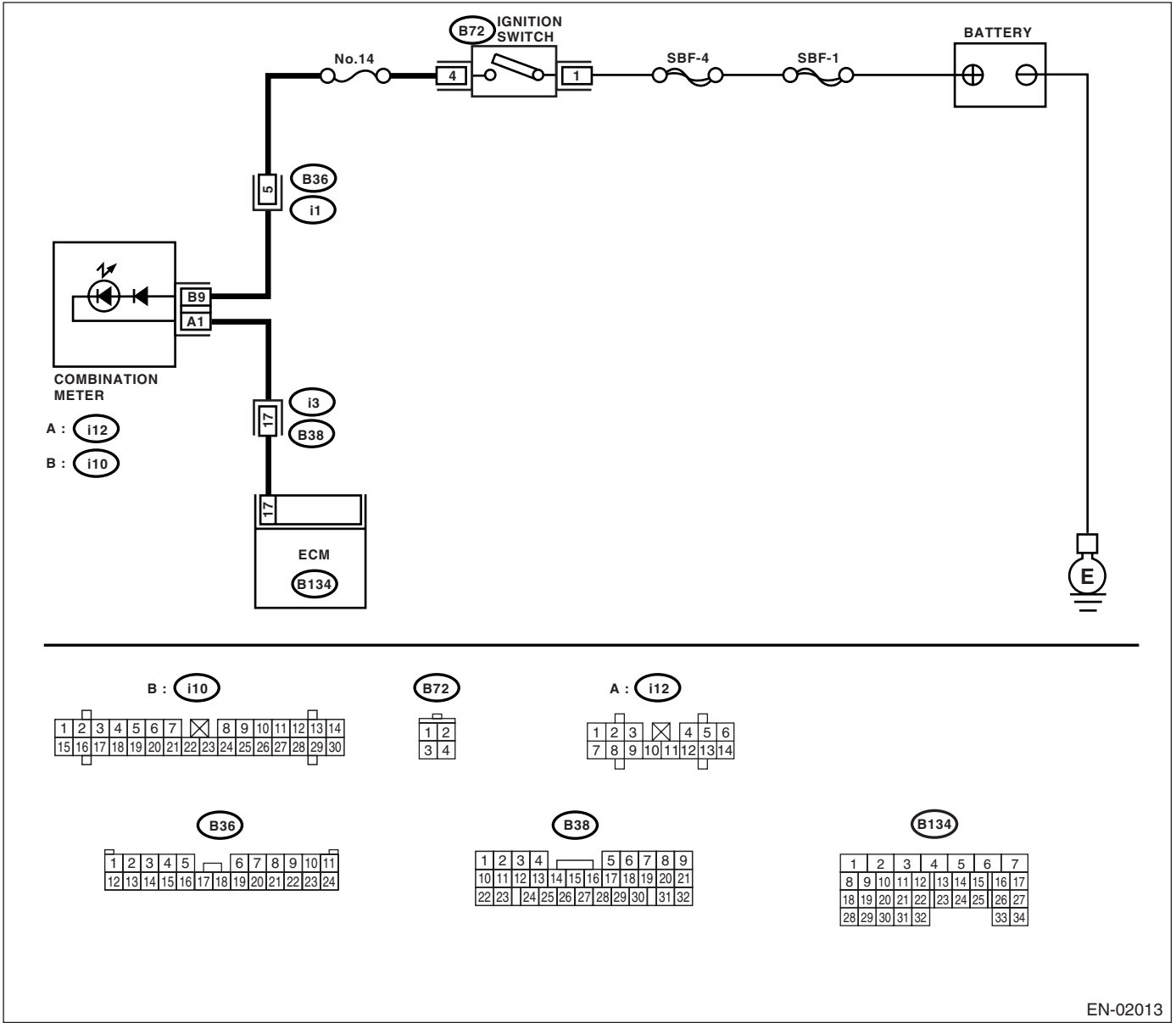
### DIAGNOSIS:

The malfunction indicator light circuit is shorted.

### TROUBLE SYMPTOM:

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

### WIRING DIAGRAM:



EN-02013

| Step | Check                                                                                                                                                                                   | Yes                                                                                                                                   | No                                                                        |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1    | <b>CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON. | Does the malfunction indicator light come on?<br><br>Repair the short circuit in harness between combination meter and ECM connector. | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).> |

# MALFUNCTION INDICATOR LIGHT

ENGINE (DIAGNOSTICS)

## E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 H Z.

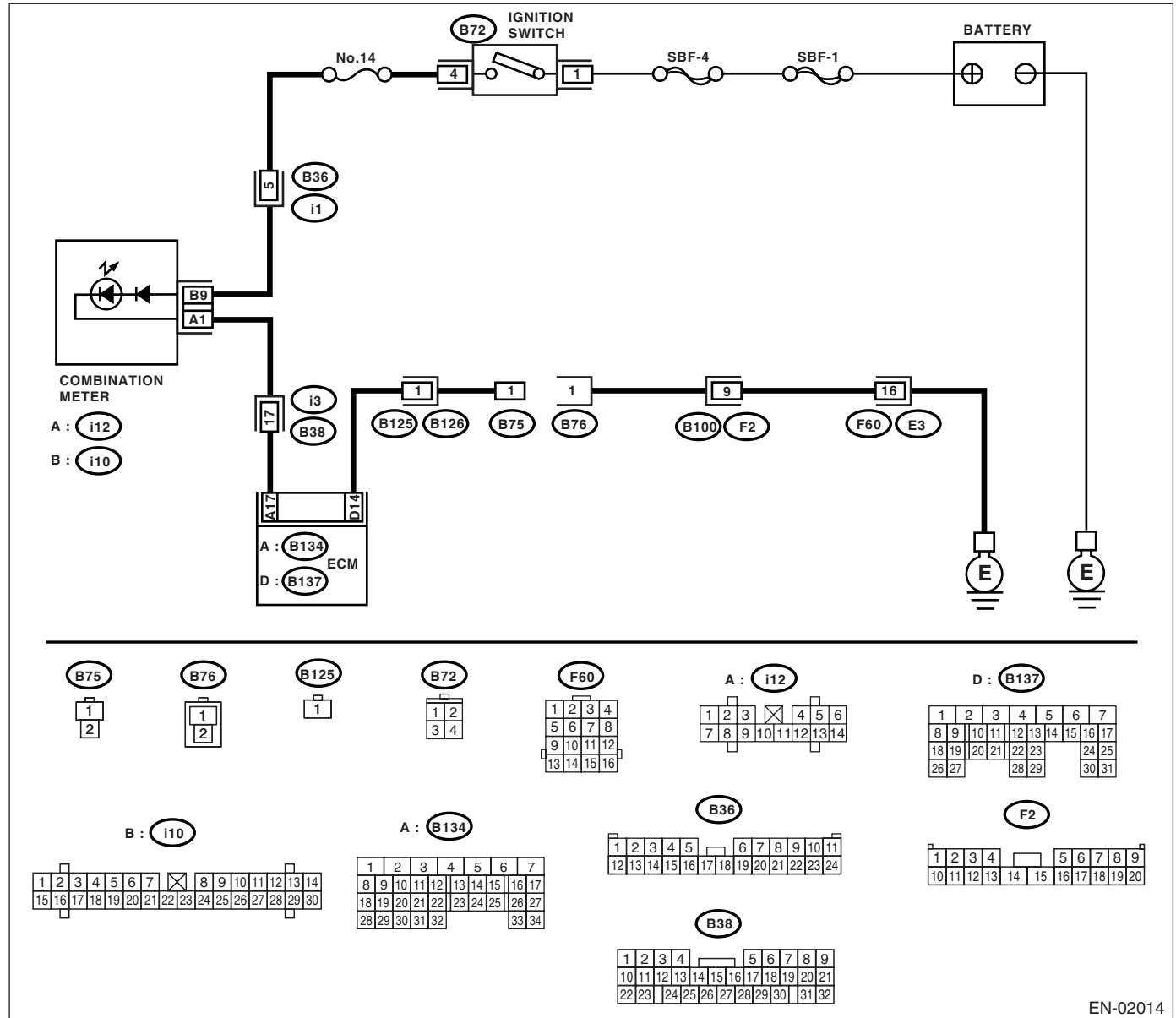
### DIAGNOSIS:

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

### TROUBLE SYMPTOM:

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

### WIRING DIAGRAM:



EN-02014

# MALFUNCTION INDICATOR LIGHT

ENGINE (DIAGNOSTICS)

| Step                                                                                                                                                                                                                                                                                                                | Check                                         | Yes                                                                                     | No                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the test mode connector.<br>3) Turn the ignition switch to ON. (engine OFF)                                                                                                                           | Does the malfunction indicator light come on? | Go to step 2.                                                                           | Repair the malfunction indicator light circuit. <Ref. to EN(H4DOTC)-49, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>              |
| <b>2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.                                                                                                                           | Does the malfunction indicator light come on? | Repair the ground short circuit in harness between combination meter and ECM connector. | Go to step 3.                                                                                                                                                     |
| <b>3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between test mode connector and chassis ground.<br><i>Connector &amp; terminal<br/>(B76) No. 1 — Chassis ground:</i> | Is the resistance less than 1 $\Omega$ ?      | Go to step 4.                                                                           | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between test mode connector and chassis ground |
| <b>4 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                | Is there poor contact in ECM connector?       | Repair the poor contact in ECM connector.                                               | Go to step 5.                                                                                                                                                     |
| <b>5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.</b><br>1) Connect the test mode connector.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><i>Connector &amp; terminal<br/>(B137) No. 14 — Chassis ground:</i>                                                                   | Is the resistance less than 1 $\Omega$ ?      | Go to step 6.                                                                           | Repair the open circuit in harness between ECM and test mode connector.                                                                                           |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.                                                                                                                                                                                                                                                | Is there poor contact in ECM connector?       | Repair the poor contact in ECM connector.                                               | Replace the ECM. <Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                                            |

# MALFUNCTION INDICATOR LIGHT

ENGINE (DIAGNOSTICS)

## F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ.

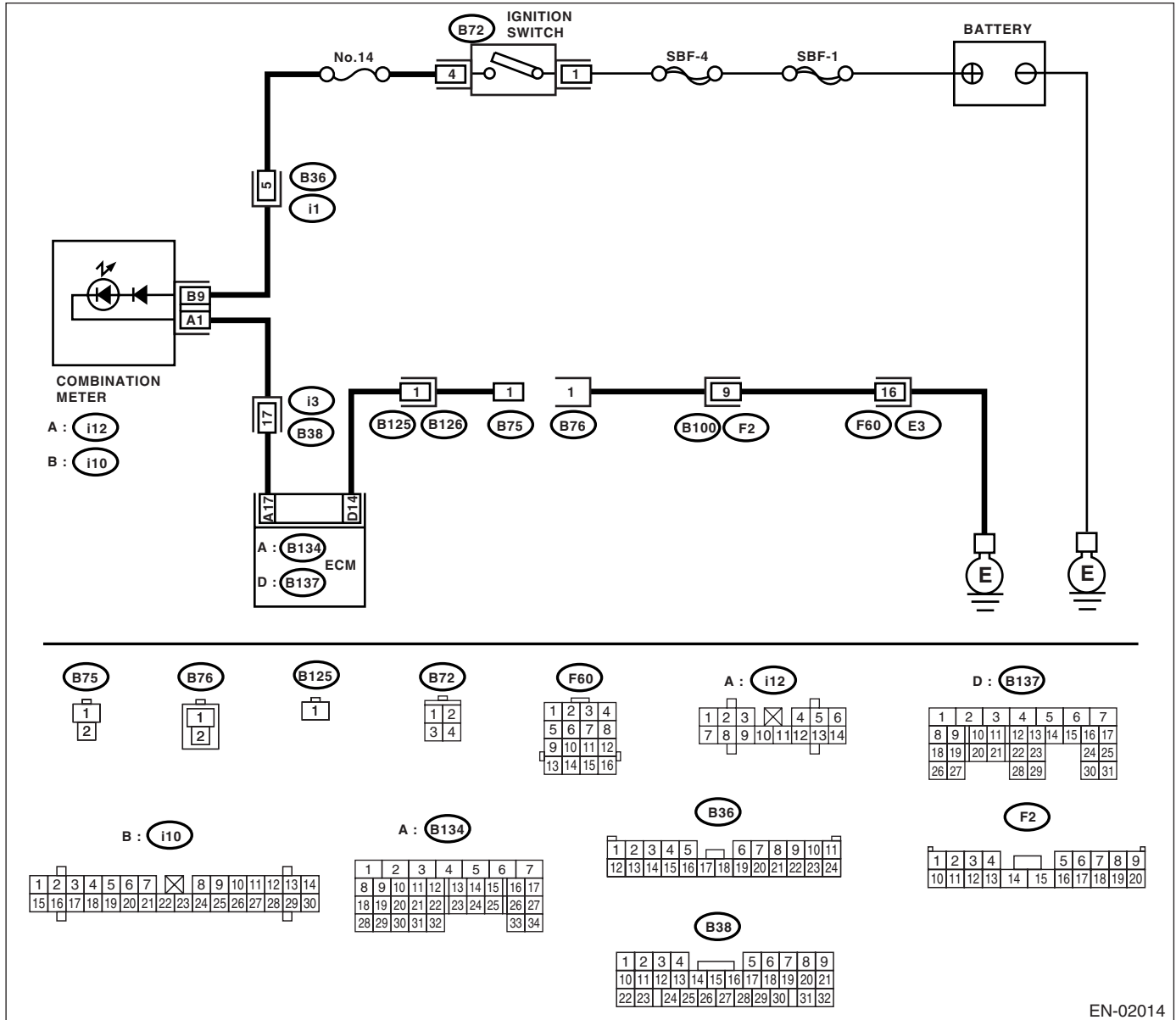
### DIAGNOSIS:

Test mode connector circuit is shorted.

### TROUBLE SYMPTOM:

Malfunction indicator light blinks at a cycle of 3 Hz when ignition switch is turned to ON.

### WIRING DIAGRAM:



EN-02014

# MALFUNCTION INDICATOR LIGHT

ENGINE (DIAGNOSTICS)

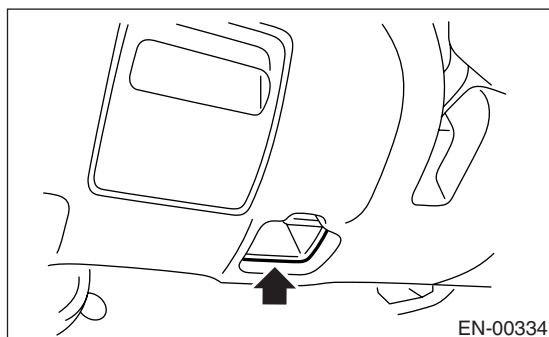
| Step                                                                                                                                                                                                                                                                                                                                 | Check                                       | Yes                                                                      | No                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b><br><b>CHECK TEST MODE CONNECTOR.</b><br>1) Disconnect the test mode connector.<br>2) Turn the ignition switch to ON.                                                                                                                                                                                                        | Does the malfunction indicator light blink? | Go to step 2.                                                            | System is in good order.<br><br><b>NOTE:</b><br>Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 14 — Chassis ground:</b> | Is the resistance less than 5 $\Omega$ ?    | Repair the short circuit in harness between ECM and test mode connector. | Replace the ECM.<br><Ref. to FU(H4DOTC)-42, Engine Control Module (ECM).>                                                                    |

## 8. OBD-II General Scan Tool

### A: OPERATION

#### 1. HOW TO USE OBD-II GENERAL SCAN TOOL

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



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

OBD-II general scan tool functions consist of:

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

Read out the data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

#### NOTE:

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>

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

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

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

| PID | Data                                                                                                               | Unit of measure |
|-----|--------------------------------------------------------------------------------------------------------------------|-----------------|
| 01  | Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information | —               |
| 03  | Fuel system control status                                                                                         | —               |
| 04  | Calculated engine load value                                                                                       | %               |
| 05  | Engine coolant temperature                                                                                         | °C              |
| 06  | Short term fuel trim                                                                                               | %               |
| 07  | Long term fuel trim                                                                                                | %               |
| 0B  | Intake manifold absolute pressure                                                                                  | kPa             |
| 0C  | Engine revolution                                                                                                  | rpm             |
| 0D  | Vehicle speed                                                                                                      | km/h            |
| 0E  | Ignition timing advance                                                                                            | °               |
| 0F  | Intake air temperature                                                                                             | °C              |
| 10  | Air flow rate from mass air flow sensor                                                                            | g/sec           |
| 11  | Throttle valve absolute opening angle                                                                              | %               |
| 13  | Check whether oxygen sensor is installed.                                                                          | —               |
| 15  | Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor                                | V and %         |
| 1C  | Supporting OBD system                                                                                              | —               |
| 24  | A/F value and A/F sensor output voltage                                                                            | — and V         |
| 34  | A/F value and A/F sensor current                                                                                   | — and mA        |

#### NOTE:

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

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

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

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

**NOTE:**

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

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

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)-35, Read Diagnostic Trouble Code (DTC).>

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

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

**NOTE:**

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

**6. MODE \$06**

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

| TID  | CID  | Test value & Test limit                                                          | Unit of measure |
|------|------|----------------------------------------------------------------------------------|-----------------|
| \$01 | \$01 | Catalyst system efficiency below threshold                                       | —               |
| \$03 | \$01 | Evaporative emission control system large leak                                   | mmHg            |
|      | \$02 | Evaporative emission control system small leak                                   |                 |
|      | \$03 | Evaporative emission control system very small leak                              |                 |
| \$05 | \$01 | O <sub>2</sub> sensor circuit slow response (Bank 1 Sensor 1)                    | —               |
| \$06 | \$01 | O <sub>2</sub> sensor circuit (Bank 1 Sensor 2)                                  | V               |
|      | \$02 |                                                                                  |                 |
| \$07 | \$01 | O <sub>2</sub> sensor circuit slow response (Bank 1 Sensor 2)                    | sec             |
| \$0C | \$01 | Coolant thermostat (Coolant temperature below thermostat regulating temperature) | °C              |
| \$0F | \$01 | Drain valve range/performance                                                    | mmHg            |
|      | \$02 |                                                                                  |                 |

## OBD-II GENERAL SCAN TOOL

ENGINE (DIAGNOSTICS)

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### **7. MODE \$07**

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

### **8. MODE \$09**

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

## 10. Read Diagnostic Trouble Code (DTC)

### A: OPERATION

#### 1. SUBARU SELECT MONITOR (NORMAL MODE)

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

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>

#### 2. SUBARU SELECT MONITOR (OBD MODE)

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

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>

#### 3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-68, List of Diagnostic Trouble Code (DTC).>

#### NOTE:

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

## 9. Subaru Select Monitor

### A: OPERATION

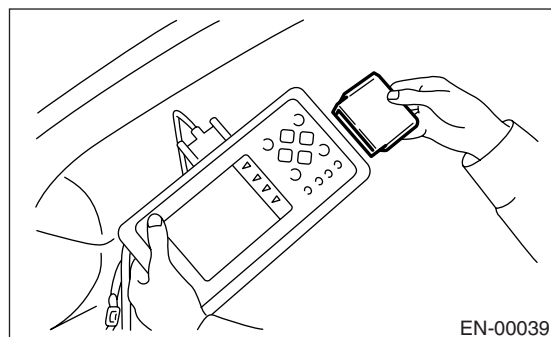
#### 1. HOW TO USE SUBARU SELECT MONITOR

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



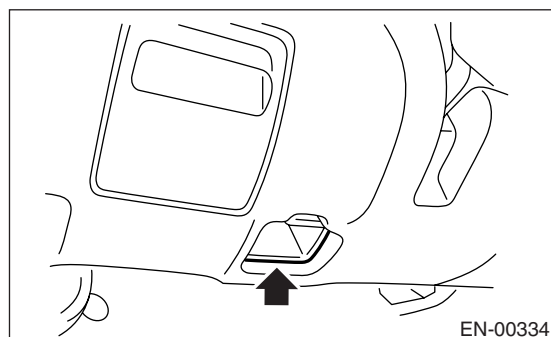
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)-7, PREPARATION TOOL, General Description.>



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

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

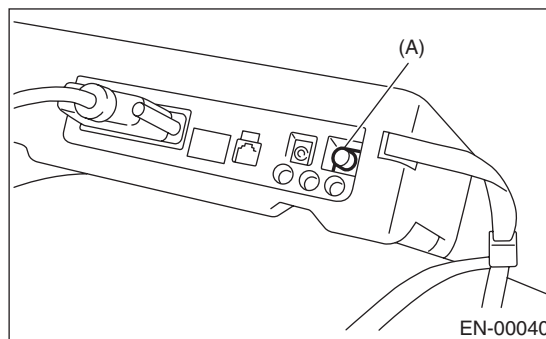


(2) Connect the diagnosis cable to data link connector.

#### CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II 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 the DTC and various data, and then record them.

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

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

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

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

# SUBARU SELECT MONITOR

## ENGINE (DIAGNOSTICS)

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

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

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

# SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

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

## NOTE:

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

# SUBARU SELECT MONITOR

## ENGINE (DIAGNOSTICS)

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

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

| Contents                                          | Display                         | Unit of measure            |
|---------------------------------------------------|---------------------------------|----------------------------|
| Number of DTC                                     | Number of DTC                   | —                          |
| Malfunction indicator light status                | MI (MIL)                        | ON or OFF                  |
| Monitoring test of misfire                        | Misfire monitoring              | Complete or incomplete     |
| Monitoring test of fuel system                    | Fuel system monitoring          | Complete or incomplete     |
| Monitoring test of comprehensive component        | Component monitoring            | Complete or incomplete     |
| Test of catalyst                                  | Catalyst Diagnosis              | Complete or incomplete     |
| Test of heated catalyst                           | Heated catalyst                 | No support                 |
| Test of evaporative emission purge control system | Evaporative purge system        | Complete or incomplete     |
| Test of secondary air system                      | Secondary air system            | No support                 |
| Test of air conditioning system refrigerant       | A/C system refrigerant          | No support                 |
| Test of oxygen sensor                             | Oxygen sensor                   | Complete or incomplete     |
| Test of oxygen sensor heater                      | O <sub>2</sub> Heater Diagnosis | Complete or incomplete     |
| Test of EGR system                                | EGR system                      | No support                 |
| Air fuel ratio control system for bank 1          | Fuel System for Bank 1          | —                          |
| Engine load data                                  | Calculated load value           | %                          |
| Engine coolant temperature signal                 | Coolant Temp.                   | °C or °F                   |
| Short term fuel trim by front oxygen (A/F) sensor | Short term fuel trim B1         | %                          |
| Long term fuel trim by front oxygen (A/F) sensor  | Long term fuel trim B1          | %                          |
| Intake manifold absolute pressure signal          | Mani. Absolute Pressure         | mmHg or kPa or inHg or psi |
| Engine speed signal                               | Engine Speed                    | rpm                        |
| Vehicle speed signal                              | Vehicle Speed                   | km/h or MPH                |
| Ignition timing advance for #1 cylinder           | Ignition timing adv. #1         | °                          |
| Intake air temperature signal                     | Intake Air Temp.                | °C or °F                   |
| Intake air amount                                 | Mass Air Flow                   | g/s                        |
| Throttle position signal                          | Throttle Opening Angle          | %                          |
| Oxygen sensor #11                                 | Oxygen Sensor #11               | —                          |
| Oxygen sensor #12                                 | Oxygen Sensor #12               | —                          |
| Rear oxygen sensor output signal                  | Oxygen Sensor #12               | V                          |
| Air fuel ratio correction by rear oxygen sensor   | Short term fuel trim #12        | %                          |
| On-board diagnostic system                        | OBD System                      | CARB-OBD2                  |
| A/F sensor output signal                          | A/F sensor #11                  | V                          |
| A/F lambda signal                                 | A/F sensor #11                  | —                          |
| A/F lambda signal #11                             | A/F sensor #11                  | —                          |
| A/F sensor current #11                            | A/F sensor #11                  | mA                         |

#### NOTE:

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

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

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

| Contents                                          | Display                  | Unit of measure          |
|---------------------------------------------------|--------------------------|--------------------------|
| DTC for freeze frame data                         | Freeze frame data        | DTC                      |
| Air fuel ratio control system for bank 1          | Fuel system for Bank1    | Closed loop or Open loop |
| Air fuel ratio control system for bank 2          | Fuel system for Bank2    | Open loop                |
| O <sub>2</sub> sensor output voltage              | Oxygen Sensor #12        | V                        |
| Short term fuel trim by O <sub>2</sub> sensor     | Short term fuel trim #12 | %                        |
| Engine load data                                  | Calculated load value    | %                        |
| Engine coolant temperature signal                 | Coolant Temp.            | °C or °F                 |
| Short term fuel trim by front oxygen (A/F) sensor | Short term fuel trim B1  | %                        |
| Long term fuel trim by front oxygen (A/F) sensor  | Long term fuel trim B1   | %                        |
| Intake manifold absolute pressure signal          | Mani. Absolute Pressure  | mmHg, kPa, inHg or psi   |
| Engine speed signal                               | Engine Speed             | rpm                      |
| Vehicle speed signal                              | Vehicle Speed            | km/h or MPH              |
| Ignition timing advance for #1 cylinder           | Ignition timing adv. #1  | °                        |
| Intake air temperature signal                     | Intake Air Temp.         | °C or °F                 |
| Intake air amount                                 | Mass Air Flow            | g/s                      |
| Throttle position signal                          | Throttle Opening Angle   | %                        |

### NOTE:

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

# SUBARU SELECT MONITOR

## ENGINE (DIAGNOSTICS)

### 7. LED OPERATION MODE FOR ENGINE

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

| Contents                                       | Display                         | Message       | LED "ON" requirements                                     |
|------------------------------------------------|---------------------------------|---------------|-----------------------------------------------------------|
| Ignition switch signal                         | Ignition Switch                 | ON or OFF     | When ignition switch is turned to ON.                     |
| Test mode signal                               | Test Mode Signal                | ON or OFF     | When test mode connector is connected.                    |
| Neutral position switch signal                 | Neutral Position Switch         | ON or OFF     | When neutral position signal is entered.                  |
| Air conditioning switch signal                 | A/C Switch                      | ON or OFF     | When air conditioning switch is turned ON.                |
| Air conditioning relay signal                  | A/C Compressor Signal           | ON or OFF     | When air conditioning relay is in function.               |
| Radiator main fan relay signal                 | Radiator Fan Relay #1           | ON or OFF     | When radiator main fan relay is in function.              |
| Knocking signal                                | Knocking Signal                 | ON or OFF     | When knocking signal is entered.                          |
| Radiator sub fan relay signal                  | Radiator Fan Relay #2           | ON or OFF     | When radiator sub fan relay is in function.               |
| Rear oxygen sensor rich signal                 | Rear O <sub>2</sub> Rich Signal | ON or OFF     | When rear oxygen sensor mixture ratio is rich.            |
| Starter switch signal                          | Starter Switch Signal           | ON or OFF     | When starter switch signal is entered.                    |
| Idle switch signal                             | Idle Switch Signal              | ON or OFF     | When idle switch signal is entered.                       |
| Crankshaft position sensor signal              | Crankshaft Position Signal      | ON or OFF     | When crankshaft position sensor signal is entered.        |
| Camshaft position sensor signal                | Camshaft Position Signal        | ON or OFF     | When camshaft position sensor signal is entered.          |
| Power steering switch signal                   | P/S Switch                      | ON or OFF     | When power steering switch is entered.                    |
| Rear defogger switch signal                    | Rear Defogger Switch            | ON or OFF     | When rear defogger switch is turned ON.                   |
| Blower fan switch signal                       | Blower Fan Switch               | ON or OFF     | When blower fan switch is turned ON.                      |
| Small light switch signal                      | Light Switch                    | ON or OFF     | When small light switch is turned ON.                     |
| Tumble generator valve actuator signal         | TGV Output                      | ON or OFF     | When TGV actuator signal is entered.                      |
| Tumble generator valve drive signal            | TGV Drive                       | Close or Open | When TGV moves and valve opens.                           |
| Fuel pressure control solenoid                 | PCV Solenoid Valve              | ON or OFF     | When fuel pressure control solenoid valve is in function. |
| Drain valve signal                             | Vent. Solenoid Valve            | ON or OFF     | When drain valve is in function.                          |
| Fuel tank sensor control solenoid valve signal | Fuel Tank Sensor Ctrl Valve     | ON or OFF     | When tank sensor control solenoid valve is in function.   |
| Blow-by leak diagnosis SW                      | Blow-by Leak Connector          | ON or OFF     | When connected.                                           |
| Handle SW                                      | Handle SW                       | RHD/LHD       | When the vehicle is LHD model.                            |
| ETC motor relay                                | ETC Motor Relay                 | ON or OFF     | When electric throttle is in function.                    |
| Clutch SW                                      | Clutch SW                       | ON or OFF     | When clutch switch is turned ON.                          |
| Stop SW                                        | Stop Light Switch               | ON or OFF     | When stop light switch is turned ON.                      |
| SET/CST SW                                     | SET/COAST Switch                | ON or OFF     | When SET/COAST switch is turned ON.                       |
| RES/ACC SW                                     | RESUME/ACCEL Switch             | ON or OFF     | When RESUME/ACCEL switch is turned ON.                    |
| Brake SW                                       | Brake Switch                    | ON or OFF     | When brake switch is turned ON.                           |
| Main SW                                        | Main Switch                     | ON or OFF     | When main switch is turned ON.                            |

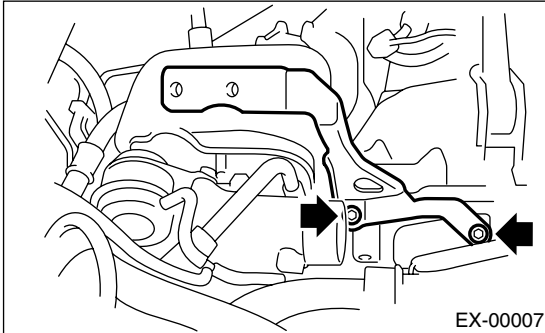
#### NOTE:

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

## 3. Center Exhaust Pipe

### A: REMOVAL

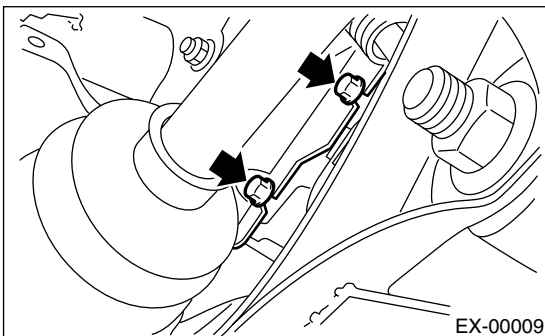
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
- 4) Remove the intercooler bracket.



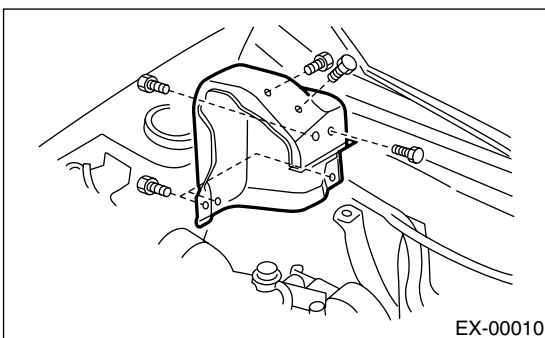
- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Remove the bolts which install the lower side of turbocharger upper cover.

#### CAUTION:

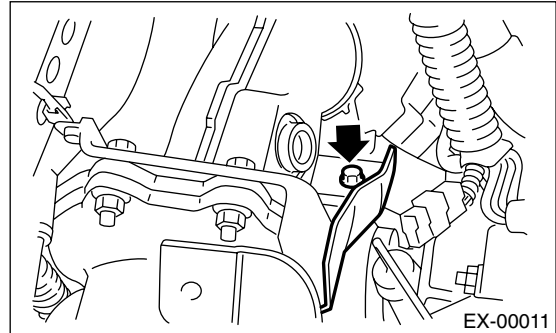
Be careful, the turbocharger and exhaust pipe are hot.



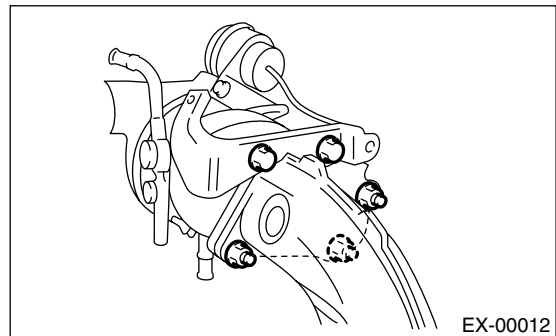
- 8) Lower the vehicle.
- 9) Remove the turbocharger upper cover.



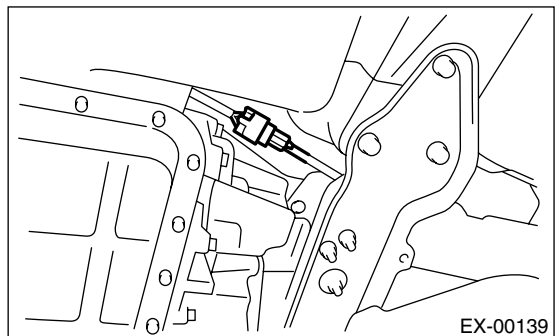
- 10) Remove the bolts which install the lower upper side of turbocharger upper cover, and remove it.



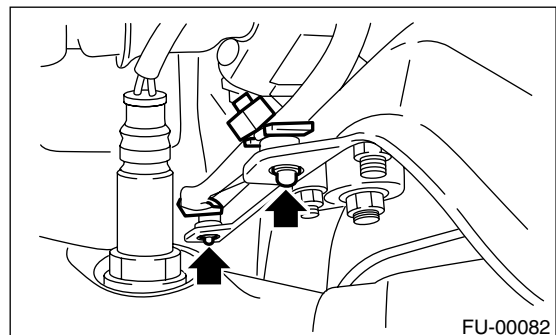
- 11) Separate the center exhaust pipe from turbocharger.



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



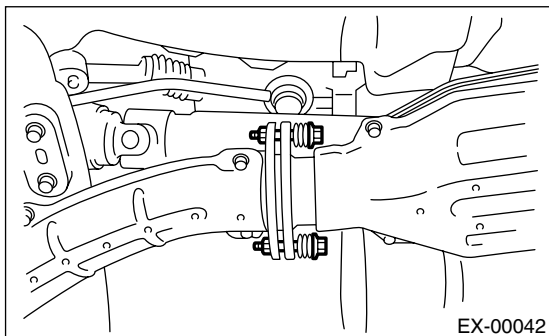
- 14) Vertically draw out the clip from crossmember.



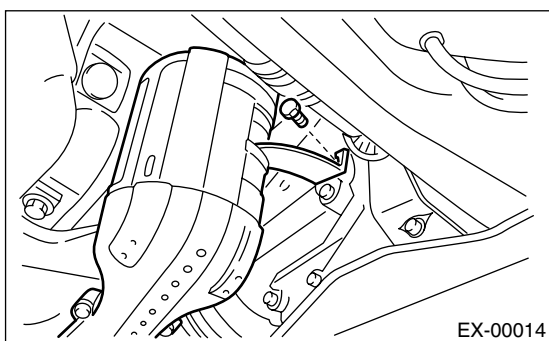
## CENTER EXHAUST PIPE

### EXHAUST

- 15) Separate the center exhaust pipe from rear exhaust pipe.



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

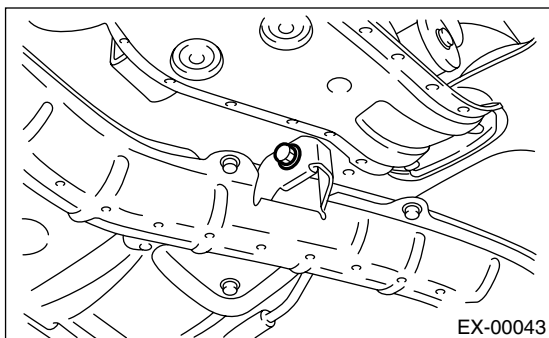


- 17) Remove the intercooler bracket.

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

#### CAUTION:

Be careful not to pull down the center exhaust pipe.



- 19) Remove the center exhaust pipe.



## B: INSTALLATION

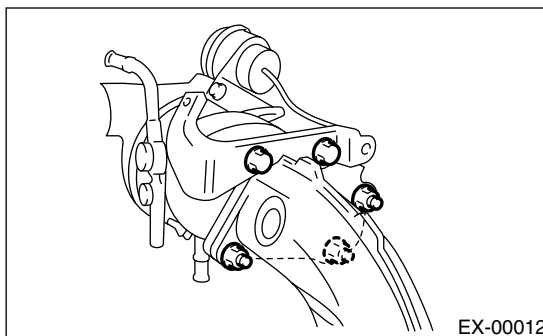
#### NOTE:

Replace the gaskets with new ones.

- 1) Install the center exhaust pipe and temporarily tighten the bolt which holds the center exhaust pipe to hanger bracket.
- 2) Temporarily tighten the bolt which holds the center pipe to transmission.
- 3) Connect the center exhaust pipe to turbocharger.

#### Tightening torque:

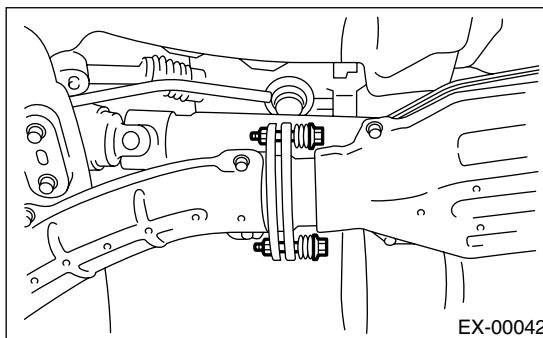
**35 N·m (3.6 kgf-m, 26.0 ft-lb)**



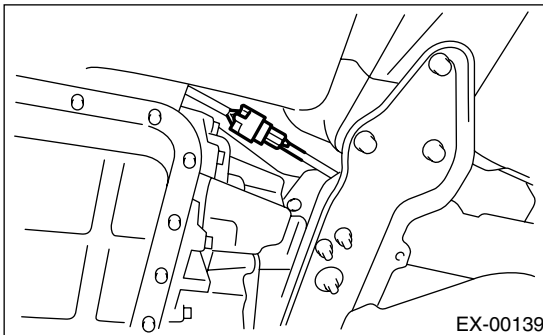
- 4) Install the center exhaust pipe to rear exhaust pipe.

#### Tightening torque:

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



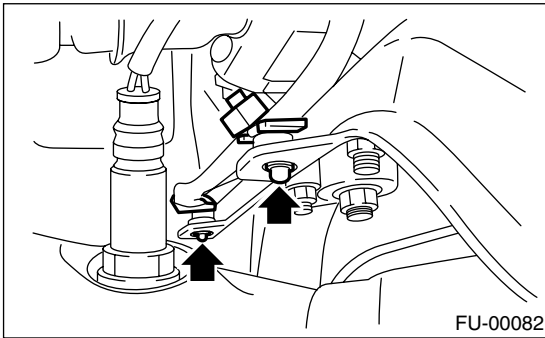
- 5) Connect the connector to rear oxygen sensor.



## CENTER EXHAUST PIPE

EXHAUST

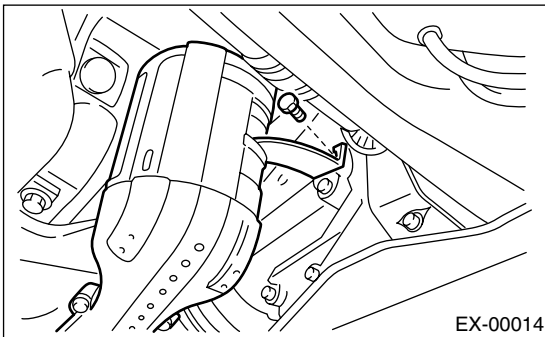
- 6) Secure the clip on crossmember.



- 7) Tighten the bolt which holds the center exhaust pipe bracket to transmission.

**Tightening torque:**

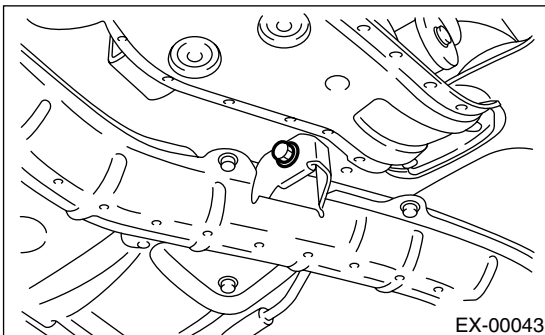
**30 N·m (3.1 kgf-m, 22.4 ft-lb)**



- 8) Tighten the bolt which holds the center exhaust pipe to hanger bracket.

**Tightening torque:**

**35 N·m (3.6 kgf-m, 26.0 ft-lb)**

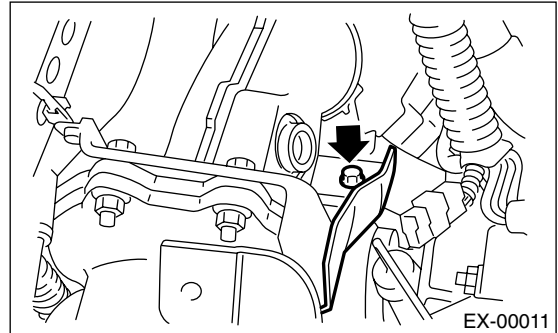


- 9) Lower the vehicle.

- 10) Place the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

**Tightening torque:**

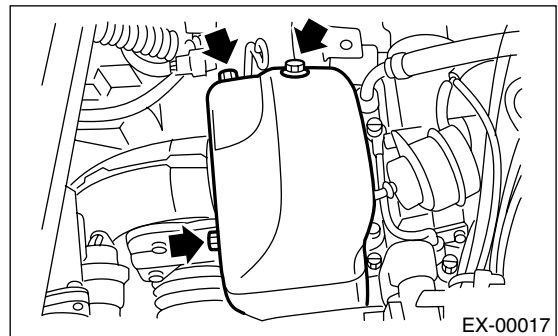
**7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**



- 11) Place the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

**Tightening torque:**

**7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**

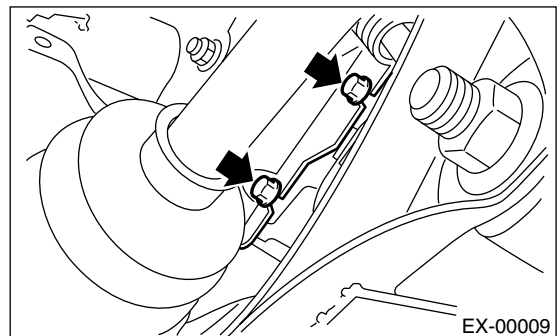


- 12) Lift-up the vehicle.

- 13) Tighten the bolts which install the under side of turbocharger upper cover.

**Tightening torque:**

**7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**



- 14) Install the under cover.

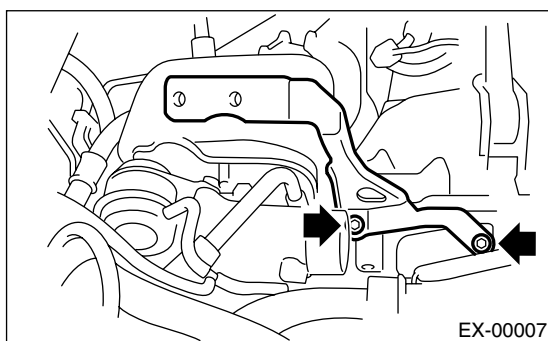
- 15) Lower the vehicle.

## CENTER EXHAUST PIPE

### EXHAUST

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16) Install the intercooler bracket.



17) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

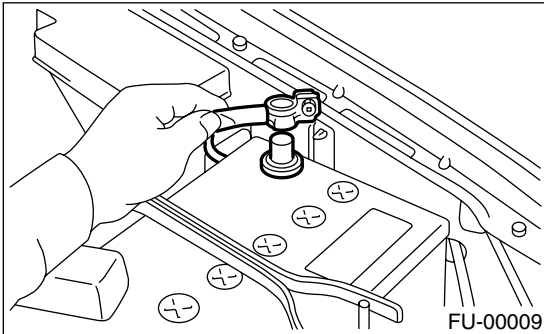
# FRONT EXHAUST PIPE

## EXHAUST

### 2. Front Exhaust Pipe

#### A: REMOVAL

1) Disconnect the ground cable from battery.

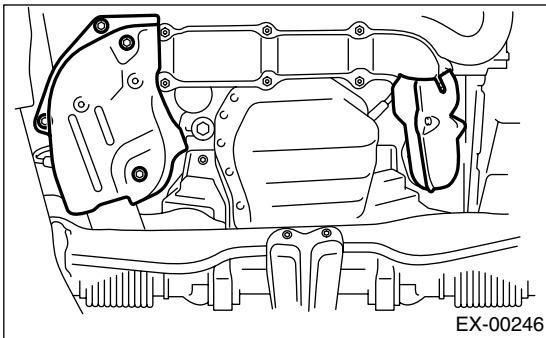


2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, REMOVAL, Front Oxygen (A/F) Sensor.>

3) Remove the under cover.

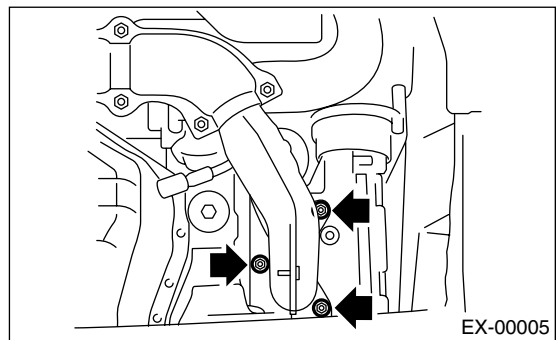
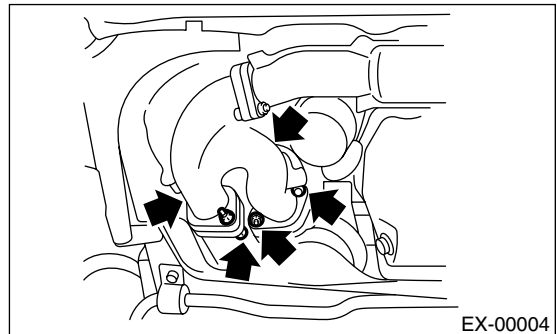
4) Remove the lower exhaust manifold cover (RH).

5) Remove the lower and upper exhaust manifold covers (LH).



6) Remove the nuts and bolts which hold the front exhaust pipe assembly to turbocharger joint pipe.

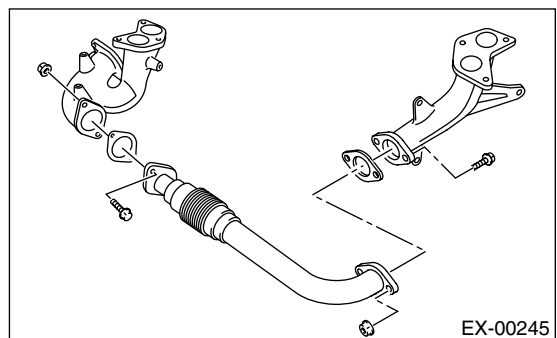
7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.



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

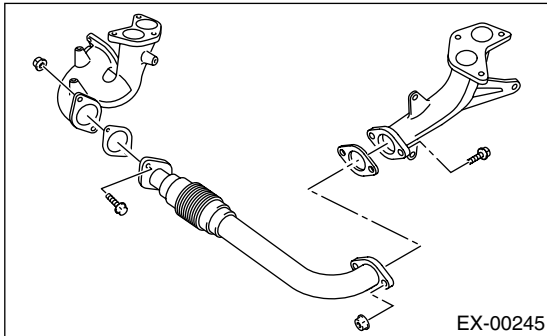
### NOTE:

Replace the gaskets with new ones.

- 1) Assemble the front exhaust pipe and exhaust manifolds.

### Tightening torque:

**35 N·m (3.6 kgf-m, 26.0 ft-lb)**



- 2) Install the front exhaust pipe covers.

### Tightening torque:

**7.5 N·m (0.8 kgf-m, 5.5 ft-lb)**

- 3) Install the upper exhaust manifold cover (RH).

### Tightening torque:

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**

- 4) Install the front exhaust pipe assembly.

### Tightening torque:

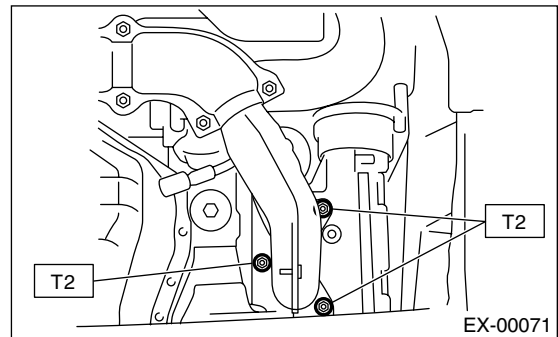
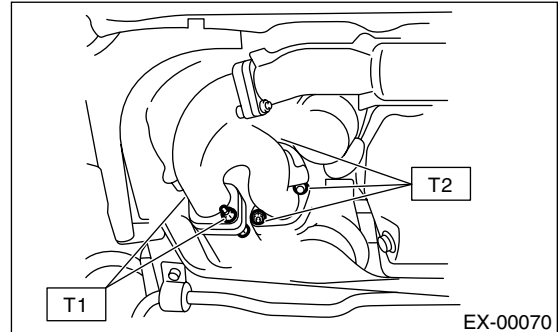
**35 N·m (3.6 kgf-m, 26.0 ft-lb)**

- 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 upper and lower exhaust manifold covers (LH).

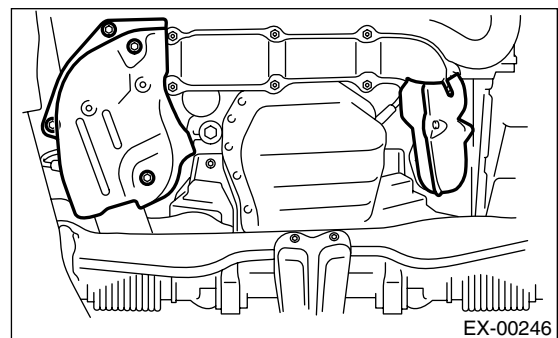
### Tightening torque:

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**

- 7) Install the lower exhaust manifold cover (RH).

### Tightening torque:

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



- 8) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, INSTALLATION, FRONT OXYGEN (A/F) SENSOR.>

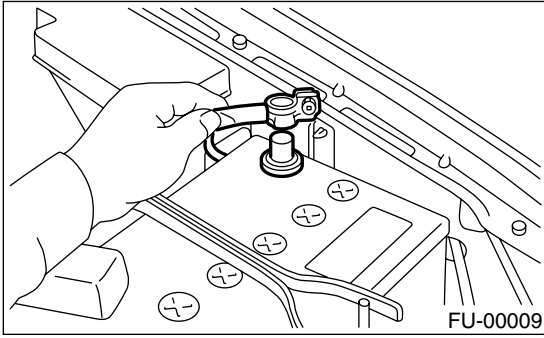
- 9) Install the under cover.

## FRONT EXHAUST PIPE

### EXHAUST

---

10) Connect the battery ground cable to battery.



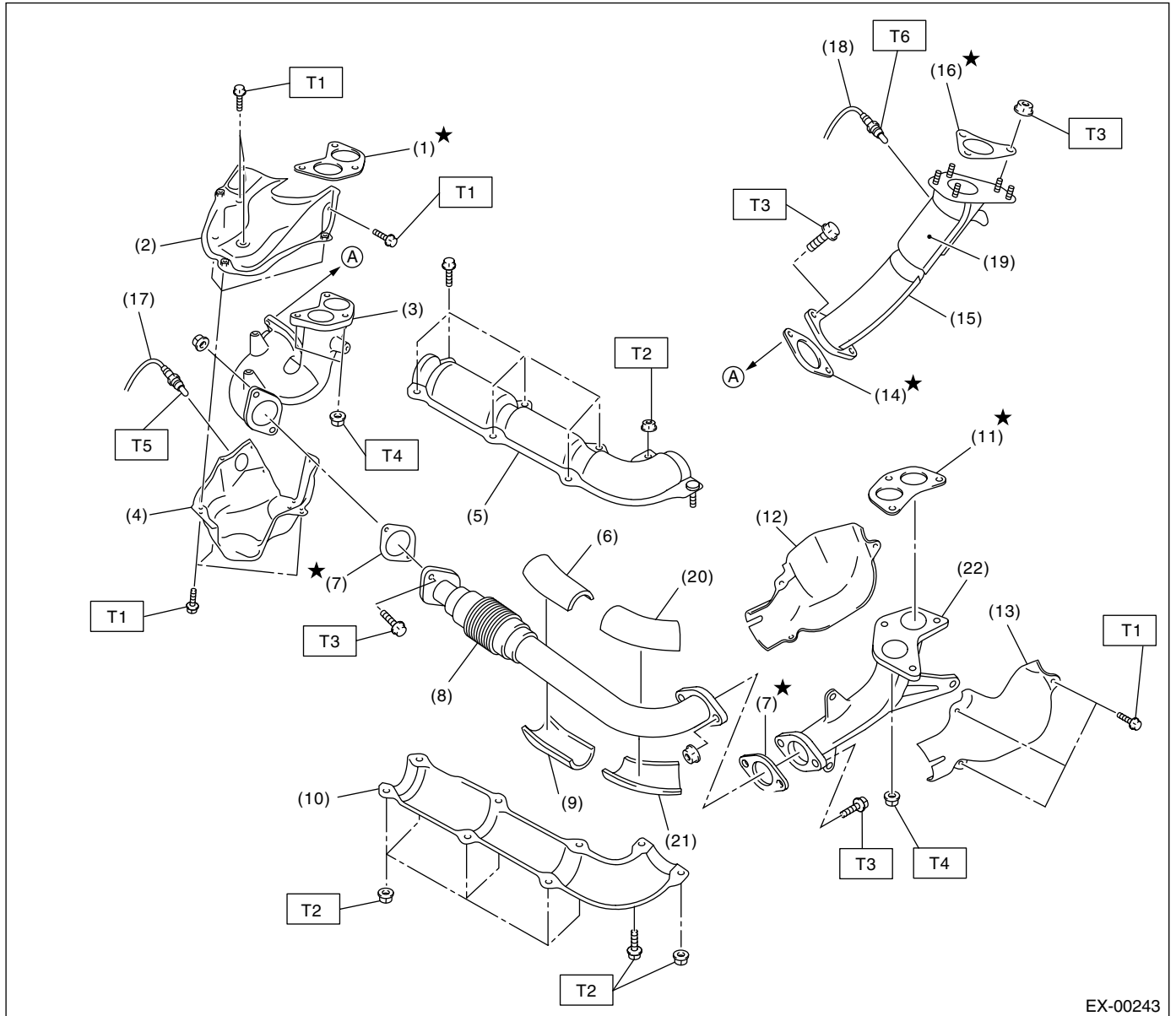
# GENERAL DESCRIPTION

## EXHAUST

### 1. General Description

#### A: COMPONENT

#### 1. FRONT EXHAUST PIPE



EX-00243

## GENERAL DESCRIPTION

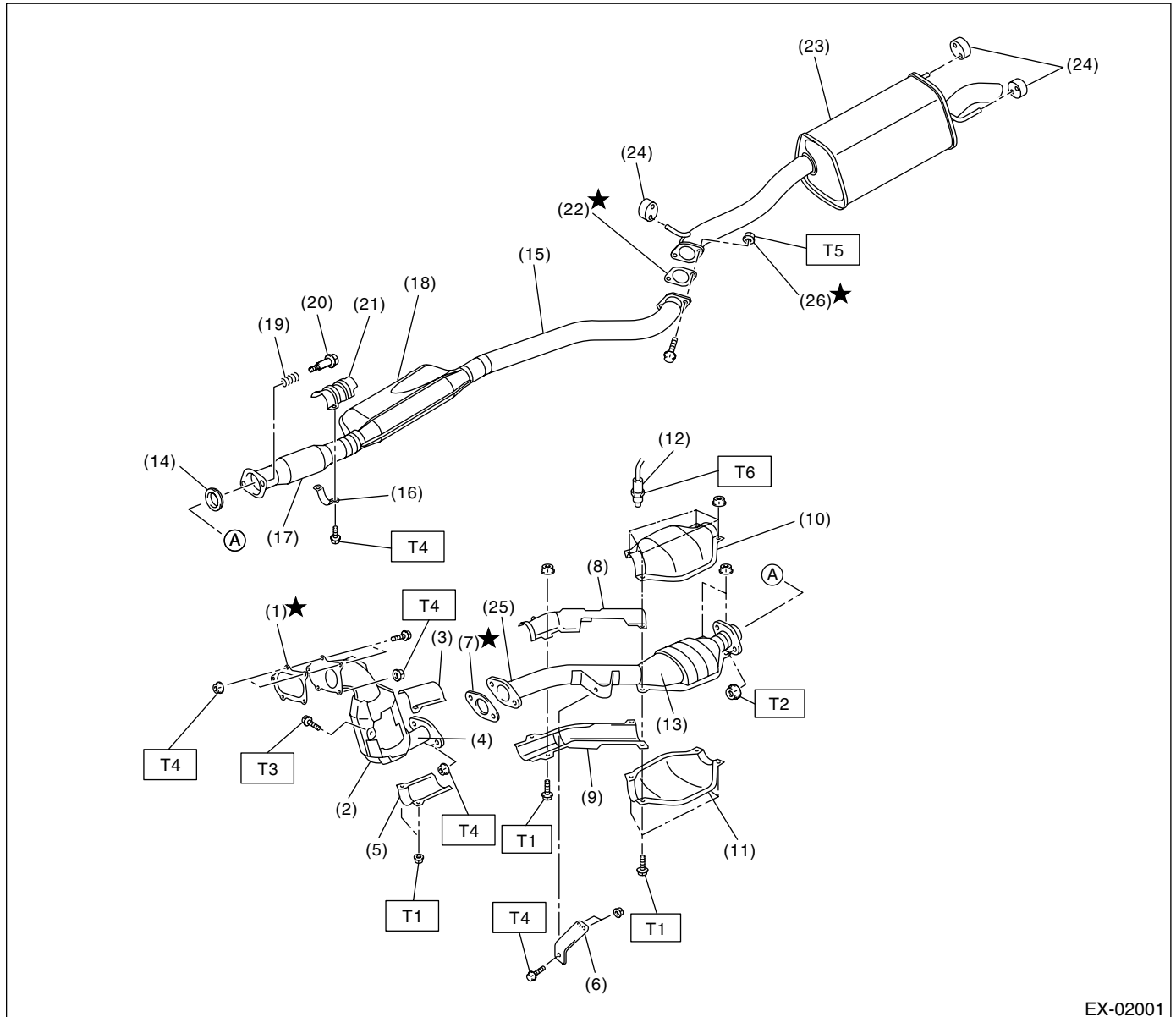
### EXHAUST

|                                             |                                              |                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) Gasket                                  | (12) Exhaust manifold upper cover (LH)       | <b><i>Tightening torque: N·m (kgf-m, ft-lb)</i></b><br><b><i>T1: 19 (1.9, 13.7)</i></b><br><b><i>T2: 7.5 (0.8, 5.5)</i></b><br><b><i>T3: 35 (3.6, 26.0)</i></b><br><b><i>T4: 40 (4, 28.9)</i></b><br><b><i>T5: &lt;Ref. to FU(H4DOTC)-37, INSTALLATION, FRONT OXYGEN (A/F) SENSOR.&gt;</i></b><br><b><i>T6: &lt;Ref. to FU(H4DOTC)-41, INSTALLATION, EXHAUST TEMPERATURE SENSOR.&gt;</i></b> |
| (2) Exhaust manifold upper cover (RH)       | (13) Exhaust manifold lower cover (LH)       |                                                                                                                                                                                                                                                                                                                                                                                              |
| (3) Exhaust manifold (RH)                   | (14) Gasket                                  |                                                                                                                                                                                                                                                                                                                                                                                              |
| (4) Exhaust manifold lower cover (RH)       | (15) Turbocharger joint pipe                 |                                                                                                                                                                                                                                                                                                                                                                                              |
| (5) Front exhaust pipe upper cover          | (16) Gasket                                  |                                                                                                                                                                                                                                                                                                                                                                                              |
| (6) Front exhaust pipe upper insulator (RH) | (17) Front oxygen (A/F) sensor               |                                                                                                                                                                                                                                                                                                                                                                                              |
| (7) Gasket                                  | (18) Exhaust temperature sensor              |                                                                                                                                                                                                                                                                                                                                                                                              |
| (8) Front exhaust pipe                      | (19) Precatalytic converter                  |                                                                                                                                                                                                                                                                                                                                                                                              |
| (9) Front exhaust pipe lower insulator (RH) | (20) Front exhaust pipe upper insulator (LH) |                                                                                                                                                                                                                                                                                                                                                                                              |
| (10) Front exhaust pipe lower cover         | (21) Front exhaust pipe lower insulator (LH) |                                                                                                                                                                                                                                                                                                                                                                                              |
| (11) Gasket                                 | (22) Exhaust manifold (LH)                   |                                                                                                                                                                                                                                                                                                                                                                                              |

# GENERAL DESCRIPTION

## EXHAUST

### 2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



EX-02001

- |                                           |                                            |                                 |
|-------------------------------------------|--------------------------------------------|---------------------------------|
| (1) Gasket                                | (13) Rear catalytic converter              | (25) Center exhaust pipe (Rear) |
| (2) Front catalytic converter             | (14) Gasket                                | (26) Self-locking nut           |
| (3) Center pipe upper cover (Front)       | (15) Rear exhaust pipe                     |                                 |
| (4) Center exhaust pipe (Front)           | (16) Clamp                                 |                                 |
| (5) Center pipe lower cover (Front)       | (17) Chamber (Front)                       |                                 |
| (6) Bracket                               | (18) Chamber (Rear)                        |                                 |
| (7) Gasket                                | (19) Spring                                |                                 |
| (8) Center pipe upper cover (Rear)        | (20) Bolt                                  |                                 |
| (9) Center pipe lower cover (Rear)        | (21) Rear exhaust pipe upper cover (Front) |                                 |
| (10) Rear catalytic converter upper cover | (22) Gasket                                |                                 |
| (11) Rear catalytic converter lower cover | (23) Muffler                               |                                 |
| (12) Rear oxygen sensor                   | (24) Cushion rubber                        |                                 |

#### **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)-39, INSTALLATION, REAR OXYGEN SENSOR.>**

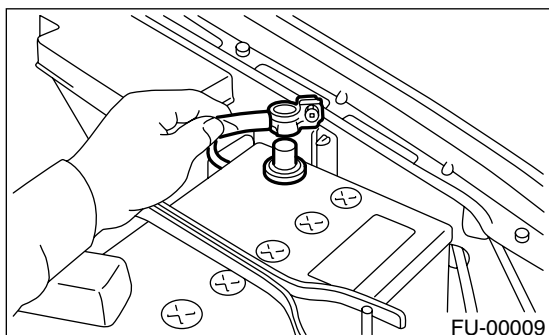
### **B: CAUTION**

- Wear working 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 or 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 safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

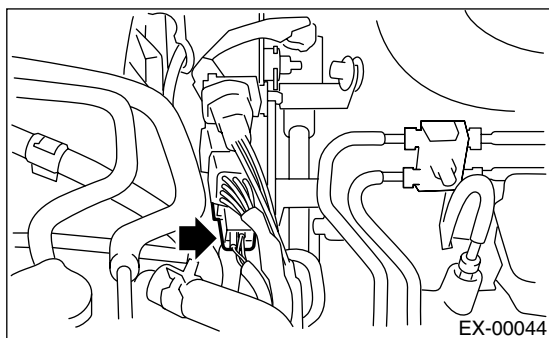
## 4. Joint Pipe

### A: REMOVAL

1) Disconnect the ground cable from battery.



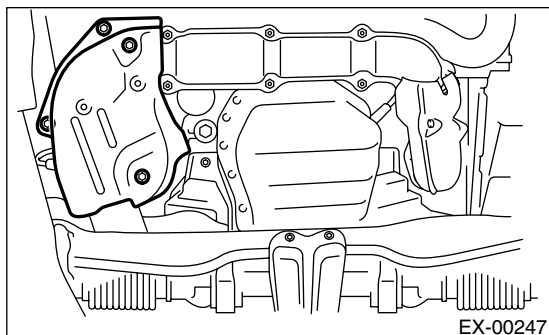
2) Disconnect the exhaust temperature sensor connector.



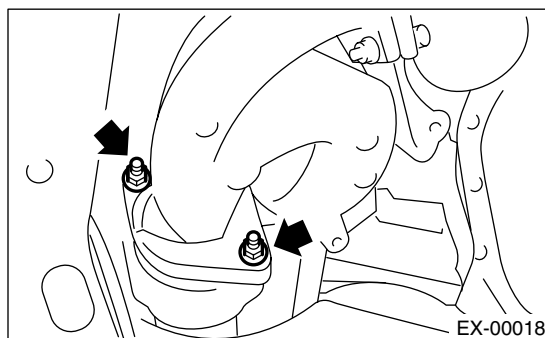
3) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-37, REMOVAL, Front Oxygen (A/F) Sensor.>

4) Remove the under cover.

5) Remove the lower exhaust manifold 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)-9, REMOVAL, Center Exhaust Pipe.>

8) Remove the turbocharger. <Ref. to IN(H4DOTC)-12, REMOVAL, Turbocharger.>

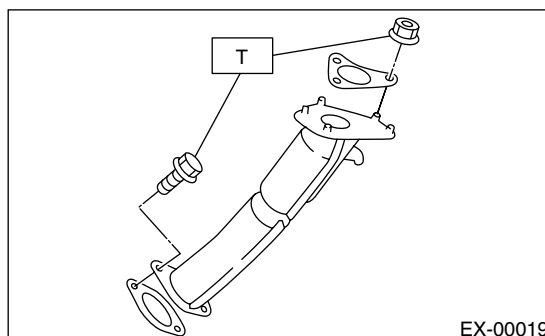
9) Take off the joint pipe in the upward direction.

### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)**



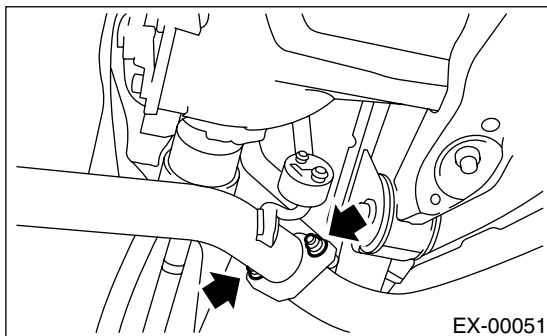
## 6. Muffler

### A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

#### CAUTION:

Be careful, the exhaust pipe is hot.



2) Remove the rubber cushions, and detach the muffler.

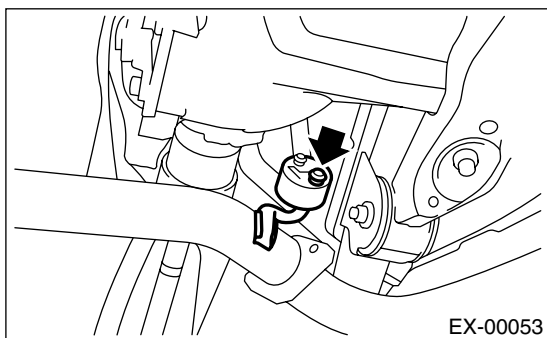
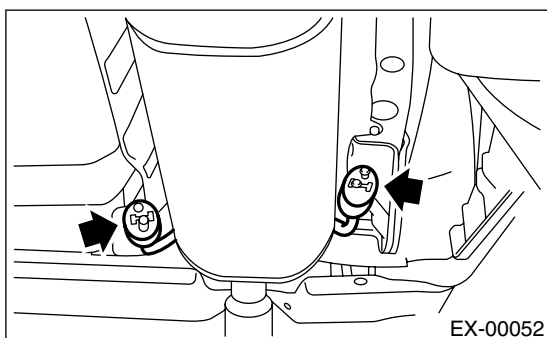
#### CAUTION:

Be careful not to drop the muffler during removal.

#### NOTE:

To facilitate removal, apply a coat of SUBARU CRC to the mating area of rubber cushions in advance.

**SUBARU CRC (Part No. 004301003)**



### B: INSTALLATION

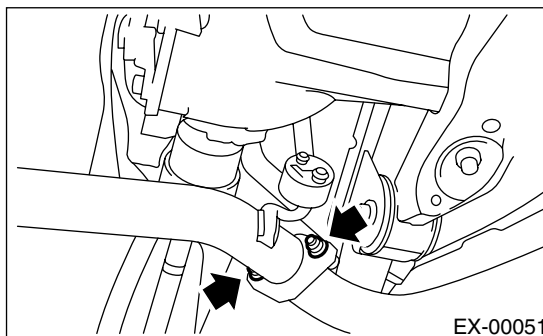
Install in the reverse order of removal.

#### NOTE:

Replace the gasket and self-locking nut with a new one.

#### Tightening torque:

**48 N·m (4.9 kgf-m, 35.4 ft-lb)**



### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

## MUFFLER

EXHAUST

---

MEMO:

## REAR EXHAUST PIPE

### EXHAUST

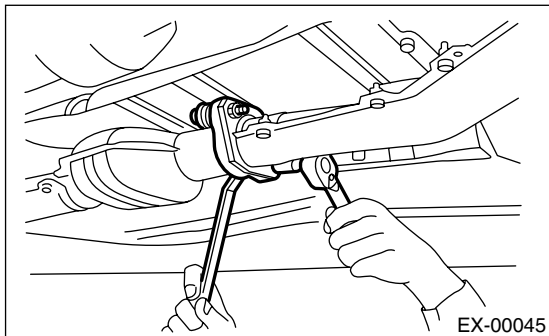
## 5. Rear Exhaust Pipe

### A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Separate the rear exhaust pipe from center exhaust pipe.

#### CAUTION:

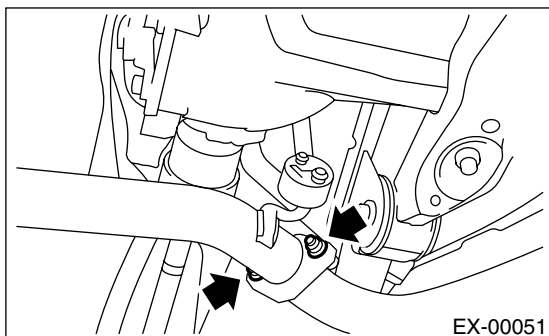
Be careful, the exhaust pipe is hot.



- 3) Separate the rear exhaust pipe from muffler.

#### CAUTION:

Be careful not to pull down the rear exhaust pipe.



- 4) Remove the rear exhaust pipe.

### B: INSTALLATION

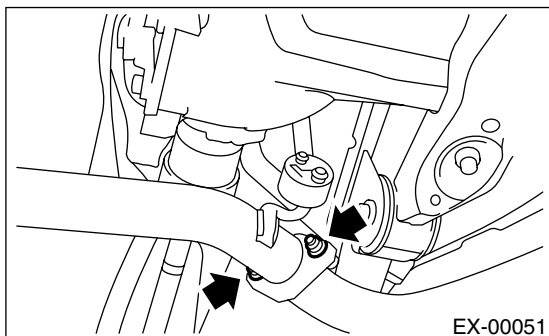
#### NOTE:

Replace the gaskets with new ones.

- 1) Install the rear exhaust pipe to muffler.

#### Tightening torque:

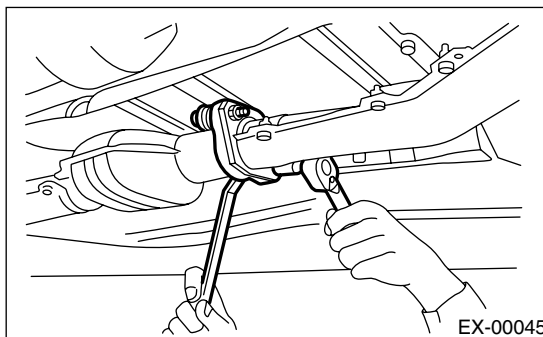
**48 N·m (4.9 kgf-m, 35.4 ft-lb)**



- 2) Install the rear exhaust pipe to center exhaust pipe.

#### Tightening torque:

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



- 3) Lower the vehicle.

### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

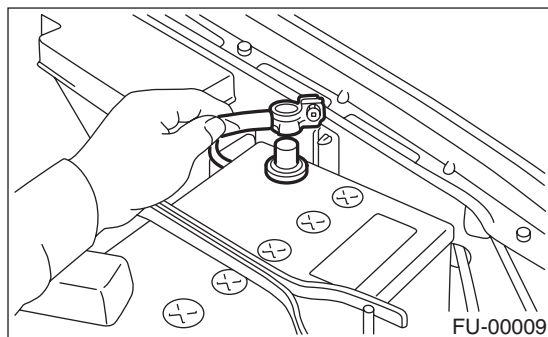
# CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

## 6. Camshaft Position Sensor

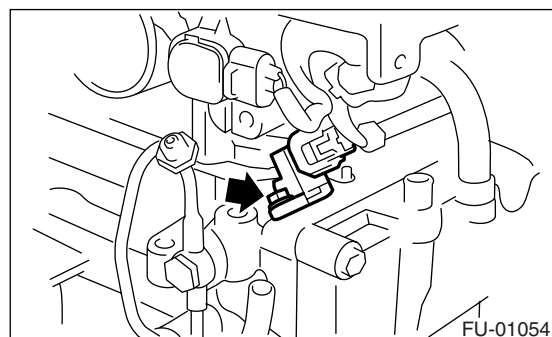
### A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the camshaft position sensor RH.

3) Remove the camshaft position sensor RH from the backside of cylinder head.



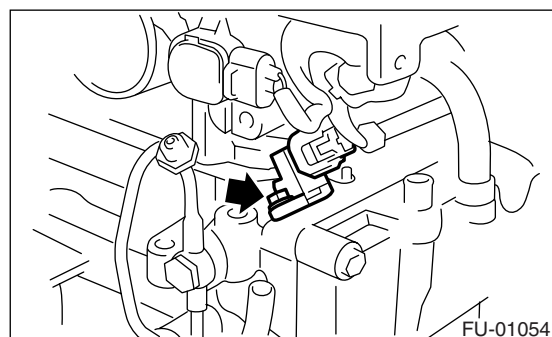
4) Remove the camshaft position sensor LH same as RH side.

### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



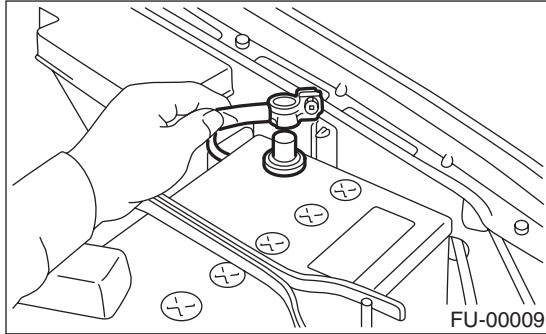
# CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

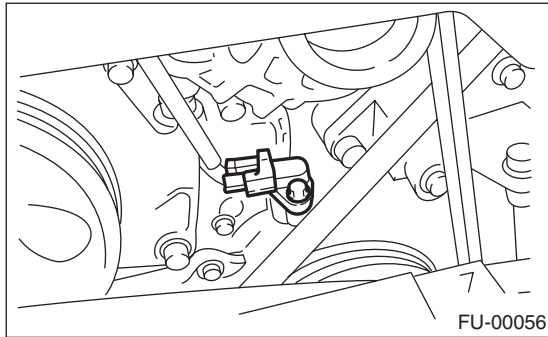
## 5. Crankshaft Position Sensor

### A: REMOVAL

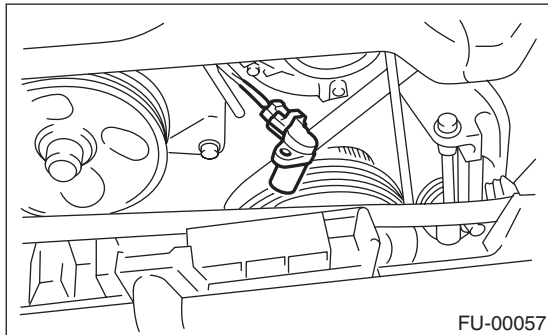
1) Disconnect the ground cable from battery.



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



3) Remove the crankshaft position sensor, and disconnect the connector from it.

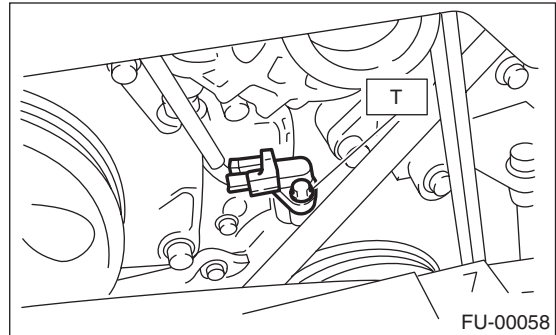


### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



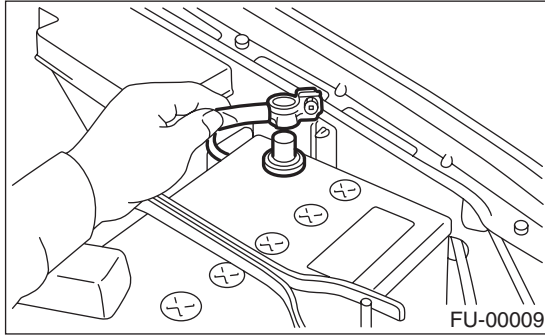
# ENGINE CONTROL MODULE (ECM)

## FUEL INJECTION (FUEL SYSTEMS)

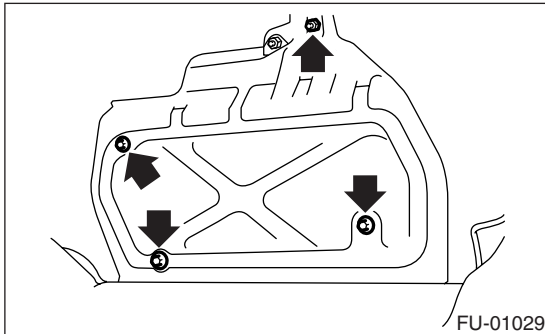
### 17.Engine Control Module (ECM)

#### A: REMOVAL

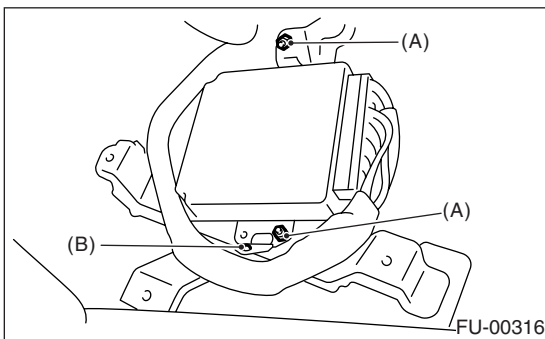
- 1) Disconnect the ground cable from battery.



- 2) Remove the lower inner trim of the passenger side. <Ref. to EI-41, REMOVAL, Lower Inner Trim.>
- 3) Detach the floor mat of the front passenger seat.
- 4) Remove the protect cover.



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



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

#### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

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

# ENGINE COOLANT TEMPERATURE SENSOR

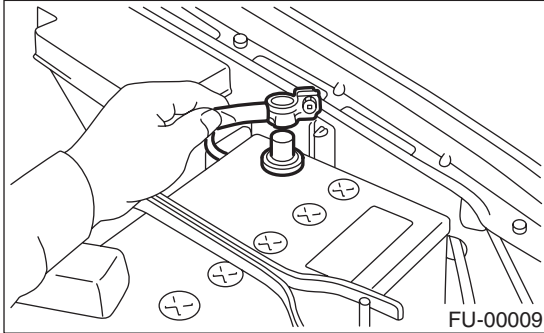
FUEL INJECTION (FUEL SYSTEMS)

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## 4. Engine Coolant Temperature Sensor

### A: REMOVAL

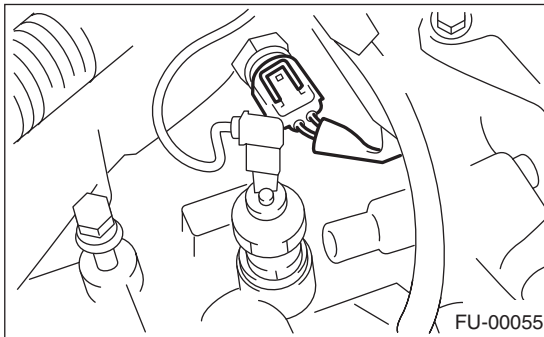
1) Disconnect the ground cable from battery.



2) Remove the generator. <Ref. to SC(H4SO)-15, REMOVAL, Generator.>

3) Drain the engine coolant. <Ref. to CO(H4SO)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

4) Disconnect the connector from the engine coolant temperature sensor.



5) Remove the engine coolant temperature sensor.

### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.3 ft-lb)**

## ENGINE CONTROL MODULE (ECM)

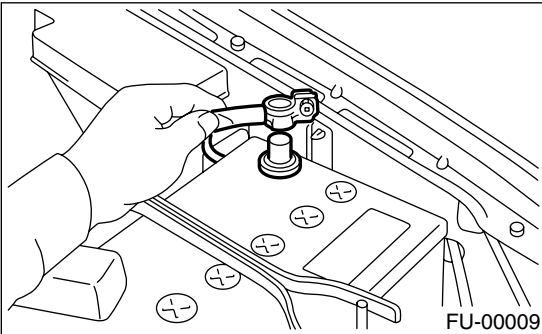
### FUEL INJECTION (FUEL SYSTEMS)

---

## 17.Engine Control Module (ECM)

### A: REMOVAL

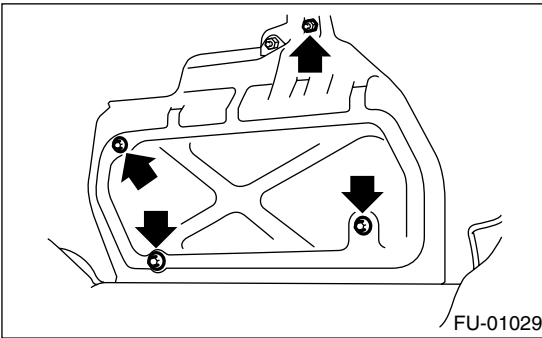
- 1) Disconnect the ground cable from battery.



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

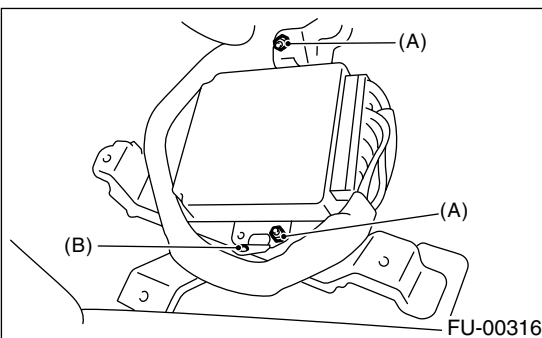
<Ref. to EI-51, REMOVAL, Lower Inner Trim.>

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



- 5) Remove the nuts (A) which hold ECM to the bracket.

- 6) Remove the clip (B) from the bracket.



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

### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

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

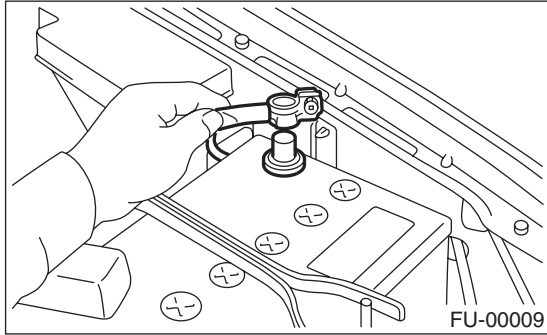
# EXHAUST TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

## 16.Exhaust Temperature Sensor

### A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the joint pipe. <Ref. to EX(H4DOTC)-12, REMOVAL, Joint Pipe.>

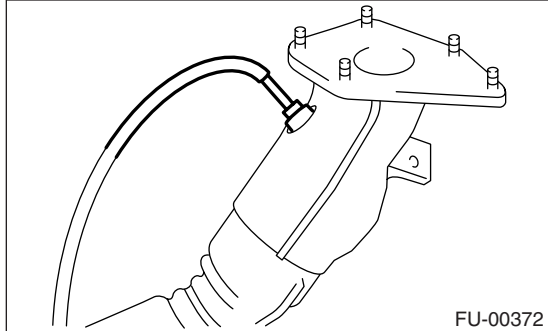
3) Apply SUBARU CRC or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for 1 minute or more.

**SUBARU CRC (Part No. 004301003)**

4) Remove the exhaust temperature sensor.

#### CAUTION:

**When removing the exhaust temperature sensor, wait until the exhaust pipe cools, otherwise it will damage exhaust pipe.**



### B: INSTALLATION

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

#### CAUTION:

**Never apply anti-seize compound to the protector of exhaust temperature sensor.**

**Anti-seize compound:**

**JET LUBE SS-30**

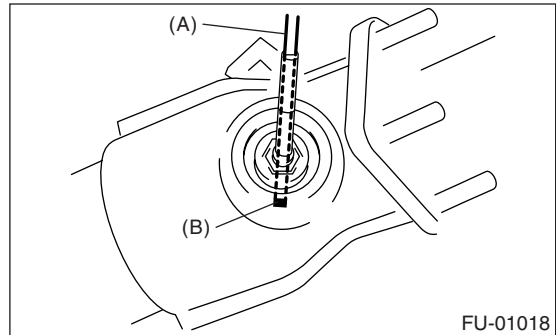
2) Install the exhaust temperature sensor.

#### NOTE:

Align the harness (A) of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

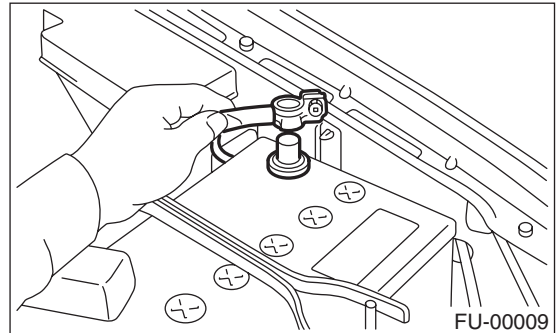
#### Tightening torque:

**21 N·m (2.1 kgf-m, 15.2 ft-lb)**



3) Install the joint pipe. <Ref. to EX(H4DOTC)-12, INSTALLATION, Joint Pipe.>

4) Connect the battery ground cable to battery.



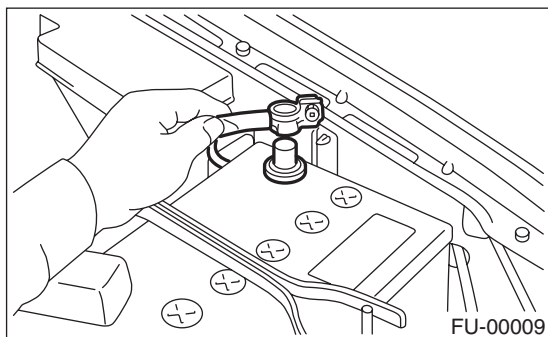
# FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

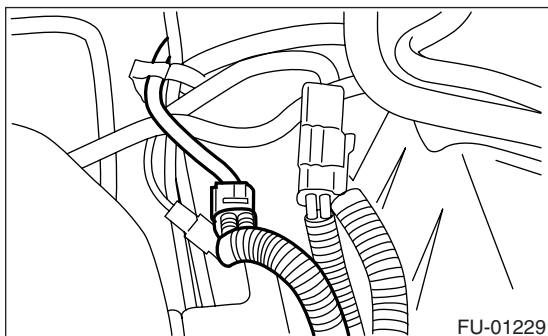
## 14.Front Oxygen (A/F) Sensor

### A: REMOVAL

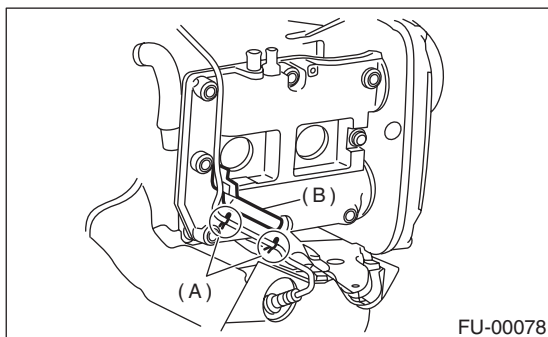
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the front oxygen (A/F) sensor.



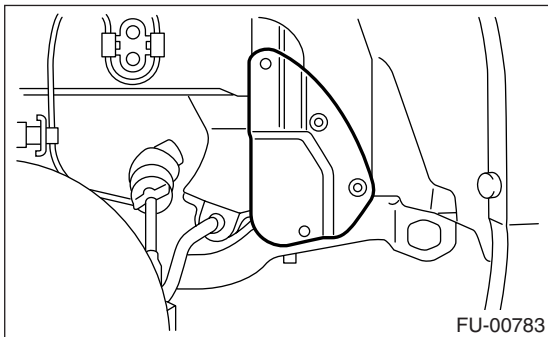
3) Disconnect the engine harness fixed by clip (A) from the bracket (B).



4) Remove the front right side wheel.

5) Lift-up the vehicle.

6) Remove the service hole cover.



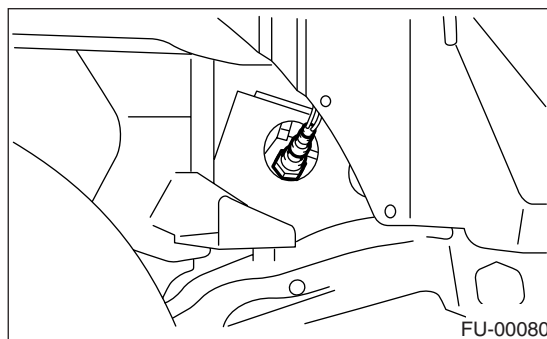
7) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

**SUBARU CRC (Part No. 004301003)**

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

### CAUTION:

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



# FRONT OXYGEN (A/F) SENSOR

## FUEL INJECTION (FUEL SYSTEMS)

### B: INSTALLATION

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

**Anti-seize compound:**

**SS-30 by JET LUBE**

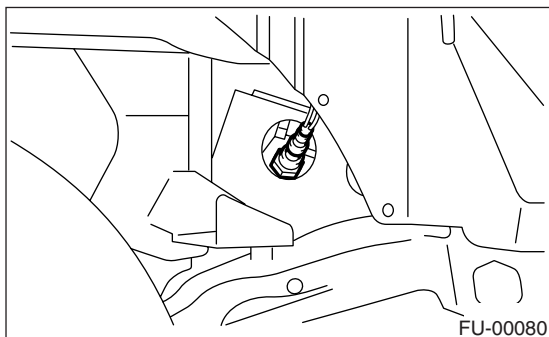
#### CAUTION:

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

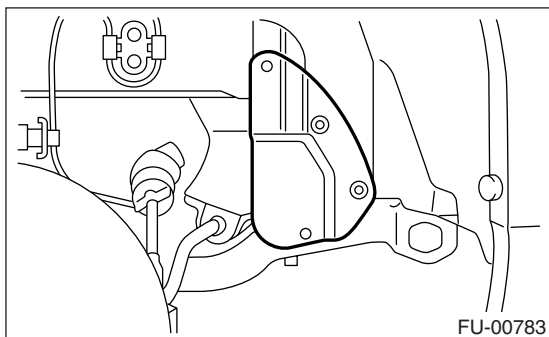
2) Install the front oxygen (A/F) sensor.

**Tightening torque:**

**30 N·m (3.1 kgf-m, 22.1 ft-lb)**



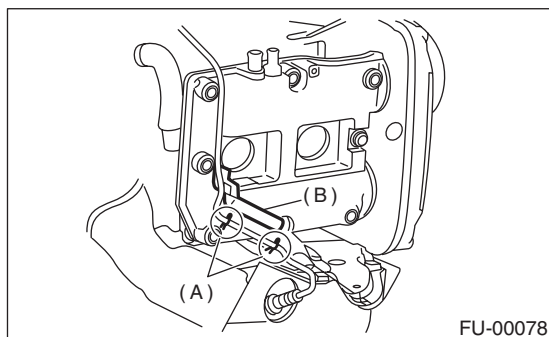
3) Install the service hole cover.



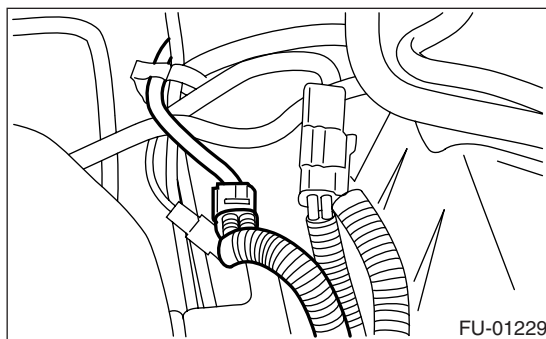
4) Lower the vehicle.

5) Install the front right side wheel.

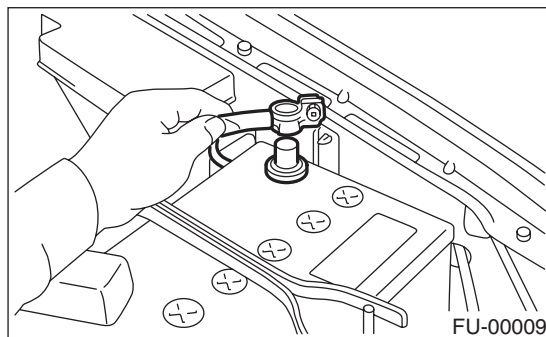
6) Connect the engine harness to the bracket (B) using clips (A).



7) Connect the connector of front oxygen (A/F) sensor.



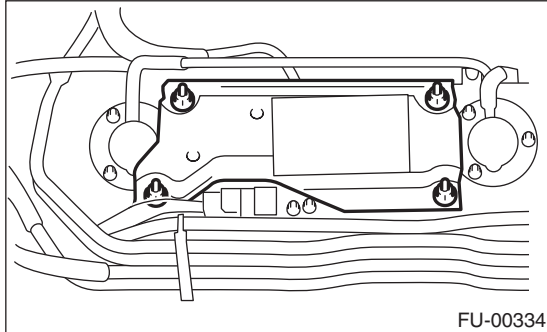
8) Connect the battery ground cable to battery.



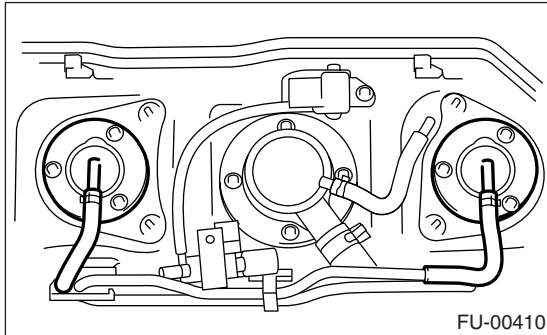
## 28. Fuel Cut Valve

### A: REMOVAL

- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-47, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



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



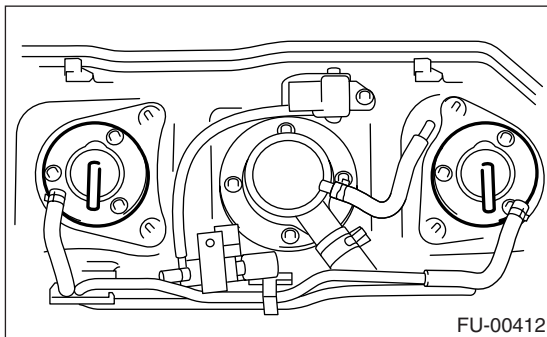
- 4) Remove the bolts which install the fuel cut valve.

### B: INSTALLATION

Install in the reverse order of removal.

#### ***Tightening torque:***

***4.4 N·m (0.45 kgf-m, 3.3 ft-lb)***

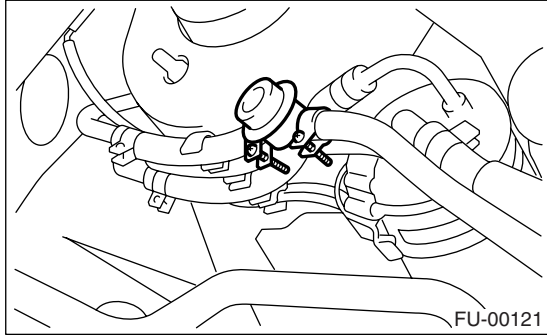


### 29. Fuel Damper Valve

#### A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

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



#### B: INSTALLATION

Install in the reverse order of removal.

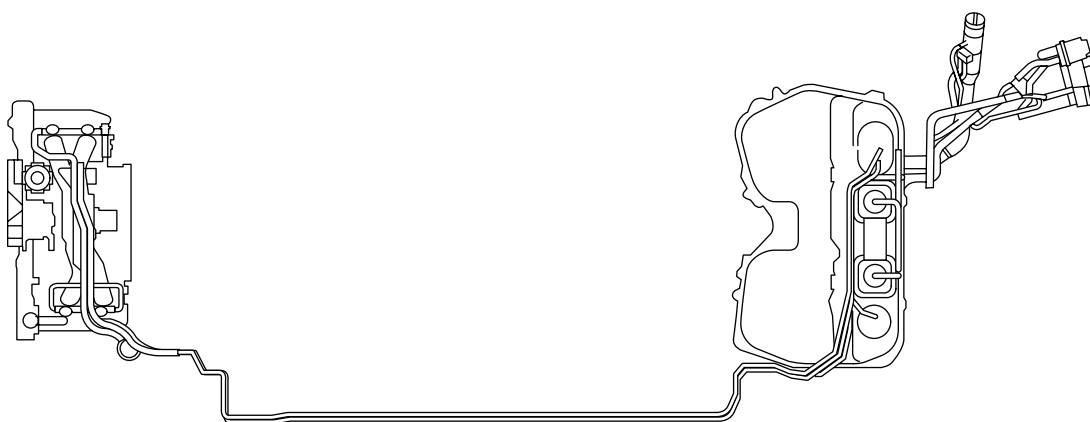
**Tightening torque:**

**1.25 N·m (0.13 kgf-m, 0.94 ft-lb)**

## 30. Fuel Delivery, Return and Evaporation Lines

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-46, REMOVAL, Floor Mat.>
- 5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

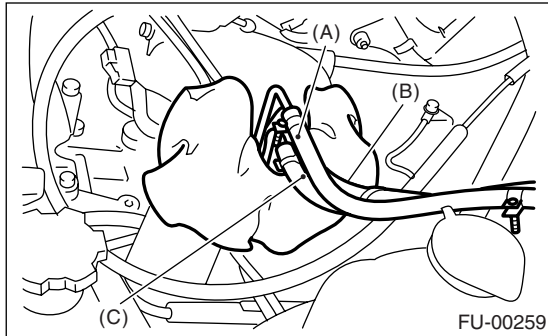


FU-01241

# FUEL DELIVERY, RETURN AND EVAPORATION LINES

## FUEL INJECTION (FUEL SYSTEMS)

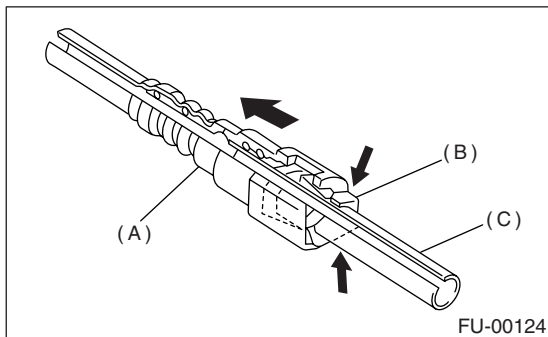
6) In engine compartment, detach the fuel delivery hose (A), return hose (B) and evaporation hose (C).



7) Lift-up the vehicle.

8) Separate the quick connector on the fuel delivery line.

- (1) Clean the pipe and connector, if they are covered with dust.
- (2) Hold the connector (A) and push retainer (B) down.
- (3) Pull out the connector (A) from retainer (B).



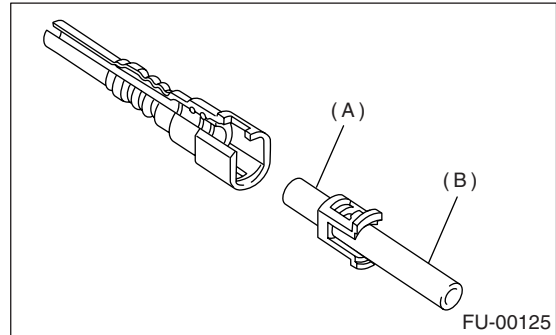
- (A) Connector  
(B) Retainer  
(C) Pipe

## B: INSTALLATION

1) Connect the quick connector on the fuel delivery line.

### NOTE:

- Always use a new retainer.
- Make sure that the connected portion is not damaged or has no dust. If necessary, clean seal surface of pipe.

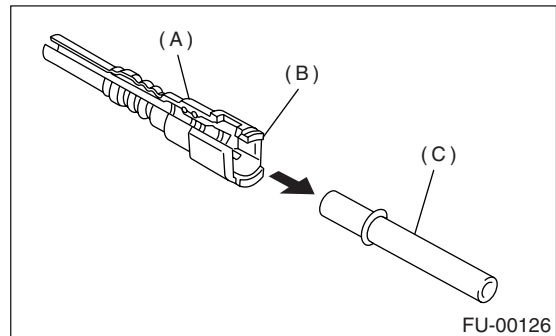


- (A) Seal surface  
(B) Pipe

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

### NOTE:

At this time, two clicking sounds are heard.



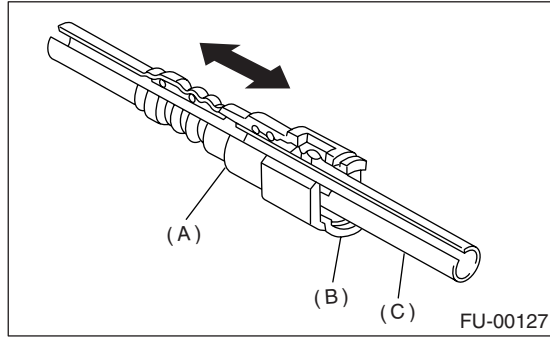
- (A) Connector  
(B) Retainer  
(C) Pipe

# FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

## CAUTION:

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



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

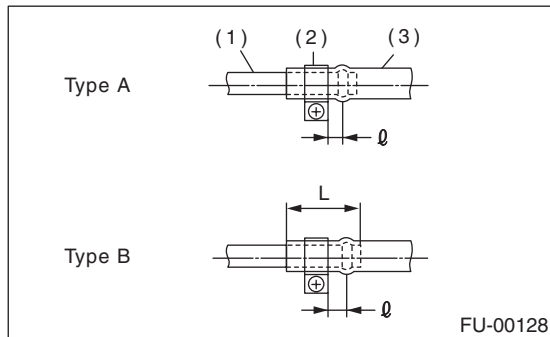
2) Connect the fuel delivery hose and return hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When the fitting length is specified.

Type B: When the fitting length is not specified.

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

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



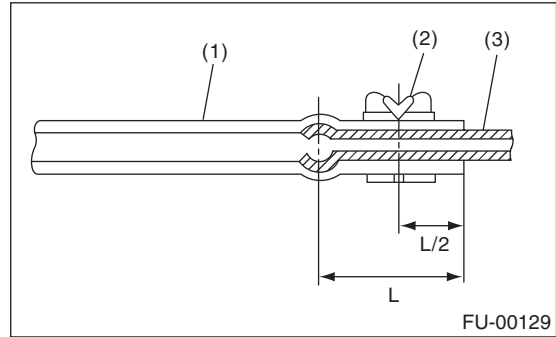
- (1) Pipe  
(2) Clamp  
(3) Hose

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

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

## CAUTION:

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



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

## C: INSPECTION

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

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

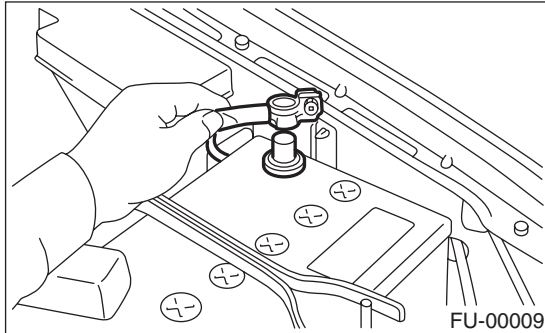
### 23. Fuel Filler Pipe

#### A: REMOVAL

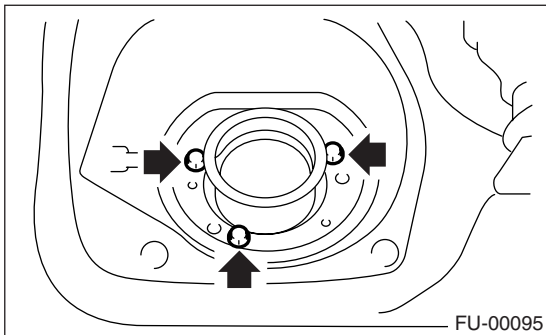
##### WARNING:

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

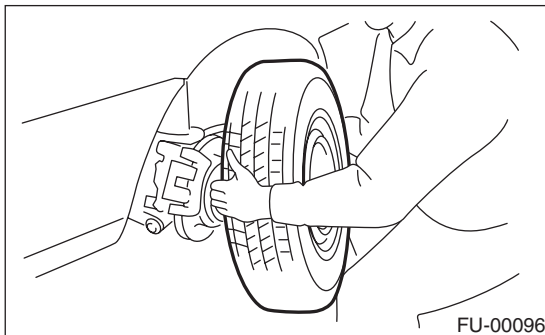
- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove the filler cap.
- 3) Disconnect the ground cable from battery.



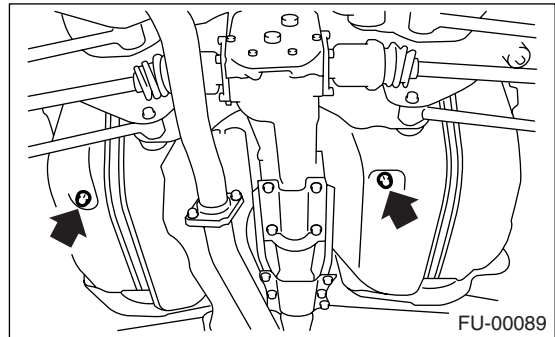
- 4) Remove the screws holding packing in place.



- 5) Lift-up the vehicle.
- 6) Remove the rear right side wheel nuts.
- 7) Remove the rear right side wheel.



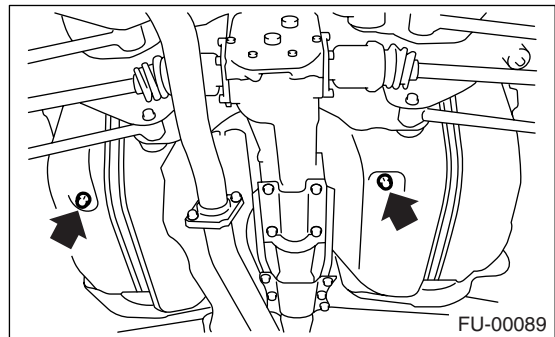
- 8) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from the fuel tank.



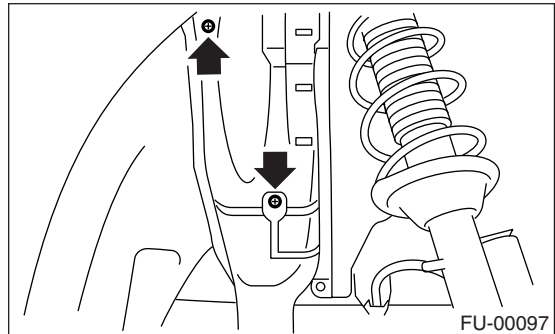
- 9) Tighten the fuel drain plug.

##### Tightening torque:

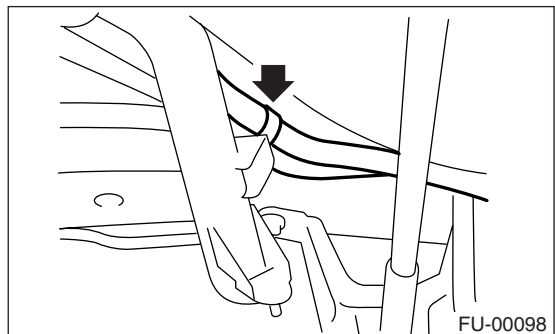
**26 N·m (2.65 kgf·m, 19.2 ft·lb)**



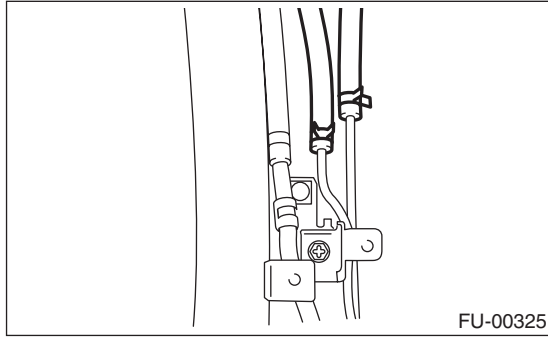
- 10) Remove the fuel filler pipe protector.



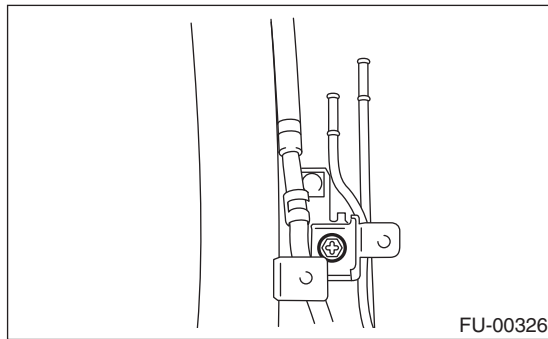
- 11) Separate the evaporation hoses from the clip of fuel filler pipe.



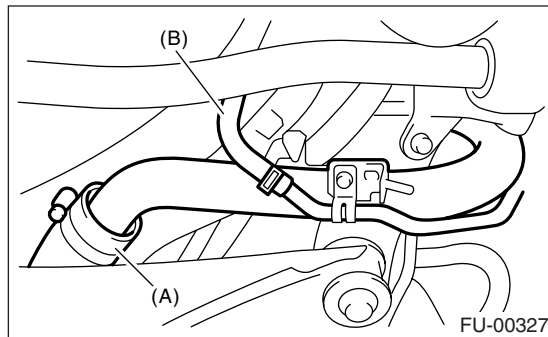
- 12) Disconnect the evaporation hoses from the pipes.



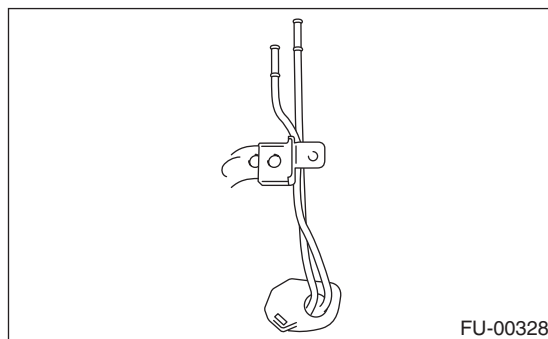
- 13) Remove the bolts which hold the fuel filler pipe bracket on the body.



- 14) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.  
15) Loosen the clip and separate the evaporation hose (B).

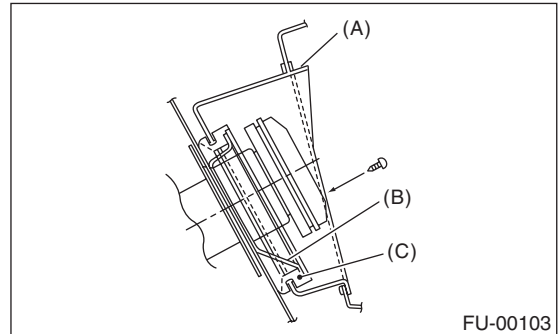


- 16) Remove the fuel filler pipe to under side of the vehicle.  
17) Remove the evaporation pipe together with clip from the body.



## B: INSTALLATION

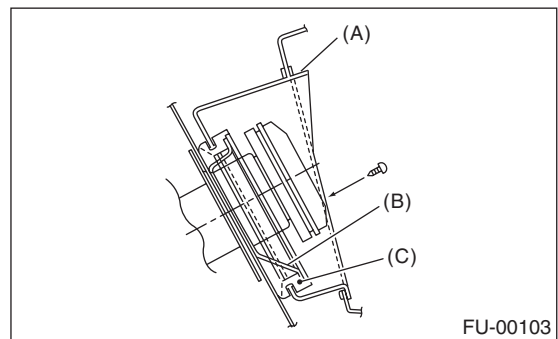
- 1) Hold the fuel filler flap lid open.  
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.



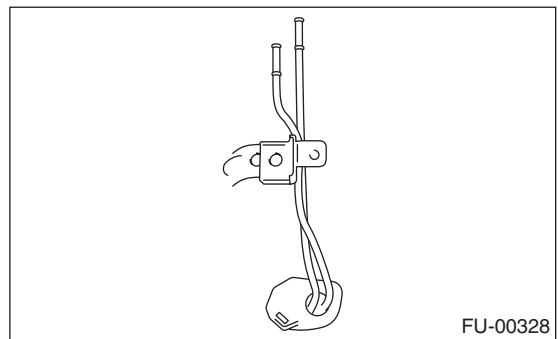
- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

### NOTE:

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



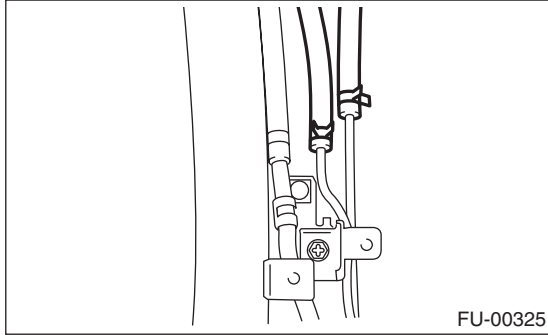
- 4) Install the evaporation pipe.



## FUEL FILLER PIPE

### FUEL INJECTION (FUEL SYSTEMS)

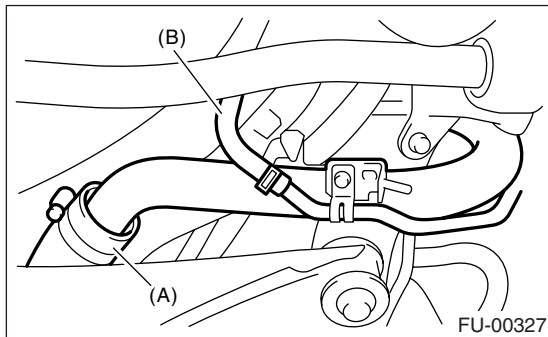
5) Connect the evaporation hose to the pipe.



6) Insert the fuel filler hose (A) approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

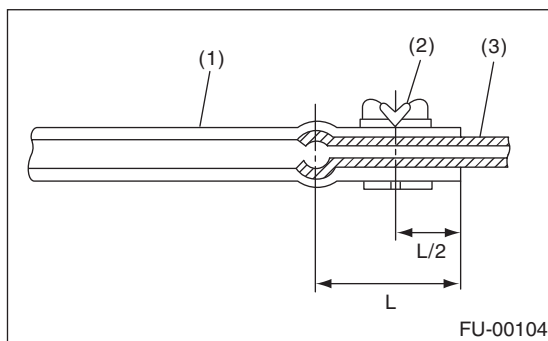
#### CAUTION:

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



7) Insert the evaporation hose approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold the clip.

**L : 27.5±2.5 mm (1.083±0.098 in)**

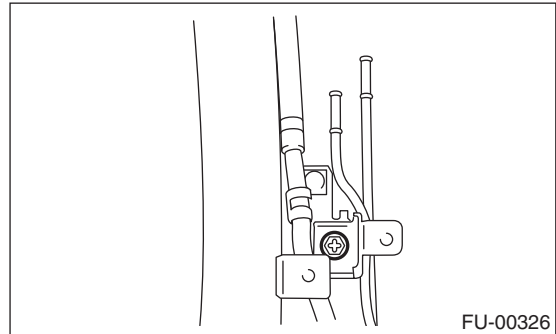


- (1) Hose
- (2) Clip
- (3) Pipe

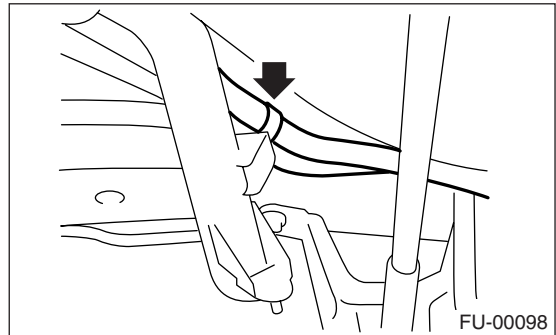
8) Tighten the bolt which holds the fuel filler pipe bracket on the body.

#### Tightening torque:

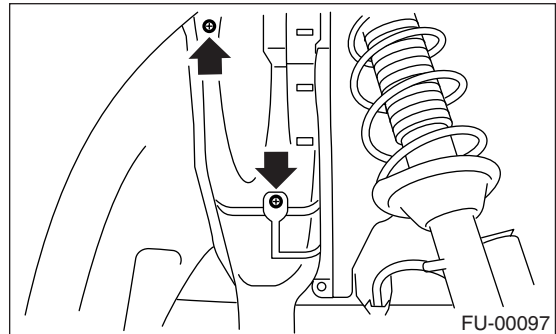
**7.5 N·m (0.75 kgf-m, 5.4 ft-lb)**



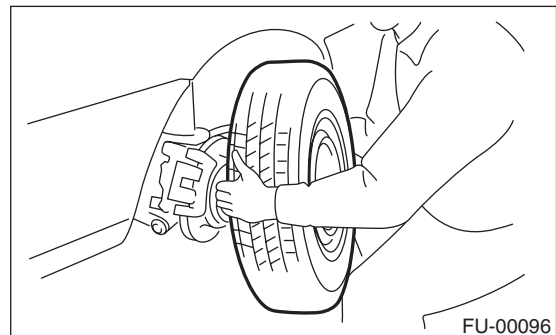
9) Secure the evaporation hose to clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



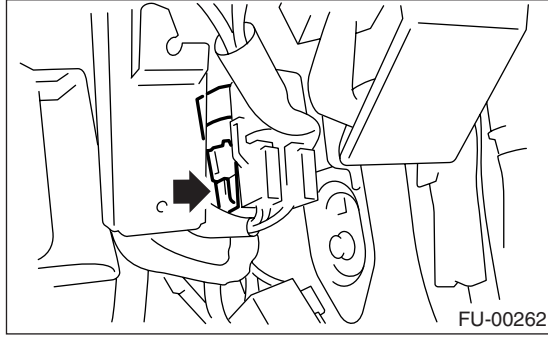
11) Install the rear right wheel.



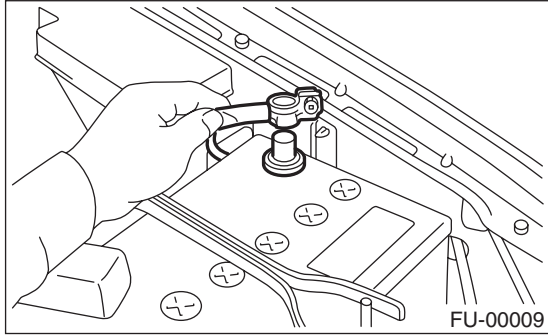
12) Lower the vehicle.

13) Tighten the wheel nuts.

14) Connect the connector to the fuel pump relay.

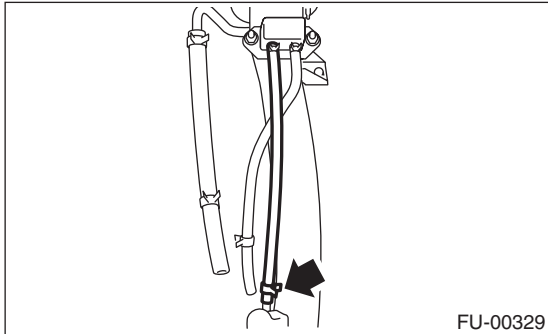


15) Connect the battery ground terminal.

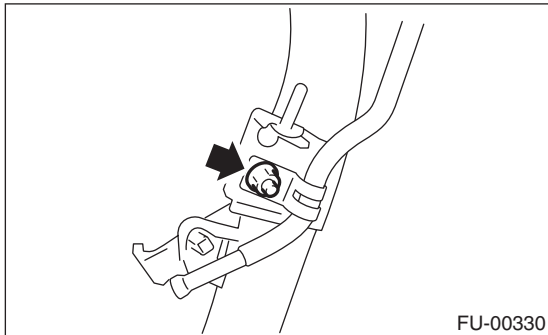


### C: DISASSEMBLY

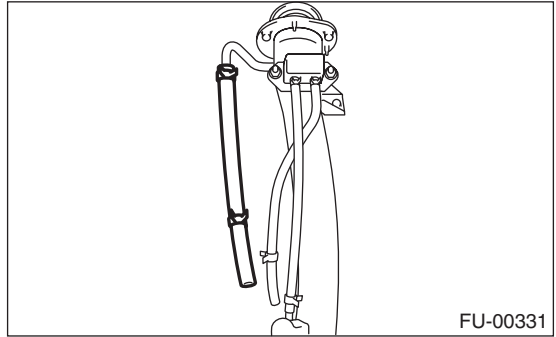
1) Move the clip, and disconnect the evaporation hose from the joint pipe.



2) Remove the bolt which installs the joint pipe on the fuel filler pipe.



3) Disconnect the evaporation hose from the fuel filler pipe.

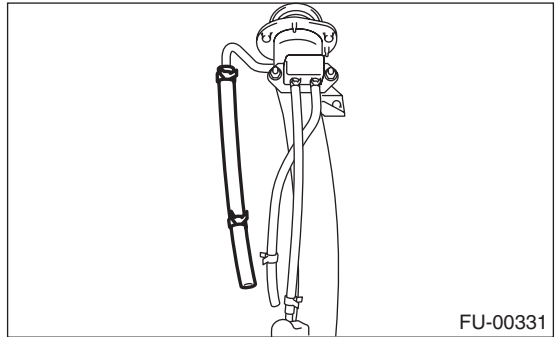


4) Remove the shut valve from the fuel filler pipe. <Ref. to EC(H4DOTC)-18, REMOVAL, Shut Valve.>

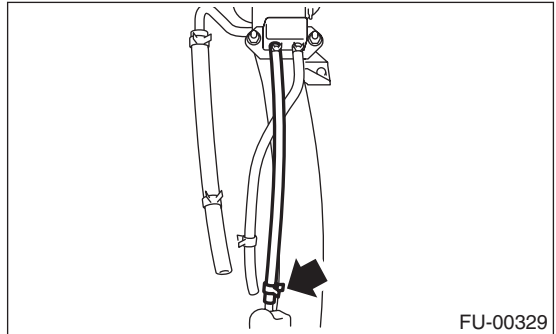
### D: ASSEMBLY

1) Install the shut valve on the fuel filler pipe. <Ref. to EC(H4DOTC)-18, INSTALLATION, Shut Valve.>

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



3) Connect the evaporation hose to the evaporation pipe.

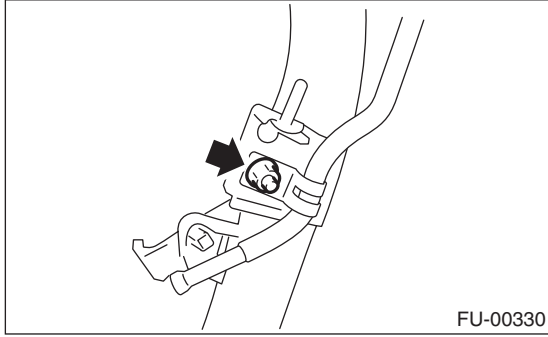


## FUEL FILLER PIPE

### FUEL INJECTION (FUEL SYSTEMS)

---

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



# FUEL FILTER

FUEL INJECTION (FUEL SYSTEMS)

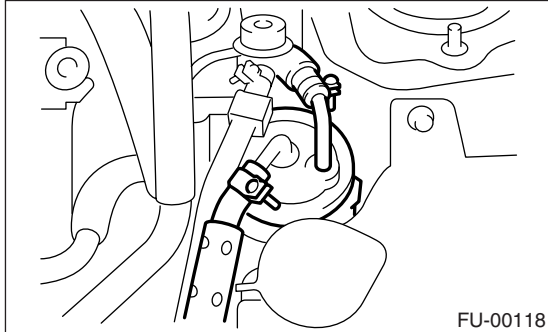
## 27. Fuel Filter

### A: REMOVAL

#### WARNING:

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

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Disconnect the fuel delivery hoses from the fuel filter.



- 3) Remove the filter from the holder.

### B: INSTALLATION

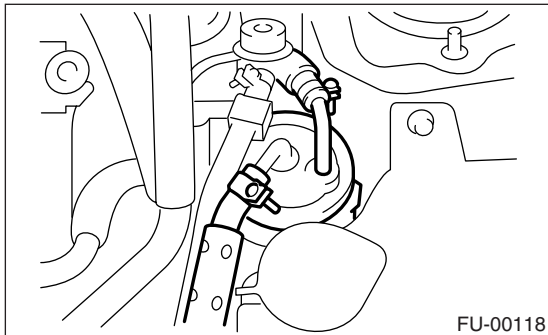
#### CAUTION:

- If fuel hoses are damaged at the connecting portion, replace them with new ones.
- If clamps are badly damaged, replace them with new ones.

- 1) Install in the reverse order of removal.
- 2) Tighten the hose clamp screws.

#### Tightening torque:

**1.25 N·m (0.13 kgf-m, 0.94 ft-lb)**



### C: INSPECTION

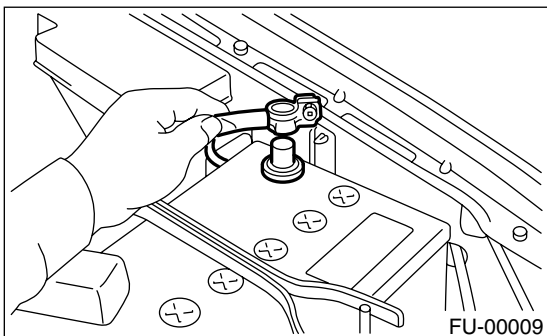
- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if the replacement interval has been reached, replace it.
- 3) If the water is found in it, shake fuel filter and expel the water from the inlet port.
- 4) If fuel hoses are damaged at the connecting portion, replace it with a new one.
- 5) If clamps are badly damaged, replace with new ones.

### 10. Fuel Injector

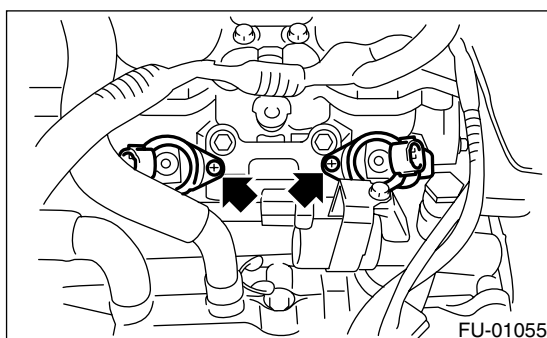
#### A: REMOVAL

##### 1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.

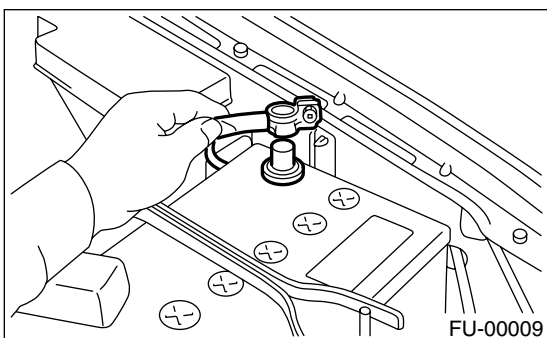


- 4) Disconnect the connector from the fuel injector.
- 5) Remove the screw and remove the fuel injector.

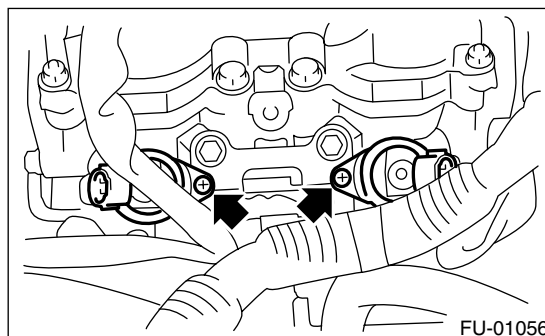


##### 2. LH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the fuel injector.
- 6) Remove the screw and remove the fuel injector.



#### B: INSTALLATION

##### 1. RH SIDE

Install in the reverse order of removal.

NOTE:

Replace the O-rings with new ones.

##### 2. LH SIDE

Install in the reverse order of removal.

NOTE:

Replace the O-rings with new ones.

## 25. Fuel Level Sensor

### A: REMOVAL

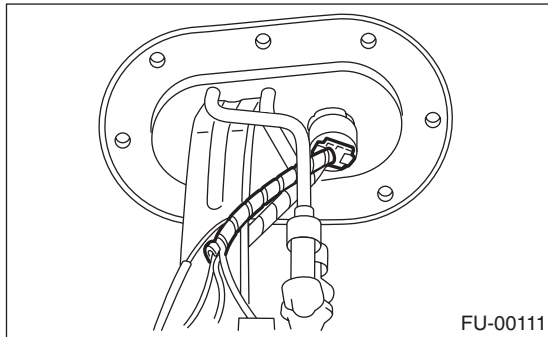
#### WARNING:

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

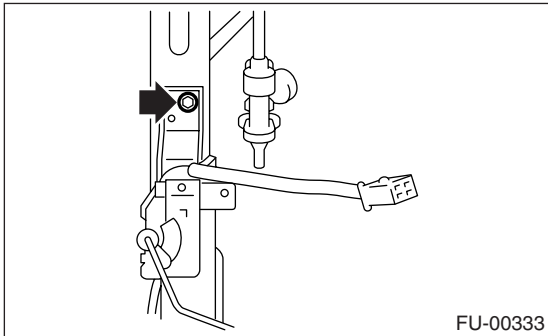
#### NOTE:

Fuel level sensor is built in fuel pump assembly.

- 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-55, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from the fuel pump bracket.



- 3) Remove the bolt which installs the fuel level sensor on the mounting bracket.



### B: INSTALLATION

Install in the reverse order of removal.

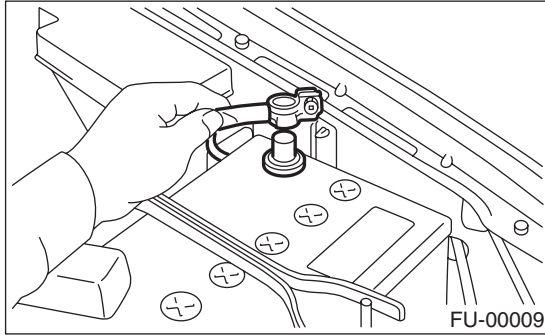
#### ***Tightening torque:***

***4.4 N·m (0.45 kgf-m, 3.3 ft-lb)***

## 20. Fuel Pump Control Unit

### A: REMOVAL

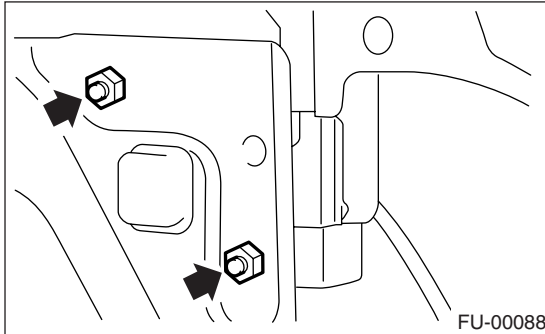
1) Disconnect the ground cable from battery.



2) Remove the rear quarter trim. <Ref. to EI-42, REMOVAL, Rear Quarter Trim.>

3) Disconnect the connector from the fuel pump control unit.

4) Remove the fuel pump control unit.



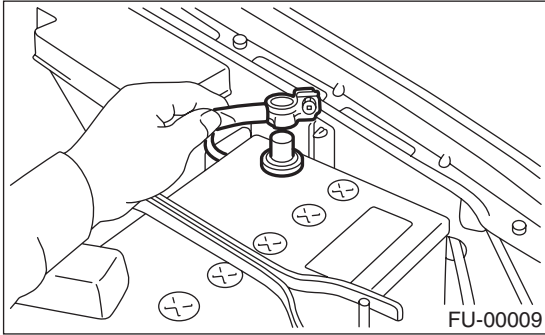
### B: INSTALLATION

Install in the reverse order of removal.

### 19. Fuel Pump Relay

#### A: REMOVAL

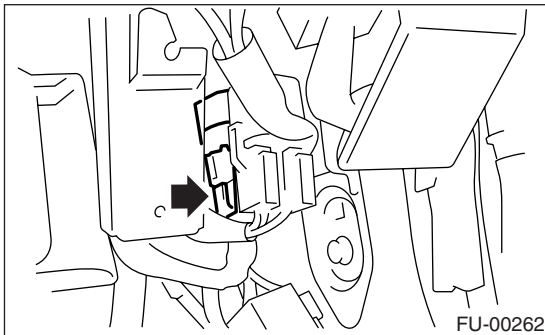
1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-34, REMOVAL, Glove Box.>

3) Remove the bolt which holds fuel pump relay bracket on the body.

4) Disconnect the connector from the fuel pump relay.



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

#### B: INSTALLATION

Install in the reverse order of removal.

## FUEL PUMP

### FUEL INJECTION (FUEL SYSTEMS)

## 25. Fuel Pump

### A: REMOVAL

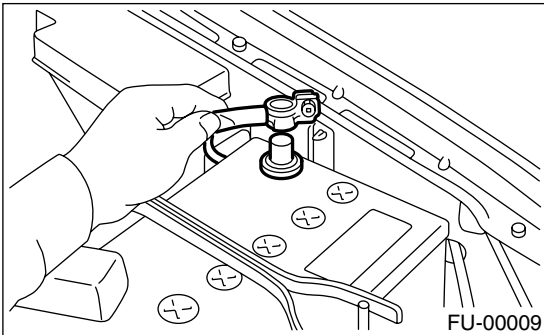
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.
- During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.

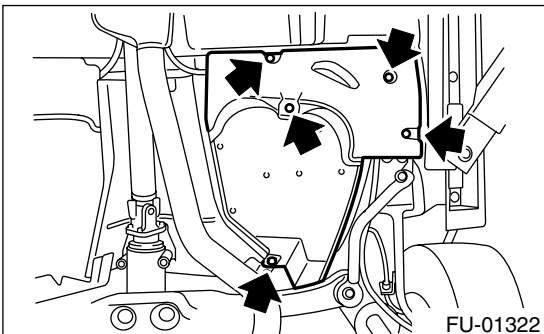
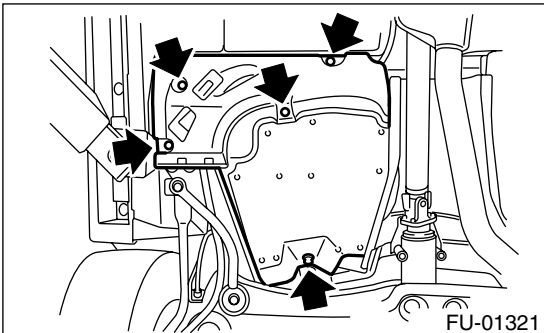
#### NOTE:

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

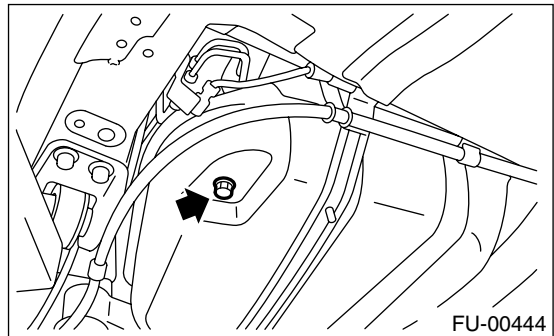
- 1) Release fuel pressure. <Ref. to FU(H4DOTC)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect battery ground cable.



- 4) Lift-up the vehicle.
- 5) Remove front side fuel tank cover.



- 6) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



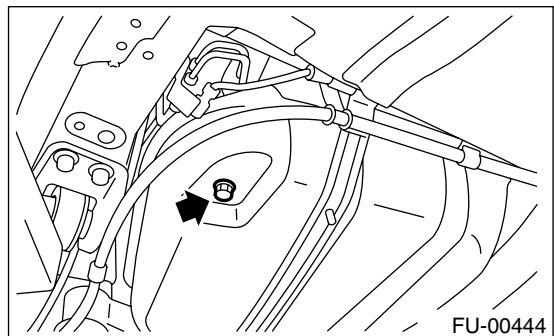
- 7) Tighten fuel drain plug and install front right side fuel tank cover.

#### NOTE:

Replace gasket with new one.

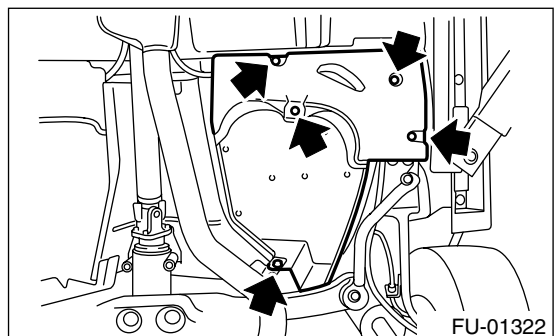
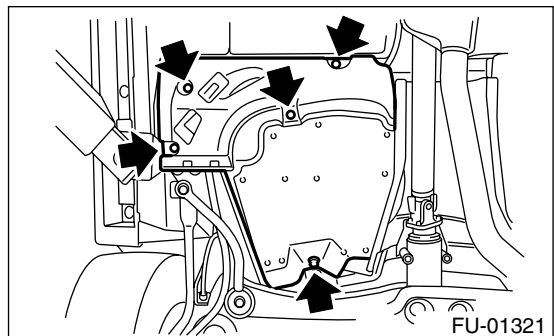
#### Tightening torque:

**26 N·m (2.65 kgf-m, 19.2 ft-lb)**



#### Tightening torque:

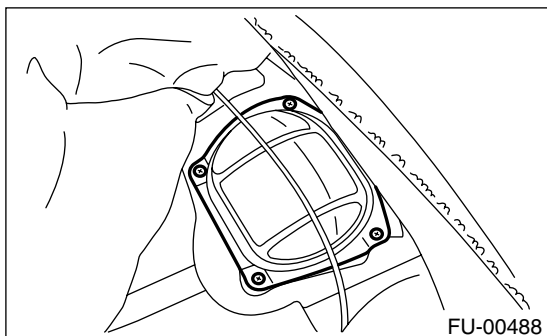
**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



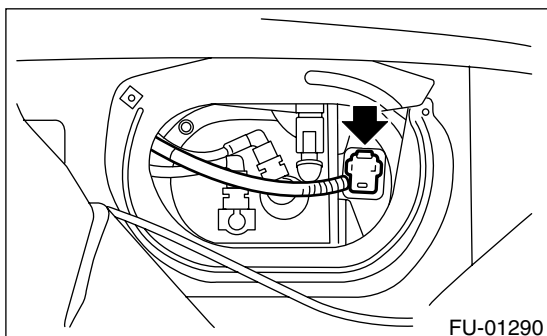
# FUEL PUMP

## FUEL INJECTION (FUEL SYSTEMS)

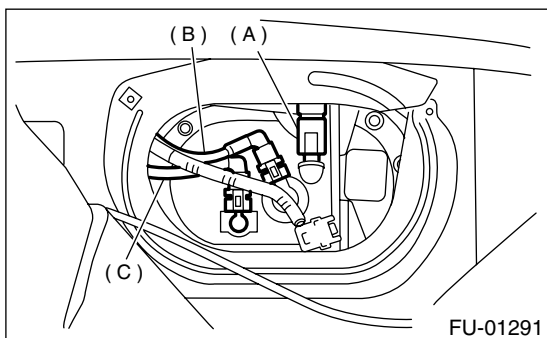
- 8) Raise rear seat and turn floor mat up.
- 9) Remove access hole lid.



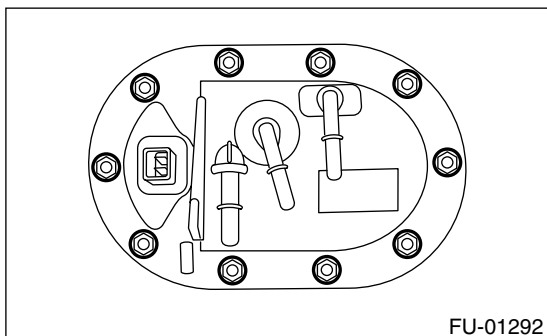
- 10) Disconnect connector from fuel pump.



- 11) Move clips and then disconnect jet pump hose (C).
- 12) Disconnect quick connector and then disconnect fuel delivery hose (A) and return hose (B).  
<Ref. to FU(H4DOTC)-74, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



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



- 14) Take off fuel pump assembly from fuel tank.

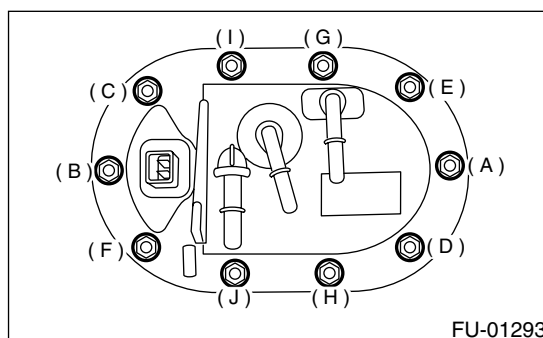
### B: INSTALLATION

Install in the reverse order of removal. Do the following:

- (1) Always use new gaskets.
- (2) Ensure sealing portion is free from fuel or foreign particles before installation.
- (3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

**Tightening torque:**

**5.9 N·m (0.6 kgf-m, 4.3 ft-lb)**

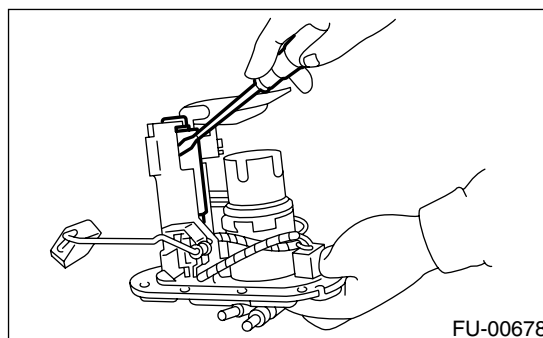


### C: Disassembly

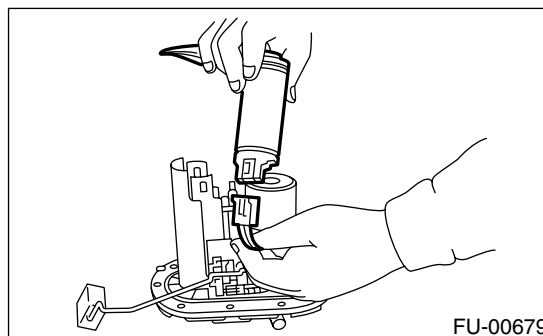
- 1) Remove fuel pump and pump holder.

NOTE:

When disassembling pump holder, be careful as it is installed with two pawls.



- 2) Disconnect connector from fuel pump.



### D: ASSEMBLY

Assemble in the reverse order of disassembly.

## FUEL PUMP

### FUEL INJECTION (FUEL SYSTEMS)

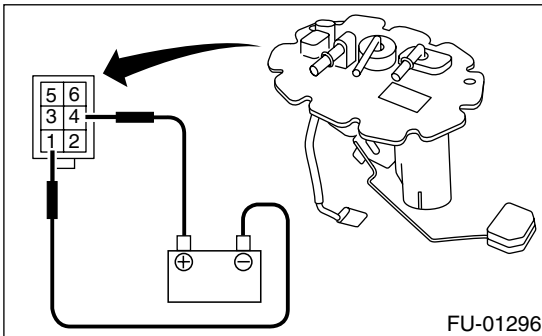
---

#### E: INSPECTION

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

##### WARNING:

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



# FUEL SUB LEVEL SENSOR

## FUEL INJECTION (FUEL SYSTEMS)

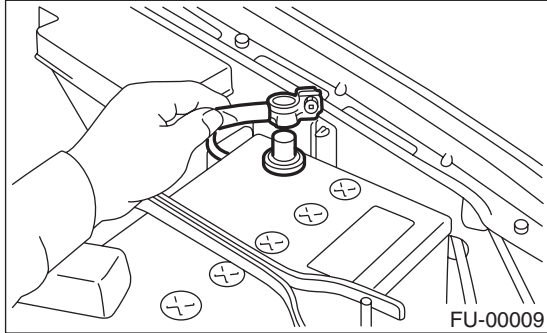
### 26. Fuel Sub Level Sensor

#### A: REMOVAL

##### WARNING:

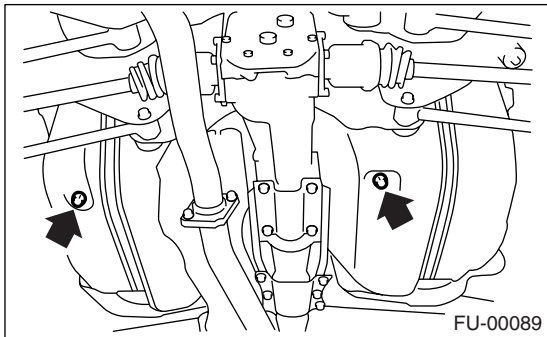
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.

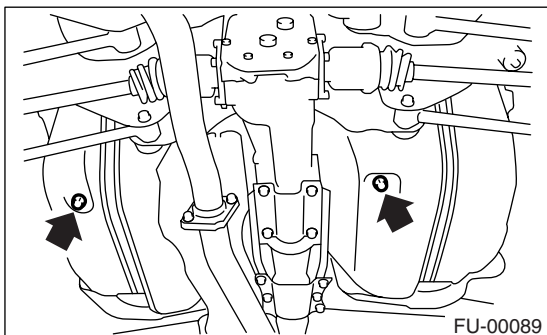
3) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from the fuel tank.



4) Tighten the fuel drain plug.

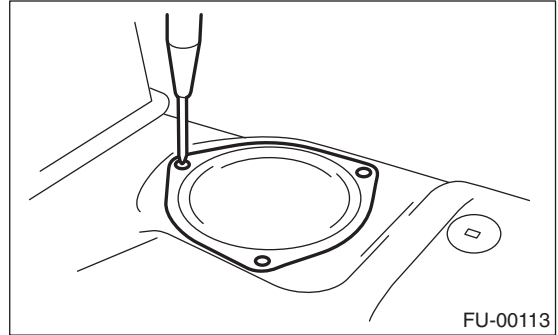
##### Tightening torque:

**26 N·m (2.65 kgf-m, 19.2 ft-lb)**



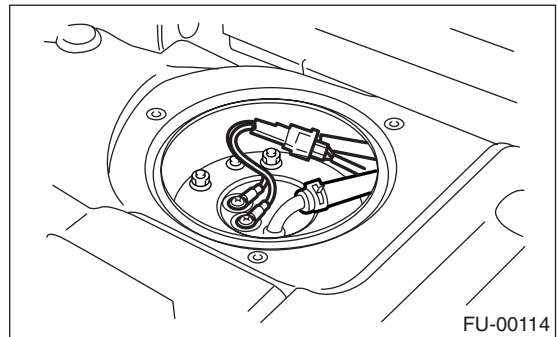
5) Remove the rear seat.

6) Remove the service hole cover.

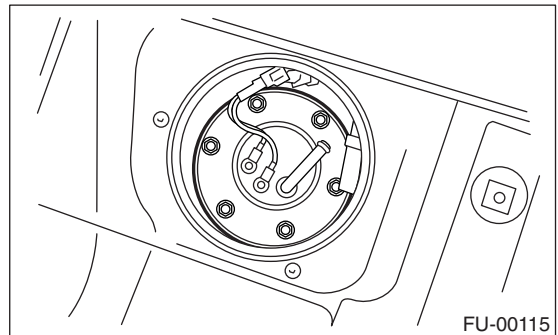


7) Disconnect the connector from the fuel sub meter.

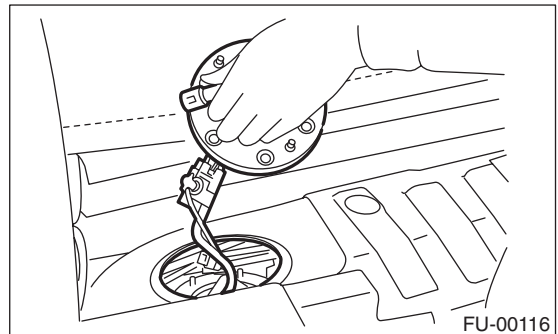
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install the fuel sub meter unit on the fuel tank.



10) Remove the fuel sub meter unit.

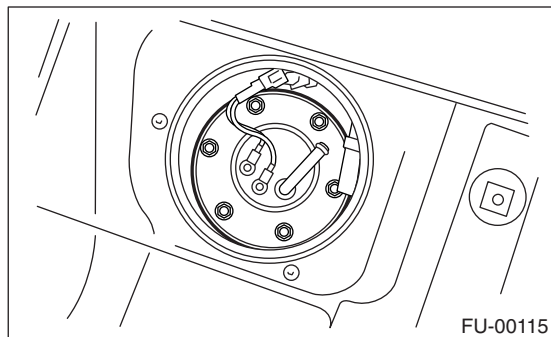


### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



# FUEL SYSTEM TROUBLE IN GENERAL

## FUEL INJECTION (FUEL SYSTEMS)

### 31. Fuel System Trouble in General

#### A: INSPECTION

| Trouble and possible cause                         |                                                                        | Corrective action                                             |
|----------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------|
| <b>1. Insufficient fuel supply to the injector</b> |                                                                        |                                                               |
| 1)                                                 | Fuel pump will not operate.                                            |                                                               |
|                                                    | ○ Defective terminal contact.                                          | Inspect connections, especially ground, and tighten securely. |
|                                                    | ○ Trouble in electromagnetic or electronic circuit parts.              | Replace fuel pump.                                            |
| 2)                                                 | Lowering of fuel pump function.                                        | Replace fuel pump.                                            |
| 3)                                                 | Clogged dust or water in the fuel filter.                              | Replace fuel filter, clean or replace fuel tank.              |
| 4)                                                 | Clogged or bent fuel pipe or hose.                                     | Clean, correct or replace fuel pipe or hose.                  |
| 5)                                                 | Air is mixed in the fuel system.                                       | Inspect or retighten each connection part.                    |
| 6)                                                 | Clogged or bent breather tube or pipe.                                 | Clean, correct or replace air breather tube or pipe.          |
| 7)                                                 | Damaged diaphragm of pressure regulator.                               | Replace.                                                      |
| <b>2. Leakage or blow out fuel</b>                 |                                                                        |                                                               |
| 1)                                                 | Loosened joints of the fuel pipe.                                      | Retightening.                                                 |
| 2)                                                 | Cracked fuel pipe, hose and fuel tank.                                 | Replace.                                                      |
| 3)                                                 | Defective welding part on the fuel tank.                               | Replace.                                                      |
| 4)                                                 | Defective drain packing of the fuel tank.                              | Replace.                                                      |
| 5)                                                 | Clogged or bent air breather tube or air vent tube.                    | Clean, correct or replace air breather tube or air vent tube. |
| <b>3. Gasoline smell inside of compartment</b>     |                                                                        |                                                               |
| 1)                                                 | Loose joints at air breather tube, air vent tube and fuel filler pipe. | Retightening.                                                 |
| 2)                                                 | Defective packing air tightness on the fuel saucer.                    | Correct or replace packing.                                   |
| 3)                                                 | Cracked fuel separator.                                                | Replace separator.                                            |
| 4)                                                 | Inoperative fuel pump modulator or circuit.                            | Replace.                                                      |
| <b>4. Defective fuel meter indicator</b>           |                                                                        |                                                               |
| 1)                                                 | Defective operation of fuel level sensor.                              | Replace.                                                      |
| 2)                                                 | Defective operation of fuel meter.                                     | Replace.                                                      |
| <b>5. Noise</b>                                    |                                                                        |                                                               |
| 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.

To prevent water condensation.

- Top off the fuel tank or drain the fuel completely.
  - Drain the water condensation from the fuel filter.
- Refilling the fuel tank.
- Refill the fuel tank while there is still some fuel left in the tank.
- Protecting the fuel system against freezing and water condensation.

#### (3) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the fuel tank. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain the water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

#### (4) Affected areas

When the water condensation is notched in the fuel filter, drain the water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

- Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

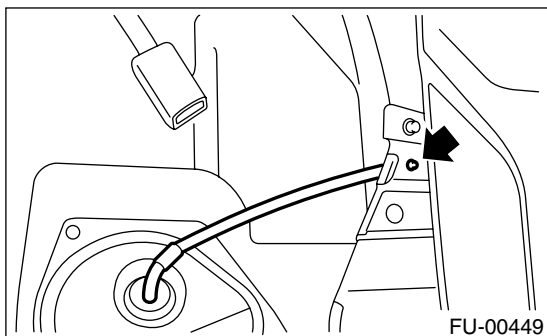
## FUEL TANK

### FUEL INJECTION (FUEL SYSTEMS)

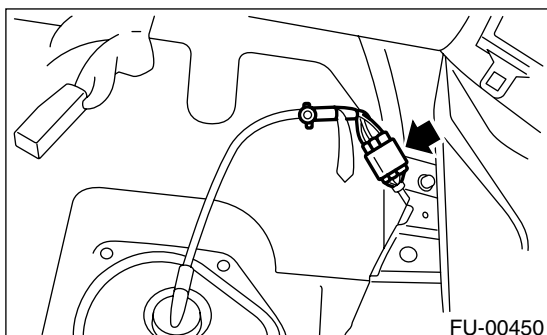
## 23. Fuel Tank

### A: REMOVAL

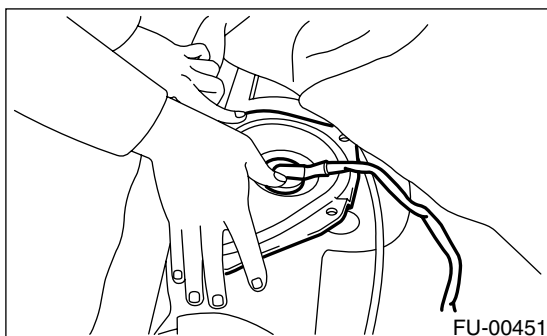
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(H4DOTC)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-47, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove holder clip which secures fuel tank cord on bracket.



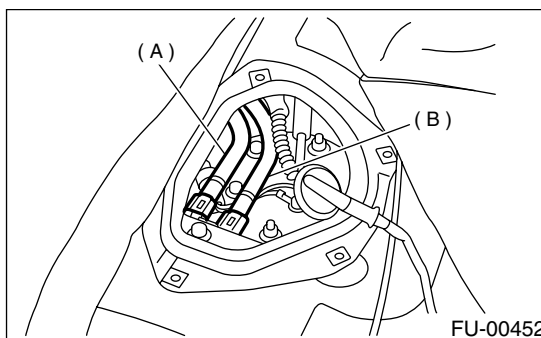
- 5) Disconnect connector of fuel tank cord to rear harness.



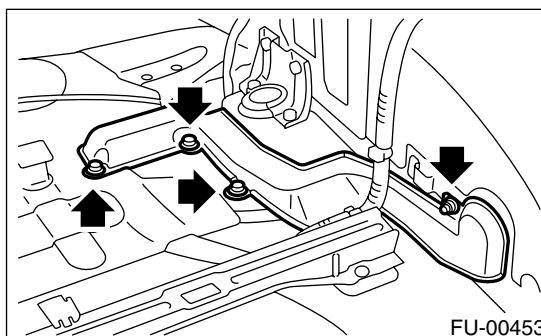
- 6) Push grommet which holds fuel tank cord on service hole cover into body side.



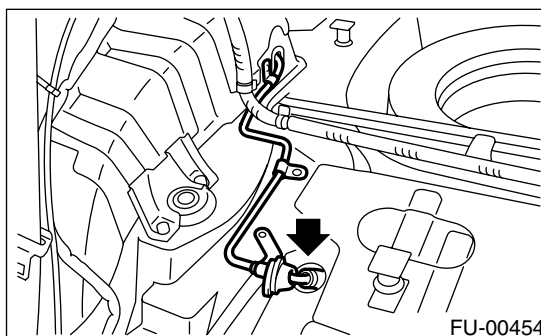
- 7) Separate quick connector of fuel delivery (A) and return hose (B). <Ref. to FU(H4DOTC)-74, REMOVAL, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



- 8) Remove parking brake cable.
  - (1) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
  - (2) Remove parking brake bracket and disconnect parking brake cable from equalizer. <Ref. to PB-6, REMOVAL, Parking Brake Cable.>
- 9) Remove rear pillar trim. <Ref. to EI-69, REMOVAL, Rear Pillar Trim.>
- 10) Remove pipe protector.



- 11) Separate quick connector of evaporation pipe. <Ref. to FU(H4DOTC)-74, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

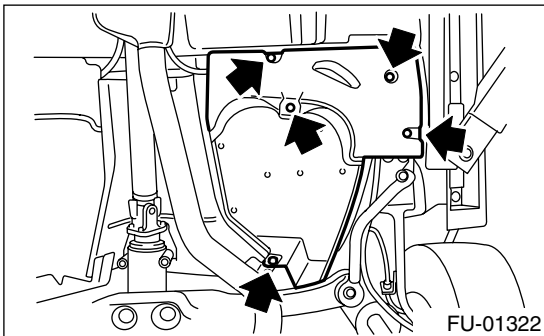
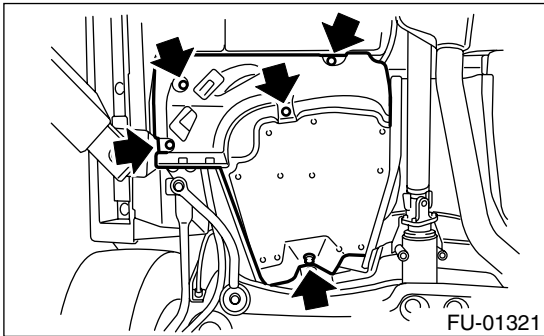


- 12) Remove wheel nuts from rear wheels.
- 13) Lift-up the vehicle.
- 14) Remove rear wheel.

## FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

15) Remove front side fuel tank cover.



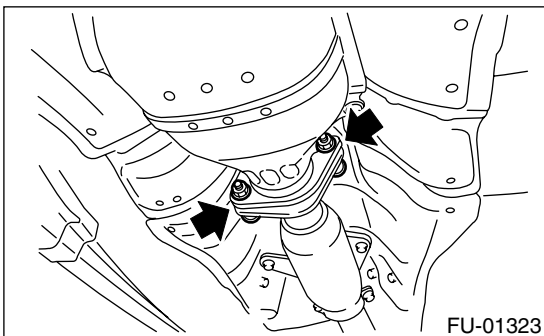
16) Remove rear exhaust pipe and muffler.

**NOTE:**

To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

**SUBARU CRC (Part No. 004301003)**

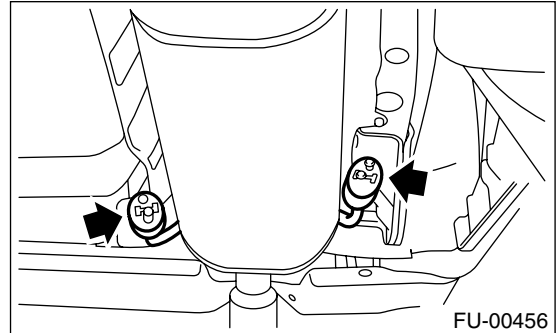
(1) Separate rear exhaust pipe from center exhaust pipe.



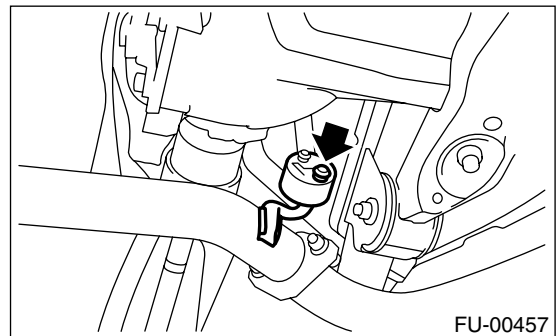
(2) Remove left and right rubber cushions.

**CAUTION:**

Be careful not to pull down muffler.

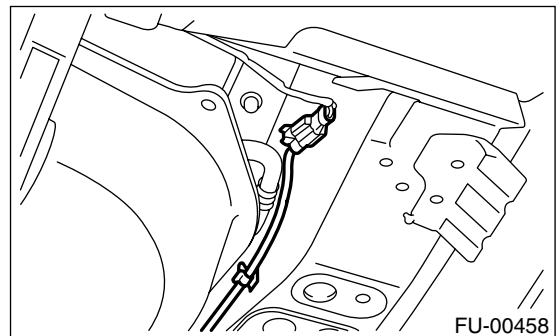


(3) Remove front rubber cushion and detach muffler assembly.



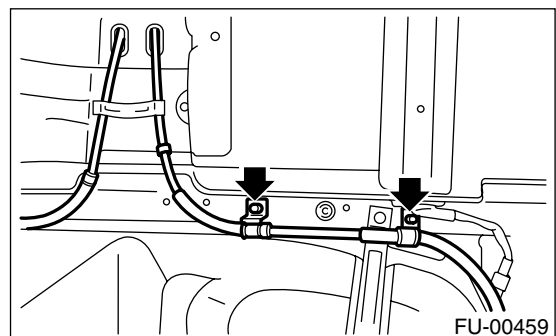
17) Remove propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>

18) Disconnect connector from ABS sensor.



19) Remove bolts which hold parking brake cable holding bracket.

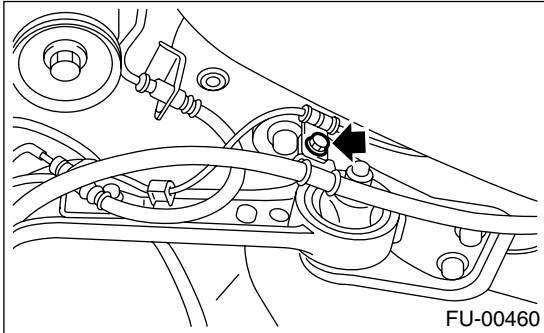
20) Remove parking brake cable from cabin by forcibly pulling it backward.



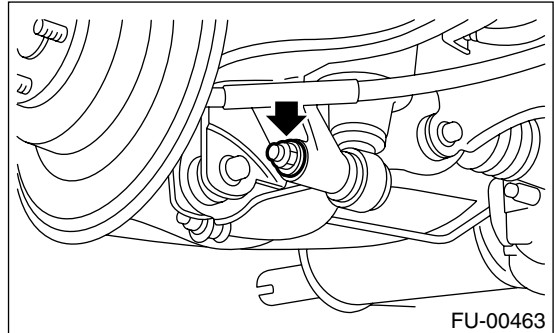
## FUEL TANK

### FUEL INJECTION (FUEL SYSTEMS)

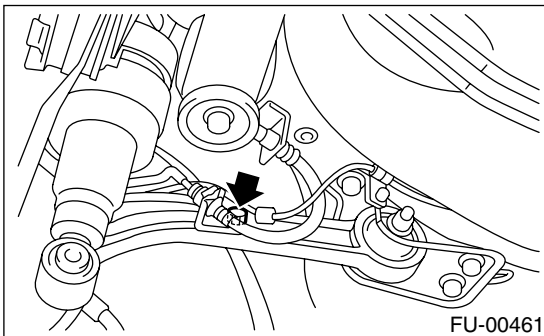
21) Remove bolts which hold parking brake cable holding bracket.



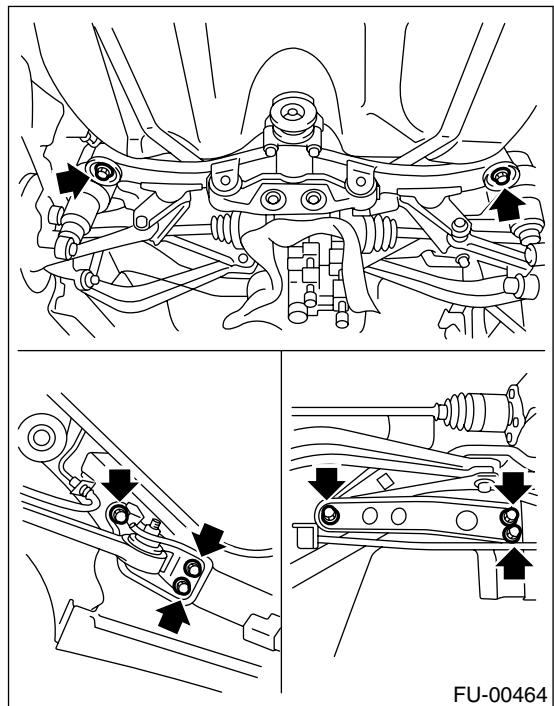
(2) Remove bolt which holds rear shock absorber to rear suspension arm.



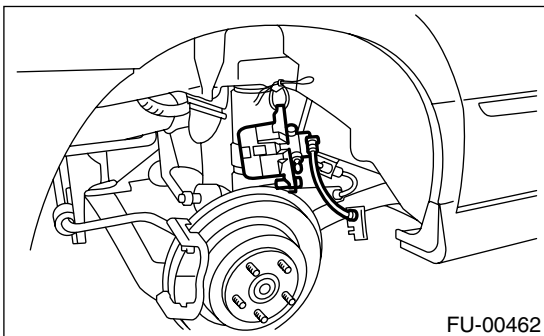
22) Remove bolts which hold rear brake hoses holding bracket.



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

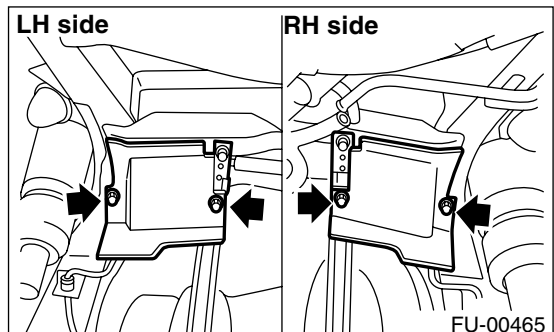


23) Remove rear brake caliper, then tie it up to the body side of the vehicle as shown in figure.



(4) Remove rear suspension assembly.

25) Remove rear side fuel tank cover.



24) Remove rear suspension assembly.

#### **WARNING:**

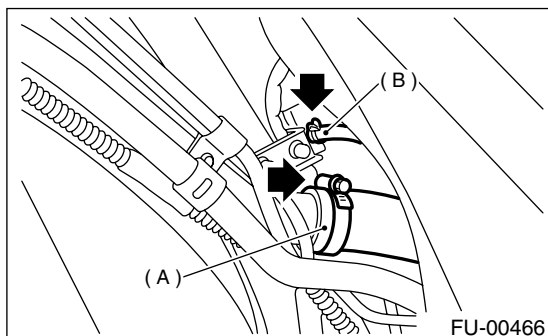
**A helper is required to perform this work.**

(1) Support rear differential with transmission jack.

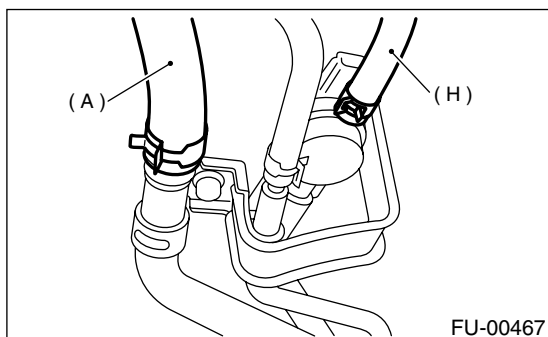
## FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

26) Disconnect fuel filler hose (A) and fuel tank pressure sensor hose (B).

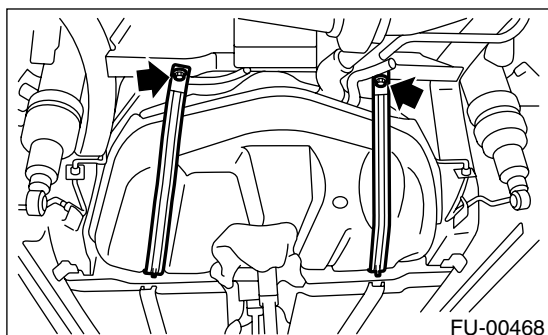


27) Disconnect air vent hose (A) from evaporation pipe assembly and disconnect evaporation hose (H) from pressure control solenoid valve.



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

**WARNING:**  
A helper is required to perform this work.

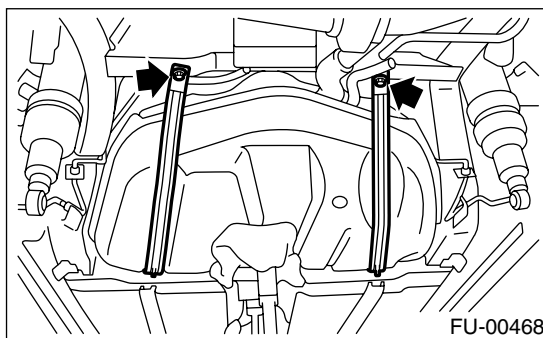


### B: Installation

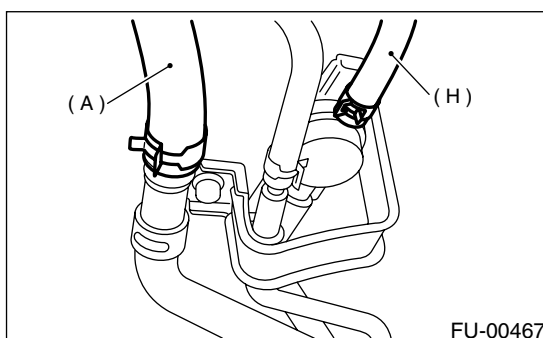
1) Support fuel tank with transmission jack and push fuel tank harness into access hole with grommet.

2) Set fuel tank and temporarily tighten bolts of fuel tank bands.

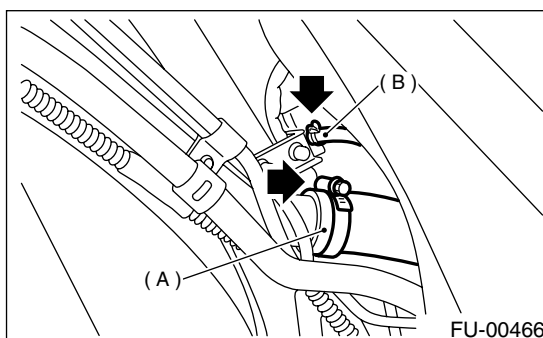
**WARNING:**  
A helper is required to perform this work.



3) Connect air vent hose (A) to evaporation pipe assembly and connect evaporation hose (H) to pressure control solenoid valve.



4) Connect fuel filler hose (A) and fuel tank pressure sensor hose (B).



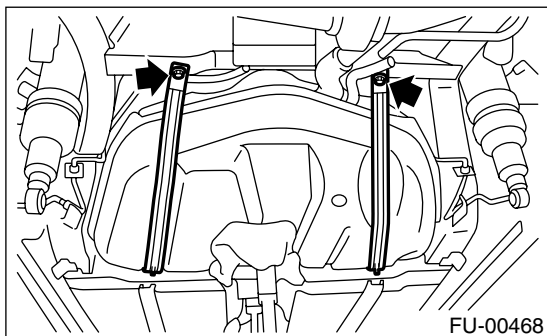
## FUEL TANK

### FUEL INJECTION (FUEL SYSTEMS)

5) Tighten band mounting bolts.

**Tightening torque:**

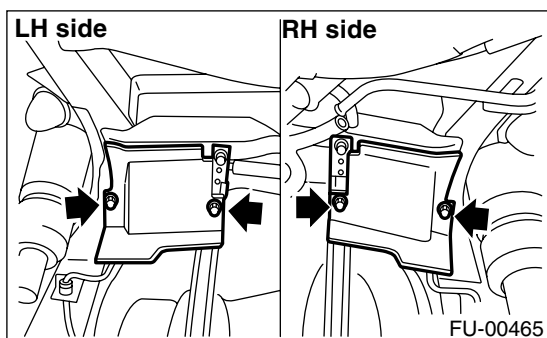
**33 N·m (3.4 kgf-m, 25 ft-lb)**



6) Install rear side fuel tank cover.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



7) Install rear suspension assembly.

**WARNING:**

**A helper is required to perform this work.**

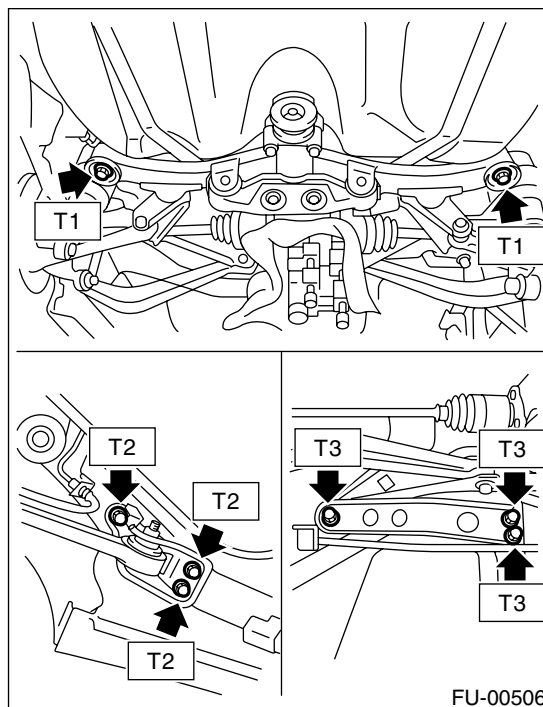
(1) Support rear suspension assembly and then tighten bolts which secure rear suspension assembly.

**Tightening torque:**

**T1: 172 N·m (17.5 kgf-m, 127 ft-lb)**

**T2: 108 N·m (11.0 kgf-m, 80 ft-lb)**

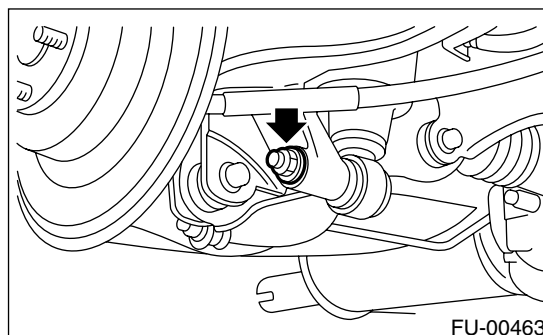
**T3: 66 N·m (6.7 kgf-m, 48 ft-lb)**



(2) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-14, INSTALLATION, Link Upper.>

**Tightening torque:**

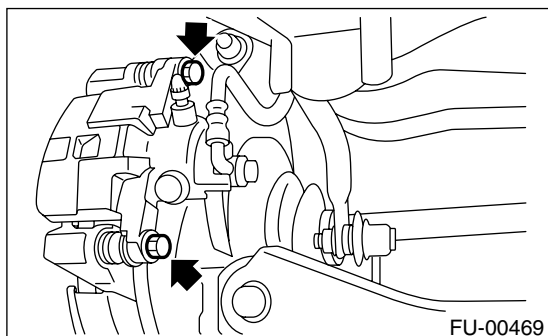
**157 N·m (16 kgf-m, 116 ft-lb)**



## FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

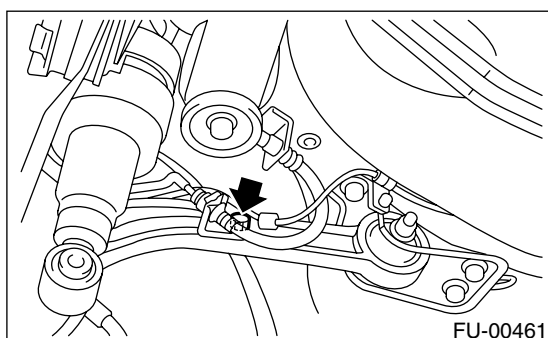
8) Install rear brake caliper. <Ref. to BR-22, INSTALLATION, Rear Disc Brake Assembly.>



9) Tighten bolts which hold rear brake hoses holding bracket.

**Tightening torque:**

**33 N·m (3.4 kgf-m, 25 ft-lb)**

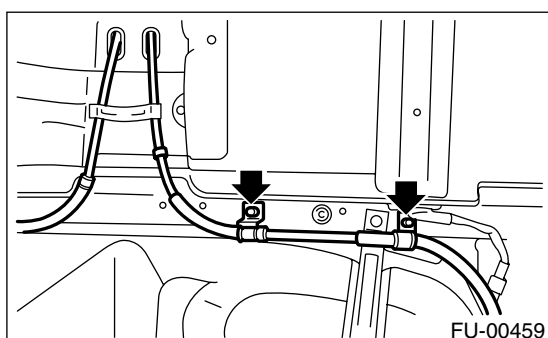


10) Install parking brake cable to cabin by forcibly pushing it forward.

11) Tighten bolts which hold parking brake cable holding bracket.

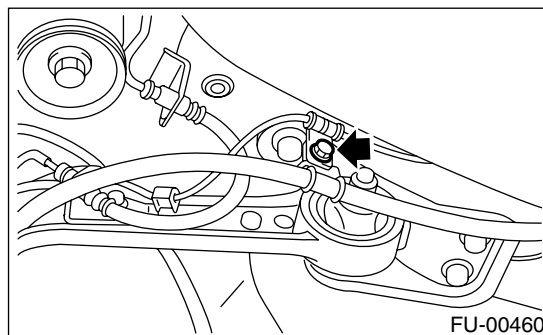
**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

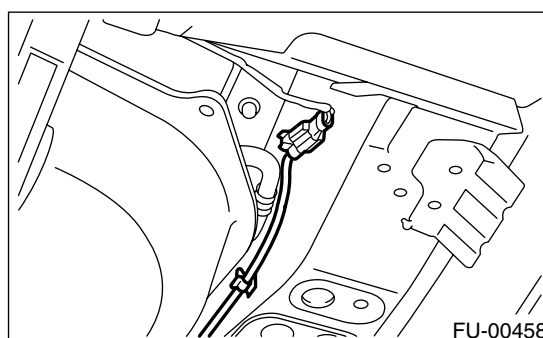


**Tightening torque:**

**32 N·m (3.3 kgf-m, 23.9 ft-lb)**



12) Connect connector to ABS sensor.



13) Install propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>

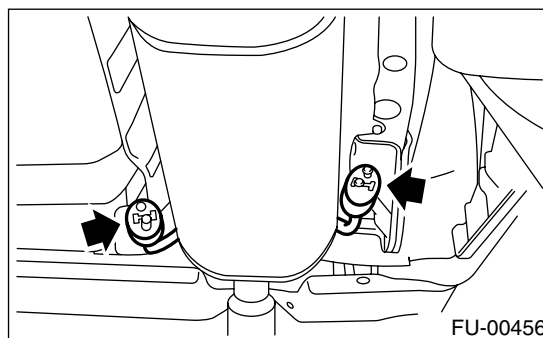
14) Install rear exhaust pipe and muffler.

**NOTE:**

To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

**SUBARU CRC (Part No. 004301003)**

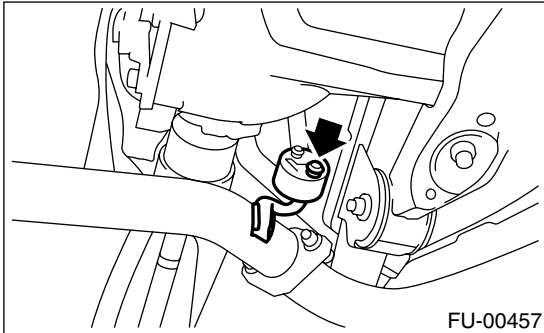
(1) Install left and right rubber cushions.



## FUEL TANK

### FUEL INJECTION (FUEL SYSTEMS)

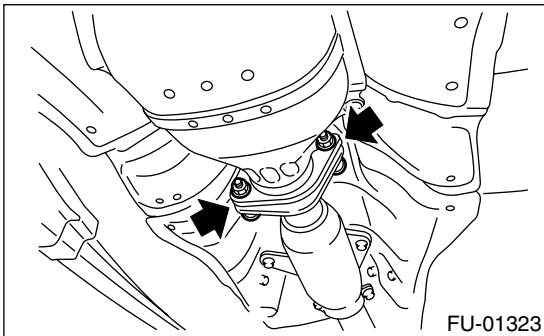
- (2) Install front rubber cushion and attach muffler assembly.



- (3) Install rear exhaust pipe to center exhaust pipe.

**Tightening torque:**

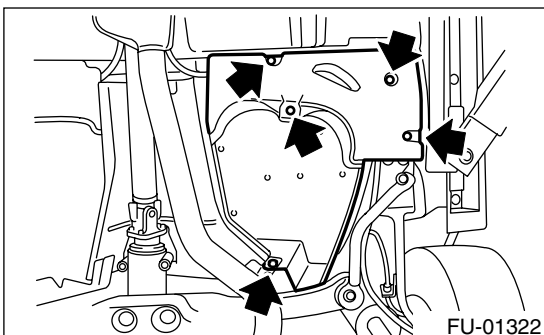
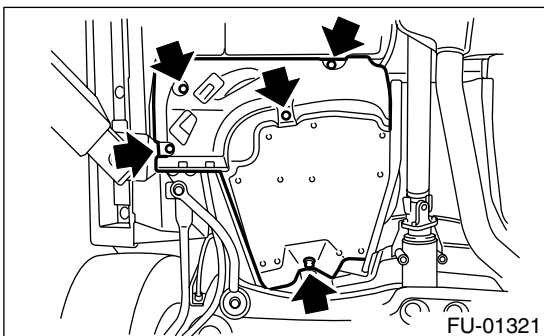
**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



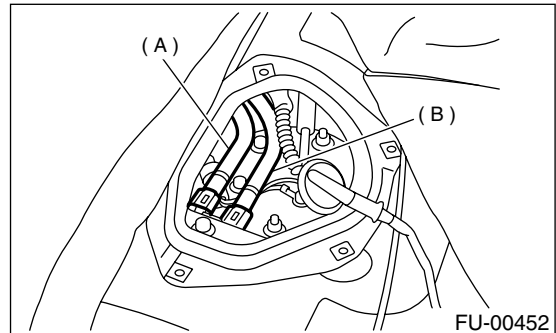
- 15) Install front side fuel tank cover.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

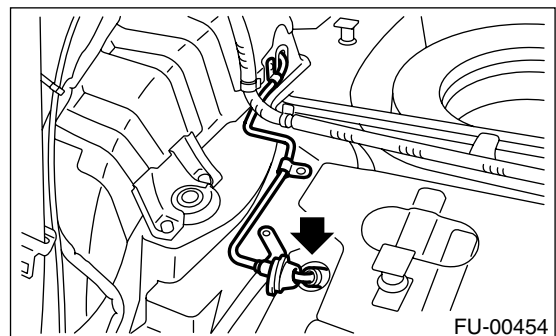


- 16) Install rear wheel.  
17) Lower the vehicle.  
18) Tighten wheel nuts to rear wheel.  
19) Install parking brake cable. <Ref. to PB-5, INSTALLATION, Parking Brake Lever.>  
20) Install console box. <Ref. to EI-45, INSTALLATION, Console Box.>  
21) Connect fuel hoses and hold them with quick connector. <Ref. to FU(H4DOTC)-75, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

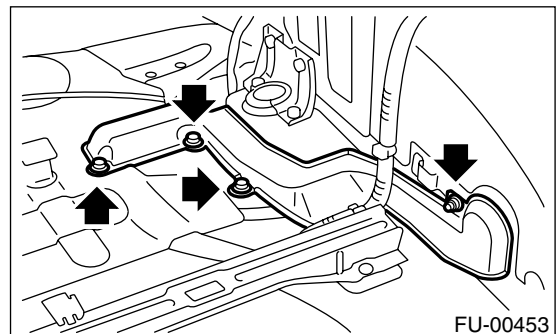


- (A) Delivery hose  
(B) Return hose

- 22) Connect evaporation pipe and hold it with quick connector. <Ref. to FU(H4DOTC)-75, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



- 23) Install pipe protector.

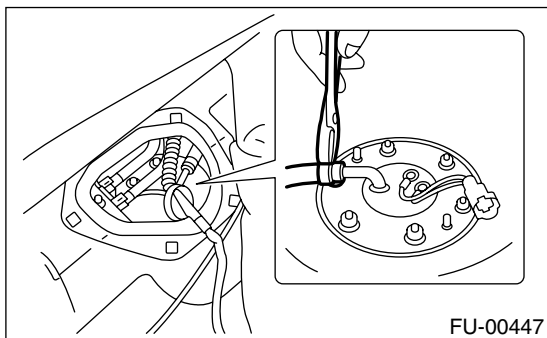


- 24) Install rear pillar trim. <Ref. to EI-69, REMOVAL, Rear Pillar Trim.>

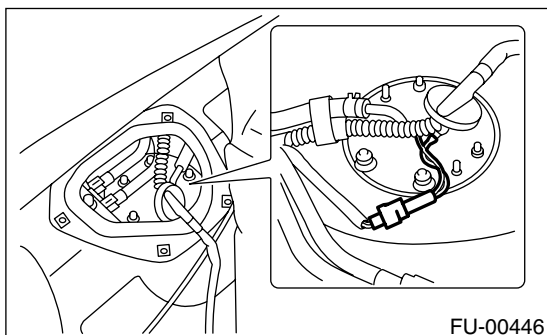
## FUEL TANK

### FUEL INJECTION (FUEL SYSTEMS)

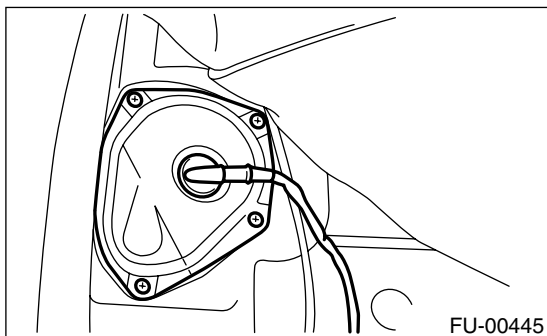
25) Connect fuel jet pump hose.



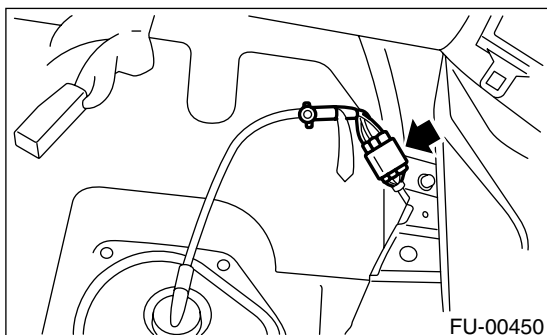
26) Connect connector to fuel sub level sensor.



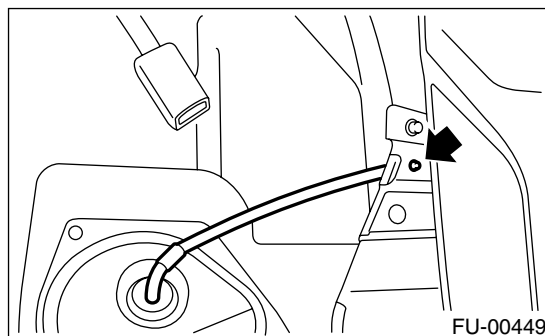
27) Install sub service hole cover.



28) Connect connectors to fuel tank cord and plug service hole with grommet.

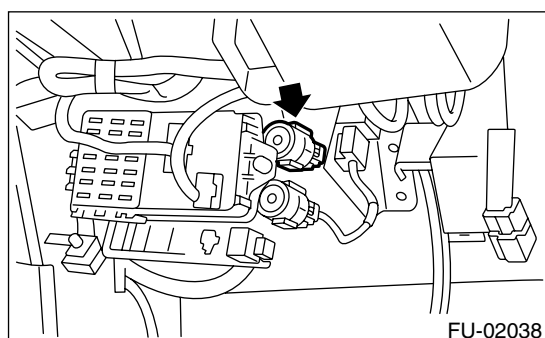


29) Install holder clip which secures fuel tank cord on bracket.



30) Set rear seat and floor mat.

31) Connect connector to fuel pump relay.



32) Adjust parking brake lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

33) Check wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

### C: INSPECTION

1) Make sure there are no cracks, holes, or other damage on the fuel tank.

2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

### 21. Fuel

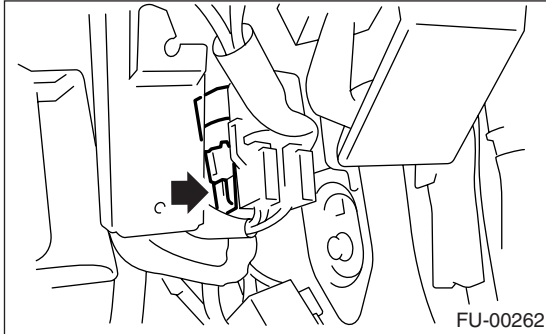
#### A: OPERATION

##### 1. RELEASING OF FUEL PRESSURE

###### WARNING:

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

1) Disconnect the connector from the fuel pump relay.



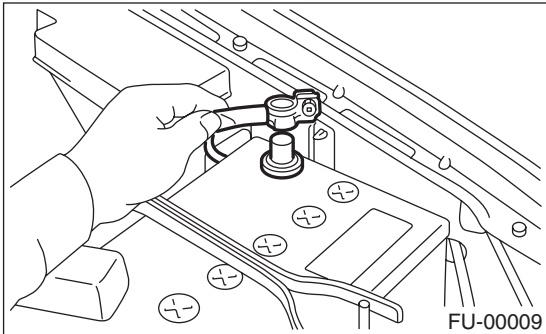
- 2) Start and run the engine until it stalls.  
 3) After the engine stalls, crank it for five more seconds.  
 4) Turn the ignition switch to OFF.

##### 2. DRAINING FUEL

###### WARNING:

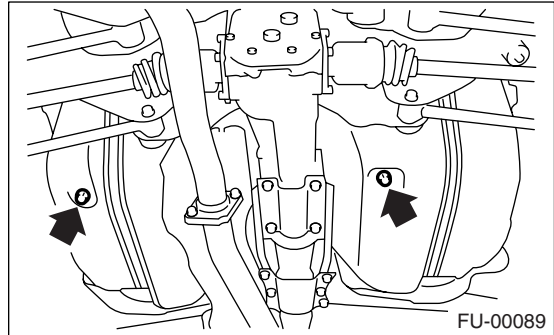
- Place “NO FIRE” signs near the working area.
- Be careful not to spill the fuel.

- 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.

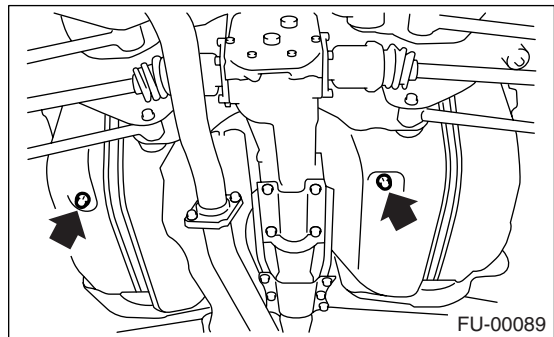
- 5) Drain the fuel from the fuel tank.  
 Set a container under the vehicle, and remove drain plug from the fuel tank.



- 6) Tighten the fuel drain plug.

###### Tightening torque:

**26 N·m (2.65 kgf-m, 19.2 ft-lb)**



## GENERAL DESCRIPTION

### FUEL INJECTION (FUEL SYSTEMS)

---

## 1. General Description

### A: SPECIFICATIONS

|             |                            |                                                                                                         |
|-------------|----------------------------|---------------------------------------------------------------------------------------------------------|
| 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 <sup>2</sup> , 65.27 — 98.2 psi)                                        |
|             | Discharge flow             | More than 130 ℓ (34.3 US gal, 28.6 Imp gal)/h<br>[12 V at 300 kPa (3.06 kg/cm <sup>2</sup> , 43.5 psi)] |
| Fuel filter |                            | Cartridge type                                                                                          |

## GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

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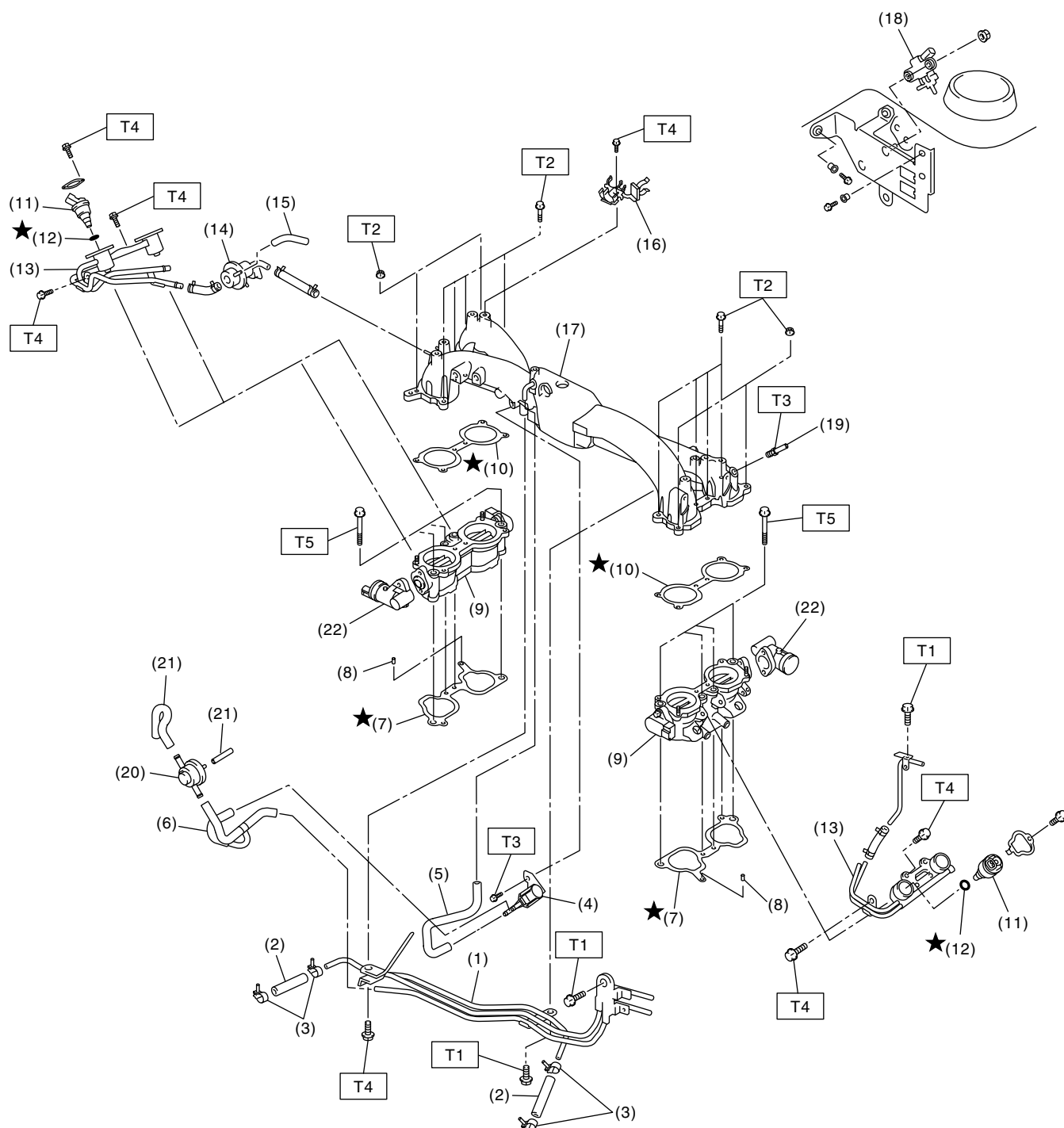
MEMO:

# GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

## B: COMPONENT

### 1. INTAKE MANIFOLD



FU-02037

FU(H4DOTC)-4

## GENERAL DESCRIPTION

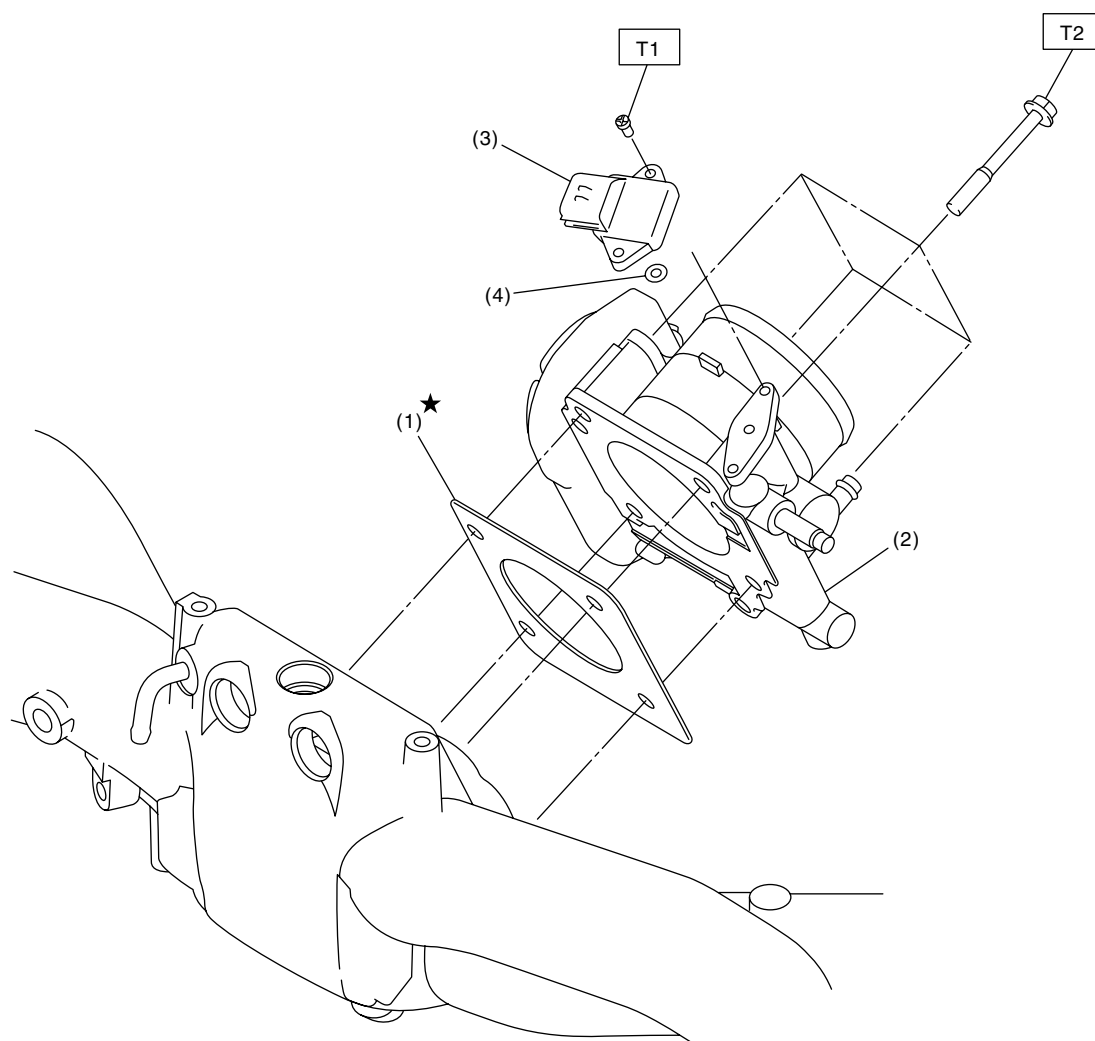
### FUEL INJECTION (FUEL SYSTEMS)

|                                    |                                            |                                                     |
|------------------------------------|--------------------------------------------|-----------------------------------------------------|
| (1) Fuel pipe ASSY                 | (13) Fuel injector pipe                    | <b><i>Tightening torque: N·m (kgf-m, ft-lb)</i></b> |
| (2) Fuel hose                      | (14) Pressure regulator                    | <b><i>T1: 5 (0.5, 3.6)</i></b>                      |
| (3) Clip                           | (15) Pressure regulator hose               | <b><i>T3: 8.25 (0.84, 6.1)</i></b>                  |
| (4) Purge control solenoid valve   | (16) Blow-by hose stay                     | <b><i>T5: 17 (1.73, 12.5)</i></b>                   |
| (5) Vacuum hose                    | (17) Intake manifold                       | <b><i>T6: 19 (1.94, 13.7)</i></b>                   |
| (6) Vacuum control hose            | (18) Wastegate control solenoid valve ASSY | <b><i>T7: 25 (2.5, 18.1)</i></b>                    |
| (7) Intake manifold gasket         |                                            |                                                     |
| (8) Guide pin                      | (19) Nipple                                |                                                     |
| (9) Tumble generator valve ASSY    | (20) Purge valve                           |                                                     |
| (10) Tumble generator valve gasket | (21) Purge hose                            |                                                     |
| (11) Fuel injector                 | (22) Tumble generator valve actuator       |                                                     |
| (12) O-ring                        |                                            |                                                     |

## GENERAL DESCRIPTION

### FUEL INJECTION (FUEL SYSTEMS)

## 2. AIR INTAKE SYSTEM



FU-01072

(1) Gasket

(2) Throttle body

(3) Manifold absolute pressure sensor

(4) O-ring

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

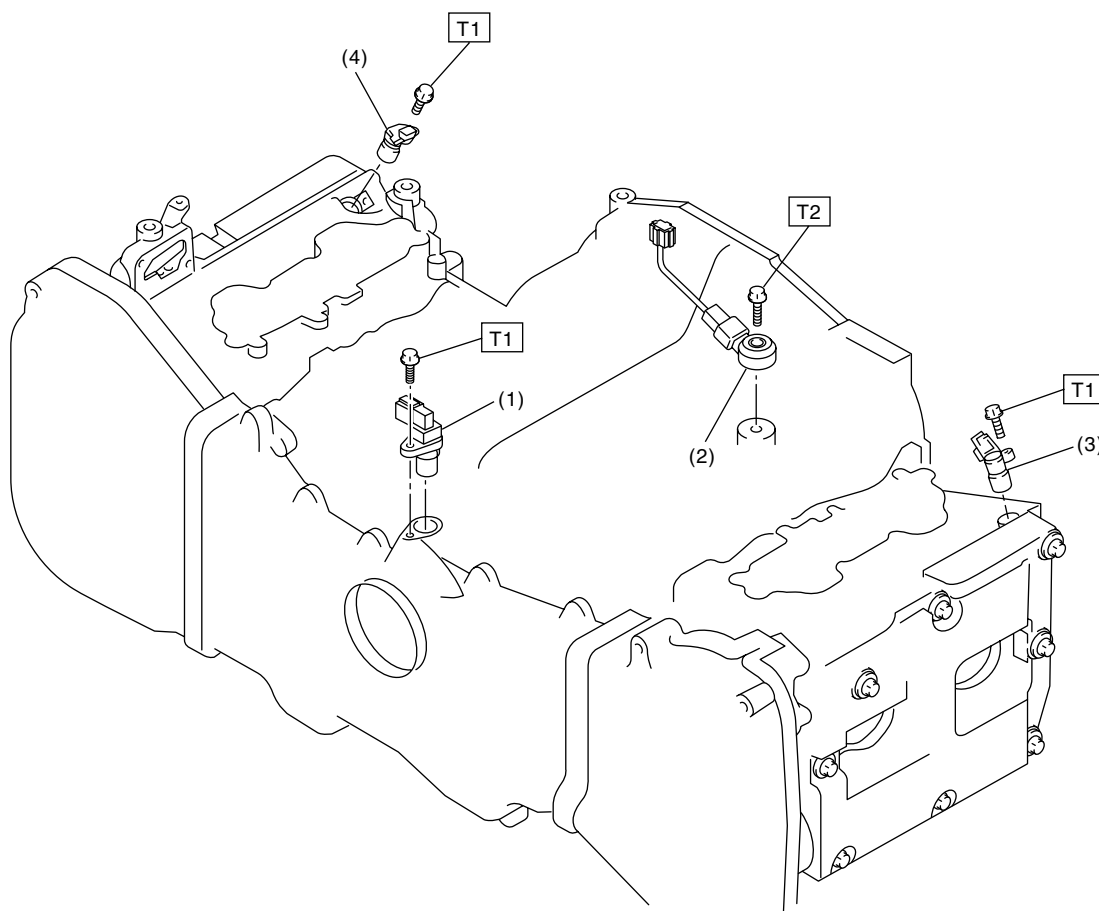
**T1: 1.6 (0.16, 1.2)**

**T2: 8 (0.8, 5.8)**

## GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

### 3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



FU-01036

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

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

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

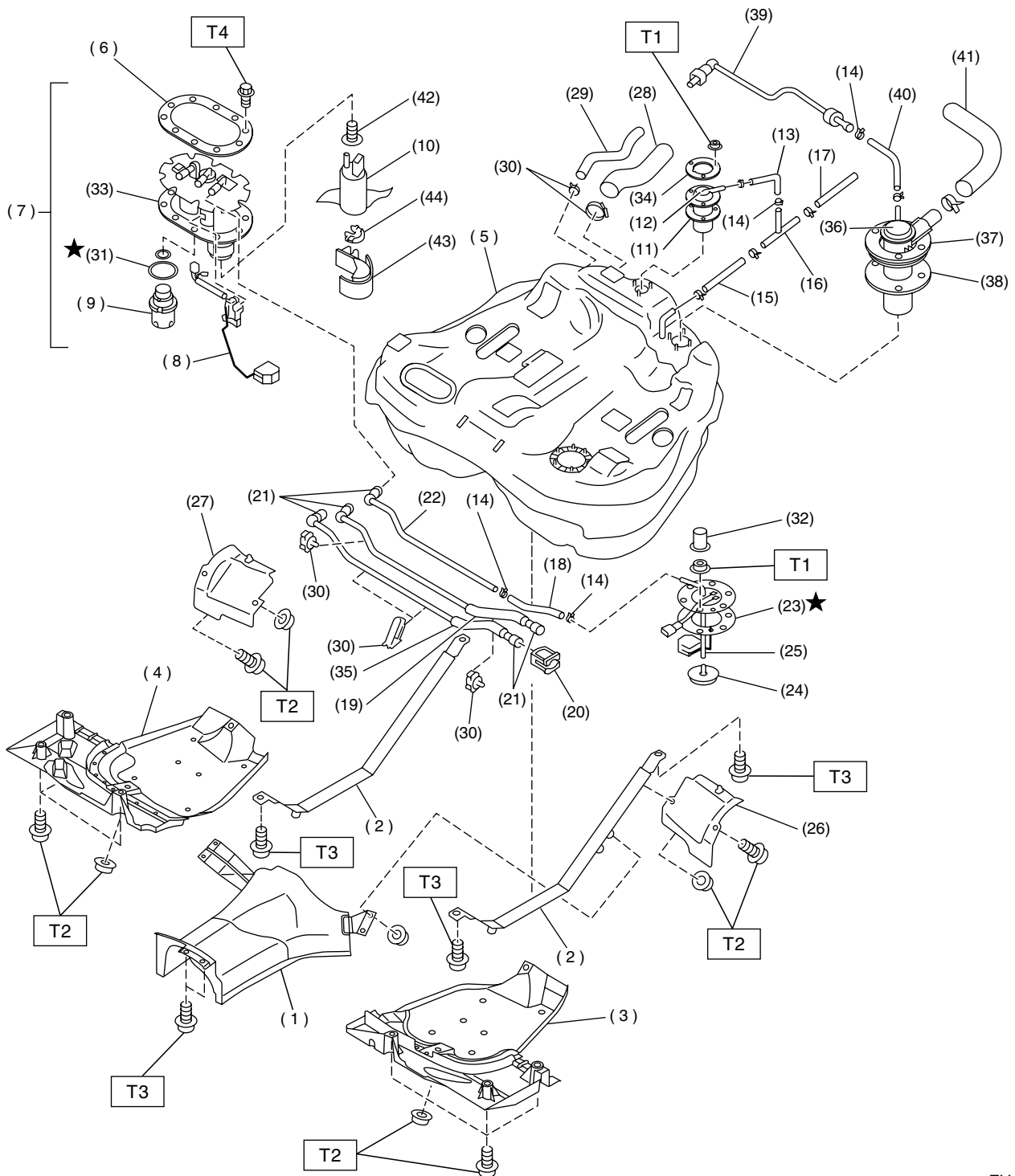
**T1: 6.4 (0.65, 4.7)**

**T2: 24 (2.4, 17.4)**

# GENERAL DESCRIPTION

## FUEL INJECTION (FUEL SYSTEMS)

### 4. FUEL TANK



FU-02002

FU(H4DOTC)-8

## GENERAL DESCRIPTION

### FUEL INJECTION (FUEL SYSTEMS)

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

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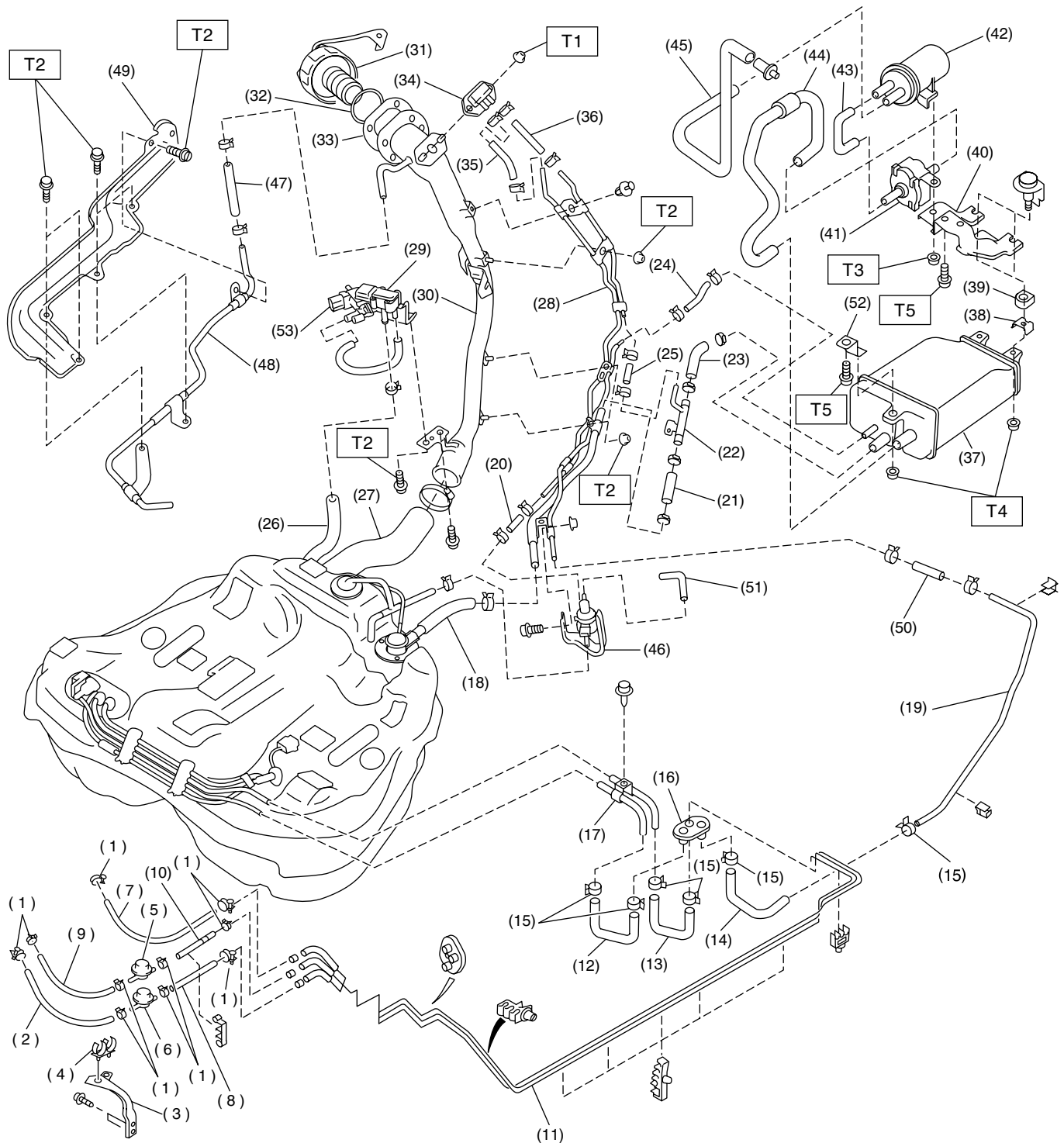
**Tightening torque: N·m (kgf-m, ft-lb)****T1: 4.4 (0.45, 3.3)****T2: 18 (1.8, 13.0)****T3: 33 (3.4, 25)****T4: 5.9 (0.6, 4.3)**

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# GENERAL DESCRIPTION

## FUEL INJECTION (FUEL SYSTEMS)

### 5. Fuel Line



FU-02003

FU(H4DOTC)-10

## GENERAL DESCRIPTION

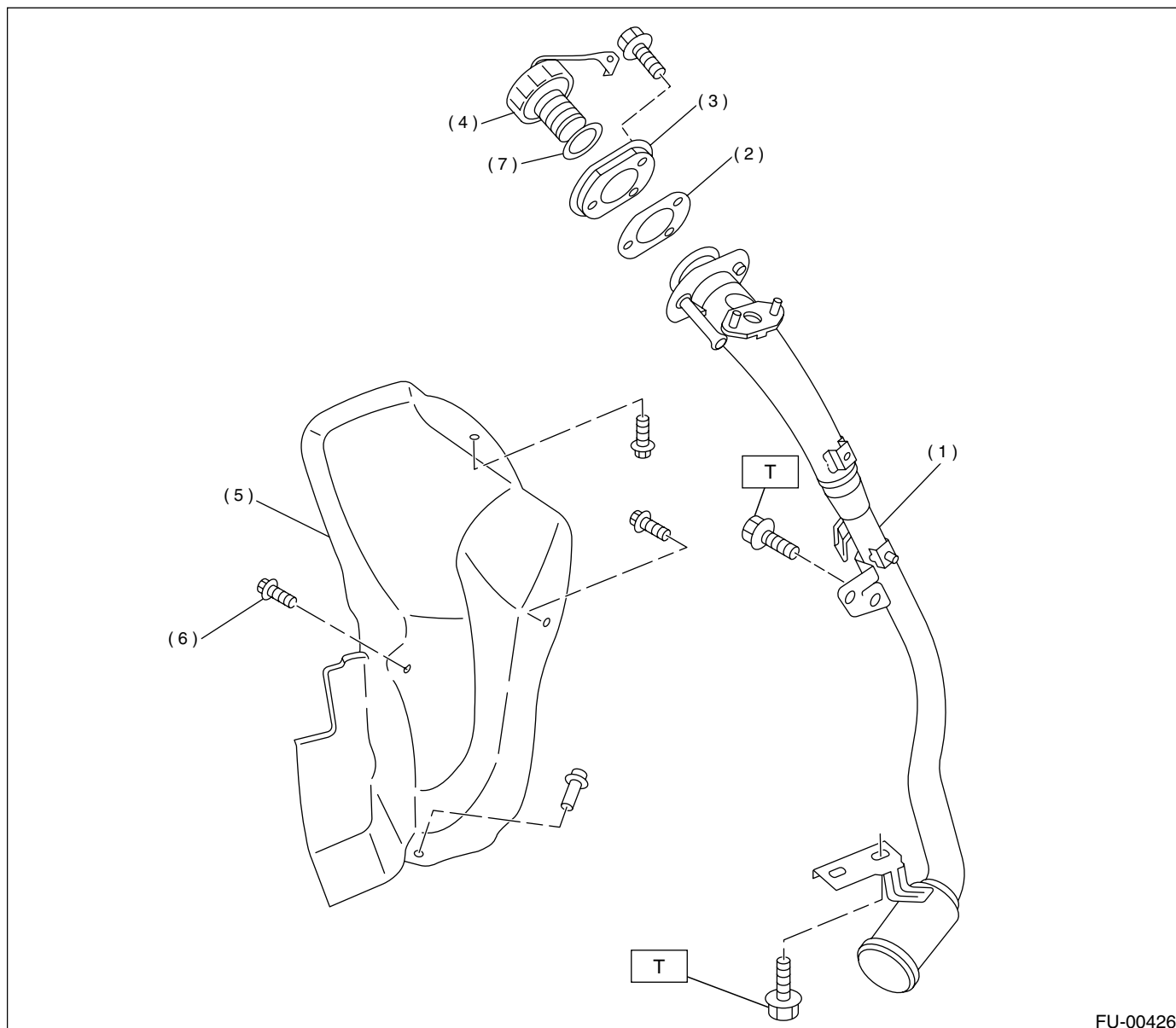
### FUEL INJECTION (FUEL SYSTEMS)

|                            |                                     |                                              |
|----------------------------|-------------------------------------|----------------------------------------------|
| (1) Clamp                  | (23) Evaporation hose I             | (45) Drain filter hose B                     |
| (2) Fuel delivery hose A   | (24) Evaporation hose J             | (46) Pressure control solenoid valve         |
| (3) Bracket                | (25) Evaporation hose K             | (47) Evaporation hose N                      |
| (4) Clamp                  | (26) Fuel tank pressure sensor hose | (48) Evaporation pipe C                      |
| (5) Fuel damper (return)   | (27) Fuel filler hose               | (49) Pipe protector                          |
| (6) Fuel damper (delivery) | (28) Evaporation pipe B             | (50) Evaporation hose O                      |
| (7) Evaporation hose F     | (29) Fuel tank pressure sensor      | (51) Pressure control solenoid valve hose    |
| (8) Fuel delivery hose B   | (30) Fuel filler pipe               | (52) Canister bracket (front)                |
| (9) Fuel return hose A     | (31) Fuel filler cap                | (53) Fuel tank sensor control valve          |
| (10) Fuel return hose B    | (32) Ring B                         |                                              |
| (11) Fuel pipe ASSY        | (33) Packing                        |                                              |
| (12) Fuel delivery hose C  | (34) Shut valve                     | <b>Tightening torque: N·m (kgf-m, ft-lb)</b> |
| (13) Fuel return hose C    | (35) Evaporation hose L             | <b>T1: 4.5 (0.46, 3.3)</b>                   |
| (14) Evaporation hose G    | (36) Evaporation hose M             | <b>T2: 7.5 (0.76, 5.5)</b>                   |
| (15) Clamp                 | (37) Canister                       | <b>T3: 18 (1.8, 13.0)</b>                    |
| (16) Grommet               | (38) Canister lower bracket         | <b>T4: 23 (2.3, 16.6)</b>                    |
| (17) Fuel pipe ASSY        | (39) Cushion rubber                 | <b>T5: 33 (3.4, 25)</b>                      |
| (18) Air vent hose A       | (40) Canister upper bracket         |                                              |
| (19) Evaporation pipe A    | (41) Drain valve                    |                                              |
| (20) Evaporation hose H    | (42) Drain filter                   |                                              |
| (21) Air vent hose B       | (43) Drain filter hose A            |                                              |
| (22) Air vent pipe         | (44) Drain valve hose               |                                              |

## GENERAL DESCRIPTION

### FUEL INJECTION (FUEL SYSTEMS)

#### 6. Fuel Filler Pipe



FU-00426

- |                           |                           |
|---------------------------|---------------------------|
| (1) Fuel filler pipe ASSY | (5) Filler pipe protector |
| (2) Filler pipe packing   | (6) Clip                  |
| (3) Filler ring           | (7) Ring B                |
| (4) Filler cap            |                           |

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

**T: 7.5 (0.75, 5.4)**

## GENERAL DESCRIPTION

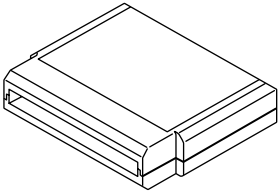
### FUEL INJECTION (FUEL SYSTEMS)

#### C: CAUTION

- Wear working 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 or 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 safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal 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                                 |
|-----------------------------------------------------------------------------------------------------|----------------------------------|--------------------|-----------------------------------------|
| <br>ST24082AA230   | 24082AA230<br>(New adopted tool) | CARTRIDGE          | Troubleshooting for electrical system.  |
| <br>ST22771AA030 | 22771AA030                       | SELECT MONITOR KIT | Troubleshooting for electrical systems. |

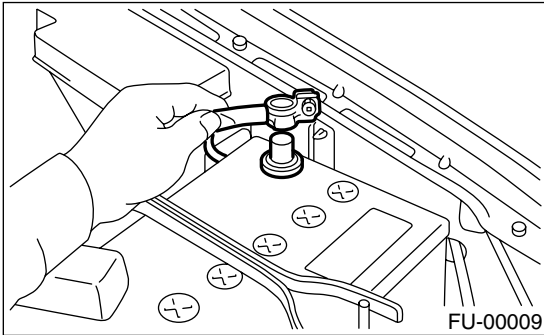
# INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

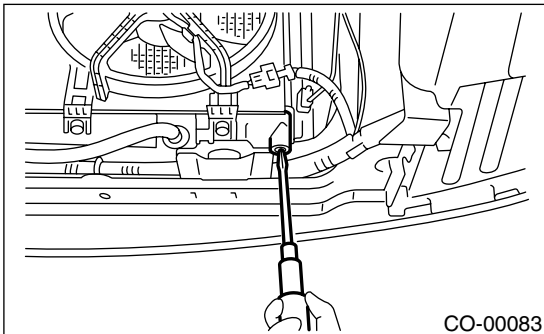
## 3. Intake Manifold

### A: REMOVAL

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.

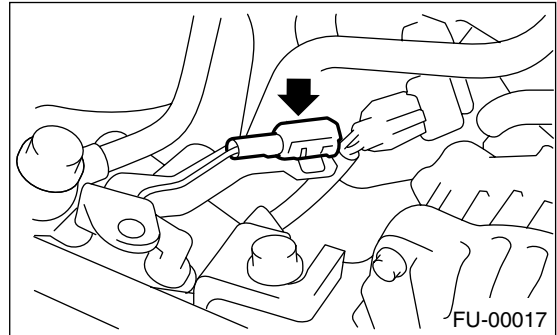


- 4) Lift up the vehicle.
- 5) Remove the under cover.
- 6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



- 7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
- 8) Remove the air cleaner element.
- 9) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
- 10) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-29, REMOVAL, Coolant Filler Tank.>
- 11) Remove the power steering pump.
  - (1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>

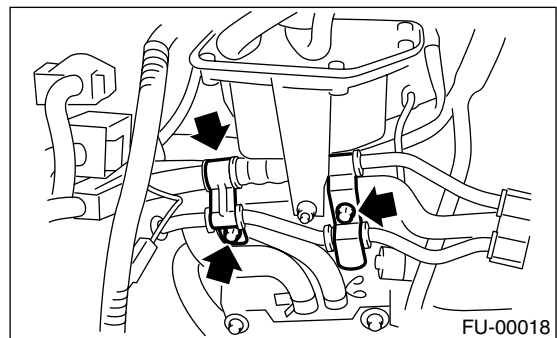
- (2) Disconnect the power steering switch connector.



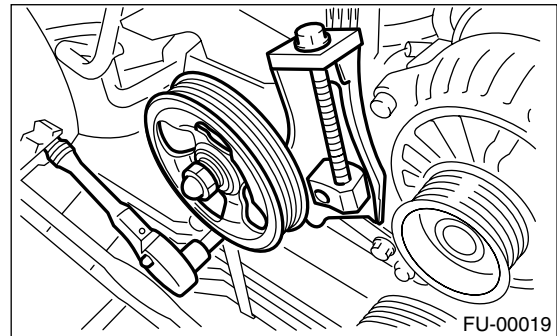
- (3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

#### NOTE:

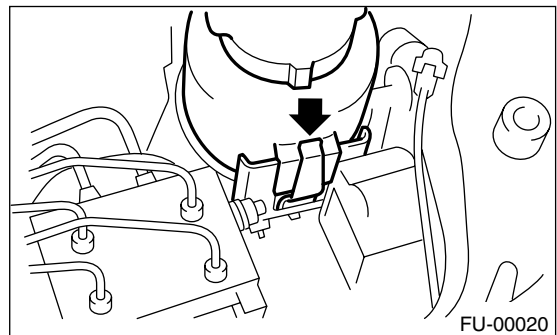
Do not disconnect the power steering hose.



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



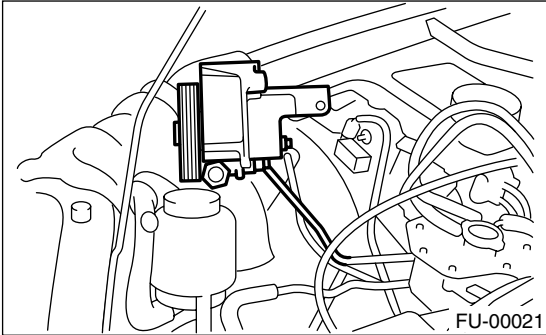
- (5) Remove the power steering tank from the bracket by pulling it upward.



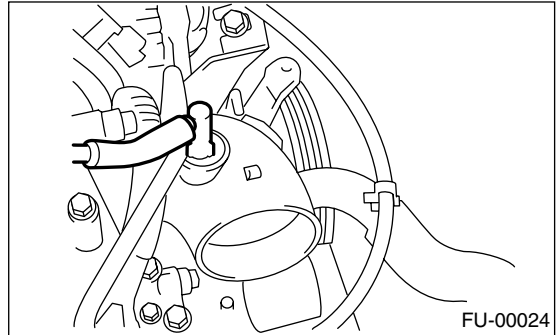
## INTAKE MANIFOLD

### FUEL INJECTION (FUEL SYSTEMS)

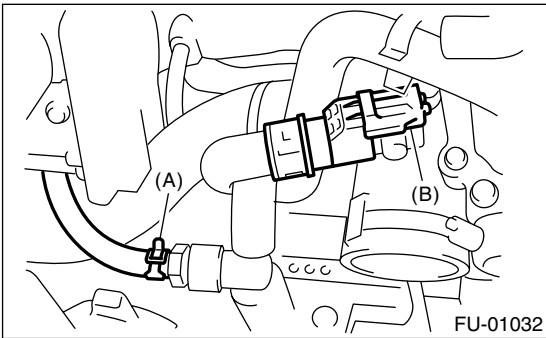
(6) Place the power steering pump on the right side wheel apron.



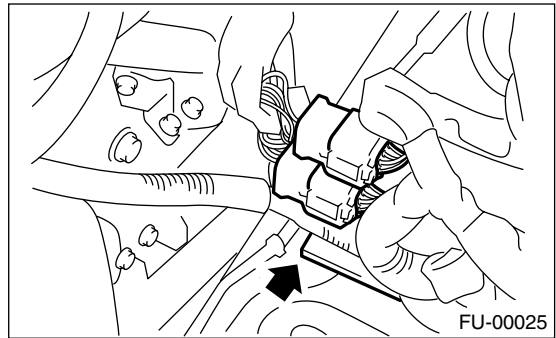
15) Disconnect the pressure hose from the intake duct.



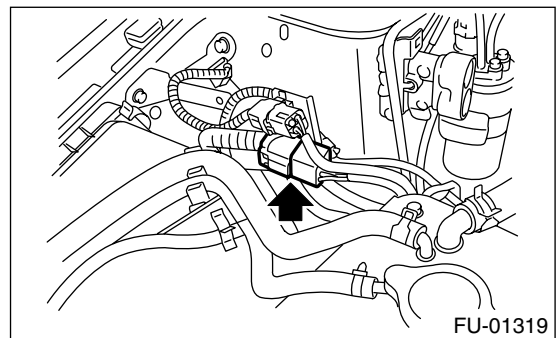
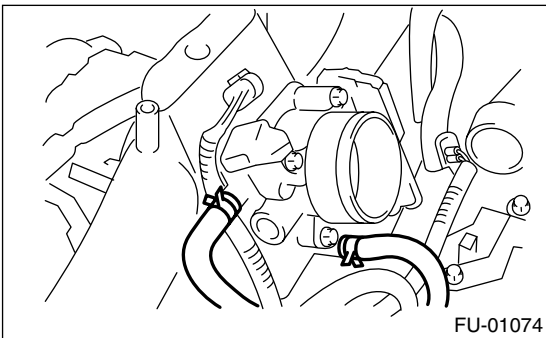
12) Disconnect the emission hose (A) and connector (B) from the PCV hose assembly.



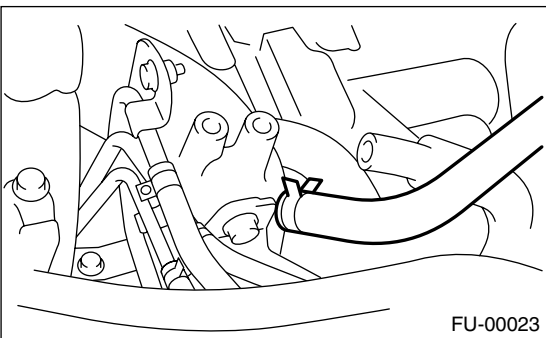
16) Disconnect the engine harness connectors from the bulkhead harness connectors.



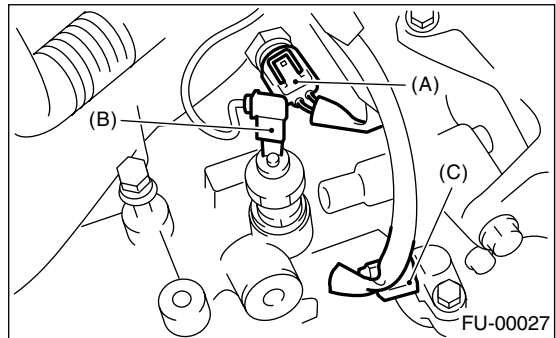
13) Disconnect the engine coolant hoses from the throttle body.



14) Disconnect the brake booster hose.



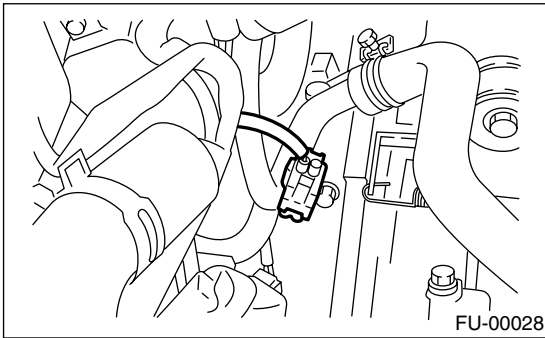
17) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



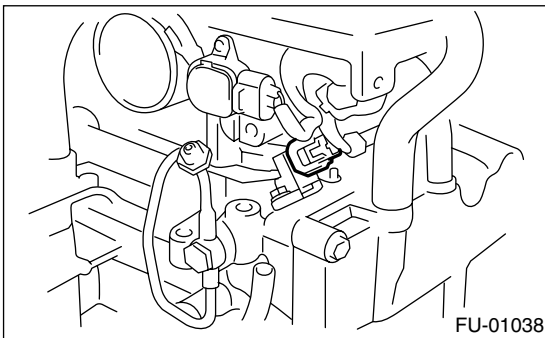
# INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

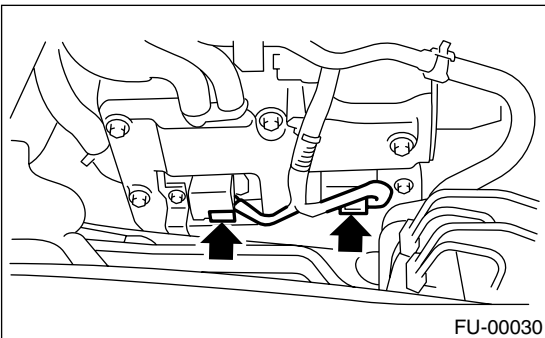
18) Disconnect the knock sensor connector.



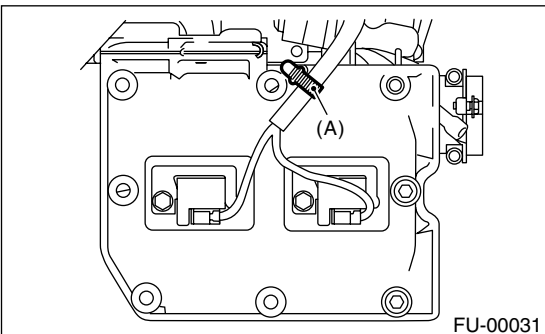
19) Disconnect the connector from the camshaft position sensor.



20) Disconnect the connector from the ignition coil.



21) Disconnect the engine harness fixed by clip (A) from the bracket.

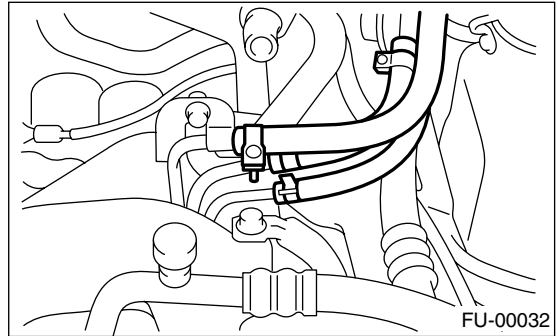


22) Disconnect the fuel delivery hose, return hose and evaporation hose.

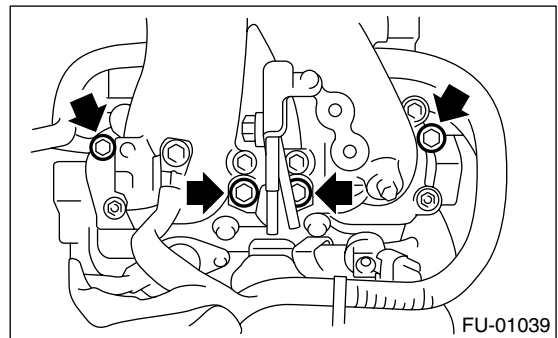
## CAUTION:

- Do not spill fuel.

- Catch fuel from hoses in a container or cloth.



23) Remove the bolts which secure the intake manifold to the cylinder heads.



24) Remove the intake manifold.

## B: INSTALLATION

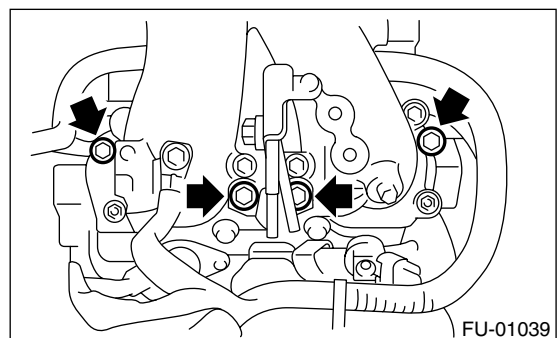
1) Install the intake manifold onto cylinder heads.

### NOTE:

Always use new gaskets.

### Tightening torque:

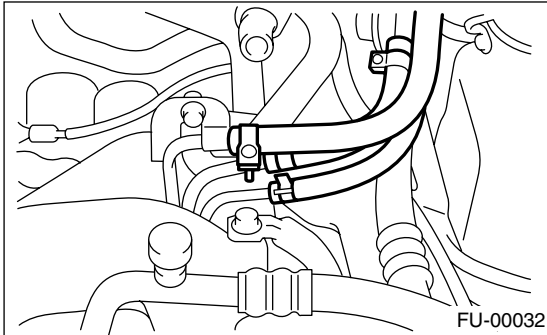
25 N·m (2.5 kgf-m, 18.1 ft-lb)



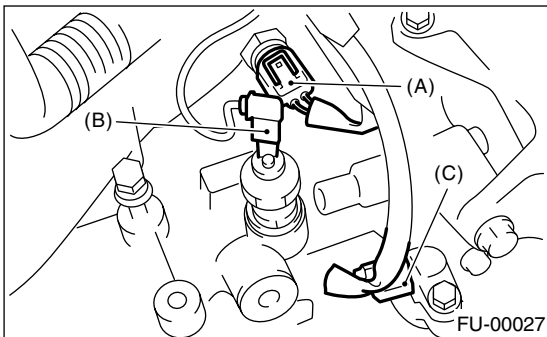
## INTAKE MANIFOLD

### FUEL INJECTION (FUEL SYSTEMS)

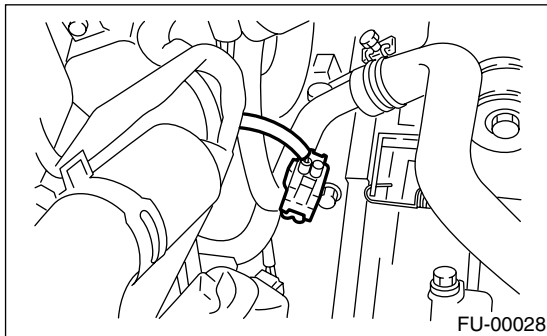
2) Connect the fuel delivery hose, return hose and evaporation hose.



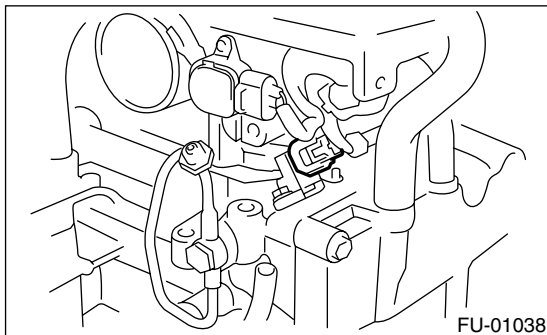
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



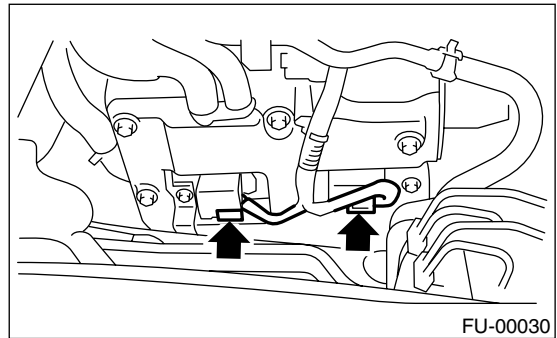
4) Connect the connector to the knock sensor.



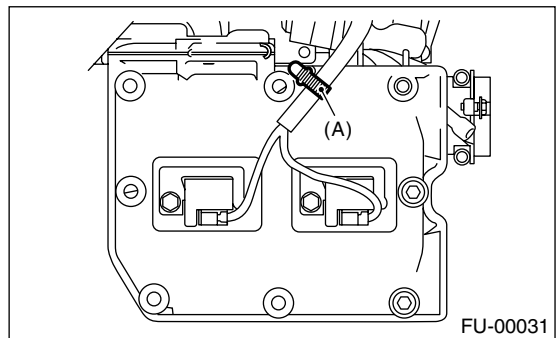
5) Connect the connector to the camshaft position sensor.



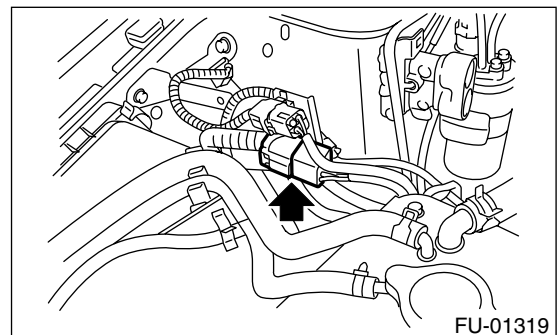
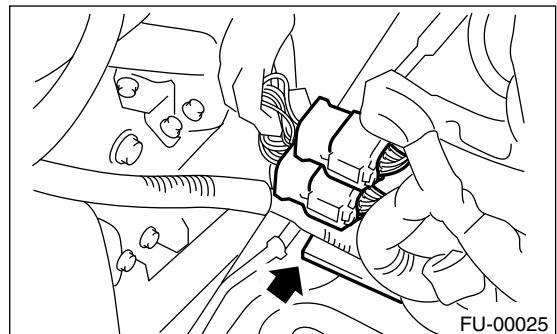
6) Connect the connector to the ignition coil.



7) Connect the engine harness with clip (A) to the bracket.



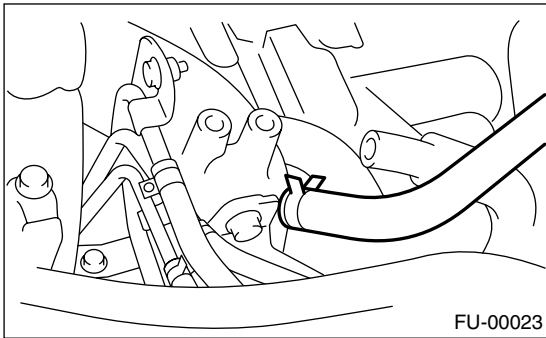
8) Connect the engine harness connector to the bulkhead harness connectors.



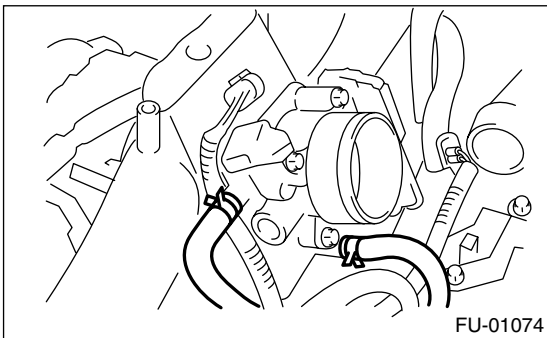
# INTAKE MANIFOLD

## FUEL INJECTION (FUEL SYSTEMS)

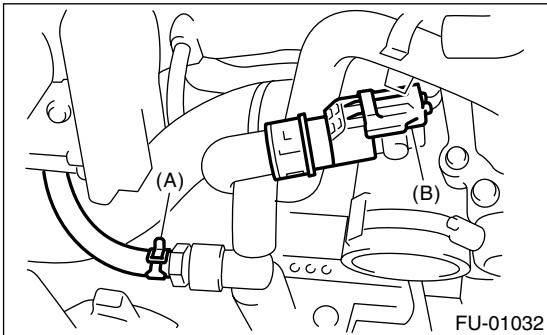
9) Connect the brake booster vacuum hose.



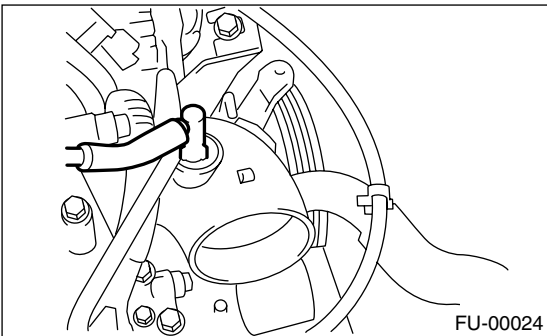
10) Connect the engine coolant hoses to the throttle body.



11) Connect the emission hose (A) and connector (B) to the PCV hose assembly.

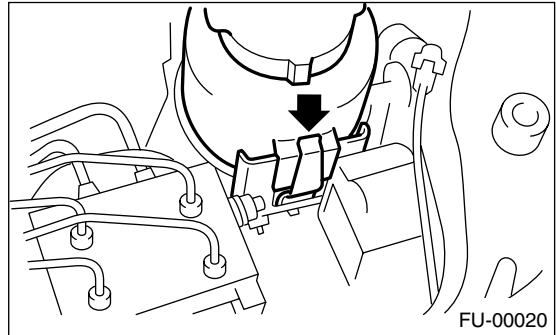


12) Connect the pressure hose to the intake duct.

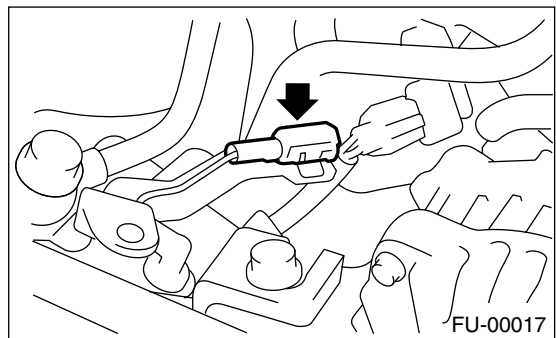


13) Install the power steering pump.

(1) Install the power steering tank on the bracket.



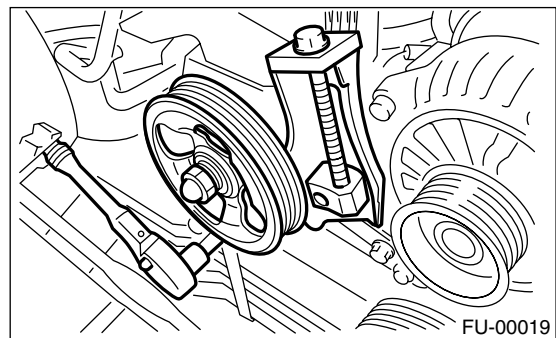
(2) Connect the connector to the power steering pump switch.



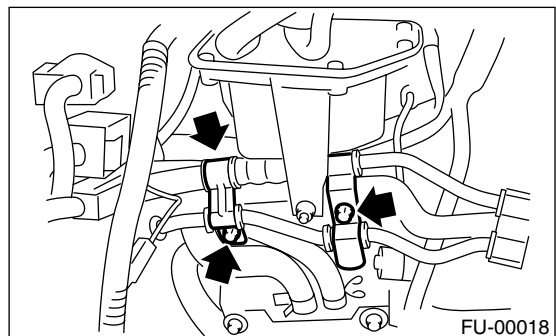
(3) Install the power steering pump, and tighten the bolts.

**Tightening torque:**

**22 N·m (2.2 kgf-m, 15.9 ft-lb)**



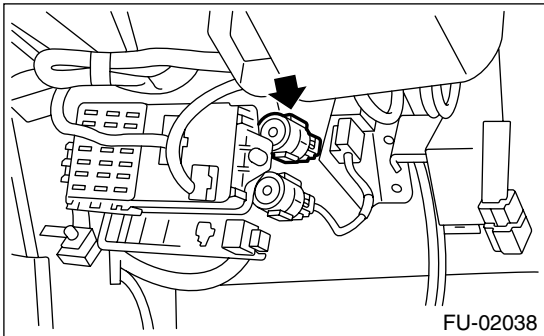
(4) Install the power steering pipe brackets on the intake manifold RH.



## INTAKE MANIFOLD

### FUEL INJECTION (FUEL SYSTEMS)

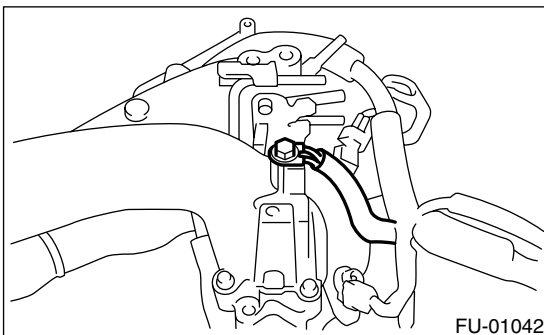
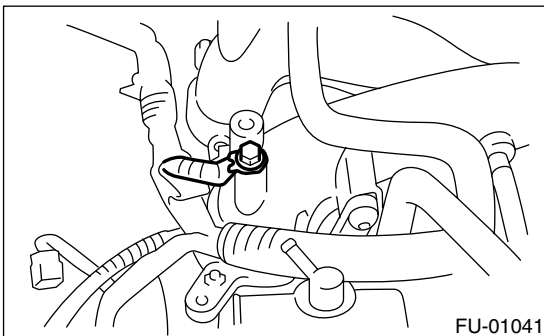
- (5) Install the front side V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
- 14) Install the coolant filler tank. <Ref. to CO(H4DOTC)-29, INSTALLATION, Coolant Filler Tank.>
- 15) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 16) Install the air cleaner element.
- 17) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOTC)-7, INSTALLATION, Air Cleaner.>
- 18) Connect the connector to the fuel pump relay.



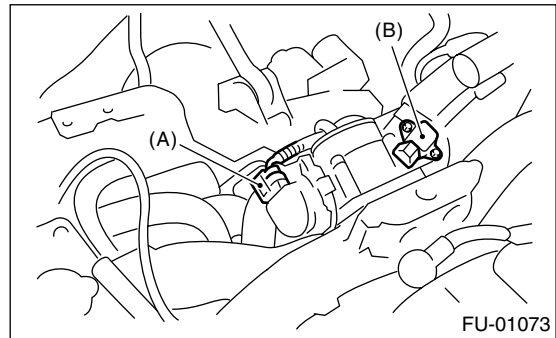
- 19) Connect the battery ground cable to battery.
- 20) Lift up the vehicle.
- 21) Install the under cover.
- 22) Fill the engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

### C: DISASSEMBLY

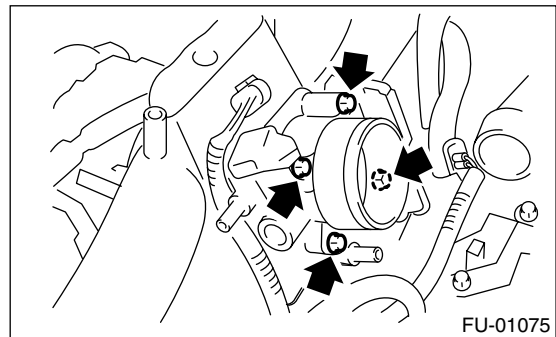
- 1) Remove the engine ground terminal from the intake manifold.



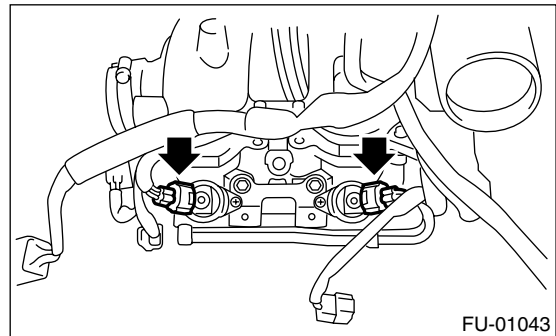
- 2) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



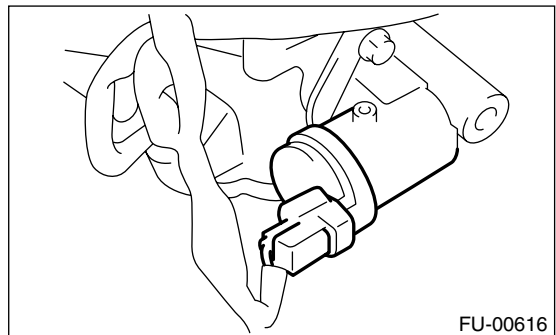
- 3) Remove the throttle body from the intake manifold.



- 4) Disconnect the connector from the fuel injector.



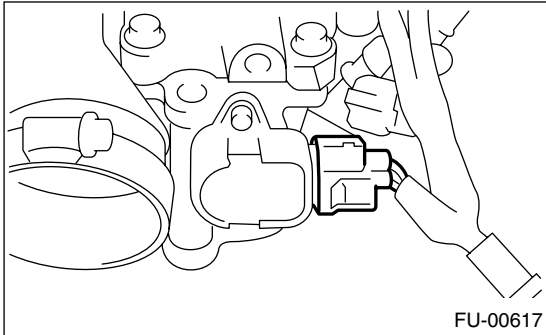
- 5) Disconnect the connector from the tumble generator valve actuator.



# INTAKE MANIFOLD

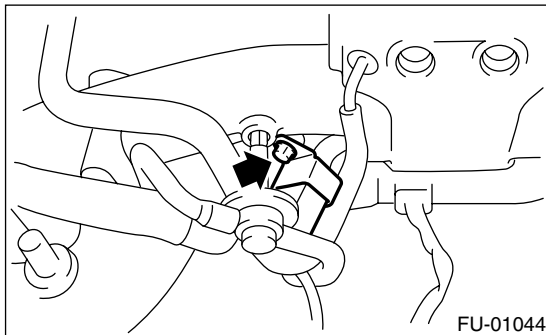
## FUEL INJECTION (FUEL SYSTEMS)

6) Disconnect the connector from the tumble generator valve sensor.

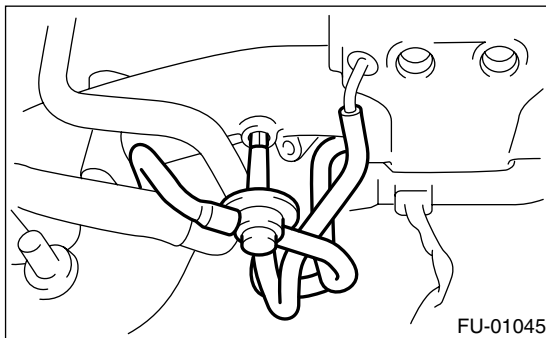


7) Disconnect the connector from the purge control solenoid valve.

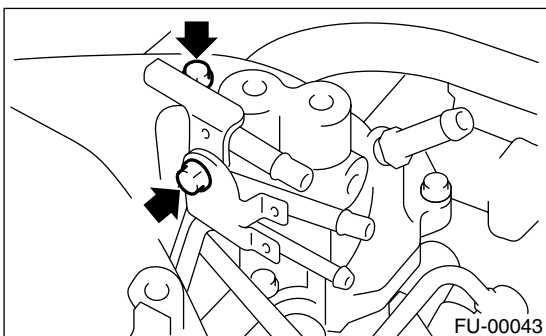
8) Remove the purge control solenoid valve.



9) Disconnect the evaporation hose and purge valve from the intake manifold.

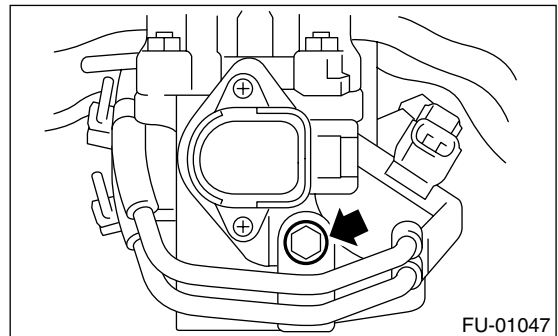
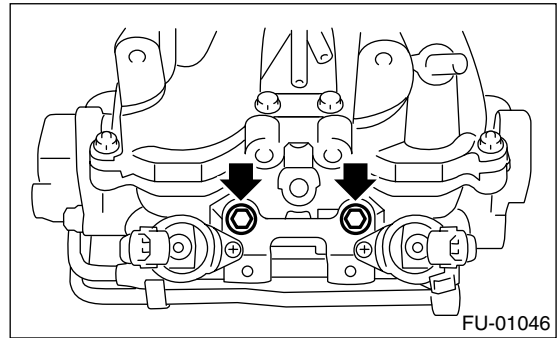


10) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.

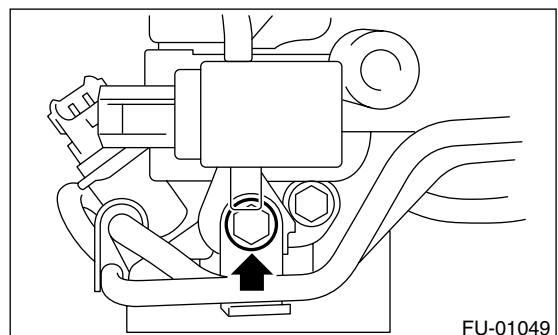
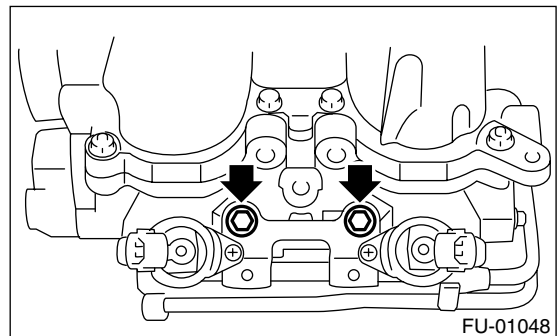


11) Remove the bolt which hold the fuel injector pipe onto intake manifold.

### • LH SIDE



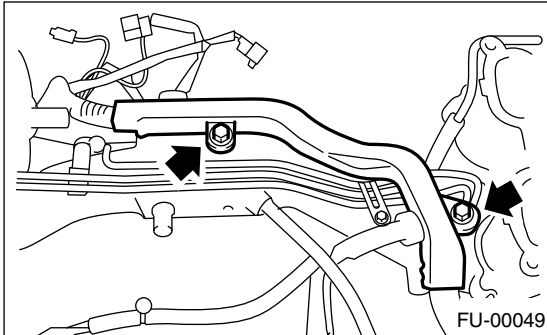
### • RH SIDE



## INTAKE MANIFOLD

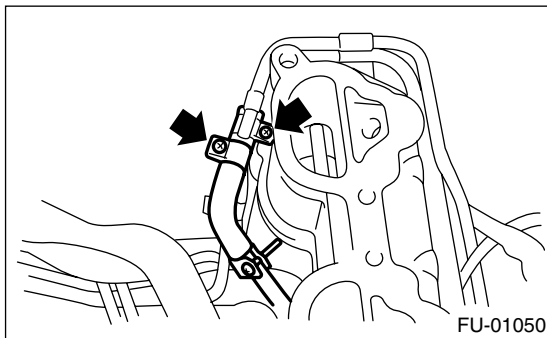
### FUEL INJECTION (FUEL SYSTEMS)

12) Remove the harness bracket which holds the engine harness onto intake manifold.

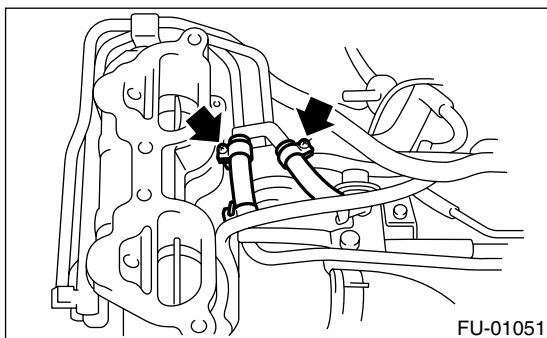


13) Remove the engine harness from the intake manifold.

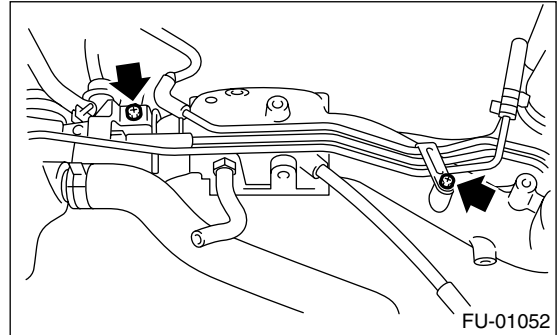
14) Loosen the clamp which holds the front left side fuel hose to injector pipe, and then remove the pipe from clamp.



15) Loosen the clamp which holds the right side fuel hose to injector pipe, and then remove the pipe from clamp.

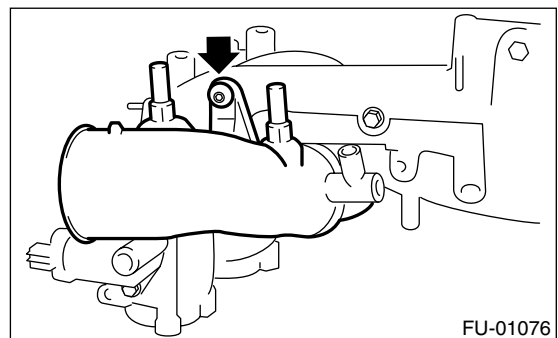


16) Remove the bolts which install the fuel pipe on intake manifold.

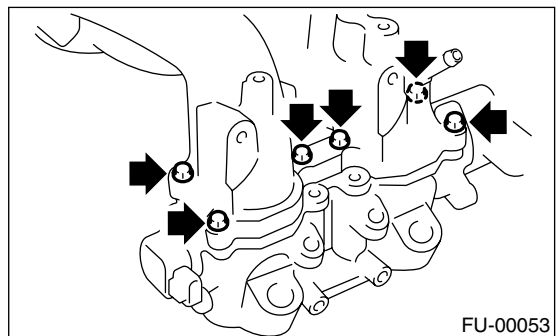


17) Remove the fuel pipe assembly and pressure regulator from the intake manifold.

18) Remove the intake duct from the intake manifold.



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



# INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

## D: ASSEMBLY

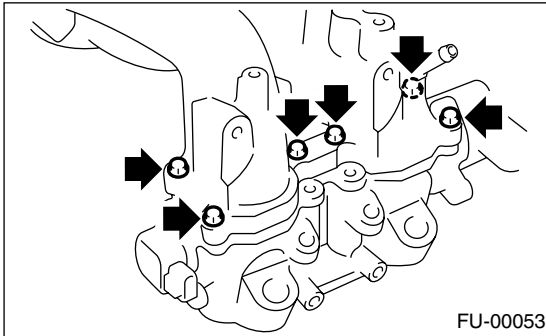
### NOTE:

Replace the gasket with a new one.

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

### **Tightening torque:**

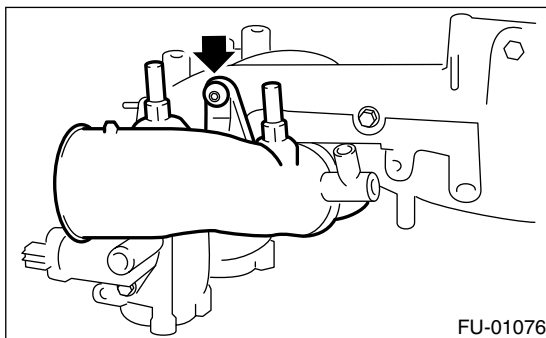
**8.25 N·m (0.84 kgf-m, 6.1 ft-lb)**



2) Install the air intake duct to the intake manifold.

### **Tightening torque:**

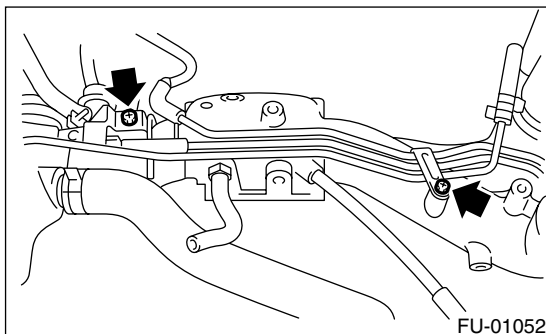
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

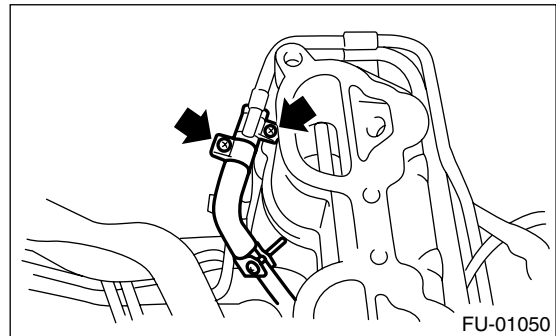
### **Tightening torque:**

**4.9 N·m (0.5 kgf-m, 3.6 ft-lb)**



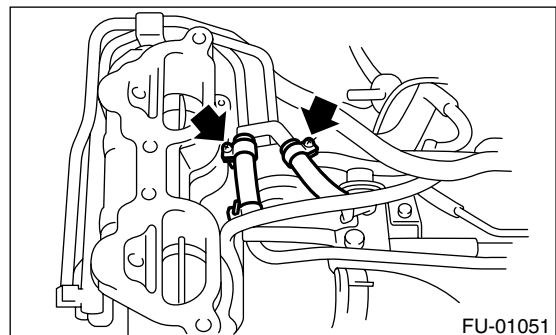
4) Install the fuel injector pipe LH.

5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.



6) Install the fuel injector pipe RH.

7) Connect the right side fuel hose to injector pipe, and tighten the clamp screw.

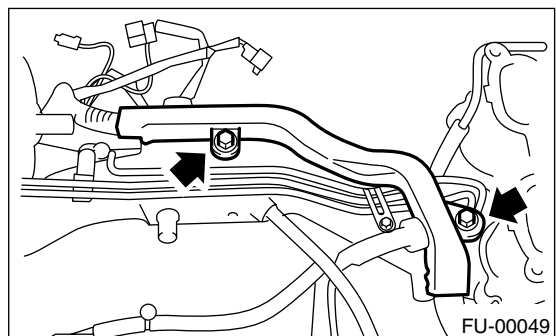


8) Install the engine harness to the intake manifold.

9) Install the harness bracket which holds the engine harness onto intake manifold.

### **Tightening torque:**

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



10) Tighten the bolts which install the fuel injector pipe onto intake manifold.

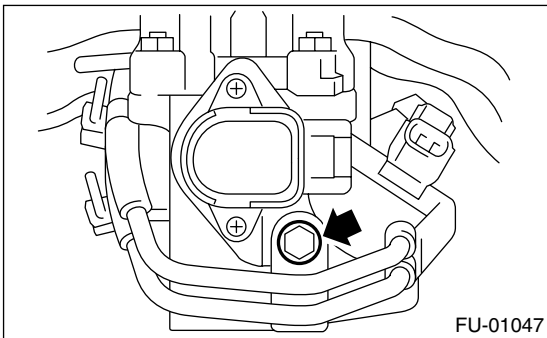
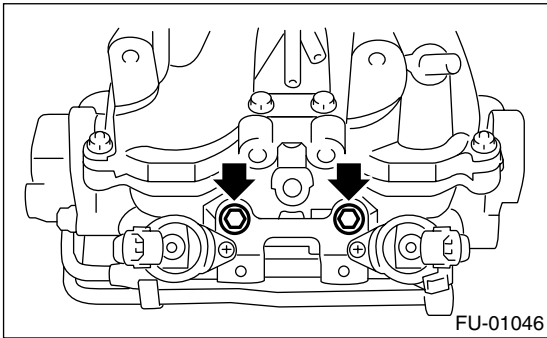
### **Tightening torque:**

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**

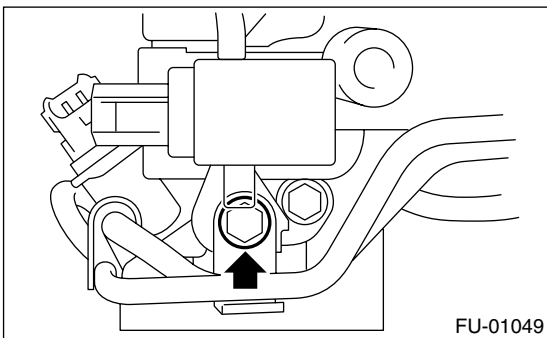
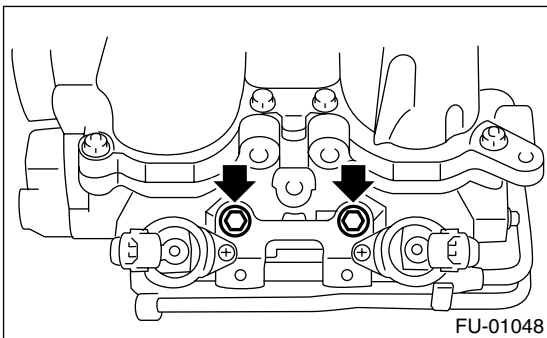
## INTAKE MANIFOLD

### FUEL INJECTION (FUEL SYSTEMS)

#### • LH SIDE

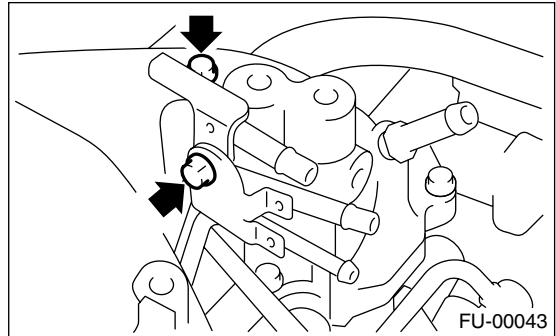


#### • RH SIDE



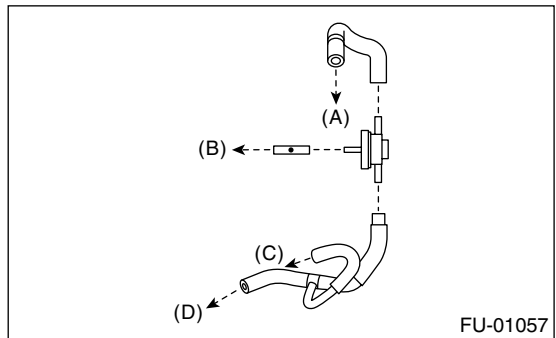
11) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

**Tightening torque:**  
**5 N·m (0.5 kgf-m, 3.6 ft-lb)**



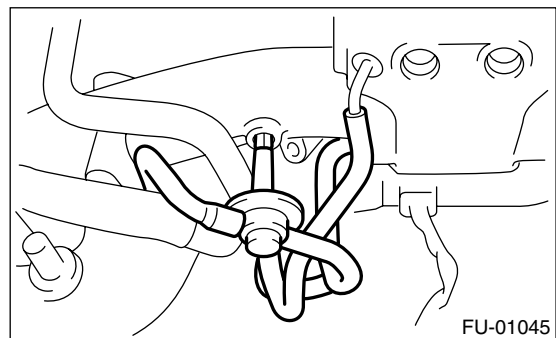
12) Connect the evaporation hoses to the purge valve.

**NOTE:**  
Connect the evaporation hoses as shown in the figure.



- (A) To intake duct
- (B) To intake manifold
- (C) To purge control solenoid valve
- (D) To fuel pipe ASSY

13) Connect the evaporation hose and purge valve to the intake manifold.



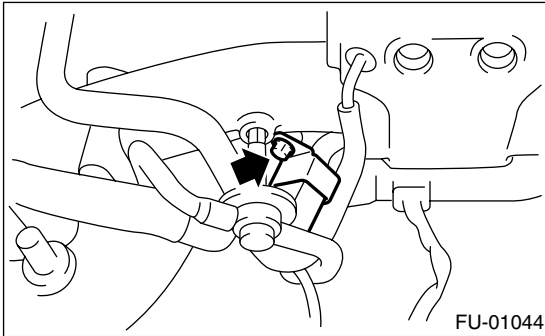
14) Install the purge control solenoid valve.

# INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

## **Tightening torque:**

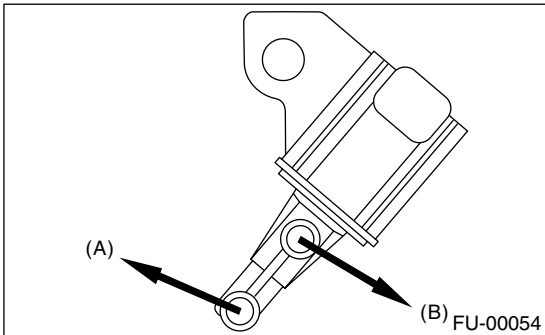
**16 N·m (1.6 kgf-m, 11.8 ft-lb)**



15) Connect the hoses to the purge control solenoid valve.

### **NOTE:**

Connect the evaporation hoses as shown in the figure.

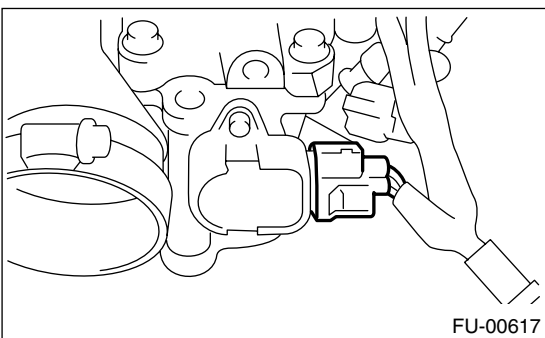


(A) To purge valve

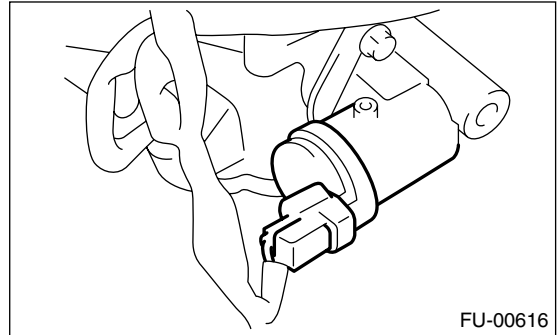
(B) To intake manifold

16) Connect the connector to the purge control solenoid valve.

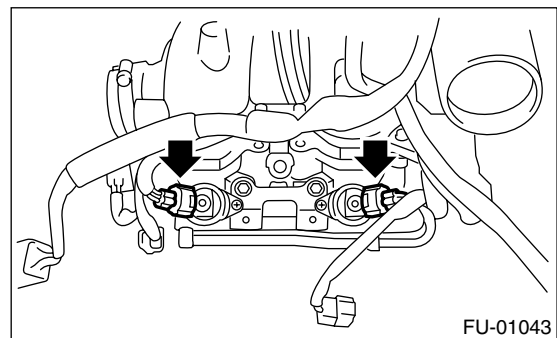
17) Connect the connector to the tumble generator valve sensor.



18) Connect the connector to the tumble generator valve actuator.



19) Connect the connector to the fuel injector.



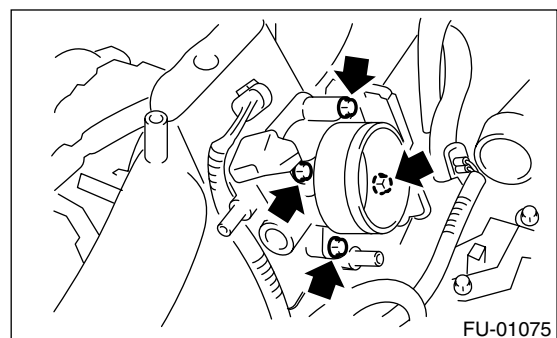
20) Install the throttle body to the intake manifold.

### **NOTE:**

Replace the gasket with a new one.

## **Tightening torque:**

**8 N·m (0.8 kgf-m, 5.8 ft-lb)**

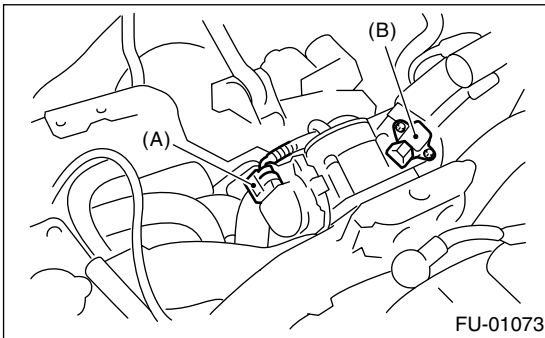


## INTAKE MANIFOLD

### FUEL INJECTION (FUEL SYSTEMS)

---

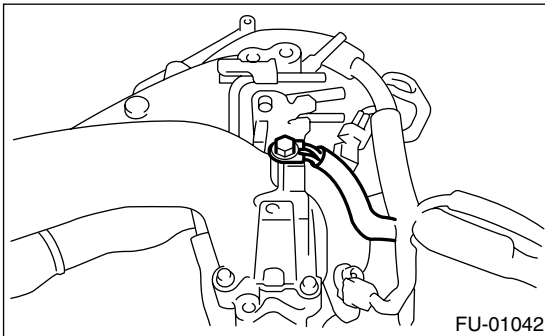
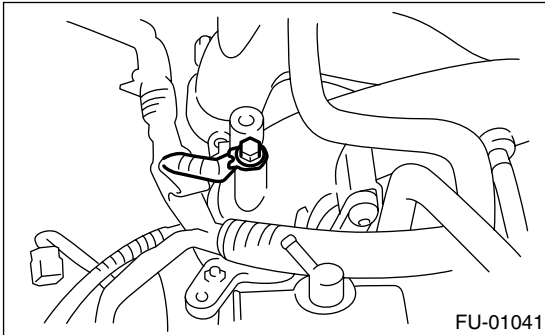
21) Connect the connector to the throttle position sensor (A) and manifold absolute pressure sensor (B).



22) Install the engine ground terminal to the intake manifold.

***Tightening torque:***

***19 N·m (1.94 kgf-m, 13.7 ft-lb)***



### **E: INSPECTION**

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

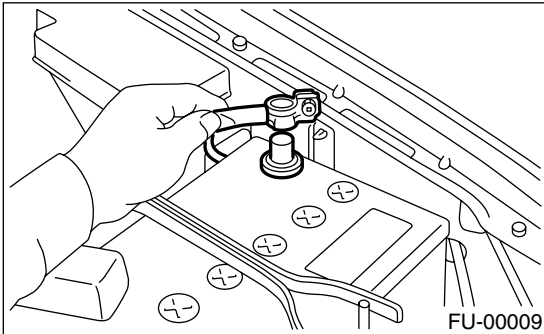
# KNOCK SENSOR

## FUEL INJECTION (FUEL SYSTEMS)

### 7. Knock Sensor

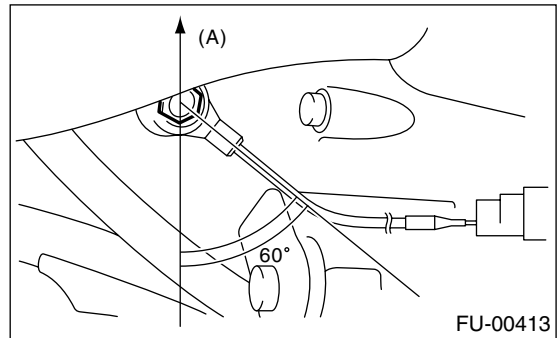
#### A: REMOVAL

- 1) Disconnect the ground cable from battery.



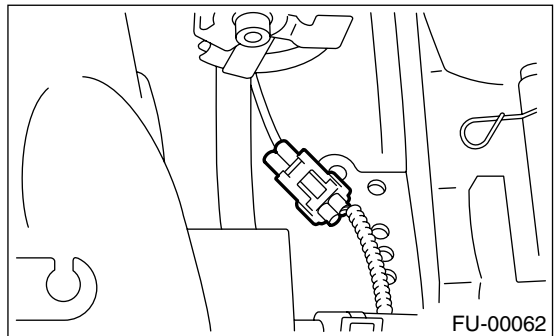
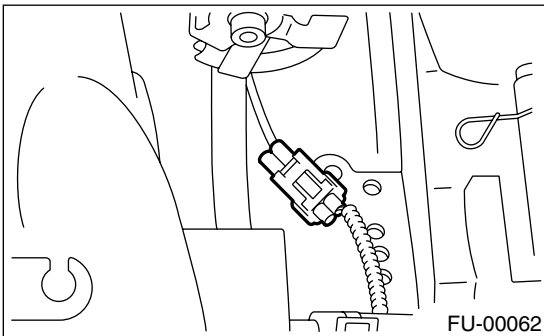
#### NOTE:

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

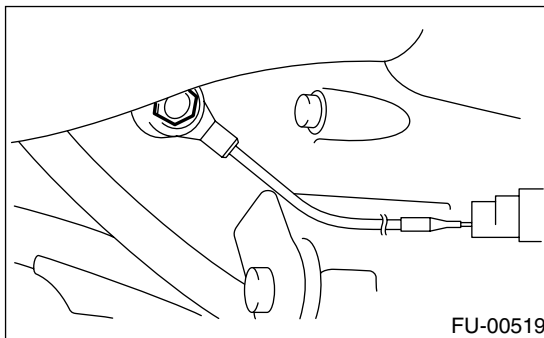


(A) Front side

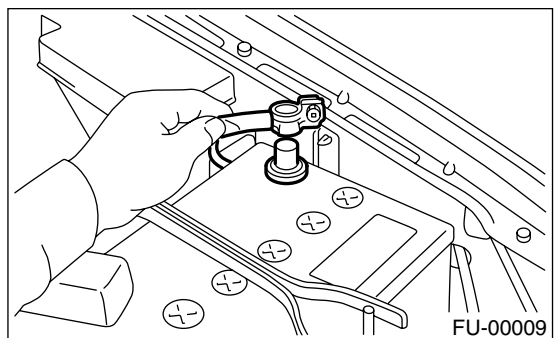
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from the cylinder block.



- 3) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 4) Connect the battery ground cable to battery.



#### B: INSTALLATION

- 1) Install the knock sensor to the cylinder block.

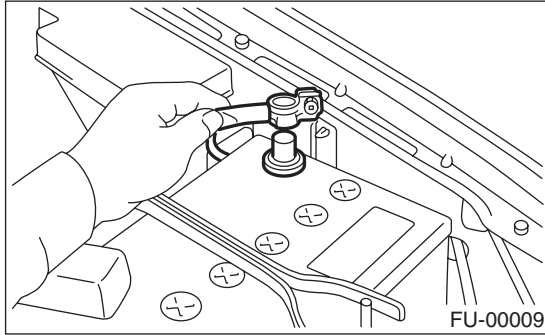
#### Tightening torque:

**24 N·m (2.4 kgf-m, 17.4 ft-lb)**

## 18.Main Relay

### A: REMOVAL

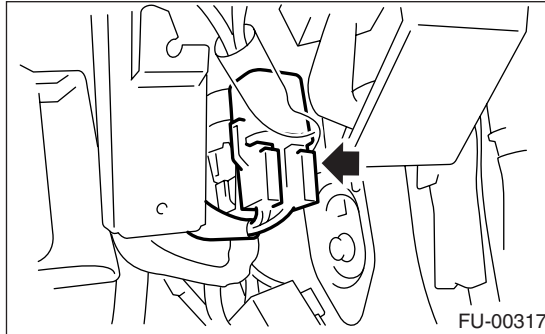
1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-34, REMOVAL, Glove Box.>

3) Remove the bolt which holds the main relay bracket on the body.

4) Disconnect the connectors from the main relay.



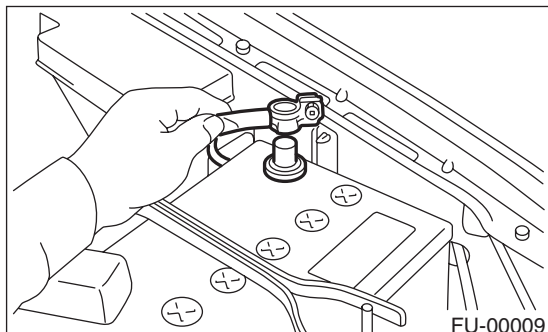
### B: INSTALLATION

Install in the reverse order of removal.

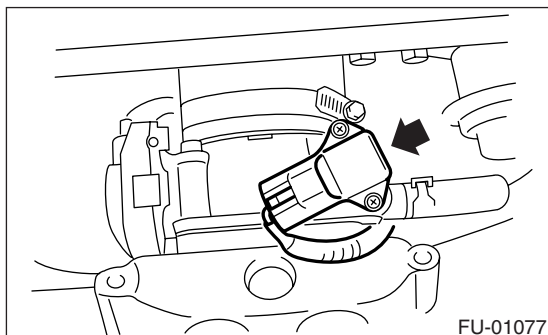
## 9. Manifold Absolute Pressure Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.



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



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

### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Replace the O-rings for the manifold absolute pressure sensor with new ones.

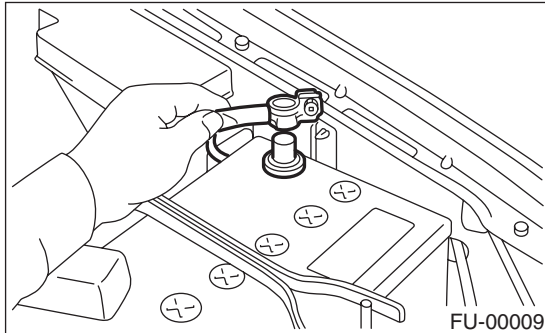
#### *Tightening torque:*

**1.6 N·m (0.16 kgf-m, 1.2 ft-lb)**

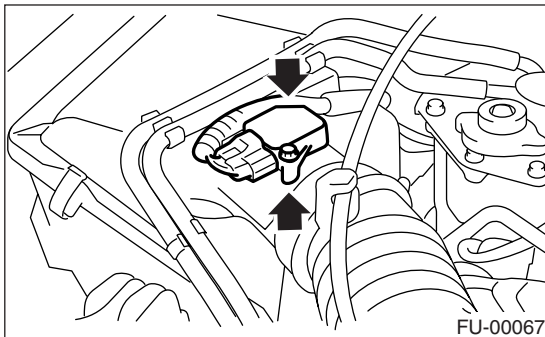
## **8. Mass Air Flow and Intake Air Temperature Sensor**

### **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)***

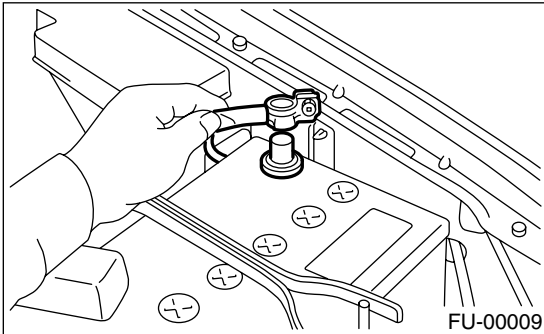
## REAR OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

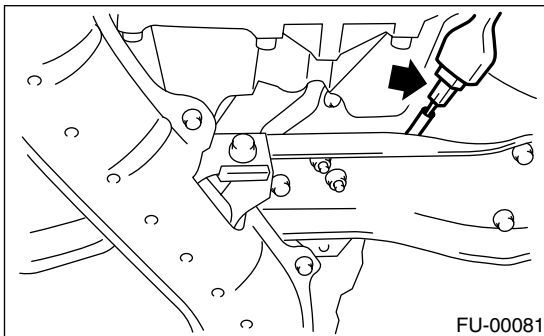
### 15.Rear Oxygen Sensor

#### A: REMOVAL

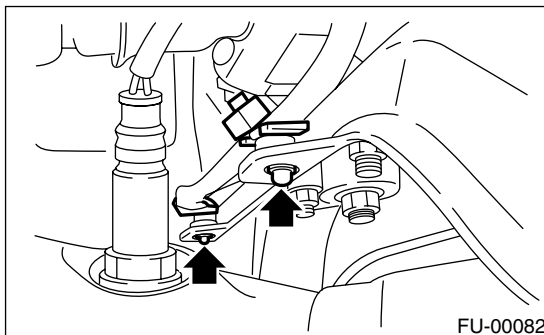
- 1) Disconnect the ground cable from battery.



- 2) Lift-up the vehicle.
- 3) Disconnect the connector from the rear oxygen sensor.



- 4) Remove the clip by pulling out from the upper side of crossmember.



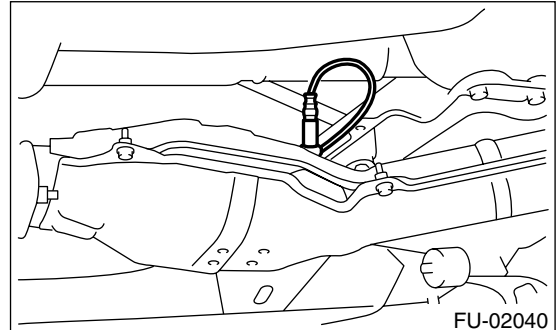
- 5) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

**SUBARU CRC (Part No. 004301003)**

- 6) Remove the rear oxygen sensor.

#### CAUTION:

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



#### B: INSTALLATION

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

#### CAUTION:

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

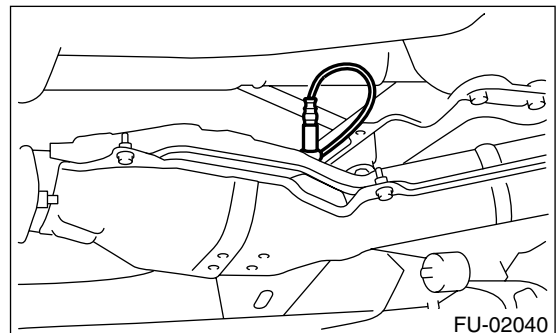
**Anti-seize compound:**

**SS-30 by JET LUBE**

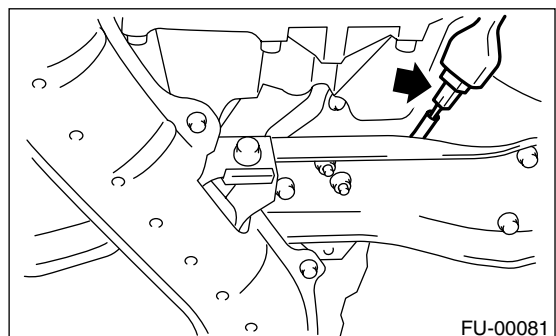
- 2) Install the rear oxygen sensor.

**Tightening torque:**

**21 N·m (2.1 kgf-m, 15.2 ft-lb)**



- 3) Connect the connector to the rear oxygen sensor.

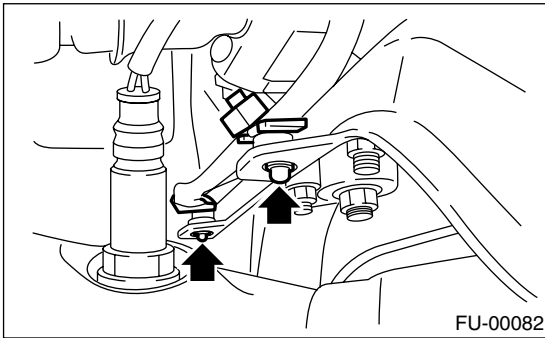


## REAR OXYGEN SENSOR

### FUEL INJECTION (FUEL SYSTEMS)

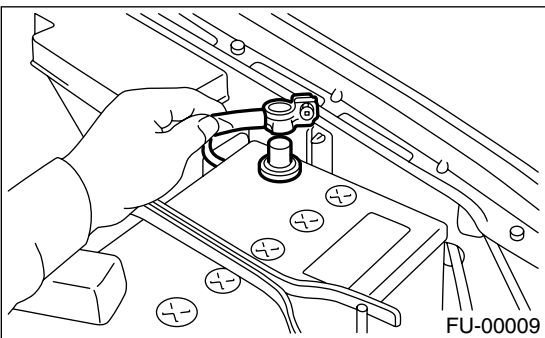
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- 4) Connect the clip to the crossmember.



- 5) Lower the vehicle.

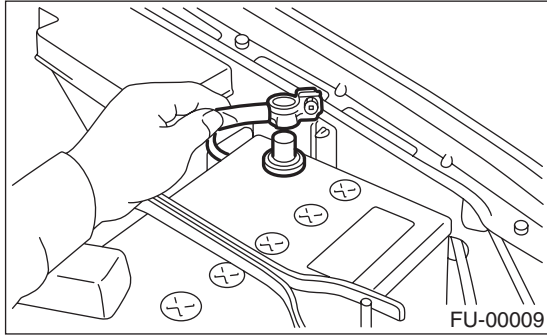
- 6) Connect the battery ground cable to battery.



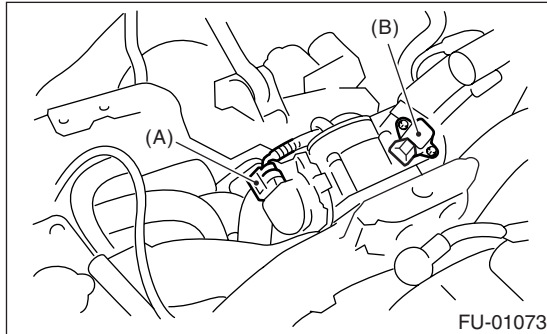
## 2. Throttle Body

### A: REMOVAL

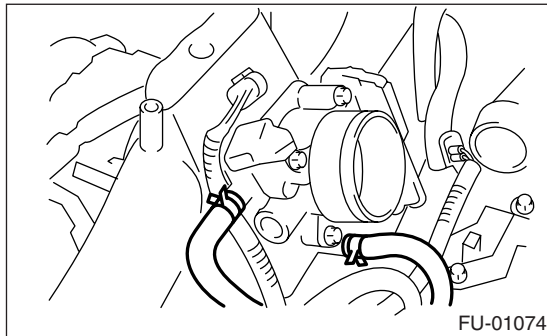
- 1) Disconnect the ground cable from battery.



- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
- 3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



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



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

### B: INSTALLATION

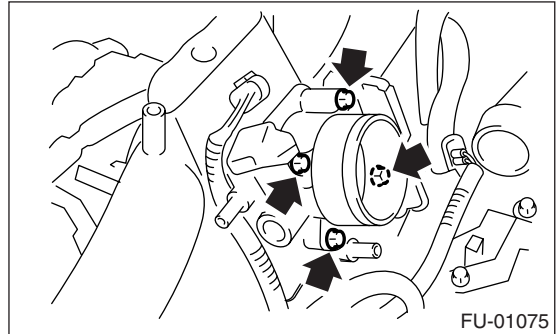
Install in the reverse order of removal.

NOTE:

Always use a new gasket.

**Tightening torque:**

**8 N·m (0.8 kgf-m, 5.8 ft-lb)**

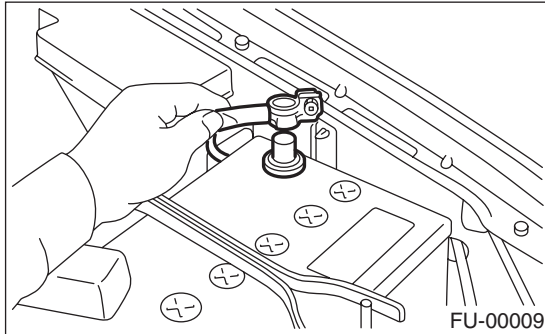


## 12. Tumble Generator Valve Actuator

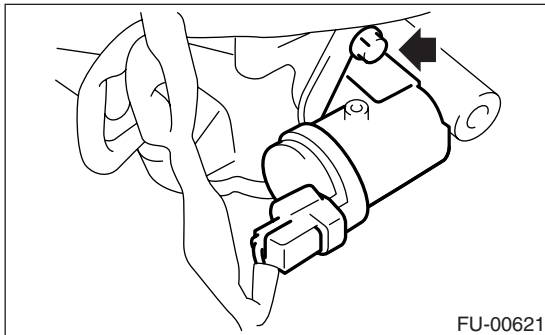
### A: REMOVAL

#### 1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.

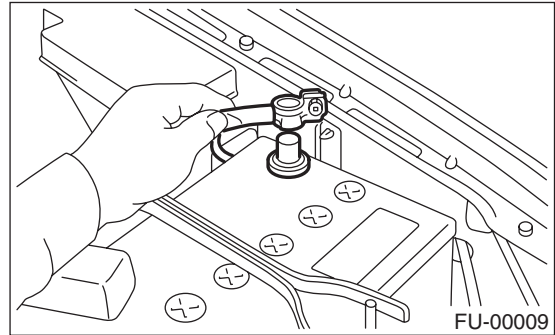


- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from tumble generator valve actuator RH.
- 6) Remove the tumble generator valve actuator RH.

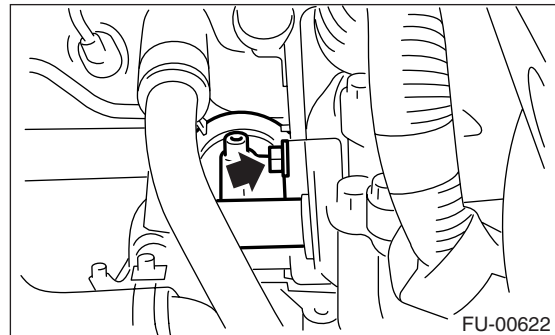


#### 2. LH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Disconnect the connector from tumble generator valve actuator LH.
- 5) Remove the tumble generator valve actuator LH.



### B: INSTALLATION

#### 1. RH SIDE

Install in the reverse order of removal.

#### 2. LH SIDE

Install in the reverse order of removal.

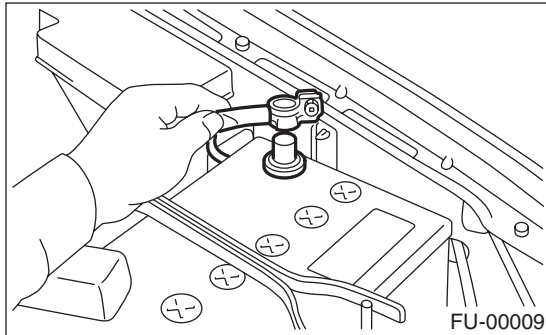
# TUMBLE GENERATOR VALVE ASSEMBLY

## FUEL INJECTION (FUEL SYSTEMS)

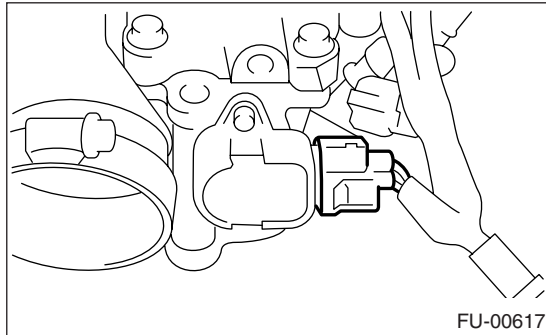
### 11. Tumble Generator Valve Assembly

#### A: REMOVAL

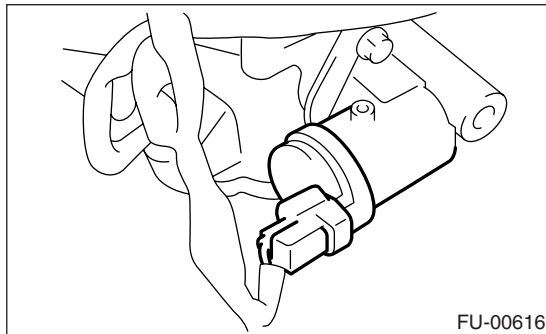
- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the tumble generator valve sensor.

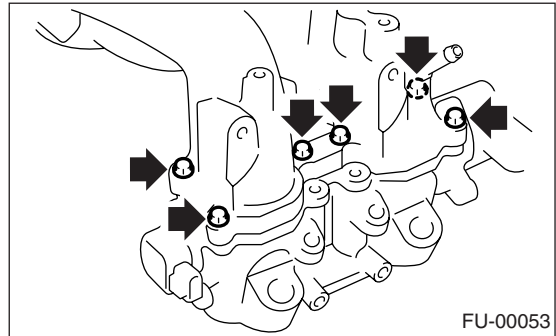


- 6) Disconnect the connector from the tumble generator valve actuator.



- 7) Remove the fuel injector. <Ref. to FU(H4DOTC)-32, REMOVAL, Fuel Injector.>

- 8) Remove the tumble generator valve body from the intake manifold.



#### B: INSTALLATION

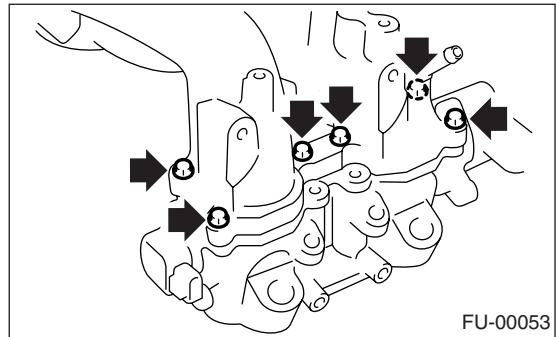
Install in the reverse order of removal.

#### NOTE:

Always use new gaskets.

#### Tightening torque:

**8.25 N·m (0.84 kgf-m, 6.1 ft-lb)**



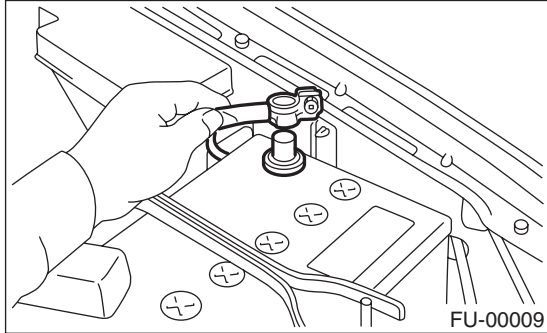
## WASTEGATE CONTROL SOLENOID VALVE

### FUEL INJECTION (FUEL SYSTEMS)

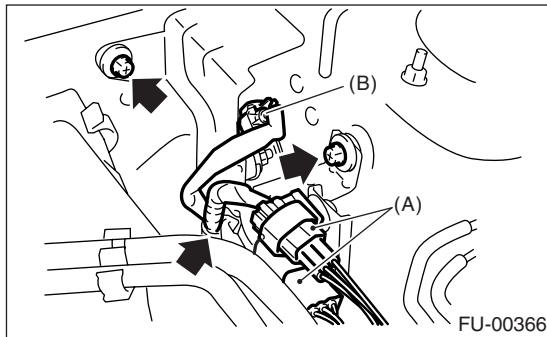
## 13. Wastegate Control Solenoid Valve

### A: REMOVAL

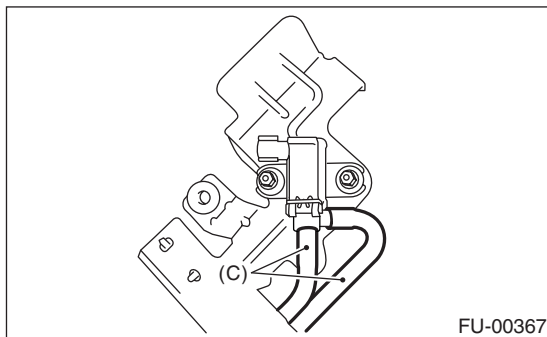
- 1) Disconnect the ground cable from battery.



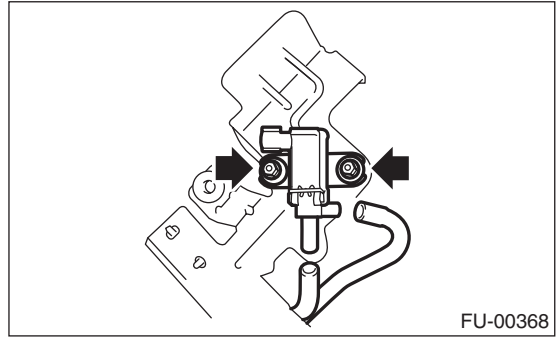
- 2) Disconnect the engine harness connector (A) from bracket.  
3) Disconnect the connector (B) from wastegate control solenoid valve.  
4) Remove the bracket from body.



- 5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



- 6) Remove the wastegate control solenoid valve from bracket.

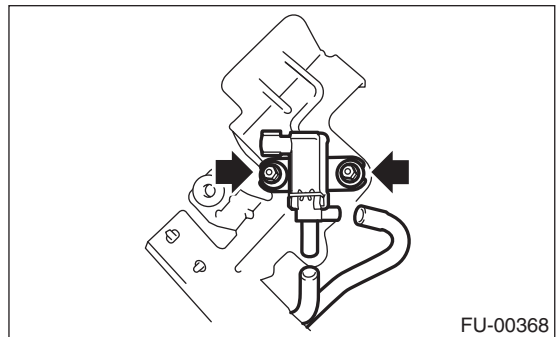


### B: INSTALLATION

Install in the reverse order of removal.

#### ***Tightening torque:***

***6.5 N·m (0.66 kgf-m, 4.8 ft-lb)***



# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

## 2. Diagnostic Trouble Code (DTC) Detecting Criteria

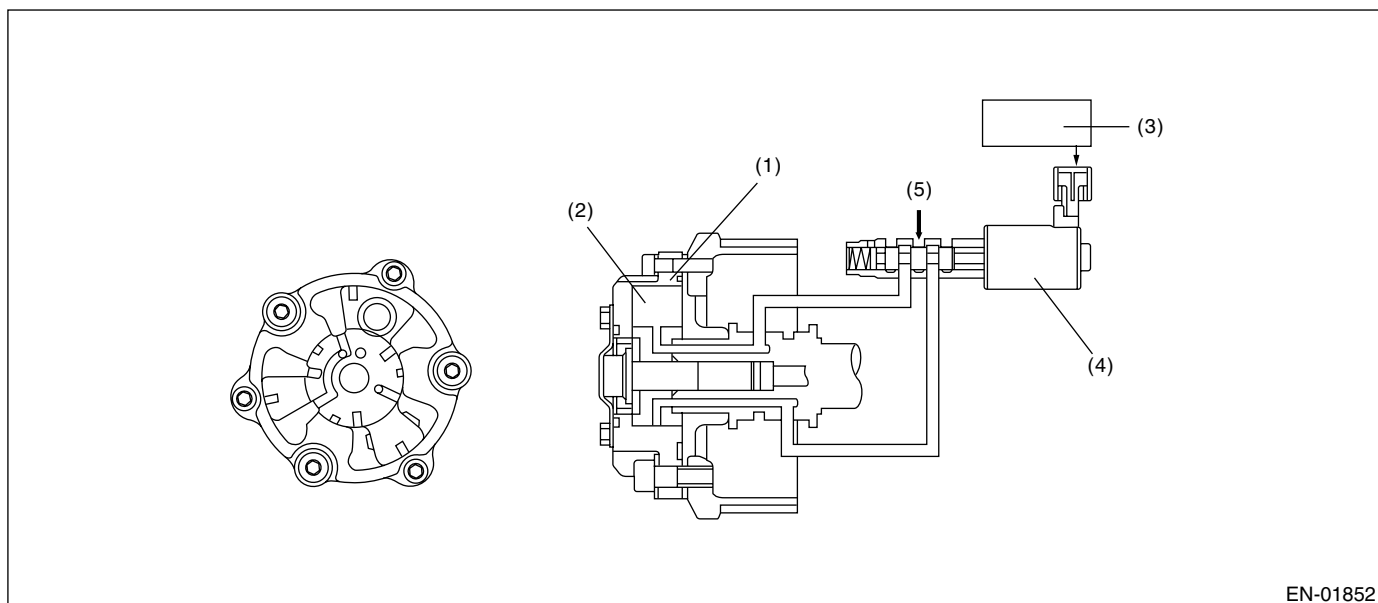
### A: DTC P0011 — “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.

- 1) Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.
- 2) Judge NG when the most retarded learning value is outside of the normal range.

#### 2. COMPONENT DESCRIPTION



EN-01852

(1) AVCS timing controller

(3) Engine control module (ECM)

(5) Oil pressure

(2) Vane

(4) Oil flow control valve

#### 3. ENABLE CONDITION (For abnormality judgment only)

| Secondary Parameters      | Enable Conditions                  |
|---------------------------|------------------------------------|
| Abnormality judgement (1) |                                    |
| Battery voltage           | $\geq 10.9 \text{ V}$              |
| Engine speed              | $\geq 1500 \text{ rpm}$            |
| Coolant temperature       | $\geq 60^{\circ}\text{C}$ (140 °F) |
| Abnormality judgement (2) |                                    |
| Battery voltage           | $\geq 10.9 \text{ V}$              |
| Engine speed              | $\geq 500 \text{ rpm}$             |
| Coolant temperature       | $\geq 60^{\circ}\text{C}$ (140 °F) |

#### 4. GENERAL DRIVING CYCLE

- 1) Always perform the diagnosis after idling when the engine speed is more than 1500 rpm.
- 2) Always perform the diagnosis after warming up the engine when the engine speed is more than 500 rpm.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

- 1) Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large.
- 2) Judge NG when the most retarded learning value is outside of the normal range.

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 20 seconds.

### • Judgment Value

| Malfunction Criteria                                                         | Threshold Value                                                                              |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| (1) Judgement value<br> AVCS target position – AVCS actual position          | $\geq 7.5^\circ$                                                                             |
| (2) Judgement value<br>AVCS control<br><br>Most timing retard learning value | During most timing retard learning<br>$< -29.5^\circ\text{CA}$ or<br>$> 29.5^\circ\text{CA}$ |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

### • Judgment Value

| Malfunction Criteria                                                                                                       | Threshold Value                                            |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| (1) Judgement value<br>AVCS control<br>Amount of AVCS target timing advance<br>AVCS target position – AVCS actual position | During feedback<br>$5 - 30^\circ\text{CA}$<br>$< 10^\circ$ |
| (2) Judgement value<br>Most timing retard learning value                                                                   | $-29.5 - 29.5^\circ\text{CA}$                              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### **B: DTC P0021 — “A” 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 — “A” CAM-SHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —.>

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

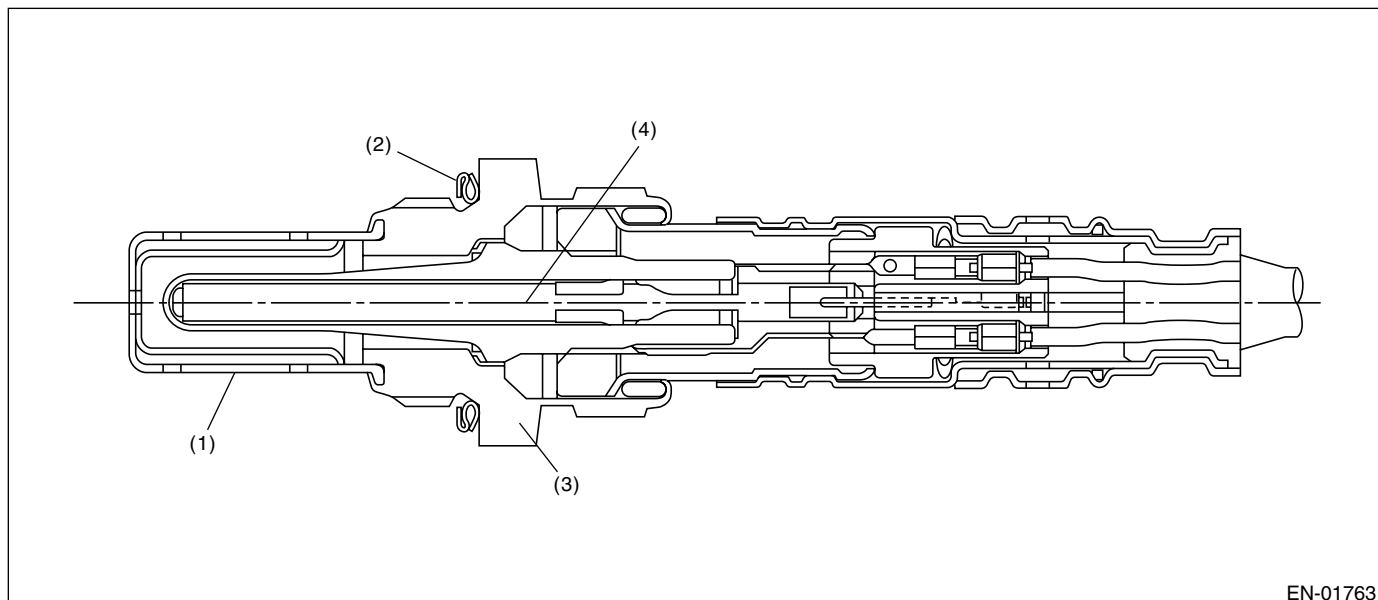
### C: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.

Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

#### 2. COMPONENT DESCRIPTION



EN-01763

- (1) Protection tube
- (2) Gasket
- (3) Sensor housing
- (4) Ceramic heater

#### 3. ENABLE CONDITION

| Secondary Parameters                                                | Enable Conditions  |
|---------------------------------------------------------------------|--------------------|
| Time needed for all secondary parameters to be in enable conditions | 60 seconds or more |
| Battery voltage                                                     | > 10.9 V           |
| After fuel shut-off                                                 | 20 seconds or more |
| Front oxygen (A/F) sensor heater control duty $\geq 70\%$           | Experienced        |

#### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

### Judgment Value

| Malfunction Criteria                   | Threshold Value |
|----------------------------------------|-----------------|
| Impedance of front oxygen (A/F) sensor | > 50 $\Omega$   |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3  $\rightarrow$  0
- Purge control: Not allowed to purge

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

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

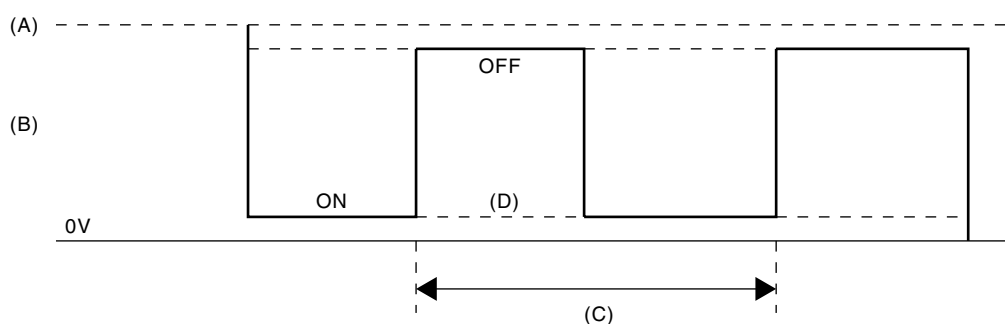
#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be Low.

#### 2. COMPONENT DESCRIPTION



EN-01792

(A) Battery voltage

(C) 128 milliseconds

(B) Front oxygen (A/F) sensor heater  
output voltage

(D) Low abnormality

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

### • Judgment Value

| Malfunction Criteria                          | Threshold Value |
|-----------------------------------------------|-----------------|
| Output voltage level                          | Low             |
| Front oxygen (A/F) sensor heater control duty | < 87.5%         |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | High            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

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

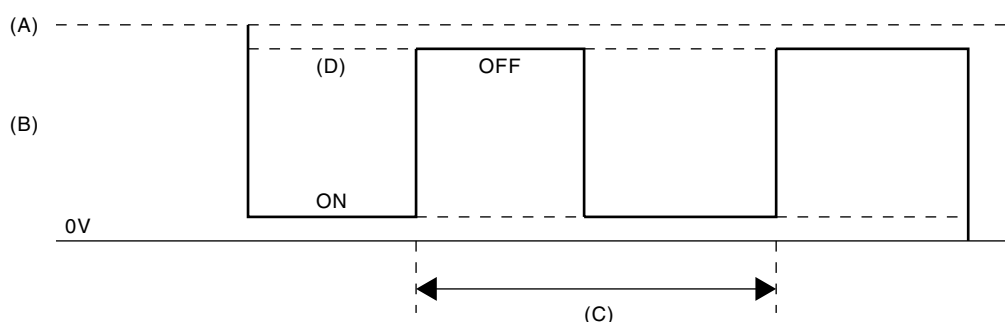
### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be High.

### 2. COMPONENT DESCRIPTION



EN-01793

- |                                                     |                                     |
|-----------------------------------------------------|-------------------------------------|
| (A) Battery voltage                                 | (C) 128 milliseconds                |
| (B) Front oxygen (A/F) sensor heater output voltage | (D) High abnormality output voltage |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

### • Judgment Value

| Malfunction Criteria                          | Threshold Value |
|-----------------------------------------------|-----------------|
| Output voltage level                          | High            |
| Front oxygen (A/F) sensor heater control duty | $\geq 12.5\%$   |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | Low             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

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

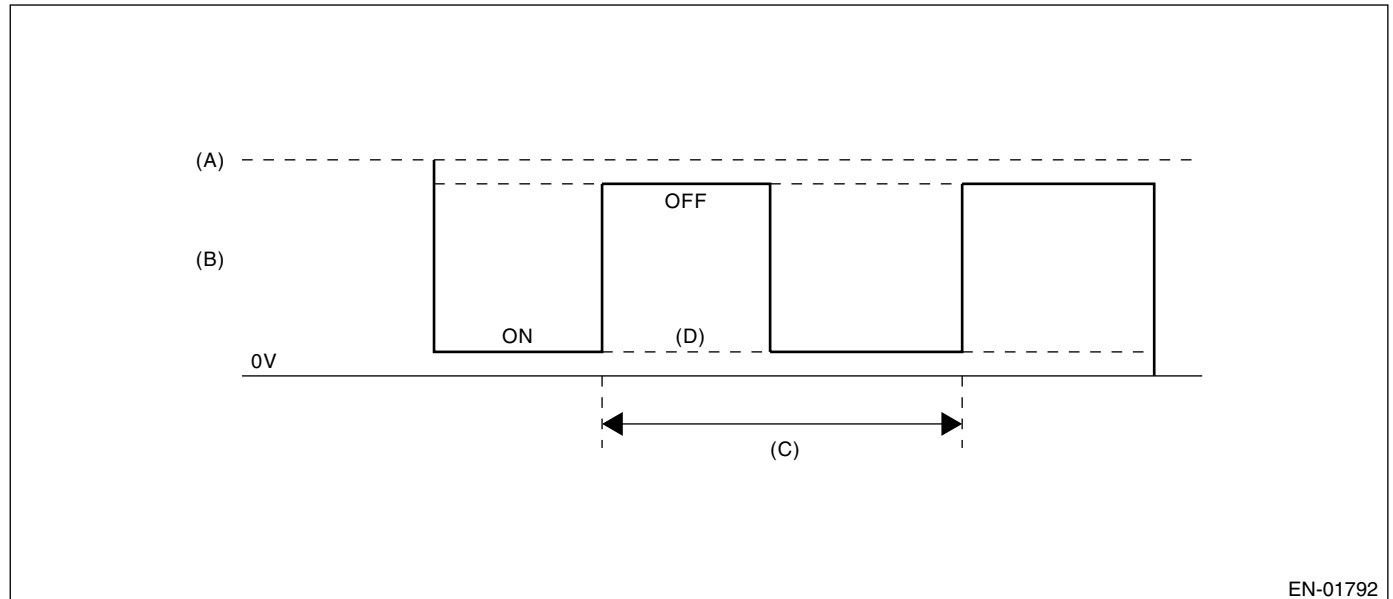
#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen sensor heater.

Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

#### 2. COMPONENT DESCRIPTION



- (A) Battery voltage  
(B) Rear oxygen sensor heater output voltage  
(C) 256 milliseconds (cycles)  
(D) Low malfunction voltage

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | > 10.9 V          |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 millisecond (10 cycles).

### • Judgment Value

| Malfunction Criteria                   | Threshold Value |
|----------------------------------------|-----------------|
| Output voltage level                   | Low             |
| Rear oxygen sensor heater control duty | < 75%           |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | High            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

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

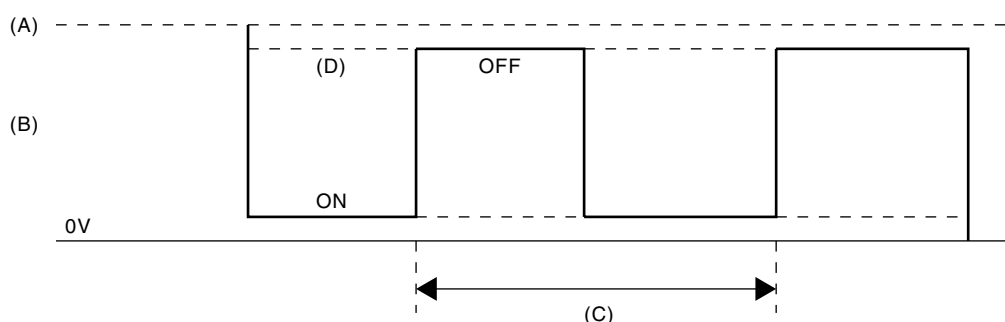
##### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater.

Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

##### 2. COMPONENT DESCRIPTION



(A) Battery voltage

(C) 256 milliseconds (cycle)

(B) Rear oxygen sensor heater output voltage

(D) High malfunction

##### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | > 10.9 V          |

##### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes 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 OK and clear the NG when all the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | Low             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

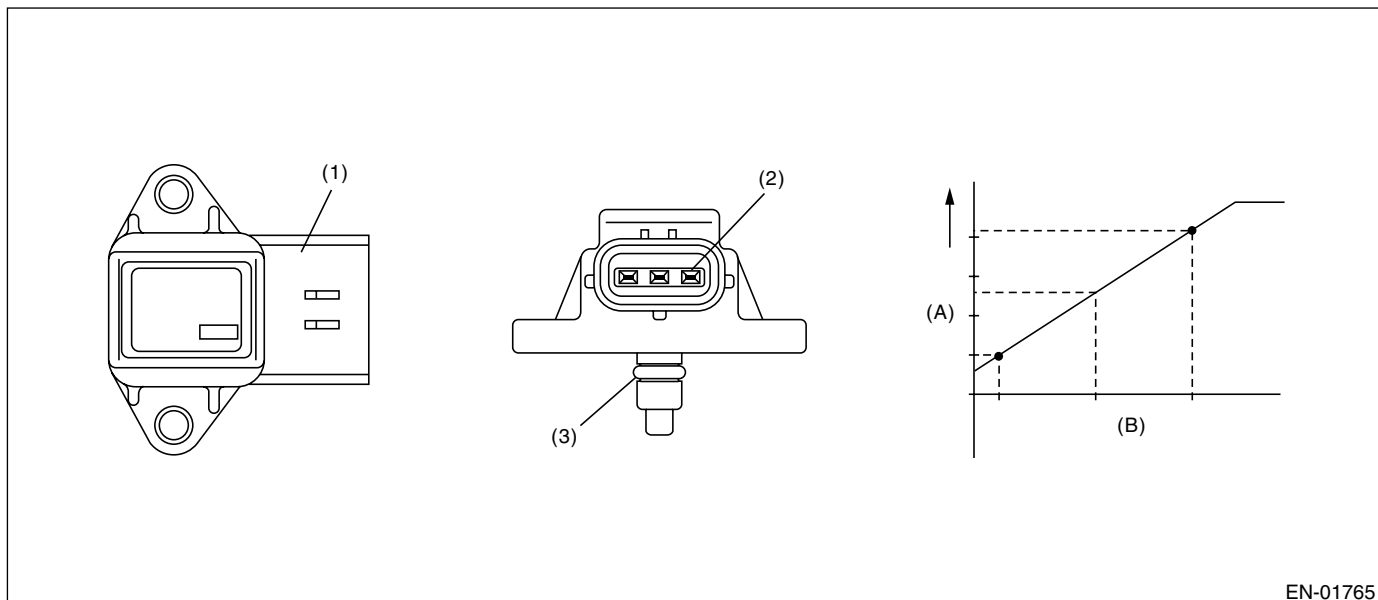
## GENERAL DESCRIPTION

### H: DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

#### 2. COMPONENT DESCRIPTION



EN-01765

- (1) Connector
- (2) Terminal

- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

#### 3. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                                   |
|----------------------------|-----------------------------------------------------|
| Engine coolant temperature | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

### • Judgment Value

| Malfunction Criteria | Threshold Value                   |
|----------------------|-----------------------------------|
| Low side             |                                   |
| Engine speed         | < 2500 rpm                        |
| Throttle position    | $\geq 10^\circ$                   |
| Output voltage       | < 1.0 V                           |
| High side            |                                   |
| Engine speed         | 600 $\longleftrightarrow$ 900 rpm |
| Throttle position    | < $1.3^\circ$                     |
| Output voltage       | $\geq 2.6$ V                      |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value                   |
|----------------------|-----------------------------------|
| Low side             |                                   |
| Engine speed         | < 2500 rpm                        |
| Throttle position    | $\geq 10^\circ$                   |
| Output voltage       | $\geq 1.0$ V                      |
| High side            |                                   |
| Engine speed         | 600 $\longleftrightarrow$ 900 rpm |
| Throttle position    | < $1.3^\circ$                     |
| Output voltage       | < 2.6 V                           |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

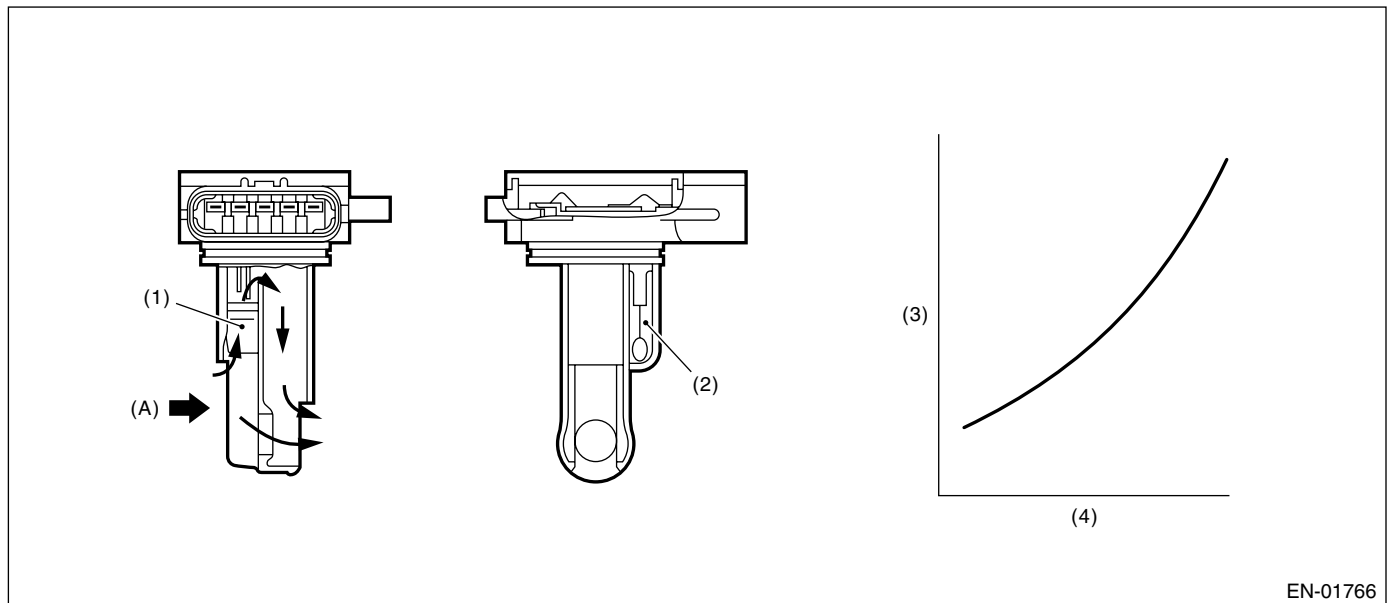
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

#### 2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Intake air volume (kg (lb)/s)

(A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                                   |
|----------------------------|-----------------------------------------------------|
| Engine coolant temperature | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

### • Judgment Value

| Malfunction Criteria     | Threshold Value                  |
|--------------------------|----------------------------------|
| Low side NG              |                                  |
| Output voltage           | < 1.5 V                          |
| Engine speed             | ≥ 2500 rpm                       |
| Throttle angle           | ≥ 15°                            |
| Intake manifold pressure | ≥ 53.3 kPa (400 mmHg, 15.7 inHg) |
| High side NG             |                                  |
| Output voltage           | ≥ 2.5 V                          |
| Engine speed             | 550 ←→ 900 rpm                   |
| Throttle angle           | < 1.92°                          |
| Intake manifold pressure | < 46.7 kPa (350 mmHg, 13.8 inHg) |

### Time Needed for Diagnosis:

|           |            |
|-----------|------------|
| Low side  | 3 seconds  |
| High side | 10 seconds |

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK the when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria     | Threshold Value                  |
|--------------------------|----------------------------------|
| Low side NG              |                                  |
| Output voltage           | ≥ 1.5 V                          |
| Engine speed             | ≥ 2500 rpm                       |
| Throttle angle           | ≥ 15°                            |
| Intake manifold pressure | ≥ 53.3 kPa (400 mmHg, 15.7 inHg) |
| High side NG             |                                  |
| Output voltage           | < 2.5 V                          |
| Engine speed             | 550 ←→ 900 rpm                   |
| Throttle angle           | < 1.92°                          |
| Intake manifold pressure | < 46.7 kPa (350 mmHg, 13.8 inHg) |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°C A is fixed.
  - At trouble: knock compensation ≠ 0°C A is fixed. (Retard max. 12°C A at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

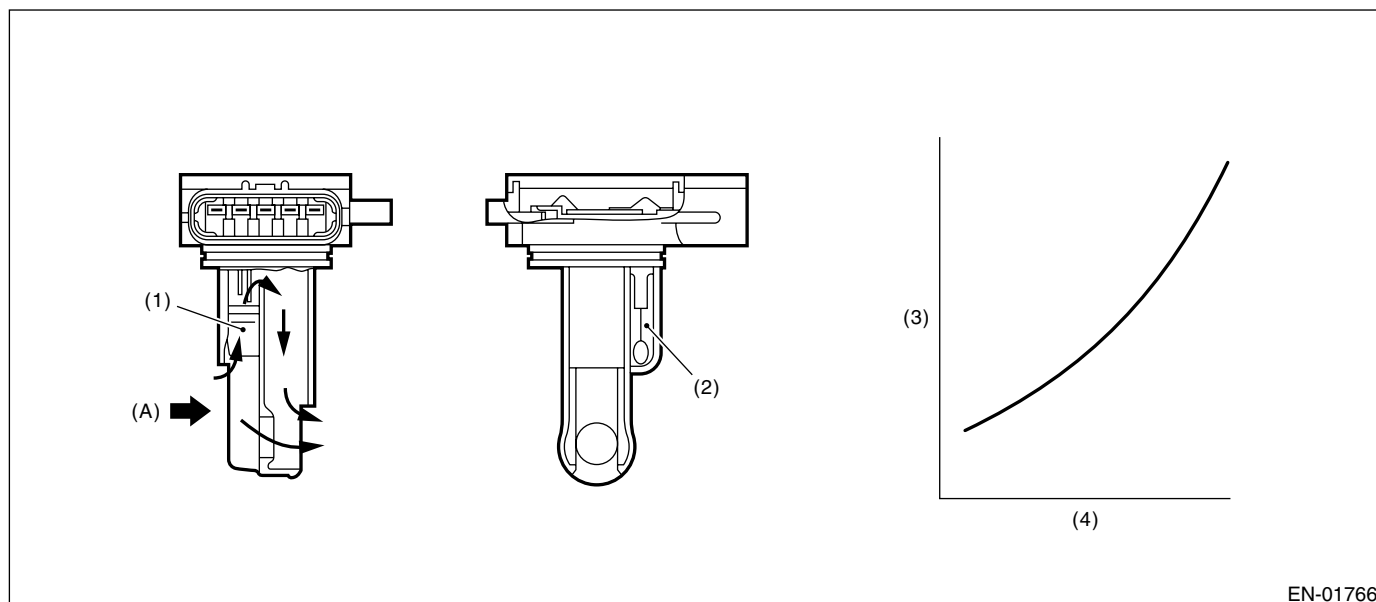
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Intake air volume (kg (lb)/s)

(A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\leq 0.2$ V    |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°C<sub>A</sub> is fixed.
  - At trouble: knock compensation ≠ 0°C<sub>A</sub> is fixed. (Retard max. 12°C<sub>A</sub> at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

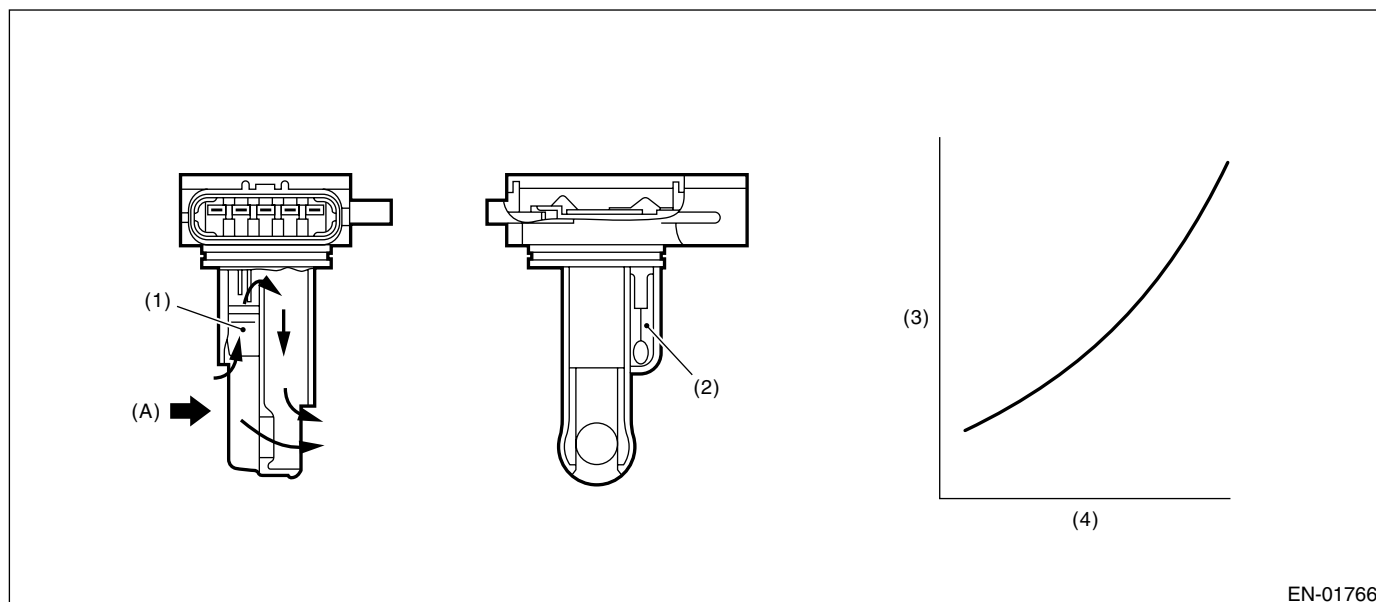
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Intake air volume (kg (lb)/s)

(A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.985$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°C A is fixed.
  - At trouble: knock compensation ≠ 0°C A is fixed. (Retard max. 12°C A at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

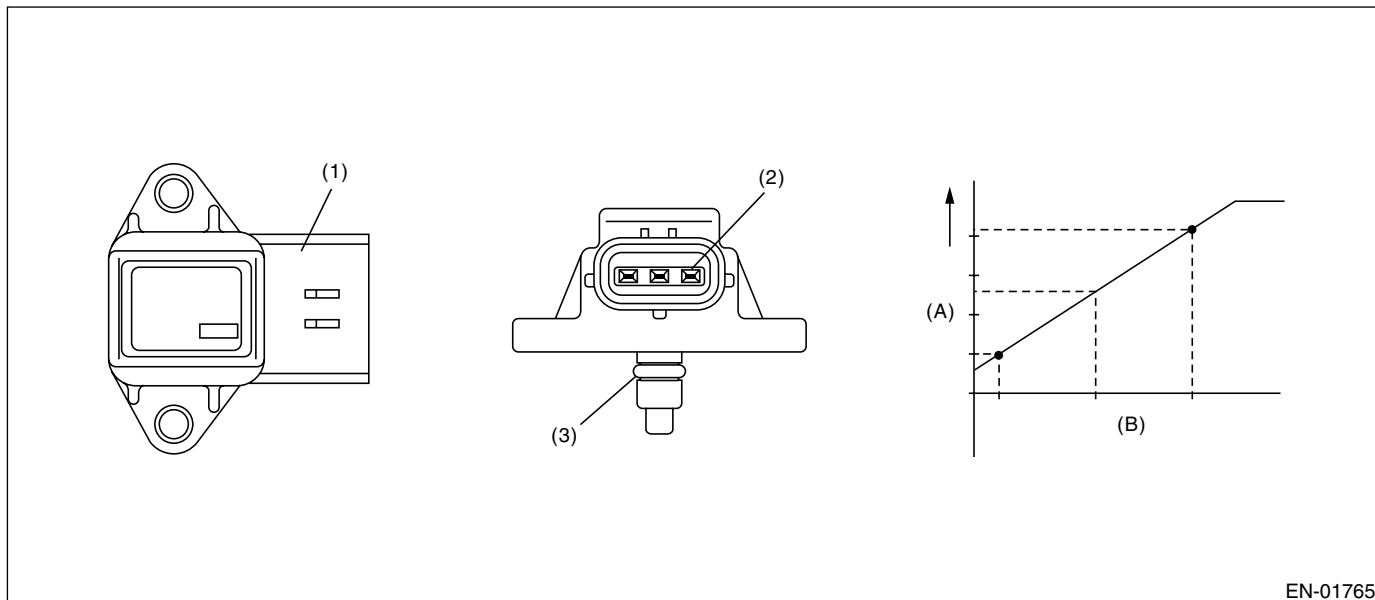
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01765

(1) Connector

(2) Terminal

(3) O-ring

(A) Output voltage

(B) Absolute pressure

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $< 0.568$ V     |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- 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 OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

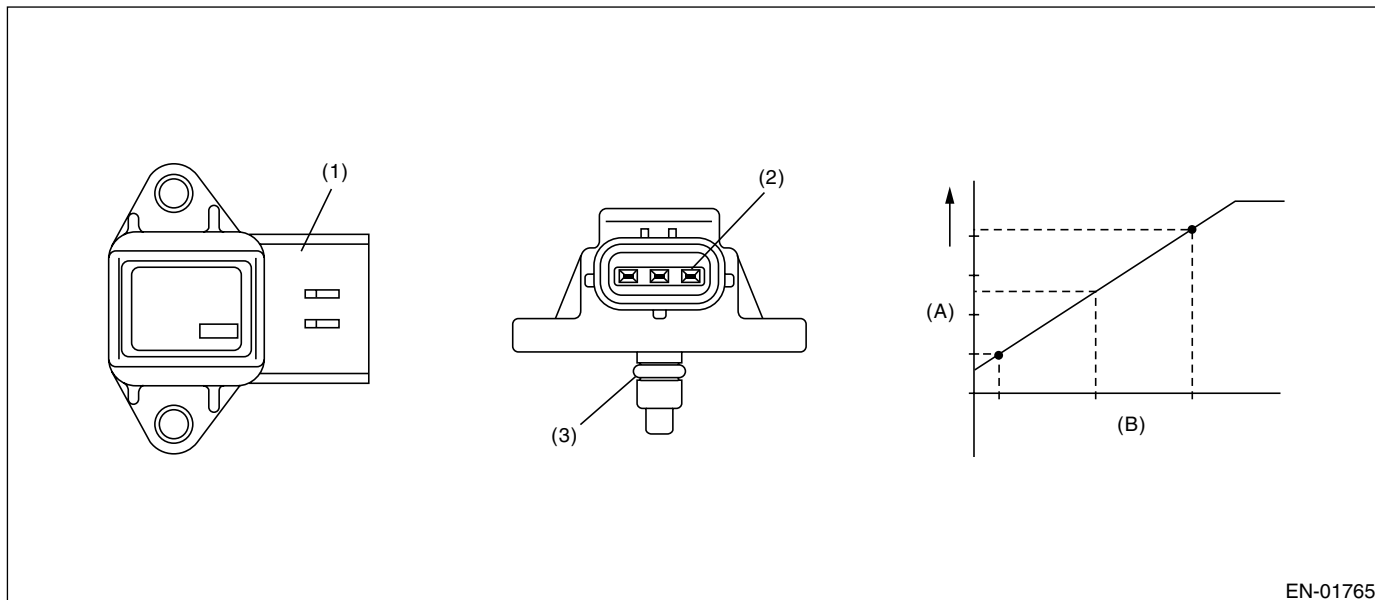
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01765

(1) Connector

(2) Terminal

(3) O-ring

(A) Output voltage

(B) Absolute pressure

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.93$ V   |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- 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 OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

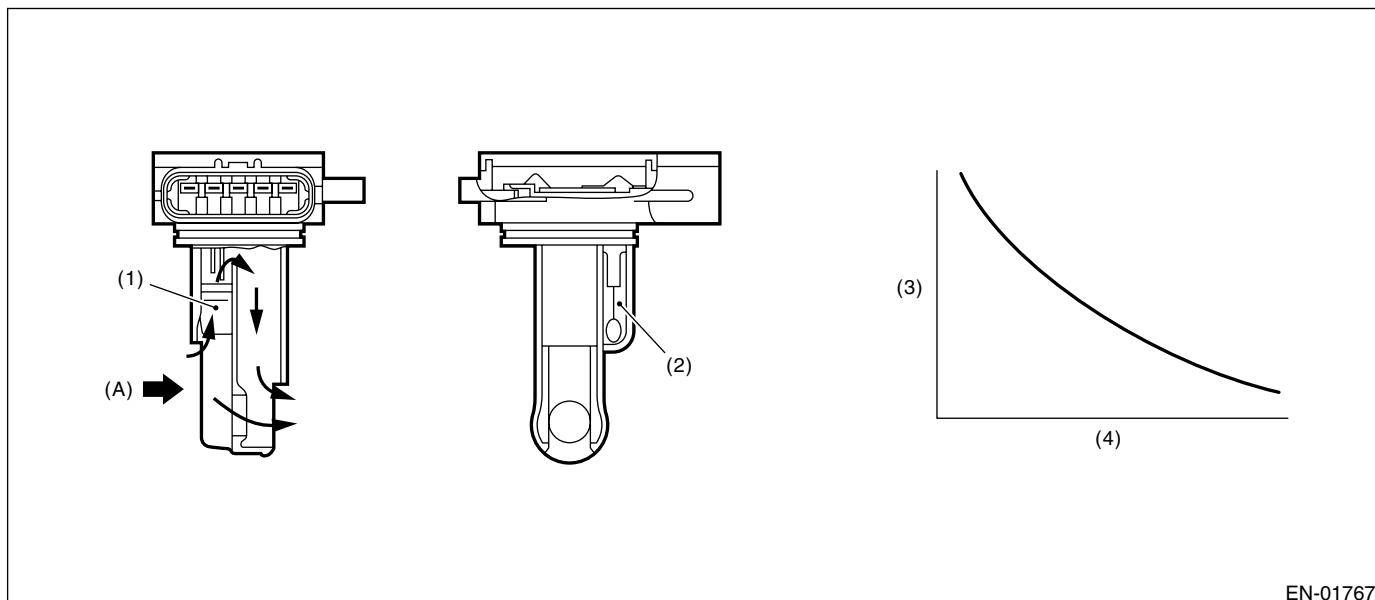
## GENERAL DESCRIPTION

### N: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

#### 2. COMPONENT DESCRIPTION



(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance ( $\Omega$ )

(4) Intake air temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

(A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters                                                 | Enable Conditions                                |
|----------------------------------------------------------------------|--------------------------------------------------|
| Coolant temp. before engine start                                    | $< 30^{\circ}\text{C}$ ( $86^{\circ}\text{F}$ )  |
| Coolant temperature                                                  | $> 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |
| Battery voltage                                                      | $\geq 10.9\text{ V}$                             |
| Continuous time when the vehicle speed is less than 50 km/h (31 MPH) | 600 seconds or more                              |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

### • Judgment Value

| Malfunction Criteria                            | Threshold Value                                           |
|-------------------------------------------------|-----------------------------------------------------------|
| Output voltage difference between Max. and Min. | < 20 mV (It is equal to approx. 0.5°C (33°F) around 25°.) |
| Exhaust temperature above 500°C (932°F)         | 60 seconds or more                                        |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                            | Threshold Value |
|-------------------------------------------------|-----------------|
| Output voltage difference between Max. and Min. | ≥ 20 mV         |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

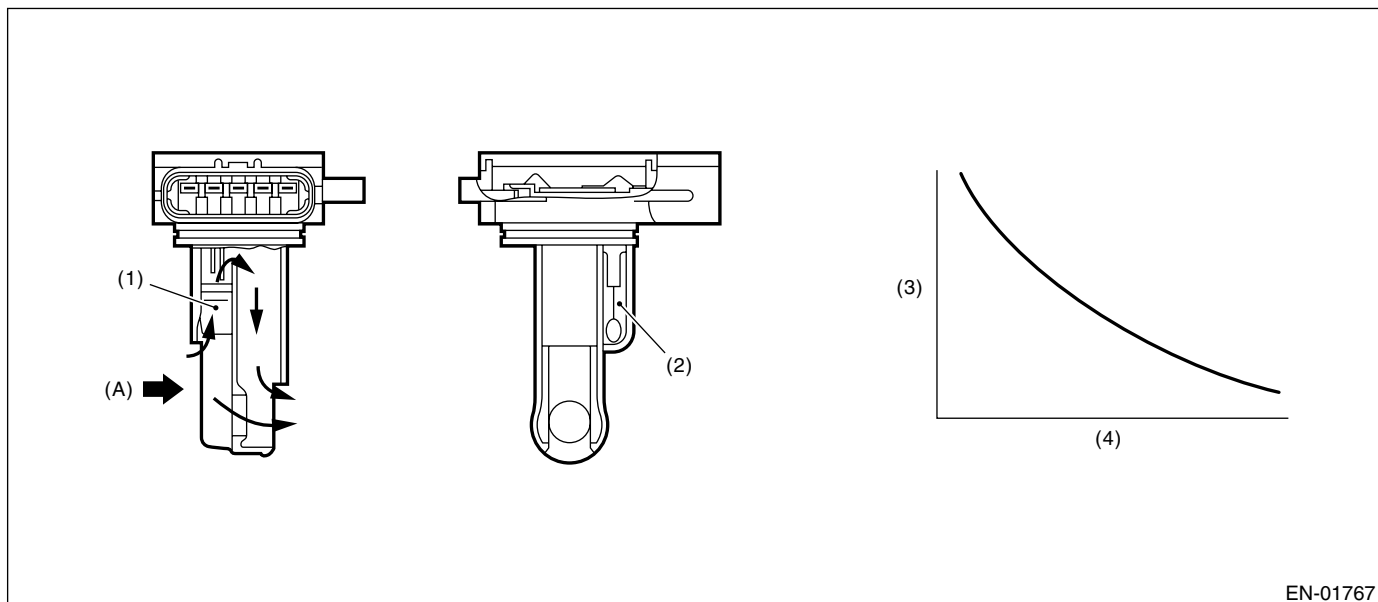
## GENERAL DESCRIPTION

### O: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01767

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance ( $\Omega$ )

(4) Intake air temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

(A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.165 V       |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.165$ V  |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

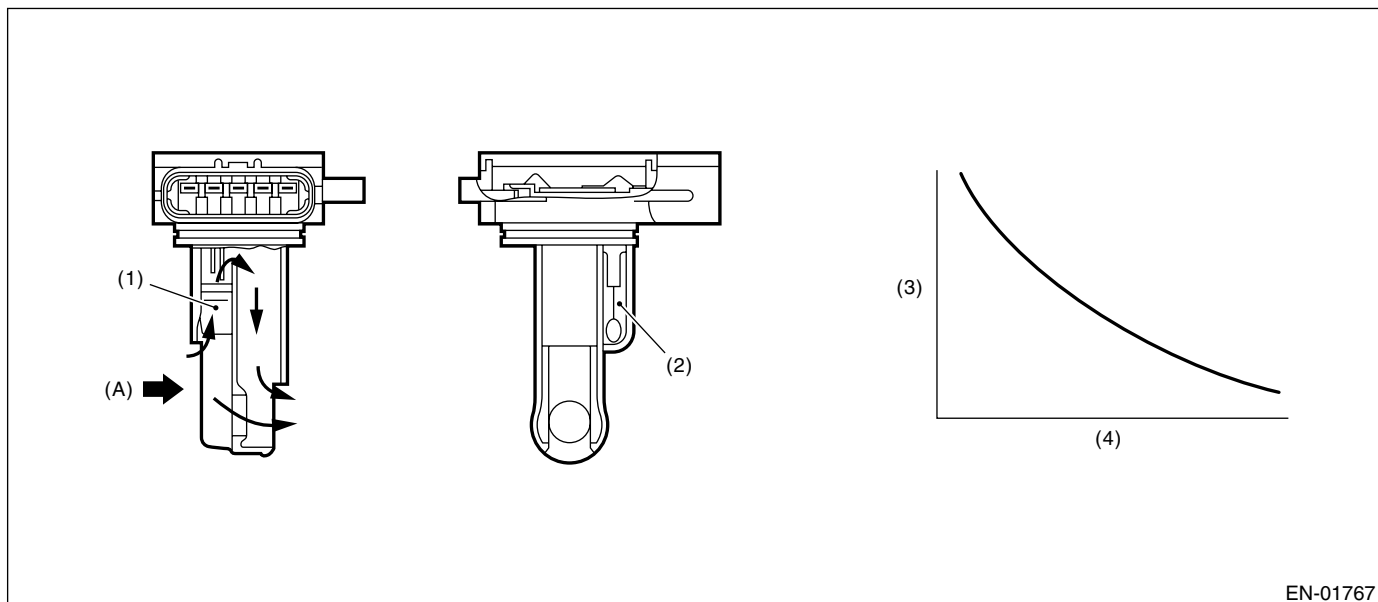
### GENERAL DESCRIPTION

## P: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance ( $\Omega$ )

(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.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.72$ V   |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.23$ V   |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

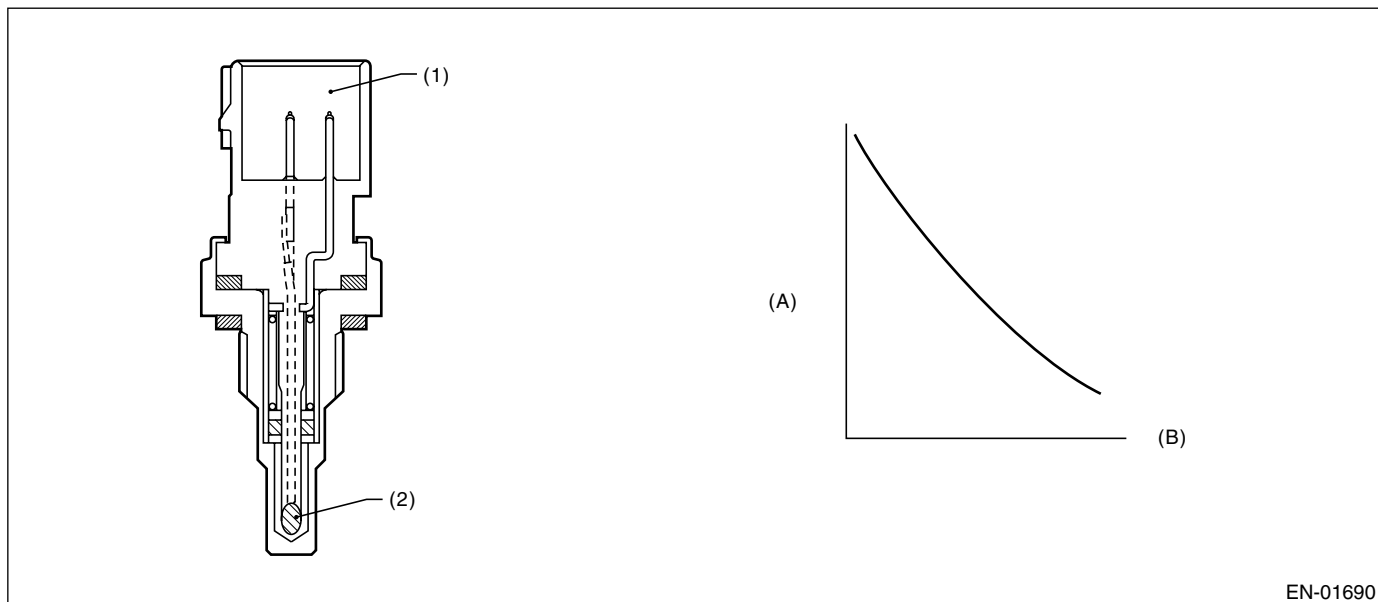
## GENERAL DESCRIPTION

### Q: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1) Connector

(2) Thermistor element

(A) Resistance value ( $k\Omega$ )

(B) Temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value     |
|----------------------|---------------------|
| Output voltage       | $< 0.165 \text{ V}$ |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

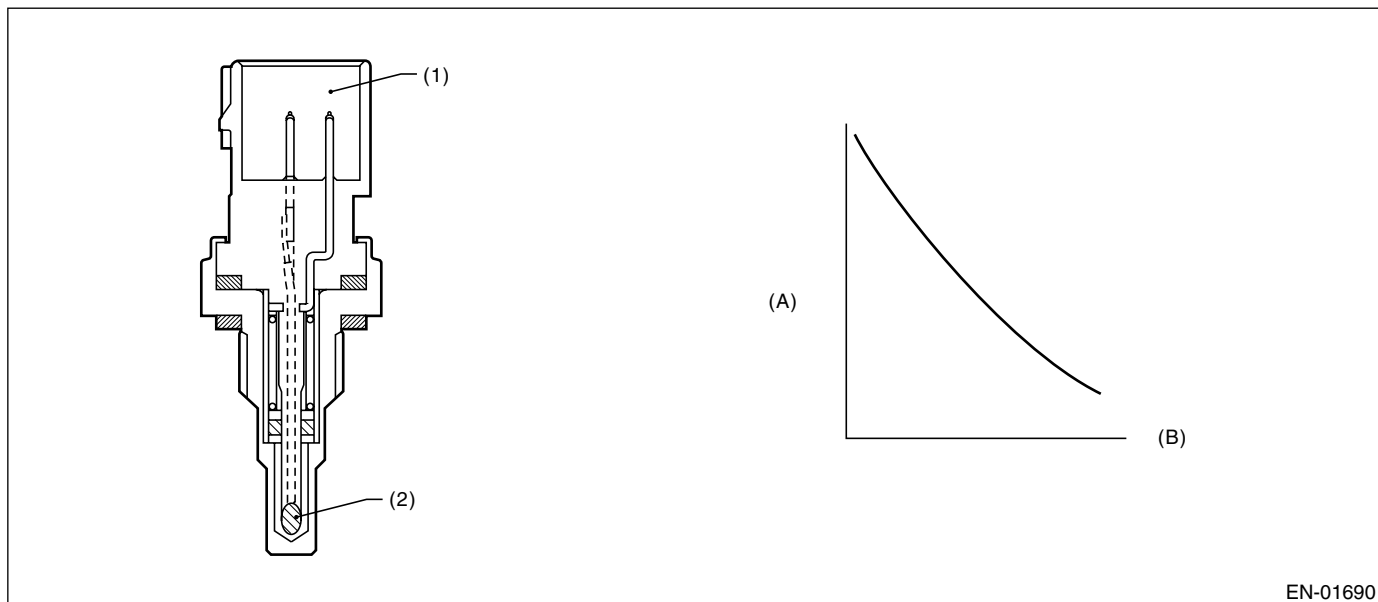
## GENERAL DESCRIPTION

### R: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1) Connector

(2) Thermistor element

(A) Resistance value ( $k\Omega$ )

(B) Temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $\geq 4.72 \text{ V}$ |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

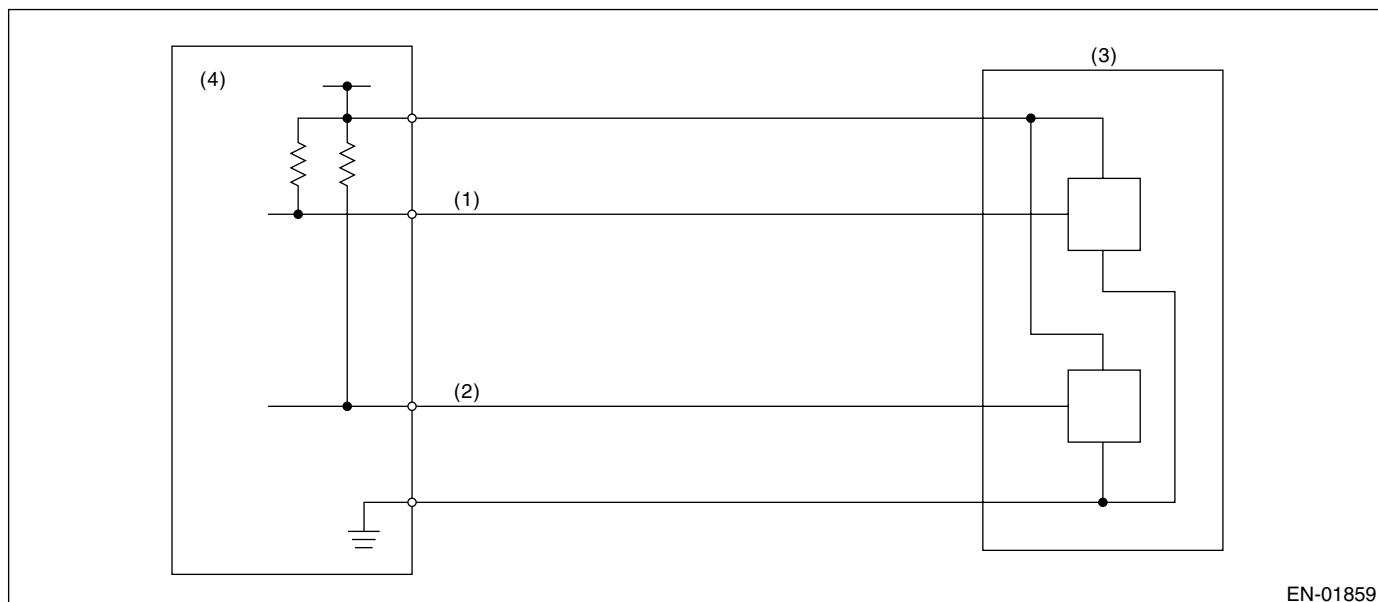
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal  
(2) Throttle position sensor 2 signal  
(3) Throttle position sensor  
(4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 0.309$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

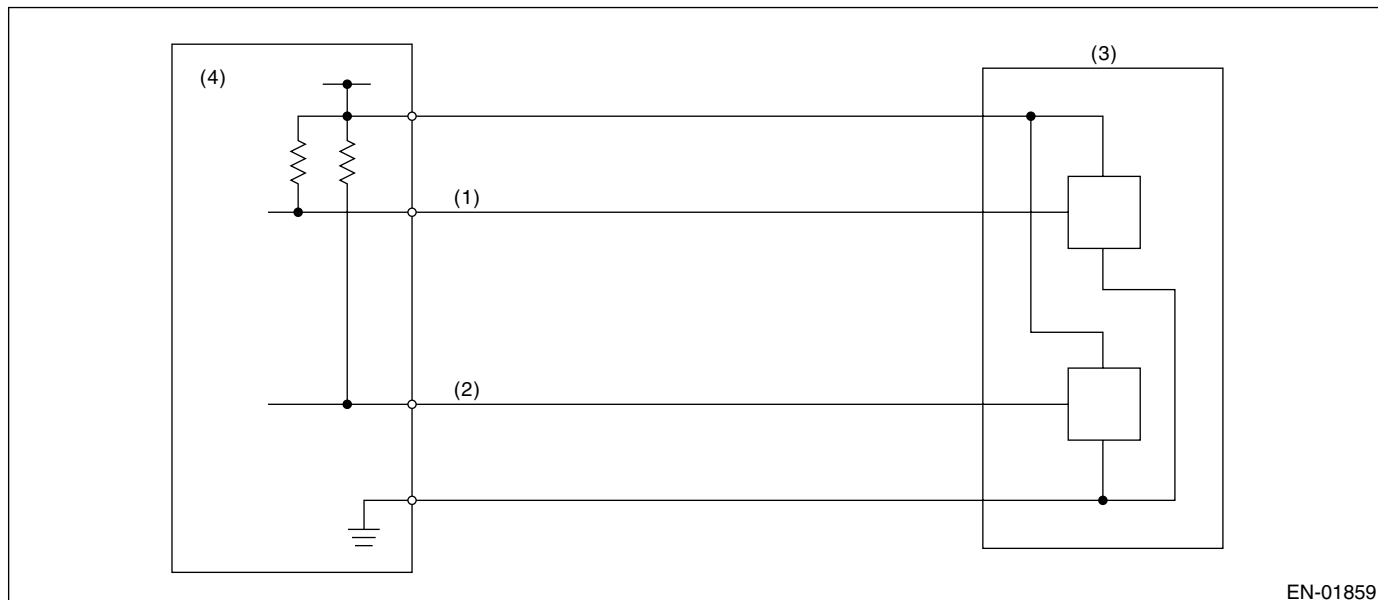
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal  
(2) Throttle position sensor 2 signal  
(3) Throttle position sensor  
(4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 4.646$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

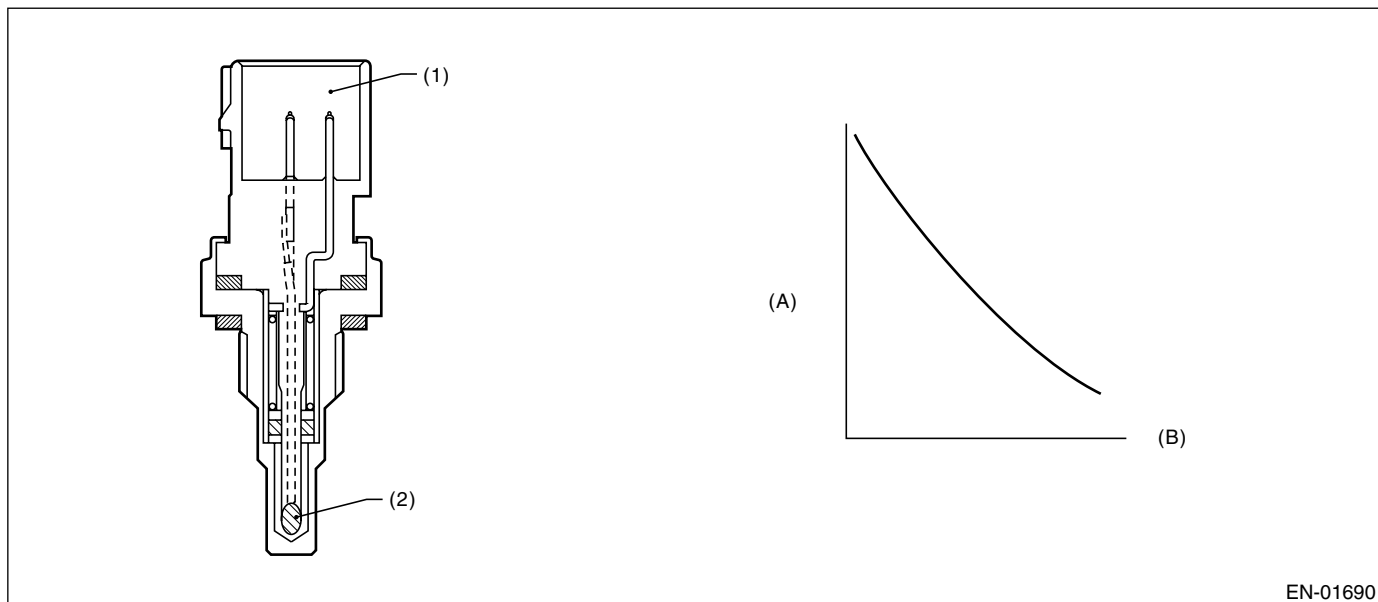
## GENERAL DESCRIPTION

### U: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

#### 2. COMPONENT DESCRIPTION



(1) Connector

(2) Thermistor element

(A) Resistance value (k $\Omega$ )

(B) Temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | $\geq 500$ rpm    |
| Battery voltage      | $> 10.9$ V        |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                      | Threshold Value                              |
|-------------------------------------------|----------------------------------------------|
| Engine coolant temperature                | < 20°C (68°F)                                |
| Timer for diagnosis after engine starting | ≥ Timer judgment value after engine starting |

Timer for diagnosis after engine starting

a) Timer stop at fuel cut mode.

b) During the driving conditions except a) above, timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

Where, TWCNT is determined as follows,

TWCNT = 0 at idle switch ON,

TWCNT show on the following table at idle switch OFF.

| Temperature<br>°C (°F) | Vehicle speed km/h (MPH) |          |           |           |           |           |           |           |
|------------------------|--------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                        | 0 (0)                    | 8 (4.97) | 16 (9.94) | 24 (14.9) | 32 (19.9) | 40 (24.9) | 48 (29.8) | 56 (34.8) |
| -20 (-4)               | 0 ms                     | 37.14 ms | 74.27 ms  | 111.41 ms | 126.66 ms | 141.91 ms | 163.59 ms | 185.26 ms |
| -10 (14)               | 0 ms                     | 27.39 ms | 54.78 ms  | 82.17 ms  | 99.65 ms  | 117.13 ms | 135.96 ms | 154.80 ms |
| 0 (32)                 | 0 ms                     | 17.65 ms | 35.29 ms  | 52.94 ms  | 72.64 ms  | 92.34 ms  | 108.34 ms | 124.33 ms |
| 10 (50)                | 0 ms                     | 7.90 ms  | 15.80 ms  | 23.70 ms  | 45.63 ms  | 67.56 ms  | 80.71 ms  | 93.87 ms  |
| 20 (68)                | 0 ms                     | 7.90 ms  | 15.80 ms  | 23.70 ms  | 45.63 ms  | 67.56 ms  | 80.71 ms  | 93.87 ms  |

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

$T_i$  is the lowest coolant temperature after starting the engine.

**Time Needed for Diagnosis:** To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria       | Threshold Value |
|----------------------------|-----------------|
| Engine coolant temperature | ≥ 20°C (68°F)   |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

---

#### 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

#### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

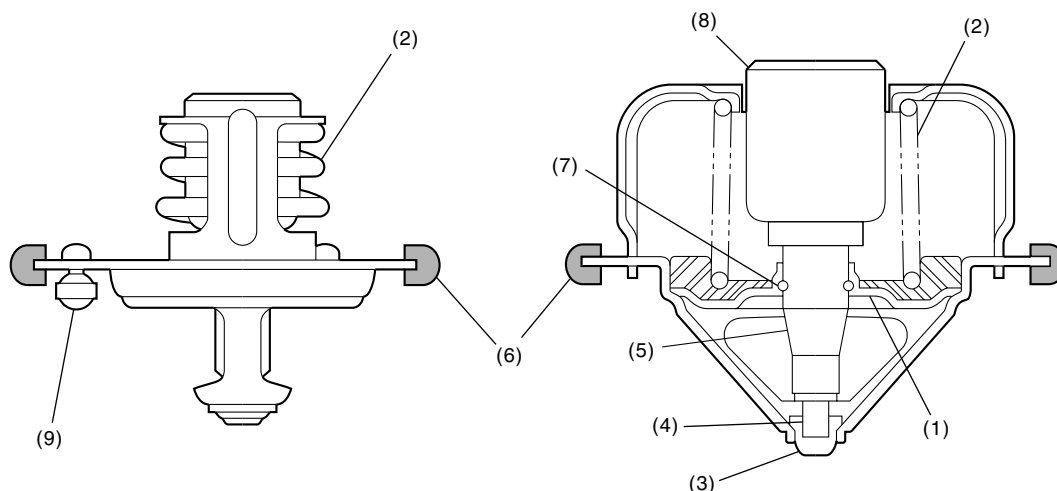
## GENERAL DESCRIPTION

### V: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

#### 2. COMPONENT DESCRIPTION



EN-01692

- |             |                    |                  |
|-------------|--------------------|------------------|
| (1) Valve   | (4) Piston         | (7) Stop ring    |
| (2) Spring  | (5) Guide          | (8) Wax element  |
| (3) Stopper | (6) Rubber packing | (9) Jiggle valve |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

### • Judgment Value

| Malfunction Criteria                          | Threshold Value                    |
|-----------------------------------------------|------------------------------------|
| Battery voltage                               | $\geq 10.9 \text{ V}$              |
| Estimated ambient air temperature             | $\geq -7^{\circ}\text{C}$ (19.4°F) |
| Engine coolant temperature at engine starting | $< 55^{\circ}\text{C}$ (131°F)     |
| Estimated coolant temperature                 | $\geq 75^{\circ}\text{C}$ (167°F)  |
| Engine coolant temperature                    | $< 75^{\circ}\text{C}$ (167°F)     |
| (Estimated – measured) coolant temperature    | $> 30^{\circ}\text{C}$ (86°F)      |

**Time Needed for Diagnosis:** 30 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                          | Threshold Value                    |
|-----------------------------------------------|------------------------------------|
| Battery voltage                               | $\geq 10.9 \text{ V}$              |
| Estimated ambient air temperature             | $\geq -7^{\circ}\text{C}$ (19.4°F) |
| Thermostat malfunction diagnosis              | Not finished                       |
| Engine coolant temperature at engine starting | $< 55^{\circ}\text{C}$ (131°F)     |
| Engine coolant temperature                    | $\geq 75^{\circ}\text{C}$ (167°F)  |
| (Estimated – measured) coolant temperature    | $\leq 30^{\circ}\text{C}$ (86°F)   |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### W: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

#### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions   |
|----------------------|---------------------|
| Engine speed         | < 300 rpm           |
| Vehicle speed        | < 1 km/h (0.62 MPH) |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once before engine starting with the ignition switch ON.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

##### • Judgment Value

| Malfunction Criteria                                                     | Threshold Value                  |
|--------------------------------------------------------------------------|----------------------------------|
| Atmospheric – manifold absolute pressure                                 | ≥ 26.7 kPa (200 mmHg, 7.88 inHg) |
| Intake manifold pressure at engine starting – manifold absolute pressure | < 1.33 kPa (10 mmHg, 2.95 inHg)  |

**Time Needed for Diagnosis:** 0.3 seconds

**Malfunction Indicator Light Illumination:** Detect when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

##### • Judgment Value

| Malfunction Criteria                     | Threshold Value                  |
|------------------------------------------|----------------------------------|
| Atmospheric – manifold absolute pressure | < 26.7 kPa (200 mmHg, 7.88 inHg) |

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

#### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

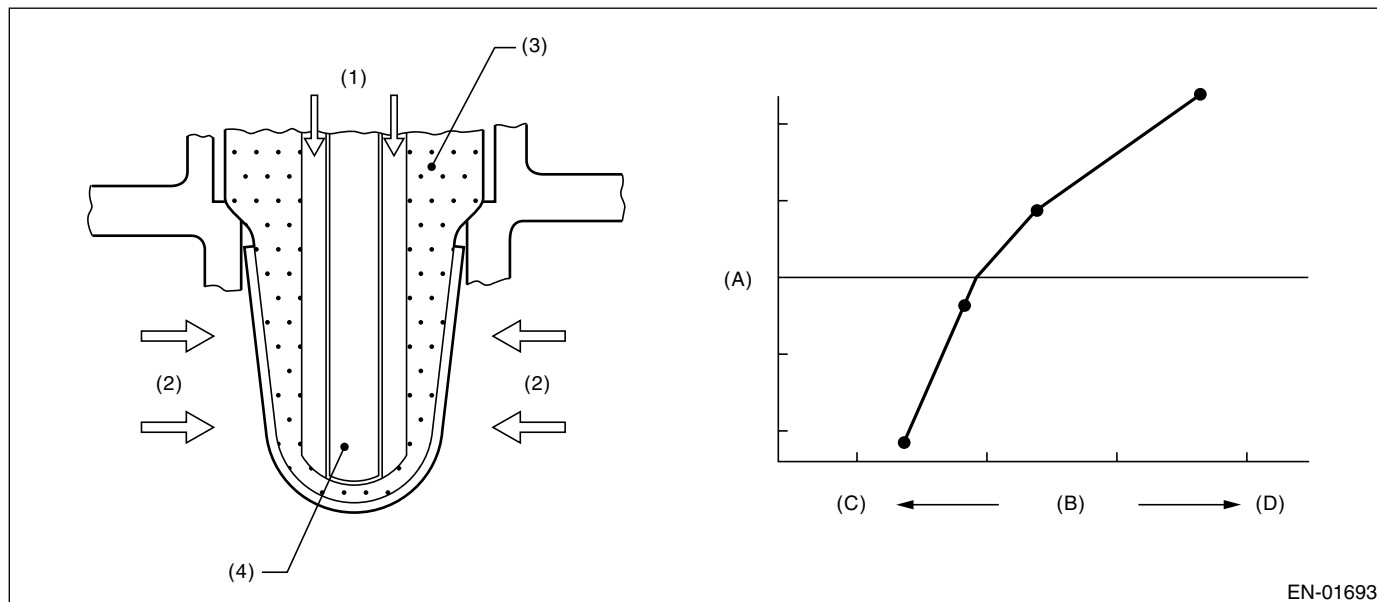
### X: DTC P0131 — O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



EN-01693

- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust          | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Voltage              | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Input voltage        | $< 1.8$ V       |
| Input current        | $< -0.01$ A     |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

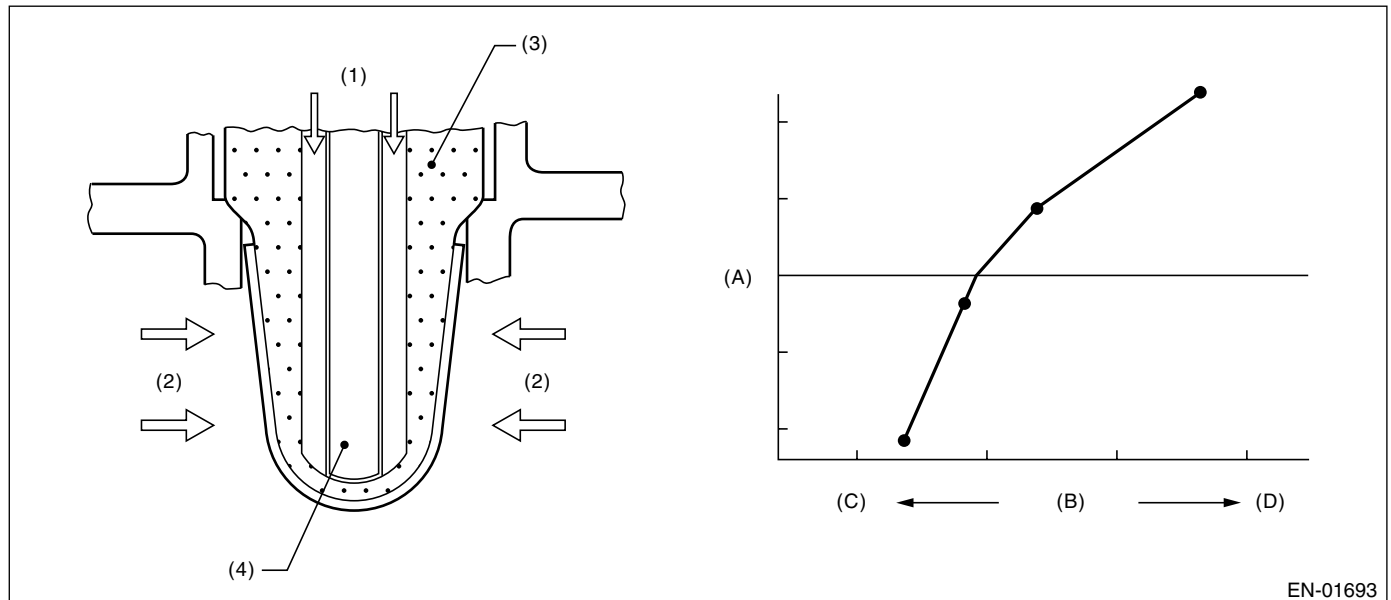
### Y: DTC P0132 — O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust          | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Voltage              | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Input voltage        | $\geq 3.8$ V    |
| Input current        | $\geq 0.01$ A   |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

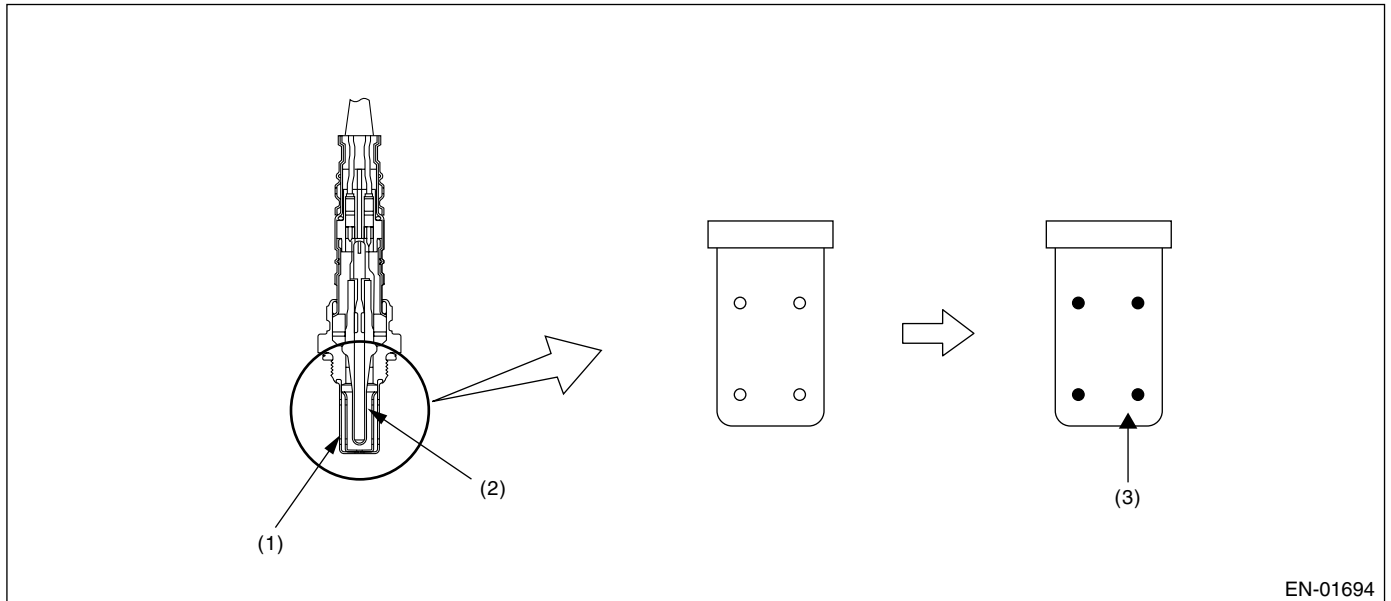
# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### Z: DTC P0133 — O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



(1) Cover

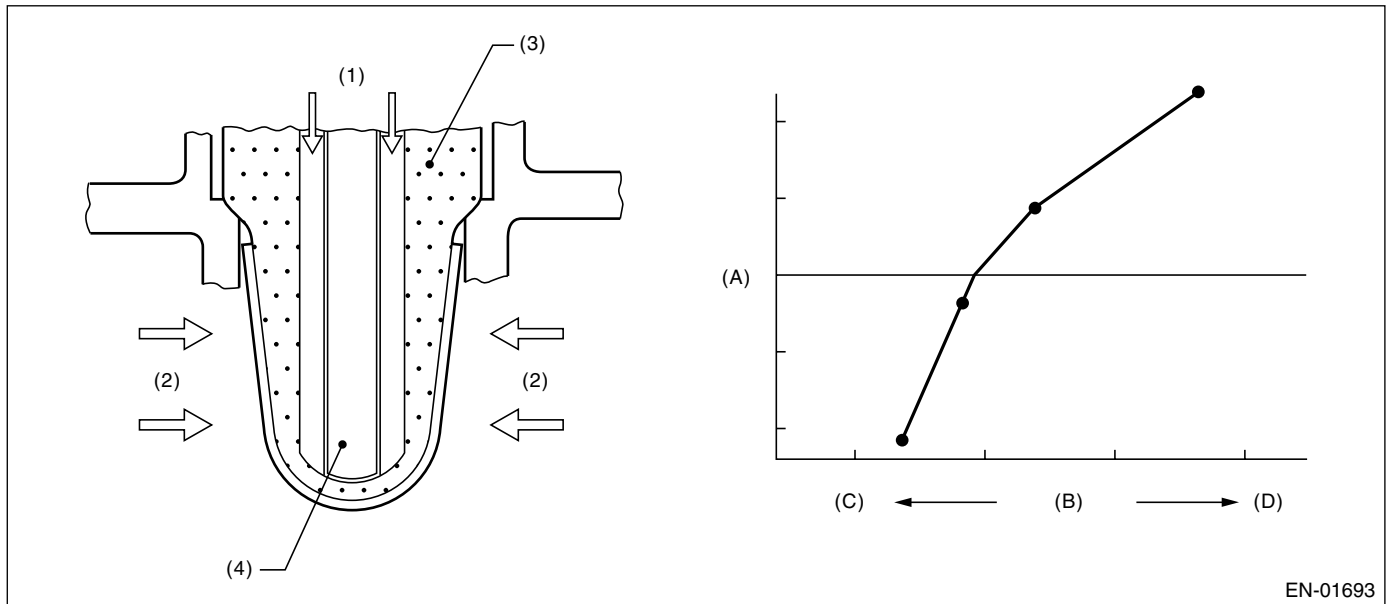
(2) Zirconia

(3) Clogging

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 2. COMPONENT DESCRIPTION



EN-01693

- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust          | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

## 3. ENABLE CONDITION

| Secondary Parameters                      | Enable Conditions                                                          |
|-------------------------------------------|----------------------------------------------------------------------------|
| All secondary parameter enable conditions | more than 1 second                                                         |
| Battery voltage                           | > 10.9 V                                                                   |
| Atmospheric pressure                      | > 75.1 kPa (563 mmHg, 22.2 inHg)                                           |
| Closed loop control with main feedback    | operating                                                                  |
| Impedance of front oxygen (A/F) sensor    | 0 $\longleftrightarrow$ 50 $\Omega$                                        |
| After starting engine                     | 120 seconds or more                                                        |
| Engine coolant temperature                | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )                        |
| Engine speed                              | 1000 $\longleftrightarrow$ 3200 rpm                                        |
| Vehicle speed                             | 10 $\longleftrightarrow$ 120 km/h<br>(6.21 $\longleftrightarrow$ 74.6 MPH) |
| Amount of intake air                      | 10 $\longleftrightarrow$ 31 g<br>(0.35 $\longleftrightarrow$ 1.09 oz)/s    |
| Engine load change during 0.5 engine rev. | $\leq 0.02$ g (0.001 oz)/rev                                               |
| All conditions for EVAP canister purge    | to be in enable                                                            |
| Learning value of EVAP conc. during purge | $\leq 0.2$                                                                 |
| 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 after starting the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

Integrate the difference of  $faf$  in every 128 milliseconds and difference of  $\lambda$  value.

After integrate 1640 times (210 seconds), calculate the diagnosis value.

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Threshold Value |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| $para_{fca} = td2f_{af}/td2l_{md}$<br>where,<br>$td2f_{af}(N) = td2f_{af}(n-1) + ld2f_{af}(n)$<br>$td2l_{md}(N) = td2l_{md}(n-1) + ld2l_{md}(n)$<br>add up for a total of 210 seconds<br>$d2f_{af}(n) = (f_{af}(n) - f_{af}(n-1)) - (f_{af}(n-1) - f_{af}(n-2))$<br>$d2l_{md}(n) = (l_{md}(n) - l_{md}(n-1)) - (l_{md}(n-1) - l_{md}(n-2))$<br>$f_{af}$ = main feedback compensation coefficient every 128 milliseconds<br>$l_{md}$ = output lambda every 128 milliseconds | $\geq 0.367$    |

**Time Needed for Diagnosis:** 210 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value  $0.3 \rightarrow 0$ .
- Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

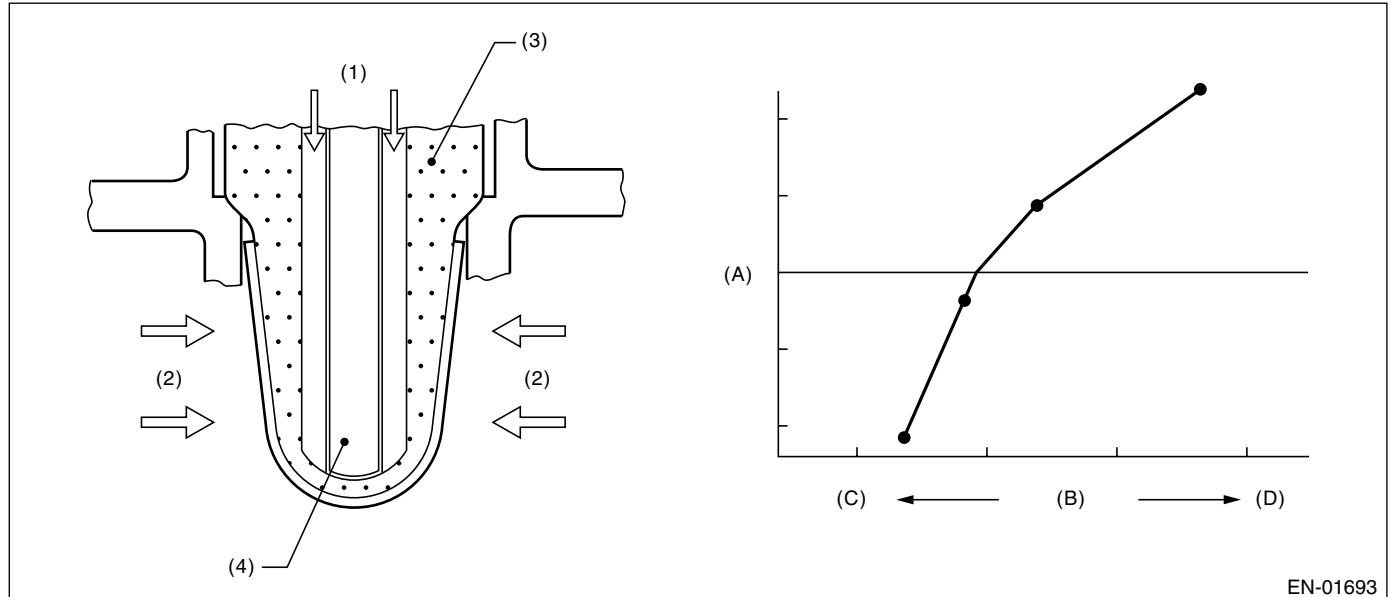
### AA:DTC P0134 — O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.

Judge NG when the element impedance is large.

#### 2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

##### Judgment Value

| Malfunction Criteria                                                                              | Threshold Value |
|---------------------------------------------------------------------------------------------------|-----------------|
| Voltage                                                                                           | ≥ 10.9 V        |
| Time after engine starting                                                                        | ≥ 50 seconds    |
| Cumulative amount of Front O <sub>2</sub> (A/F) sensor heater control duty every 128 milliseconds | ≥ 28000%        |
| Front lambda sensor impedance                                                                     | ≥ 500 Ω         |

**Time Needed for Diagnosis:** 5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

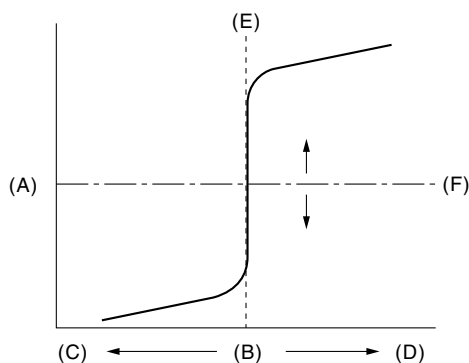
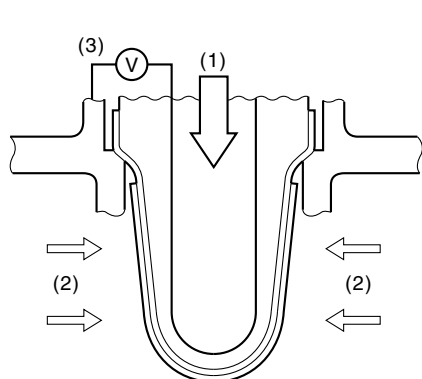
## GENERAL DESCRIPTION

### AB:DTC P0137 — O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

#### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

#### 3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

| Secondary Parameters                                                         | Enable Conditions                 |
|------------------------------------------------------------------------------|-----------------------------------|
| Closed loop control with main feedback control                               | In operation                      |
| Target output voltage of rear oxygen sensor                                  | $\geq 0.54$ V                     |
| Amount of intake air                                                         | $\geq 10$ g (0.35 oz)/s           |
| Engine coolant temperature                                                   | $\geq 75^{\circ}\text{C}$ (167°F) |
| Misfire detection during 200 engine revs.                                    | $< 5$ times                       |
| Compensation factor for front oxygen (A/F) sensor with main feedback control | Not in limit value                |
| Battery voltage                                                              | $> 10.9$ V                        |
| Cumulative time for completing the conditions with main feedback control     | $\geq 200$ seconds                |
| 5 seconds or more fuel shut-off in decel.                                    | Experienced                       |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming up the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Max. output voltage  | < 490 mV        |

**Time Needed for Diagnosis:** 200 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--------------------------------------------------|-----------------|
| Low side diagnosis of rear oxygen sensor voltage | Incomplete      |
| Max. output voltage                              | $\geq 490$ mV   |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

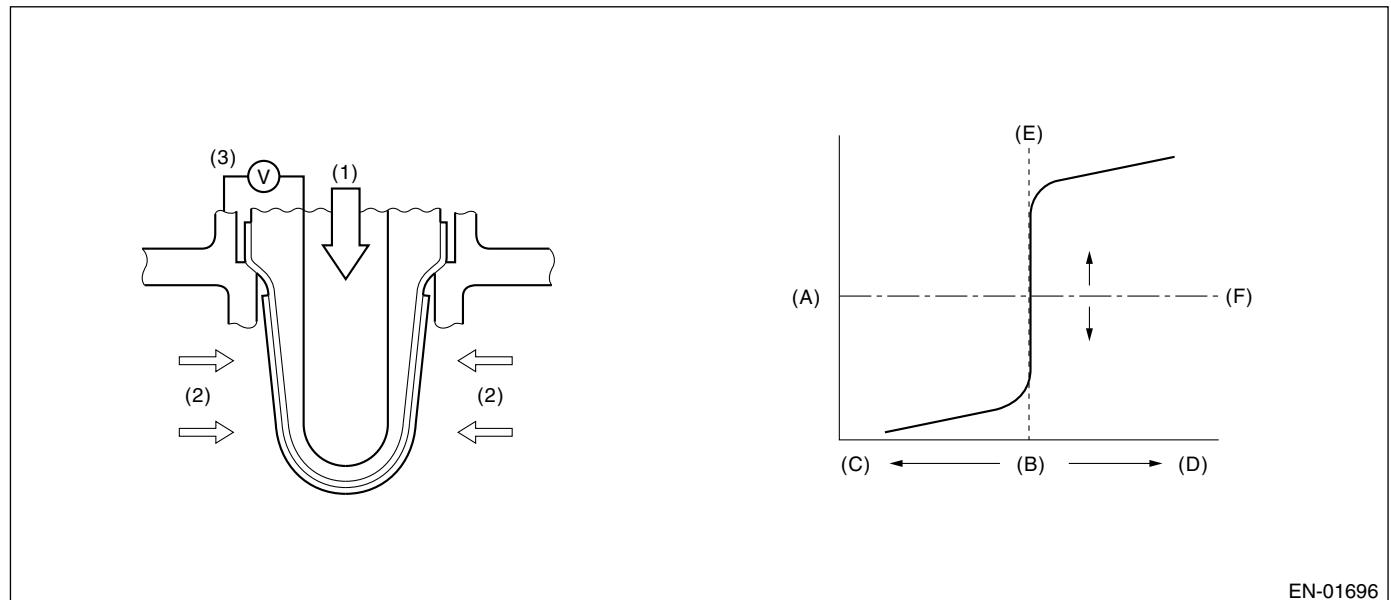
## GENERAL DESCRIPTION

### AC:DTC P0138 — O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

#### 2. COMPONENT DESCRIPTION



EN-01696

- |                         |                         |                                |
|-------------------------|-------------------------|--------------------------------|
| (1) Atmosphere          | (A) Electromotive force | (D) Lean                       |
| (2) Exhaust             | (B) Air fuel ratio      | (E) Theoretical air fuel ratio |
| (3) Electromotive force | (C) Rich                | (F) Comparative voltage        |

#### 3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

| Secondary Parameters                                                         | Enable Conditions                               |
|------------------------------------------------------------------------------|-------------------------------------------------|
| Closed loop control with main feedback control                               | In operation                                    |
| Target output voltage of rear oxygen sensor                                  | $\geq 0.54 \text{ V}$                           |
| Amount of intake air                                                         | $\geq 10 \text{ g (0.35 oz)/s}$                 |
| Engine coolant temperature                                                   | $\geq 75^{\circ}\text{C (167}^{\circ}\text{F)}$ |
| Misfire detection during 200 engine revs.                                    | $< 5 \text{ times}$                             |
| Compensation factor for front oxygen (A/F) sensor with main feedback control | Not in limit value                              |
| Battery voltage with main feedback control                                   | $> 10.9 \text{ V}$                              |
| Cumulative time for completing the conditions with main feedback control     | $\geq 200 \text{ seconds}$                      |
| 5 seconds or more fuel shut-off in decel.                                    | Experienced                                     |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming up the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Min. output voltage  | > 250 mV        |

**Time Needed for Diagnosis:** 200 seconds

**Malfunction Indicator Light Illumination:** Detect when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                              | Threshold Value |
|---------------------------------------------------|-----------------|
| High side diagnosis of rear oxygen sensor voltage | Incomplete      |
| Min. output voltage                               | $\leq 250$ mV   |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### AD:DTC P0139 — O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

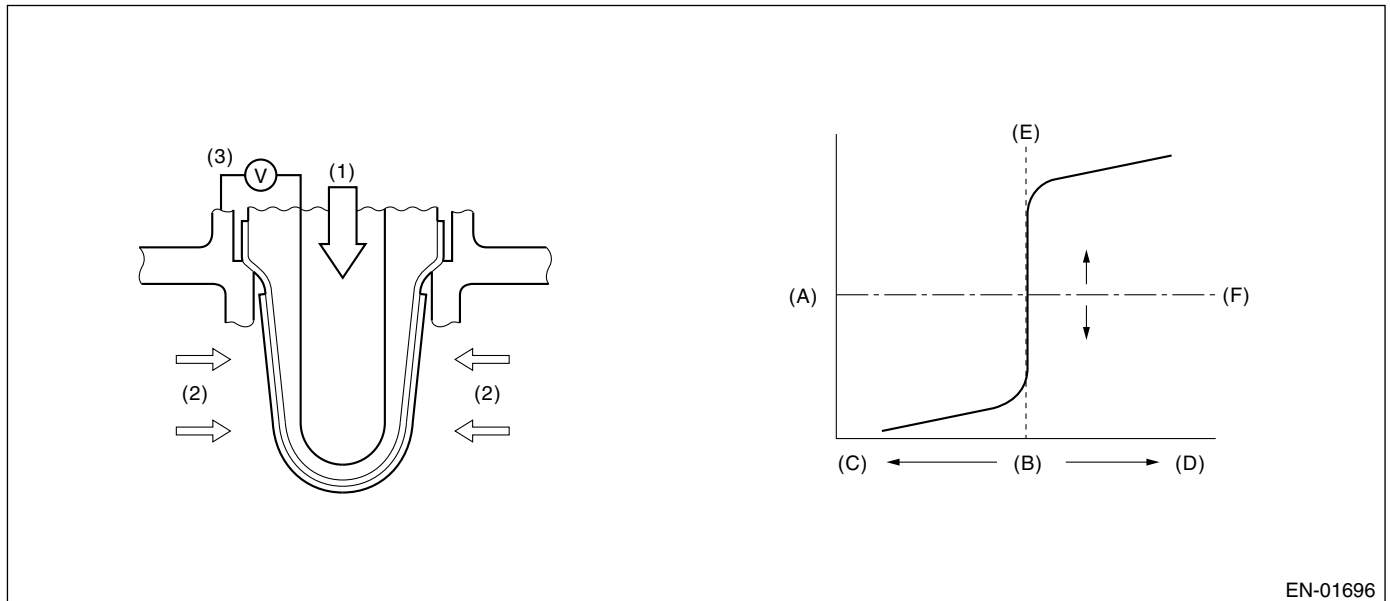
#### 1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

##### • Diagnostic Method

Measure the response time of the output change of the rear oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

#### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

#### 3. ENABLE CONDITION

| Secondary Parameters                            | Enable Conditions |
|-------------------------------------------------|-------------------|
| Battery voltage                                 | > 10.9 V          |
| A/F main feedback control condition             | Completed         |
| 5 seconds or more fuel shut-off in deceleration | Experienced       |
| After fuel shutting-off in deceleration         | 2 seconds or more |

#### 4. GENERAL DRIVING CYCLE

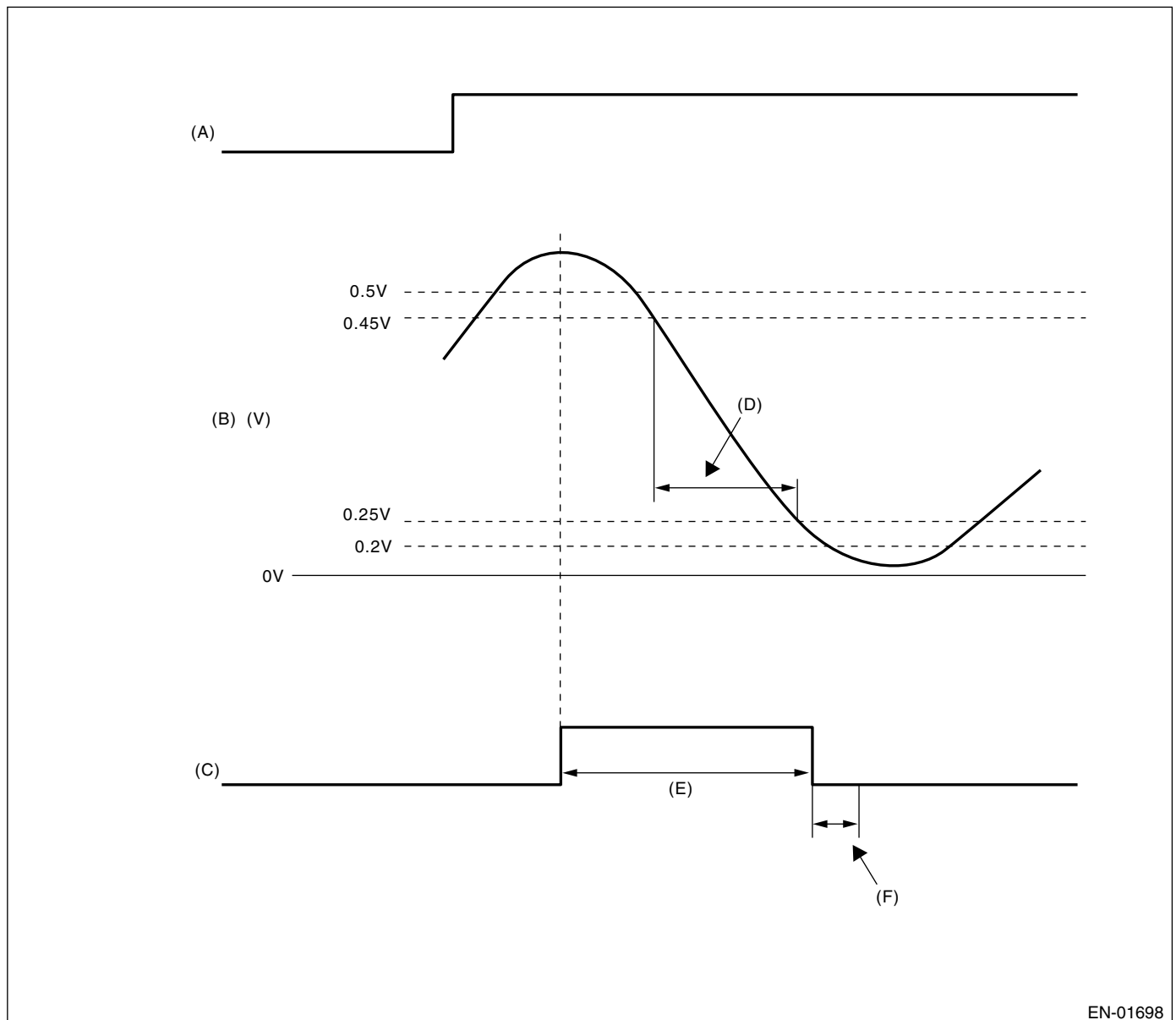
Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration in order to calculate the diagnostic value.)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.5 V (rich) to 0.2 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.45 V to 0.25 V.



EN-01698

(A) State of diagnosis execution  
(B) Rear oxygen sensor

(C) Fuel cut during deceleration  
(D) Measure response time

(E) More than 2 seconds  
(F) Perform malfunction determination 2 seconds after carriage return from deceleration fuel cut.

### • Abnormality Judgment

Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration.

Response time (Diagnosis value) > Threshold value → Abnormal

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 5 seconds or more. Judge OK when the malfunction criteria below are not completed regardless of the fuel shut-off in deceleration.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

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#### NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

#### • Judgment Value

| Malfunction Criteria                                                                                                     | Threshold Value    |
|--------------------------------------------------------------------------------------------------------------------------|--------------------|
| Shortest time change from rich (450 mV O <sub>2</sub> output) to lean (250 mV) if voltage reduces from 500 mV to 200 mV. | ≥ 327 milliseconds |

**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 was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

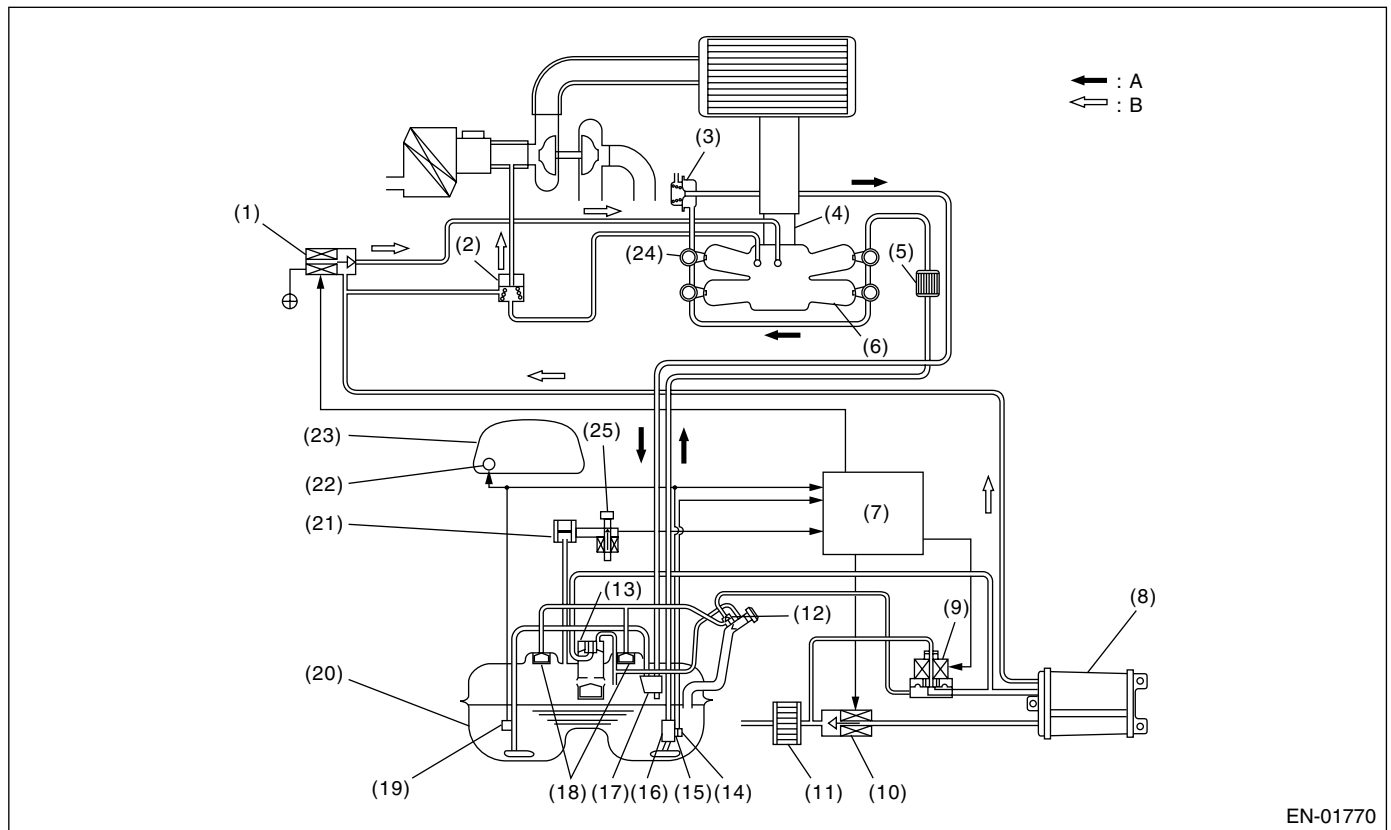
## GENERAL DESCRIPTION

### AE:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

##### • Fuel System Diagnosis



EN-01770

- |                                     |                              |                                             |
|-------------------------------------|------------------------------|---------------------------------------------|
| (1) Purge control solenoid valve    | (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 meter                             |
| (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               | (25) Tank pressure switching solenoid valve |
| (8) Canister                        | (17) Jet pump                |                                             |
| (9) Pressure control solenoid valve | (18) Fuel cut valve          |                                             |

##### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 2. ENABLE CONDITION

| Secondary Parameters                                 | Enable Conditions                    |
|------------------------------------------------------|--------------------------------------|
| A/F main learning system                             | In operation                         |
| Engine coolant temperature                           | $\geq 75^{\circ}\text{C}$ (167°F)    |
| Engine load                                          | $\geq \text{Map } 5$                 |
| Intake air change during 0.5 engine rev.             | $\leq 0.02 \text{ g (0.001 oz)/rev}$ |
| Learning value of EVAP conc. during purge            | $\leq 0.1$                           |
| Cumulative time of canister purge after engine start | 20 seconds or more                   |
| Continuous period after canister purge starting      | 30 seconds or more                   |

Map 5

| Engine speed (rpm)          | idle | 800              | 1200             | 1600             | 2000             | 2400             | 2800             | 3200             | 3600             | 4000             | 4400             |
|-----------------------------|------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Measured value (g (oz)/rev) | NA   | 0.236<br>(0.008) | 0.232<br>(0.008) | 0.226<br>(0.008) | 0.231<br>(0.008) | 0.252<br>(0.009) | 0.262<br>(0.009) | 0.243<br>(0.009) | 0.243<br>(0.009) | 0.267<br>(0.009) | 0.270<br>(0.010) |

## 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or a constant speed after warming up the engine.

## 4. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

### • Judgment Value

| Malfunction Criteria                                                                                                                                                                                                                                                                                                                          | Threshold Value                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| $\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$<br>where,<br>$\text{sglmd} = \text{measured lambda}$<br>$\text{tglmda} = \text{target lambda}$<br><br>$\text{faf} = \text{main feedback compensation coefficient every 64 milliseconds}$<br>$\text{flaf} = \text{main feedback learning compensation coefficient}$ | $\geq \text{fsobdL1}$<br>See Map 4<br><br>$\text{fsobdL1} = \text{lean side threshold value of fsobd}$ |

Map 4 Threshold value for fuel system malfunction criteria

| Amount of air (g (oz)/s) | 0 (0) | 2.4<br>(0.085) | 4.7<br>(0.166) | 7<br>(0.247) | 9.4<br>(0.332) | 11.7<br>(0.413) | 14.1<br>(0.497) |
|--------------------------|-------|----------------|----------------|--------------|----------------|-----------------|-----------------|
| fsobdL1 (%)              | 40    | 40             | 36.9           | 32.0         | 27.0           | 26.5            | 26.5            |

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

### • Judgment Value

| Malfunction Criteria                                                       | Threshold Value |
|----------------------------------------------------------------------------|-----------------|
| $\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$ | $< 19\%$        |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

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### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When "Clear Memory" was performed

### 7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

### 8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

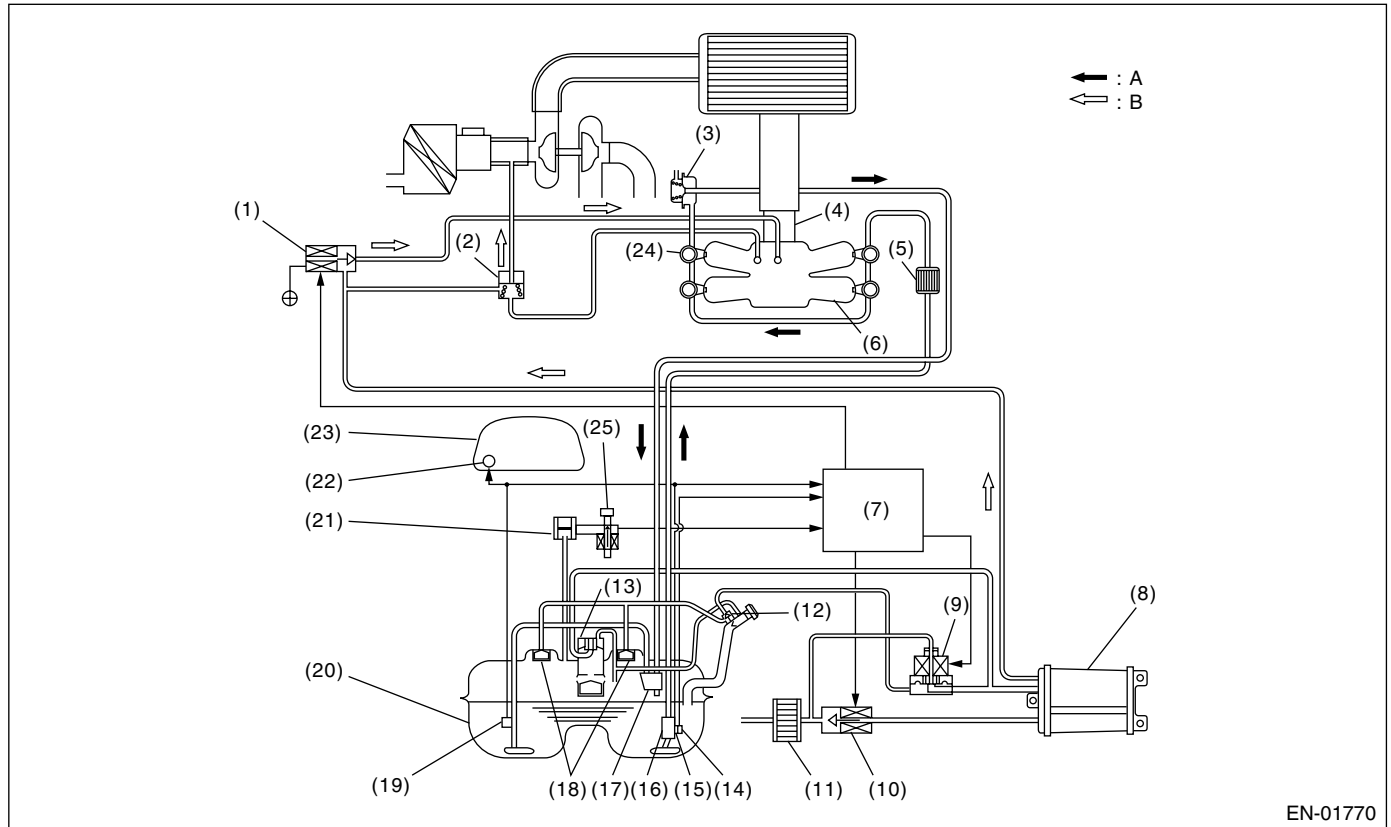
## GENERAL DESCRIPTION

### AF:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

##### • Fuel System Diagnosis



- |                                     |                              |                                             |
|-------------------------------------|------------------------------|---------------------------------------------|
| (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 meter                             |
| (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               | (25) Tank pressure switching solenoid valve |
| (8) Canister                        | (17) Jet pump                |                                             |
| (9) Pressure control solenoid valve | (18) Fuel cut valve          |                                             |

##### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 2. ENABLE CONDITION

| Secondary Parameters                                 | Enable Conditions                                   |
|------------------------------------------------------|-----------------------------------------------------|
| A/F main learning system                             | In operation                                        |
| Engine coolant temperature                           | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |
| Engine load                                          | $\geq \text{Map } 5$                                |
| Intake air change during 0.5 engine rev.             | $\leq 0.02 \text{ g (0.001 oz)/rev}$                |
| Learning value of EVAP conc. during purge            | $\leq 0.1$                                          |
| Cumulative time of canister purge after engine start | 20 seconds or more                                  |
| Continuous period after canister purge starting      | 30 seconds or more                                  |

Map 5

| Engine speed (rpm)          | idle | 800              | 1200             | 1600             | 2000             | 2400             | 2800             | 3200             | 3600             | 4000             | 4400             |
|-----------------------------|------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Measured value (g (oz)/rev) | NA   | 0.236<br>(0.008) | 0.232<br>(0.008) | 0.226<br>(0.008) | 0.231<br>(0.008) | 0.252<br>(0.009) | 0.262<br>(0.009) | 0.243<br>(0.009) | 0.243<br>(0.009) | 0.267<br>(0.009) | 0.270<br>(0.010) |

## 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or a constant speed after warming up the engine.

## 4. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

### • Judgment Value

| Malfunction Criteria                                                                                                                                                                                                                                                                                                                          | Threshold Value                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| $\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$<br>where,<br>$\text{sglmd} = \text{measured lambda}$<br><br>$\text{tglmda} = \text{target lambda}$<br>$\text{faf} = \text{main feedback compensation coefficient every 64 milliseconds}$<br>$\text{flaf} = \text{main feedback learning compensation coefficient}$ | $\leq \text{fsobdR1}$<br>See Map 4<br>$\text{fsobdR1} = \text{rich side threshold value of fsobd}$ |

Map 4 Threshold value for fuel system malfunction criteria

| Amount of air (g/s) | 0 (0) | 2.4<br>(0.085) | 4.7<br>(0.166) | 7<br>(0.247) | 9.4<br>(0.332) | 11.7<br>(0.413) |  |
|---------------------|-------|----------------|----------------|--------------|----------------|-----------------|--|
| fsobdR1 (%)         | -40   | -40            | -36.9          | -32.0        | -27.0          | -27.0           |  |

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

### • Judgment Value

| Malfunction Criteria                                                       | Threshold Value |
|----------------------------------------------------------------------------|-----------------|
| $\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$ | $\geq -20\%$    |

## **DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA**

### GENERAL DESCRIPTION

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#### **5. DTC CLEAR CONDITION**

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### **6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

#### **7. FAIL SAFE**

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

#### **8. ECM OPERATING AT DTC SETTING**

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## AG:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

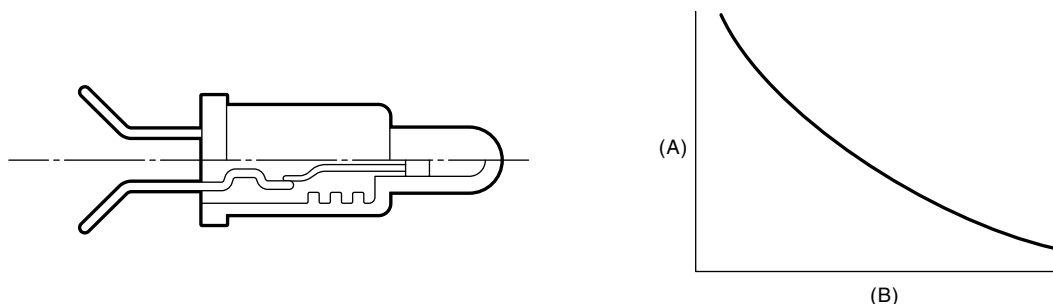
### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

#### • Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

### 2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

#### • Judgment Value

| Malfunction Criteria                                                       | Threshold Value                                          |
|----------------------------------------------------------------------------|----------------------------------------------------------|
| Fuel level                                                                 | $\geq 10 \text{ } \emptyset$ (2.64 US gal, 2.20 Imp gal) |
| After starting engine                                                      | 20 seconds or more                                       |
| Engine coolant temperature – engine coolant temperature at engine starting | $> 10^{\circ}\text{C}$ ( $50^{\circ}\text{F}$ )          |
| Fuel temperature – engine coolant temperature                              | $\geq 10^{\circ}\text{C}$ ( $50^{\circ}\text{F}$ )       |
| Battery voltage                                                            | $> 10.9 \text{ V}$                                       |

**Time Needed for Diagnosis:** 120 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### • Judgment Value

| Malfunction Criteria                                                       | Threshold Value                                          |
|----------------------------------------------------------------------------|----------------------------------------------------------|
| Fuel level                                                                 | $\geq 10 \text{ } \emptyset$ (2.64 US gal, 2.20 Imp gal) |
| After starting engine                                                      | 20 seconds or more                                       |
| Engine coolant temperature – engine coolant temperature at engine starting | $> 10^{\circ}\text{C}$ ( $50^{\circ}\text{F}$ )          |
| Fuel temperature – engine coolant temperature                              | $< 10^{\circ}\text{C}$ ( $50^{\circ}\text{F}$ )          |
| Battery voltage                                                            | $> 10.9 \text{ V}$                                       |

#### • Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

### 6. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions  |
|-----------------------|--------------------|
| After starting engine | 20 seconds or more |
| Battery voltage       | $> 10.9 \text{ V}$ |

### 7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 8. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                              | Threshold Value                |
|---------------------------------------------------|--------------------------------|
| Accumulated amount of intake air                  | $\geq 550$ kg (1212.5 lb)      |
| Fuel temperature difference between Max. and Min. | $< 3^{\circ}\text{C}$ (37.4°F) |

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                              | Threshold Value                   |
|---------------------------------------------------|-----------------------------------|
| Accumulated amount of intake air                  | $\geq 550$ kg (1212.5 lb)         |
| Fuel temperature difference between Max. and Min. | $\geq 3^{\circ}\text{C}$ (37.4°F) |

## 9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 10. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 11. FAIL SAFE

None

## 12. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

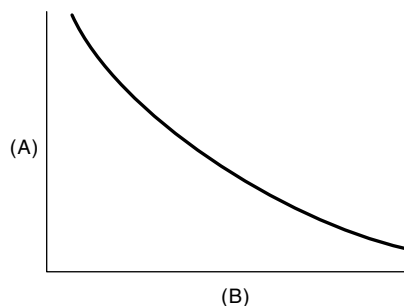
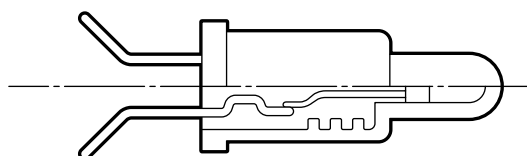
## GENERAL DESCRIPTION

### AH:DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### • Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $< 0.1646 \text{ V}$  |
| Battery voltage      | $\geq 10.9 \text{ V}$ |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

##### • Judgment Value

| Malfunction Criteria | Threshold Value         |
|----------------------|-------------------------|
| Output voltage       | $\geq 0.1646 \text{ V}$ |
| Battery voltage      | $\geq 10.9 \text{ V}$   |

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

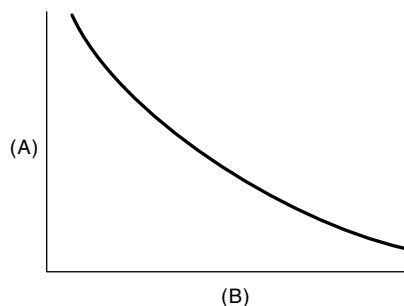
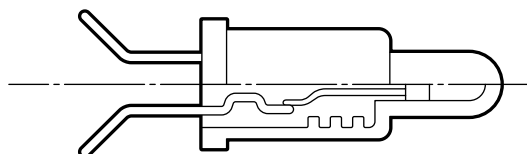
## GENERAL DESCRIPTION

### AI: DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance ( $\Omega$ )

(B) Fuel temperature °C (°F)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.72$ V   |
| Battery voltage      | $\geq 10.9$ V   |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

##### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $< 4.72$ V      |
| Battery voltage      | $\geq 10.9$ V   |

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

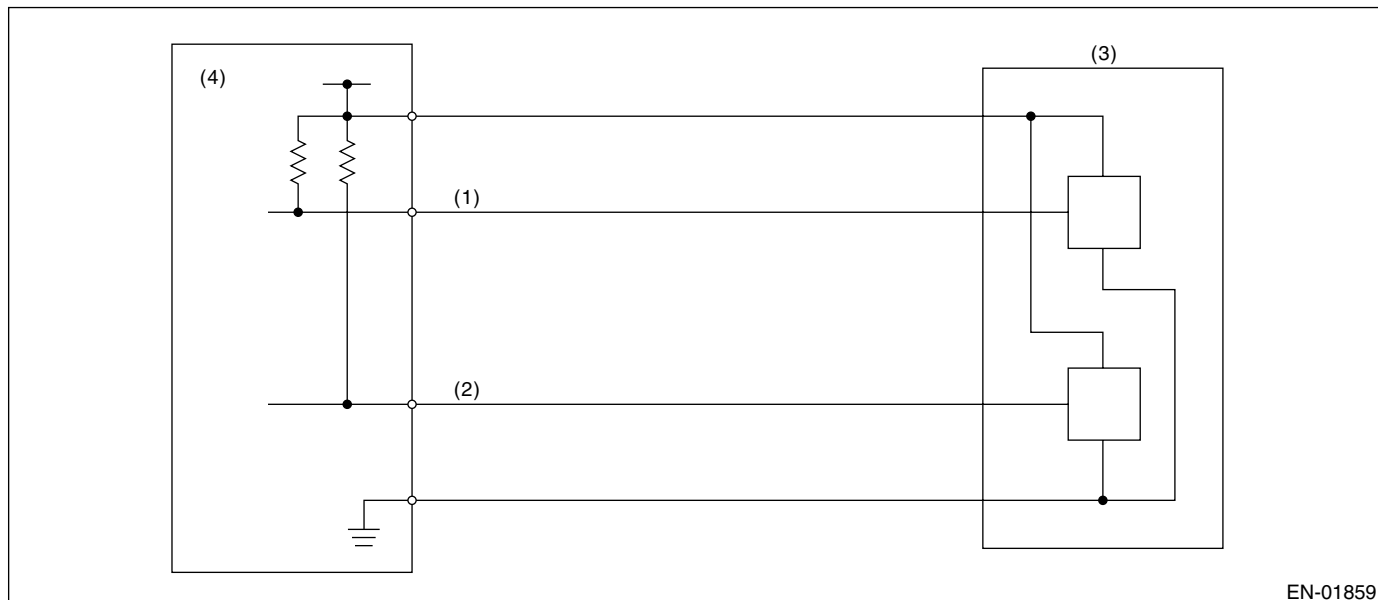
### AJ:DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.

Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(2) Throttle position sensor 2 signal

(4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 0.749$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

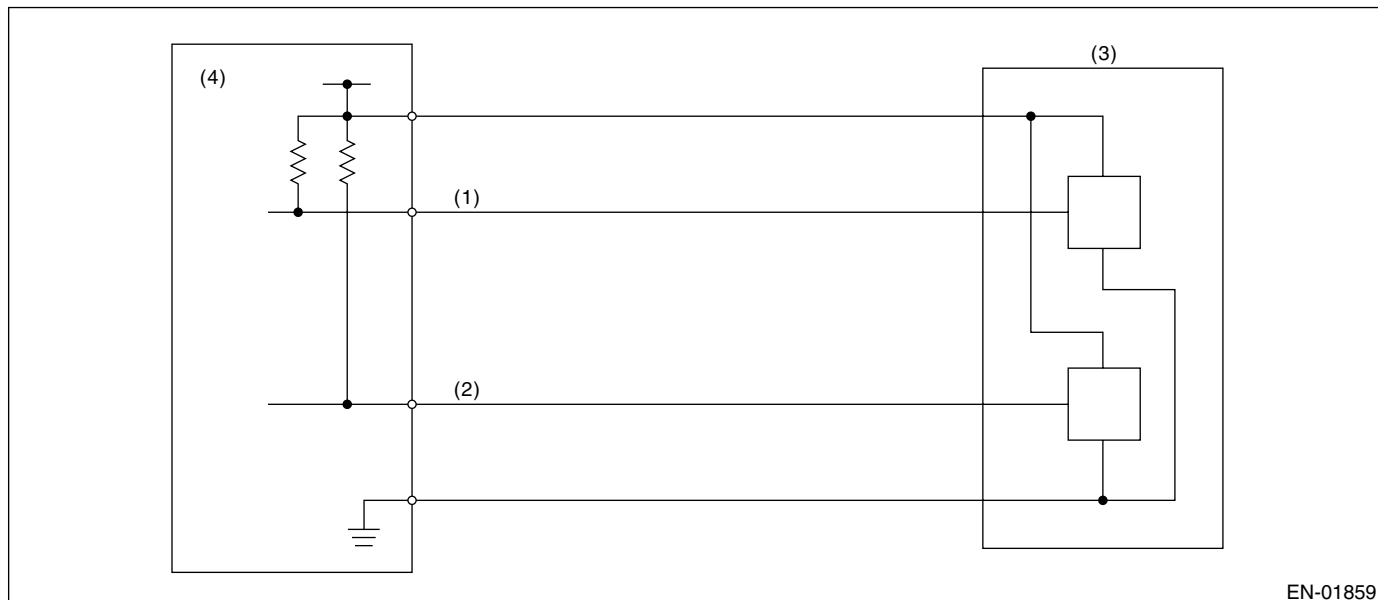
### AK:DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.

Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01859

(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(2) Throttle position sensor 2 signal

(4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 4.747$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

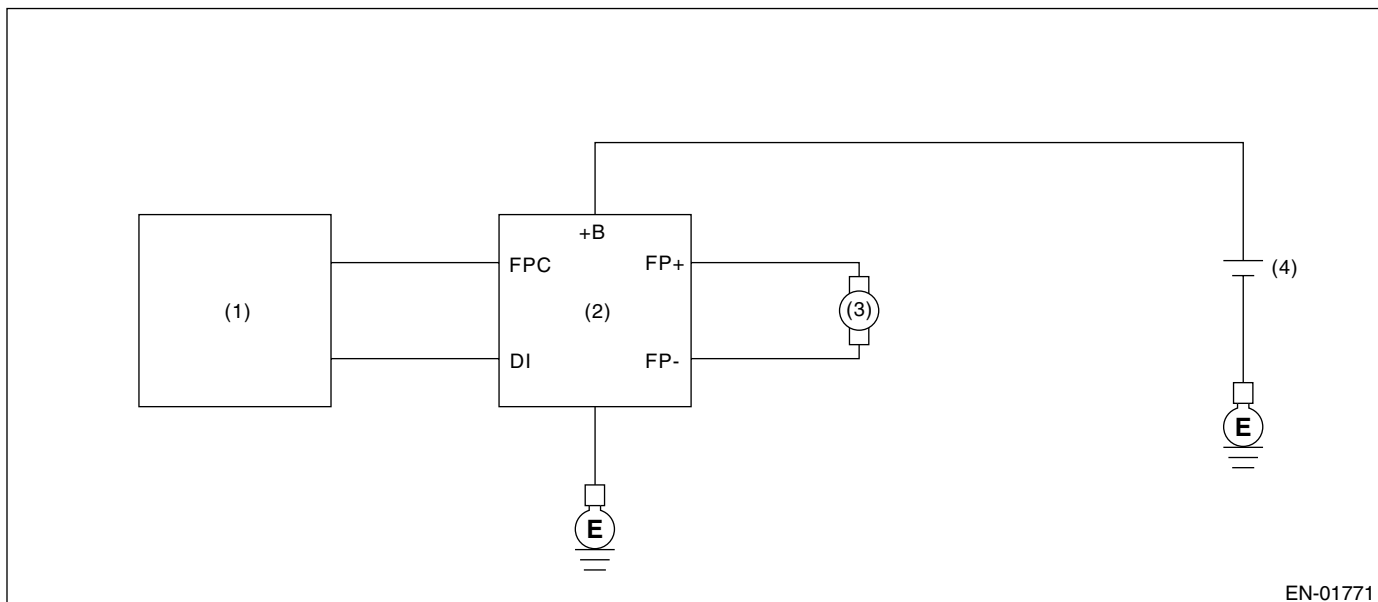
## GENERAL DESCRIPTION

### AL:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM) (3) Fuel pump  
(2) Fuel pump control unit (4) Battery

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

### • Judgment Value

| Malfunction Criteria                           | Threshold Value    |
|------------------------------------------------|--------------------|
| Battery voltage                                | $\geq 8\text{ V}$  |
| After starting engine                          | 30 seconds or more |
| Fuel pump control                              | ON                 |
| Fuel pump control unit output diagnosis signal | Low                |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                           | Threshold Value    |
|------------------------------------------------|--------------------|
| Battery voltage                                | $\geq 8\text{ V}$  |
| After starting engine                          | 30 seconds or more |
| Fuel pump control                              | ON                 |
| Fuel pump control unit output diagnosis signal | High               |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

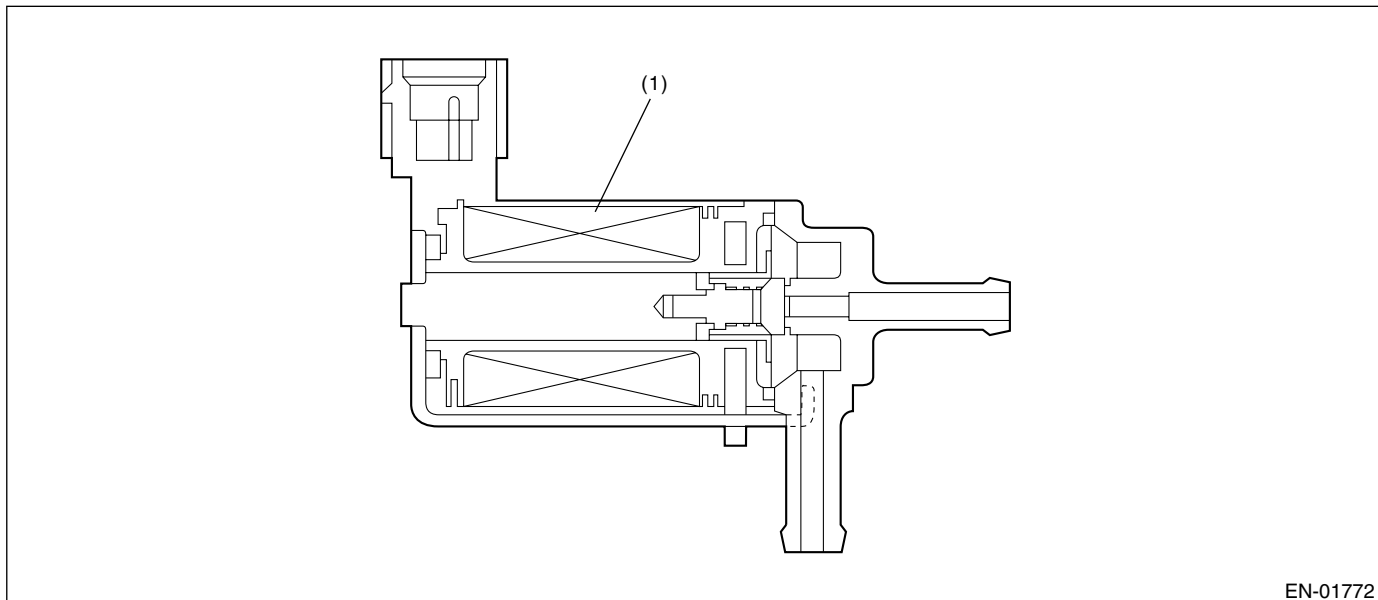
### GENERAL DESCRIPTION

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

##### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

##### 2. COMPONENT DESCRIPTION



(1) Coil

##### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

##### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

### • Judgment Value

| Malfunction Criteria     | Threshold Value |
|--------------------------|-----------------|
| Intake manifold pressure | ≥ Map 10        |

### • Map 10

|                                          |                           |                          |                          |                          |                          |                          |
|------------------------------------------|---------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Pa (kPa (mmHg, inHg))                    | 56.7<br>(440, 17.3)       | 67.2 (504,<br>19.8)      | 75.7 (568,<br>22.4)      | 84.3 (632,<br>24.9)      | 92.8 (696,<br>27.4)      | 101.3<br>(760, 29.9)     |
| Abnormal threshold<br>(kPa (mmHg, inHg)) | 152.6<br>(1145,<br>45.08) | 165.4<br>(1241,<br>48.8) | 177.2<br>(1329,<br>52.3) | 189.0<br>(1418,<br>55.8) | 200.7<br>(1506,<br>59.3) | 212.5<br>(1594,<br>62.8) |
| Normal threshold<br>(kPa (mmHg, inHg))   | 130.2<br>(977, 38.5)      | 143.0<br>(1073,<br>42.2) | 154.8<br>(1161,<br>45.7) | 166.6<br>(1250,<br>49.2) | 178.4<br>(1338,<br>52.7) | 190.1<br>(1426,<br>56.1) |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria     | Threshold Value |
|--------------------------|-----------------|
| Intake manifold pressure | < Map 10        |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

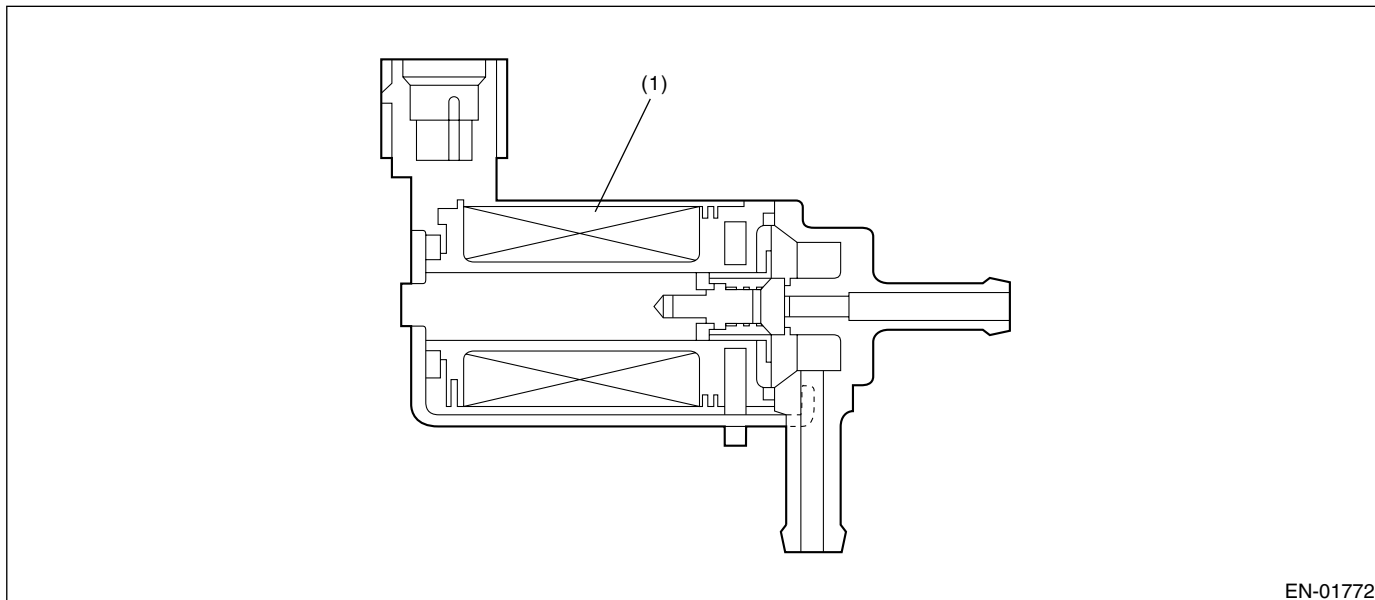
### GENERAL DESCRIPTION

#### AN:DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —

##### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

##### 2. COMPONENT DESCRIPTION



(1) Coil

##### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Battery voltage       | > 10.9 V          |
| After starting engine | 1 second or more  |

##### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

### • Judgment Value

| Malfunction Criteria                         | Threshold Value |
|----------------------------------------------|-----------------|
| Terminal output voltage                      | Low             |
| Duty ratio for turbocharged pressure control | < 75%           |

**Time Needed for Diagnosis:** 655 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | High            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

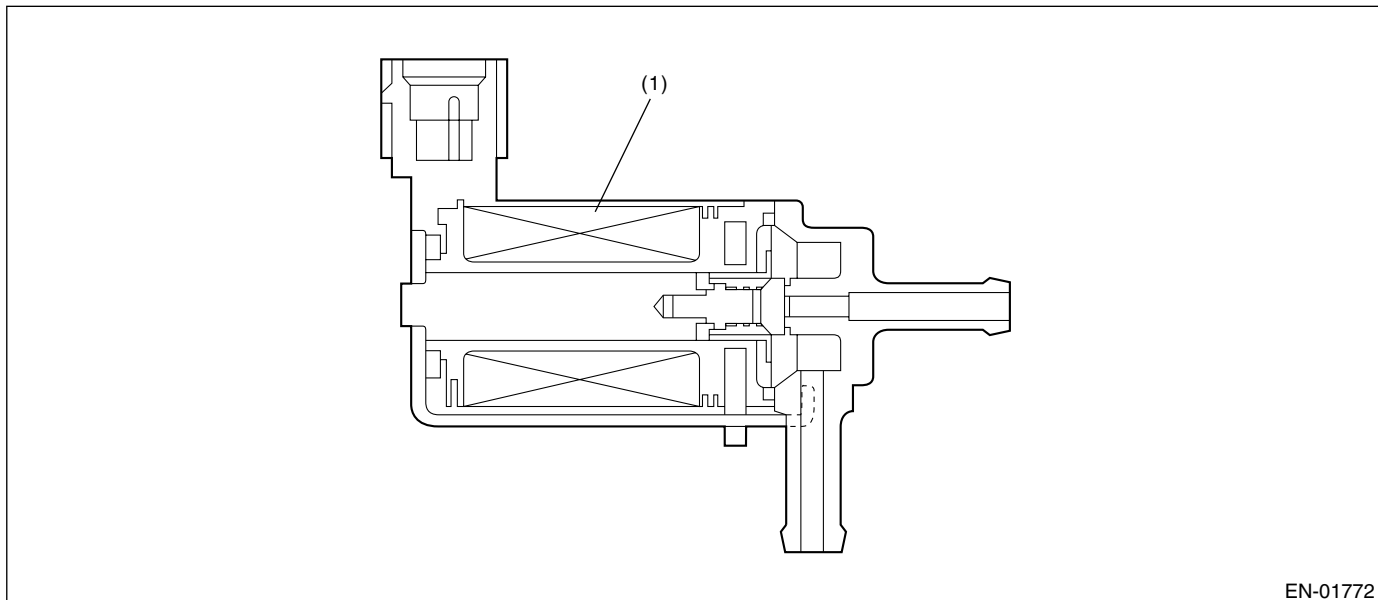
### GENERAL DESCRIPTION

#### AO:DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —

##### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

##### 2. COMPONENT DESCRIPTION



(1) Coil

##### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Battery voltage       | > 10.9 V          |
| After starting engine | 1 second or more  |

##### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

### • Judgment Value

| Malfunction Criteria                         | Threshold Value |
|----------------------------------------------|-----------------|
| Terminal output voltage                      | High            |
| Duty ratio for turbocharged pressure control | > 25%           |

**Time Needed for Diagnosis:** 655 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | Low             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### AP:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

#### 1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

#### 2. ENABLE CONDITION

| Secondary Parameters                                   | Enable Conditions                                                              |
|--------------------------------------------------------|--------------------------------------------------------------------------------|
| All secondary parameters approval continuation time    | 1 second or more                                                               |
| Intake manifold pressure change during 0.5 engine rev. | < 16.0 kPa (120 mmHg, 4.72 inHg) (MT)<br>< 14.7 kPa (110 mmHg, 4.33 inHg) (AT) |
| Engine speed change                                    | < 500 rpm/32 milliseconds                                                      |
| Throttle position change during 16 milliseconds        | < 10°                                                                          |
| Fuel shut-off function                                 | Not in operation                                                               |
| Atmospheric pressure                                   | ≥ 75.1 kPa (563 mmHg, 22.2 inHg)                                               |
| Fuel level                                             | ≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)                                            |
| Air condition                                          | No switching ON ↔ OFF                                                          |
| Radiator fan                                           | No switching ON ↔ OFF                                                          |
| Power steering switch                                  | No switching ON ↔ OFF                                                          |
| Starter                                                | ON, or OFF, or change from ON to OFF                                           |
| Evaporative system leak check                          | Not in operation                                                               |
| Engine speed                                           | 500 — 6700 rpm                                                                 |
| Intake manifold pressure                               | > Map 3 or more                                                                |
| Battery voltage                                        | ≥ 8 V                                                                          |
| Engine coolant temperature                             | ≤ 111°C (232°F)                                                                |
| Intake air temperature                                 | ≤ 101°C (214°F)                                                                |
| Heavy quality fuel judgement                           | Does not execute.                                                              |
| VDC and AT control                                     | Is not controlling.                                                            |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## Map3

- MT

### Vehicle Speed < 64.4 km/h (40 MPH)

| rpm             | 700            | 1000           | 1500           | 2000           | 2500           | 3000           | 3500             | 4000           | 4500             | 5000           | 5500             | 6000           | 6500             | 6700           |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|
| kPa             | 25.1           | 24.8           | 25.6           | 23.3           | 26.3           | 25.9           | 28.9             | 30.0           | 31.7             | 33.0           | 37.1             | 41.9           | 47.0             | 51.1           |
| (mmHg,<br>inHg) | (188,<br>7.40) | (186,<br>7.32) | (192,<br>7.56) | (175,<br>6.89) | (197,<br>7.76) | (194,<br>7.64) | (216.5,<br>8.52) | (225,<br>8.86) | (237.5,<br>9.35) | (248,<br>9.76) | (278.5,<br>11.0) | (314,<br>12.4) | (352.5,<br>13.9) | (383,<br>15.1) |

### Vehicle Speed ≥ 64.4 km/h (40 MPH)

| rpm             | 700            | 1000           | 1500             | 2000             | 2500             | 3000             | 3500             | 4000           | 4500             | 5000             | 5500             | 6000             | 6500           | 6700           |
|-----------------|----------------|----------------|------------------|------------------|------------------|------------------|------------------|----------------|------------------|------------------|------------------|------------------|----------------|----------------|
| kPa             | 25.5           | 25.1           | 30.4             | 35.6             | 38.5             | 40.4             | 41.1             | 40.8           | 44.8             | 47.3             | 49.1             | 50.9             | 52.8           | 52.8           |
| (mmHg,<br>inHg) | (191,<br>7.52) | (188,<br>7.40) | (227.7,<br>8.96) | (267.4,<br>10.5) | (288.9,<br>11.4) | (302.9,<br>11.9) | (308.6,<br>12.1) | (306,<br>12.0) | (335.8,<br>13.2) | (354.5,<br>14.0) | (368.2,<br>14.5) | (381.9,<br>15.0) | (396,<br>15.6) | (396,<br>15.6) |

- AT

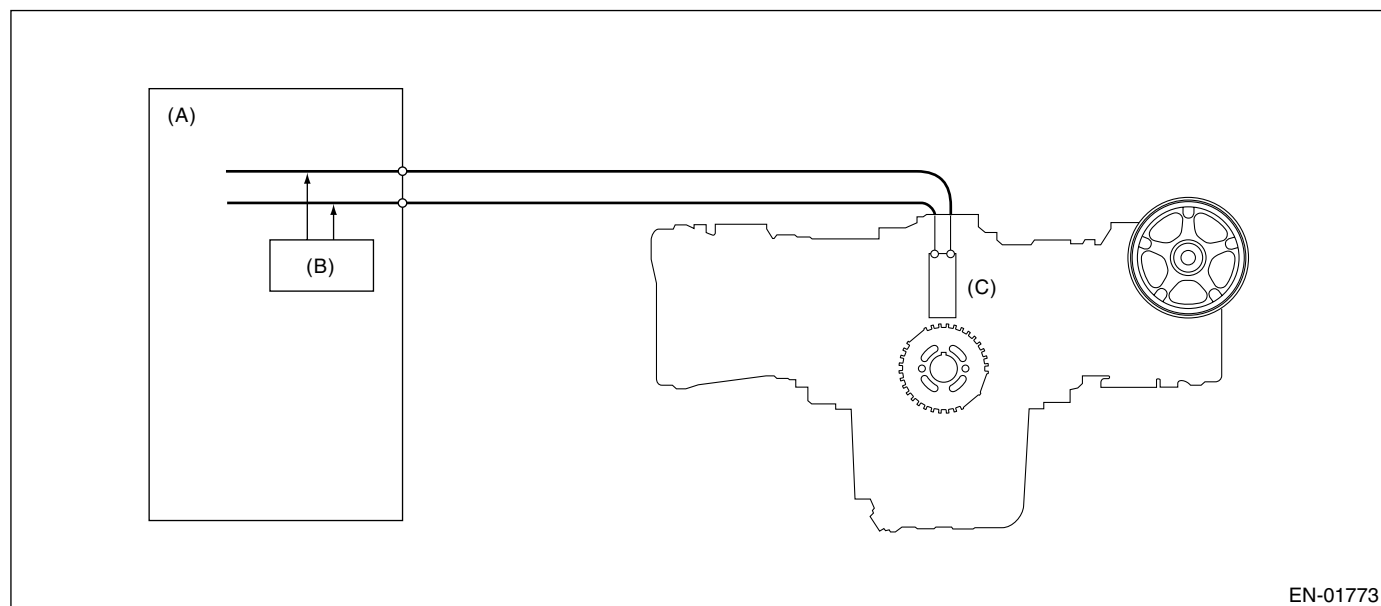
### Vehicle Speed ≥ 64.4 km/h (40 MPH)

| rpm             | 700            | 1000           | 1500           | 2000           | 2500           | 3000           | 3500             | 4000           | 4500             | 5000           | 5500             | 6000             | 6500              | 6700            |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|----------------|------------------|----------------|------------------|------------------|-------------------|-----------------|
| kPa             | 26.3           | 24.8           | 23.6           | 25.5           | 27.3           | 26.1           | 29.5             | 31.3           | 32.7             | 33.3           | 38.2             | 33.6             | 49.5              | 51.5            |
| (mmHg,<br>inHg) | (197,<br>7.76) | (186,<br>7.32) | (177,<br>6.97) | (191,<br>7.52) | (205,<br>8.07) | (196,<br>7.72) | (221.5,<br>8.72) | (235,<br>9.25) | (245.5,<br>9.67) | (250,<br>9.84) | (286.5,<br>11.3) | (252.3,<br>9.93) | (371.5,<br>14.62) | (386,<br>15.20) |

## 3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution.
- Perform the diagnosis continuously.

## 4. DIAGNOSTIC METHOD



EN-01773

(A) Engine control module (ECM)

(B) Diagnosis circuit

(C) Crankshaft position sensor

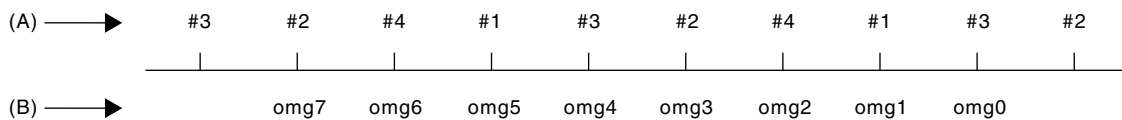
# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1000 rev. or 200 rev., judge NG for the corresponding cylinder.

|                                                                 |                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Calculate the diagnostic value (from crankshaft position speed) | → Misfire detection every single ignition (Compare diagnostic value with judgment value) <ul style="list-style-type: none"><li>• 180° Interval Difference Method</li><li>• 360° Interval Difference Method</li><li>• 720° Interval Difference Method</li></ul> | → NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment) <ul style="list-style-type: none"><li>• FTP1.5 times misfire NG judgment</li><li>• Catalyst damage misfire NG judgment</li></ul> |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



EN-01774

(A) Ignition order

(B) Crankshaft position speed

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

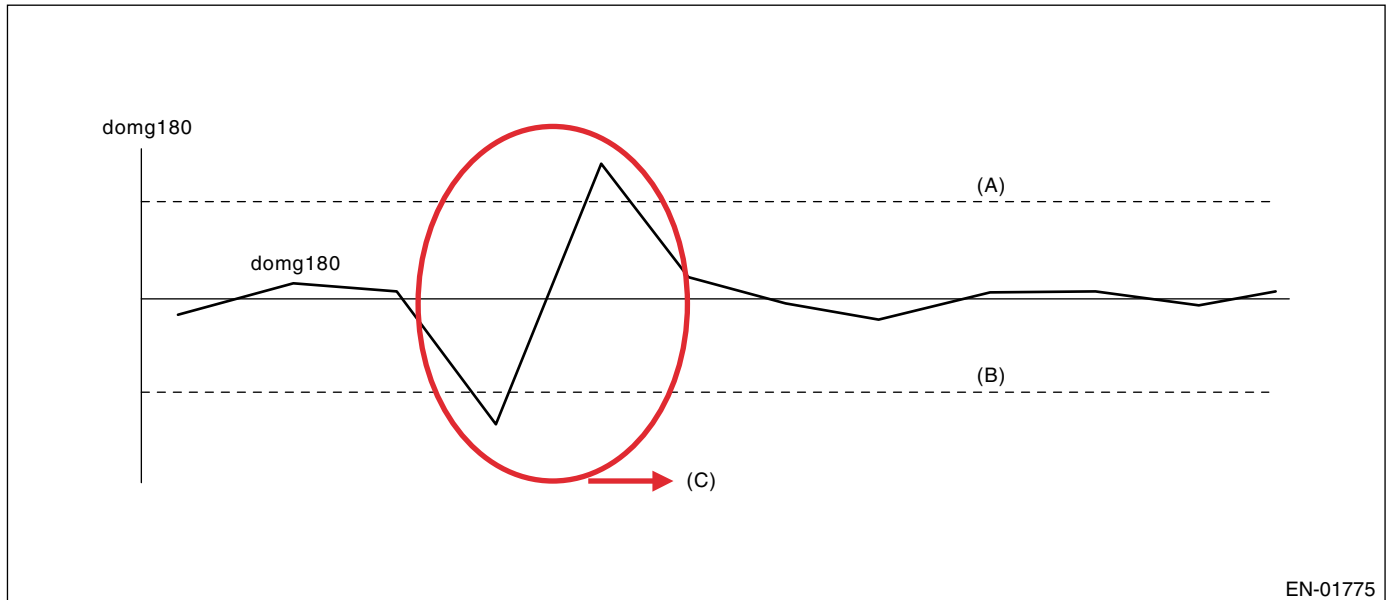
GENERAL DESCRIPTION

## • 180° Interval Difference Method

Diagnosis value  $\text{domg } 180 = (\text{omg } -1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 1)/6$

Judge misfire occurs in the following cases.

- $\text{domg } 180 > \text{judgment value of positive side}$
- $\text{domg } 180 \leq \text{judgment value of negative side}$   
(judgment value before 180°CA)



EN-01775

(A) Threshold value (positive judged value)

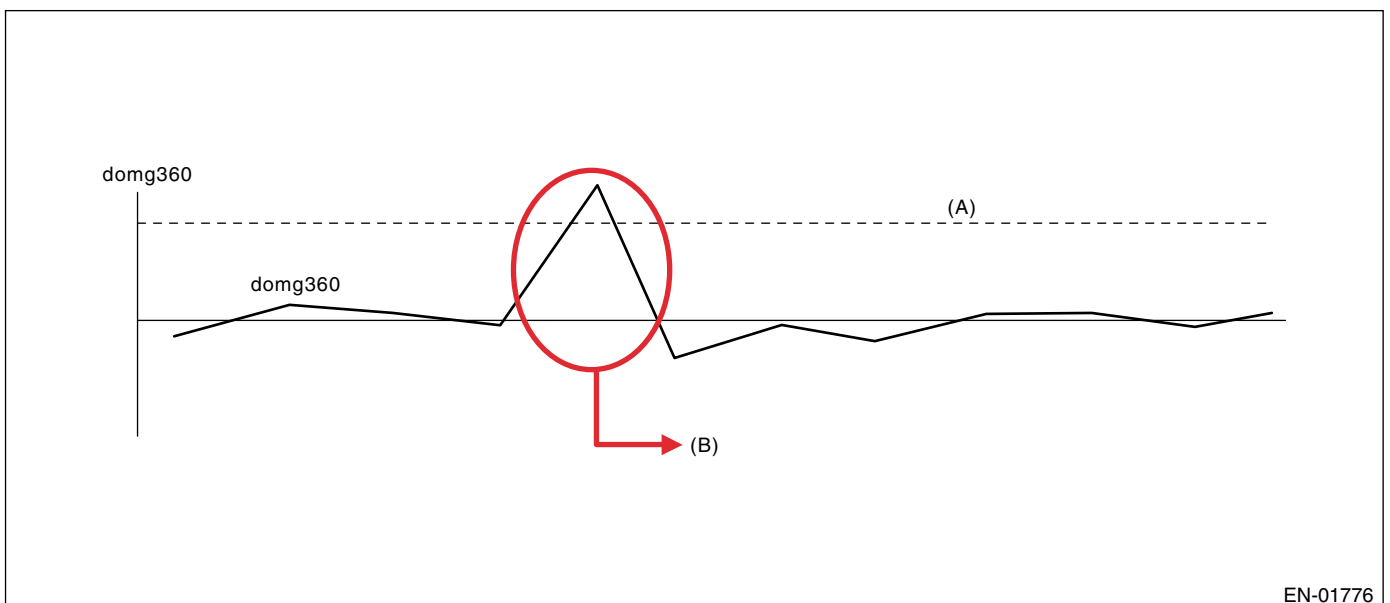
(B) Threshold value (negative judged value)

(C) Judged as misfire value)

## • 360° Interval Difference Method

Diagnosis value  $\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 4 - \text{omg } 3)$

Misfire judgment  $\text{domg } 360 > \text{judgment value} \rightarrow \text{Misfire occurs}$



EN-01776

(A) Threshold value

(B) Judged as misfire

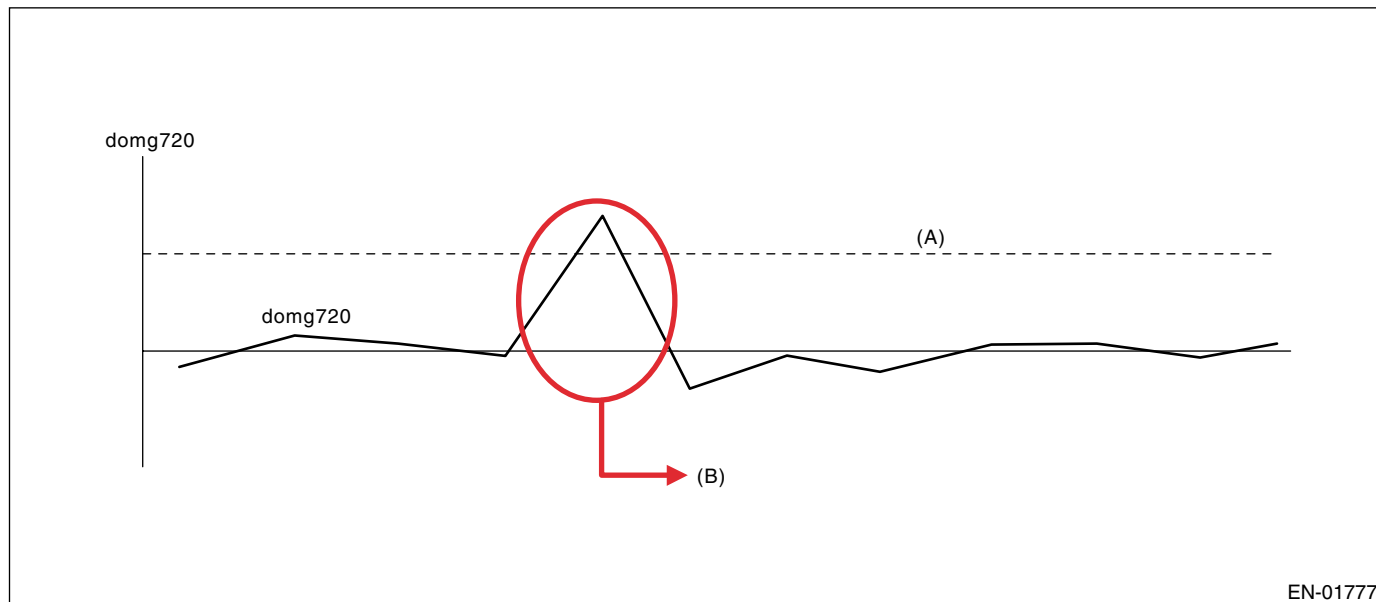
# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### • 720° Interval Difference Method

Diagnosis value  $\text{domg 720} = (\text{omg 1} - \text{omg 0}) - (\text{omg 7} - \text{omg 6})$

Misfire judgment  $\text{domg 720} > \text{judgment value} \rightarrow \text{Misfire occurs}$



EN-01777

(A) Threshold value

(B) Judged as misfire

- **FTP 1.5 times misfire (Misfire occurrence level affecting 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       |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## Map 1 Fault criteria threshold for misfire which would result in catalyst damage

| percentage               |      | Intake air (g (oz)/gev.) |                |                |                |                |                |                |                |                |                |
|--------------------------|------|--------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                          |      | 0.2<br>(0.007)           | 0.4<br>(0.014) | 0.6<br>(0.021) | 0.8<br>(0.028) | 1.0<br>(0.035) | 1.2<br>(0.042) | 1.4<br>(0.049) | 1.6<br>(0.056) | 1.8<br>(0.063) | 2.0<br>(0.071) |
| Engine<br>speed<br>(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            | —              | —              |

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.

**Time Needed for Diagnosis:** 200 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When “Clear Memory” was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

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#### **AQ: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 —.>

#### **AR: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 —.>

#### **AS: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

GENERAL DESCRIPTION

MEMO:

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

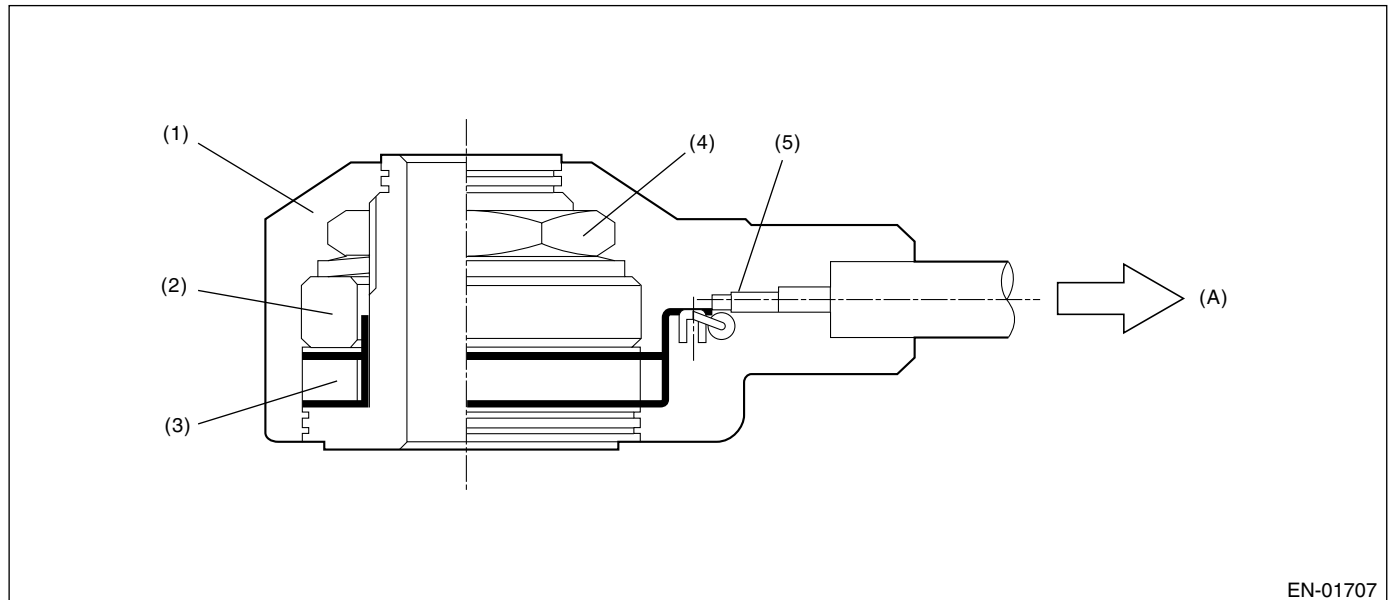
### GENERAL DESCRIPTION

#### AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

##### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

##### 2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

##### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

##### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.238 V       |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.238$ V  |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = -5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

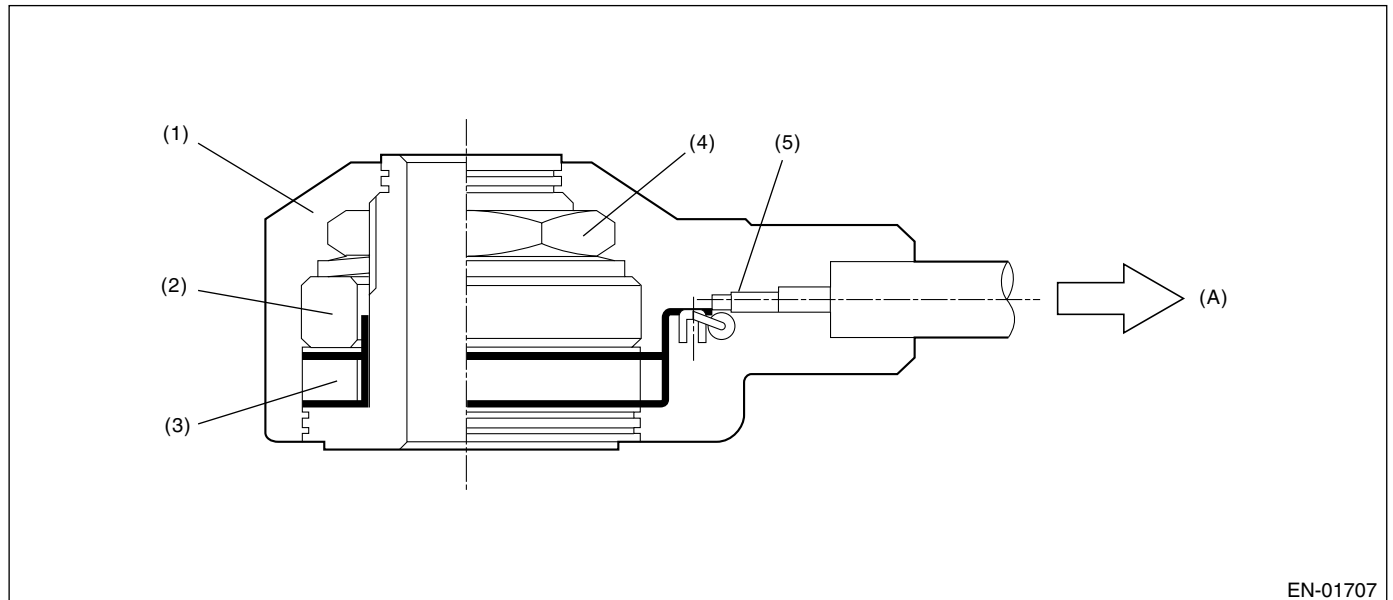
## GENERAL DESCRIPTION

### AU:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.714$ V  |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $< 4.714$ V     |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation =  $0^{\circ}\text{CA}$  is fixed.
- At trouble: knock compensation =  $-5^{\circ}\text{CA}$ . (Retard  $5^{\circ}\text{CA}$ .)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

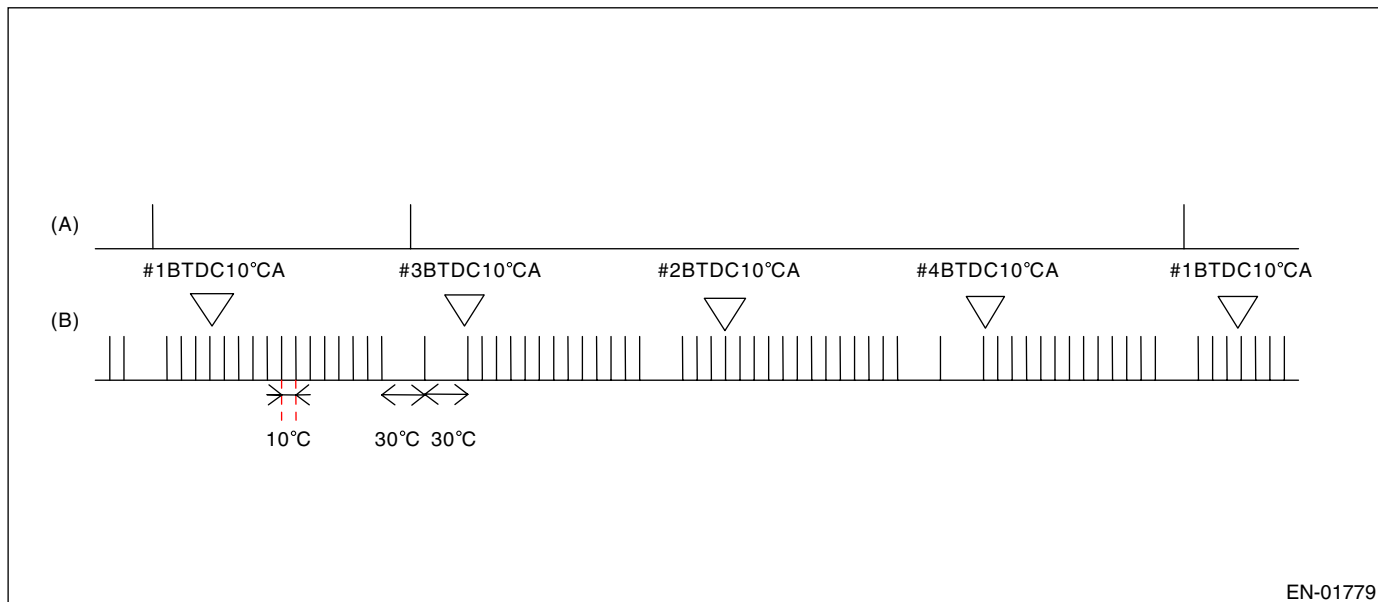
## GENERAL DESCRIPTION

### AV:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

#### 1. OUTLINE OF DIAGNOSIS

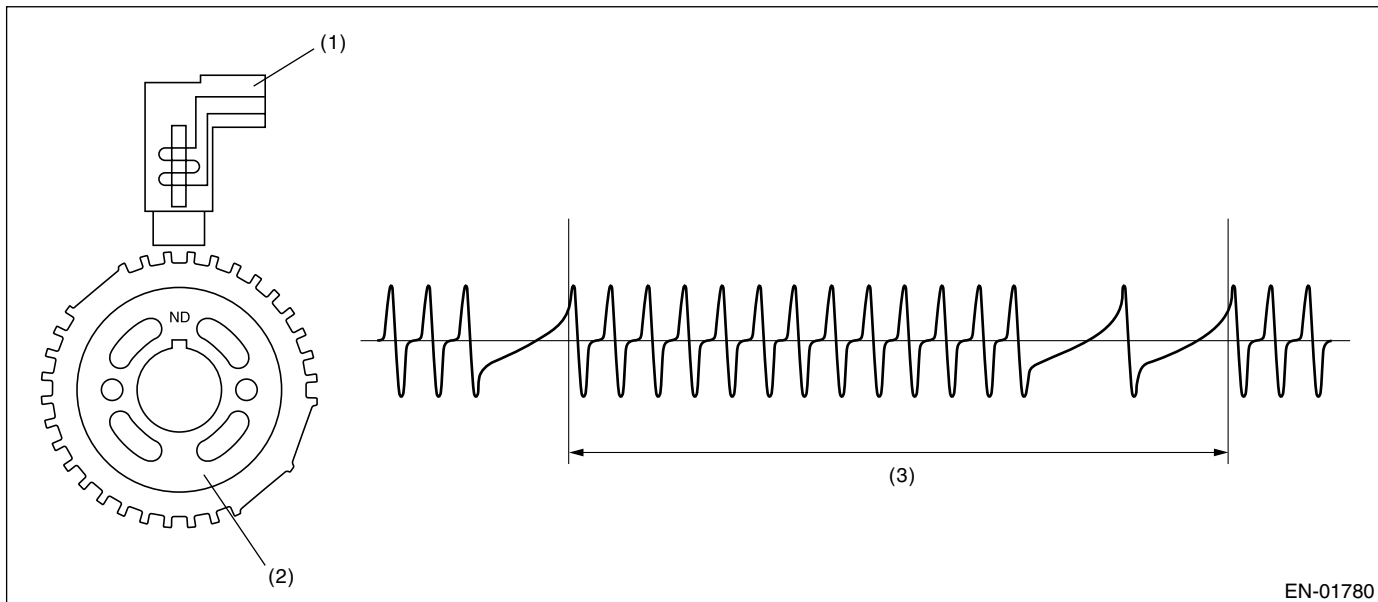
Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

#### 2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Crankshaft position sensor

(2) Crankshaft sprocket

(3) Crankshaft half-turn

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

### • Judgment Value

| Malfunction Criteria              | Threshold Value    |
|-----------------------------------|--------------------|
| Starter switch                    | ON                 |
| Crankshaft position sensor signal | Not detected       |
| Battery voltage                   | $\geq 8 \text{ V}$ |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

### • Judgment Value

| Malfunction Criteria              | Threshold Value    |
|-----------------------------------|--------------------|
| Crankshaft position sensor signal | Input exists       |
| Battery voltage                   | $\geq 8 \text{ V}$ |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

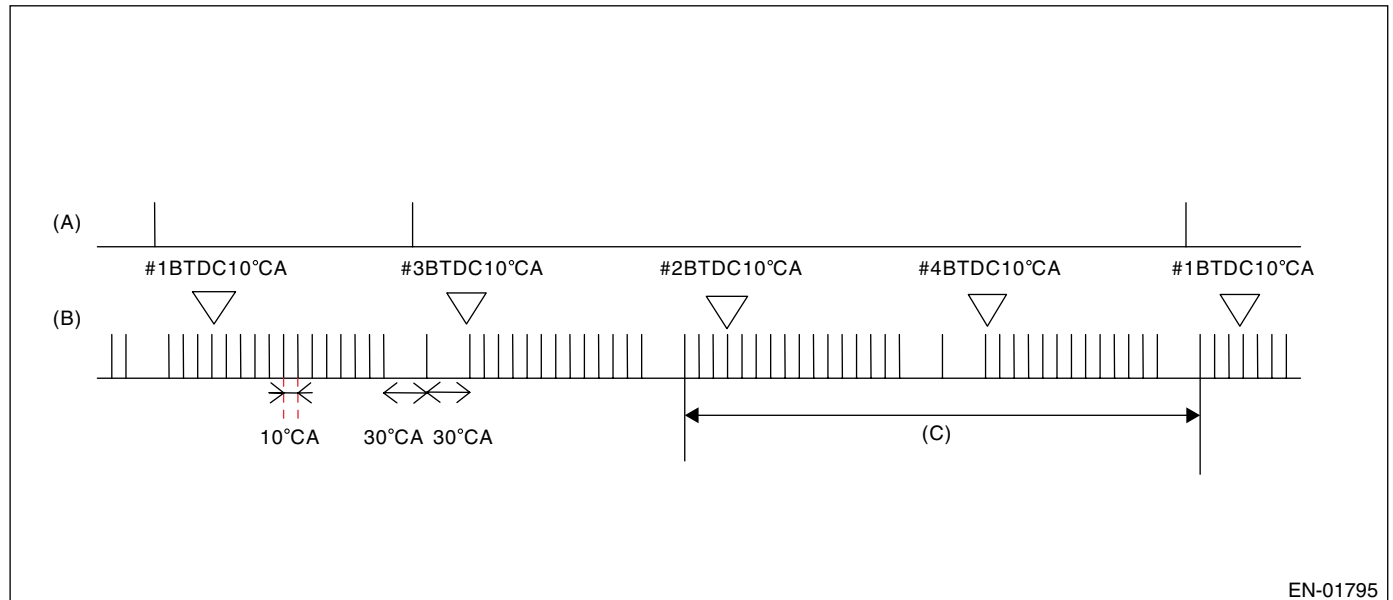
## GENERAL DESCRIPTION

### AW:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

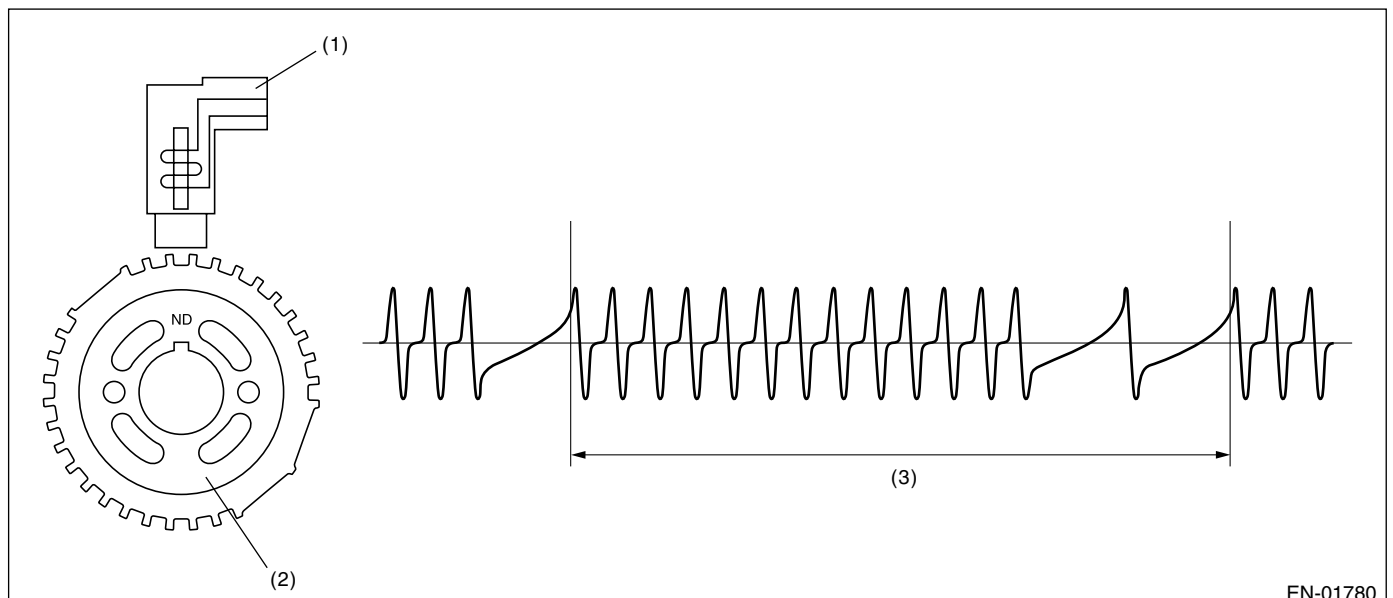
#### 2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal

(C) Number of crankshaft signal = 30 is normal.



(1) Crankshaft position sensor

(2) Crankshaft sprocket

(3) Crankshaft half-turn

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions    |
|----------------------|----------------------|
| Battery voltage      | $\geq 8 \text{ V}$   |
| Engine speed         | $< 3000 \text{ rpm}$ |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

### • Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---------------------------------------------|-----------------|
| Cylinder number distinction                 | Completed       |
| Amount of crank sensor signal during 1 rev. | Not = 30        |

**Time Needed for Diagnosis:** 10 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---------------------------------------------|-----------------|
| Cylinder number distinction                 | Completed       |
| Amount of crank sensor signal during 1 rev. | = 30            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

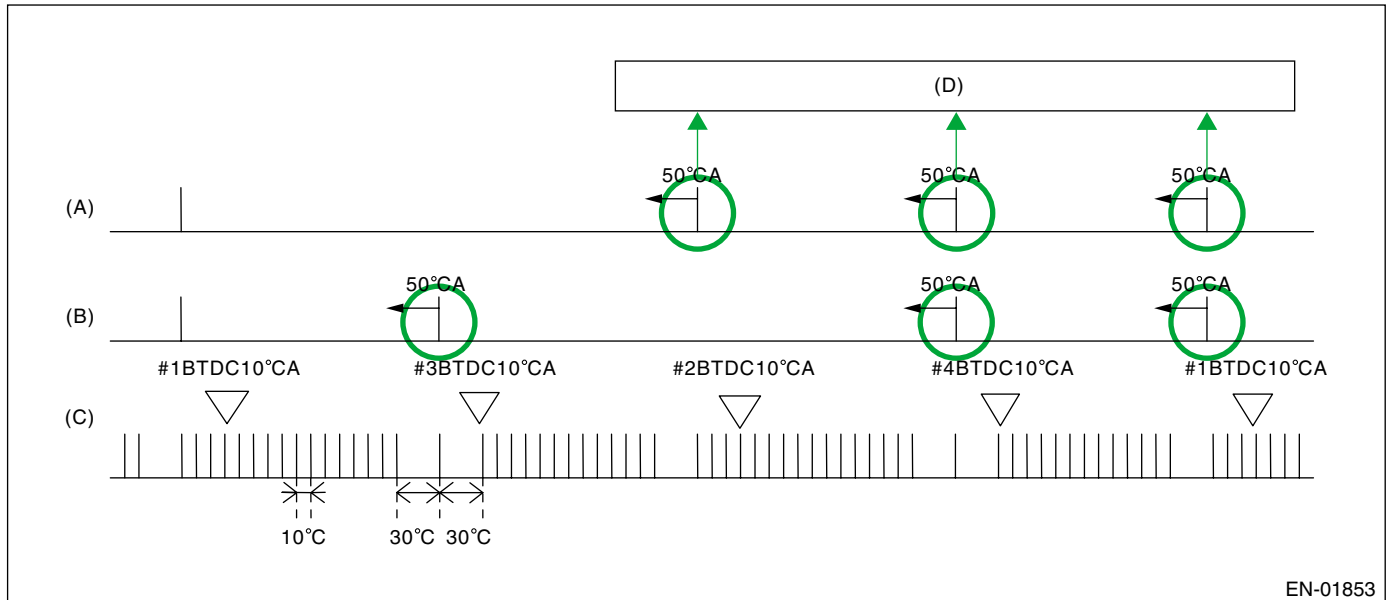
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

#### 2. COMPONENT DESCRIPTION



EN-01853

- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal

- (D) Number of camshaft position signals = Receive camshaft position signal 3 times per two engine revolutions.

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions      |
|----------------------|------------------------|
| Voltage              | $\geq 8 \text{ V}$     |
| Engine speed         | $\geq 600 \text{ rpm}$ |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.

Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

### • Judgment Value

| Malfunction Criteria                           | Threshold Value |
|------------------------------------------------|-----------------|
| Number of camshaft sensor signal during 2 rev. | Except 3        |
| Engine speed                                   | $\geq 600$ rpm  |

**Time Needed for Diagnosis:** 100 rev.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria  | Threshold Value |
|-----------------------|-----------------|
| Camshaft angle signal | Exists          |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA**

### **GENERAL DESCRIPTION**

---

#### **AY: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

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

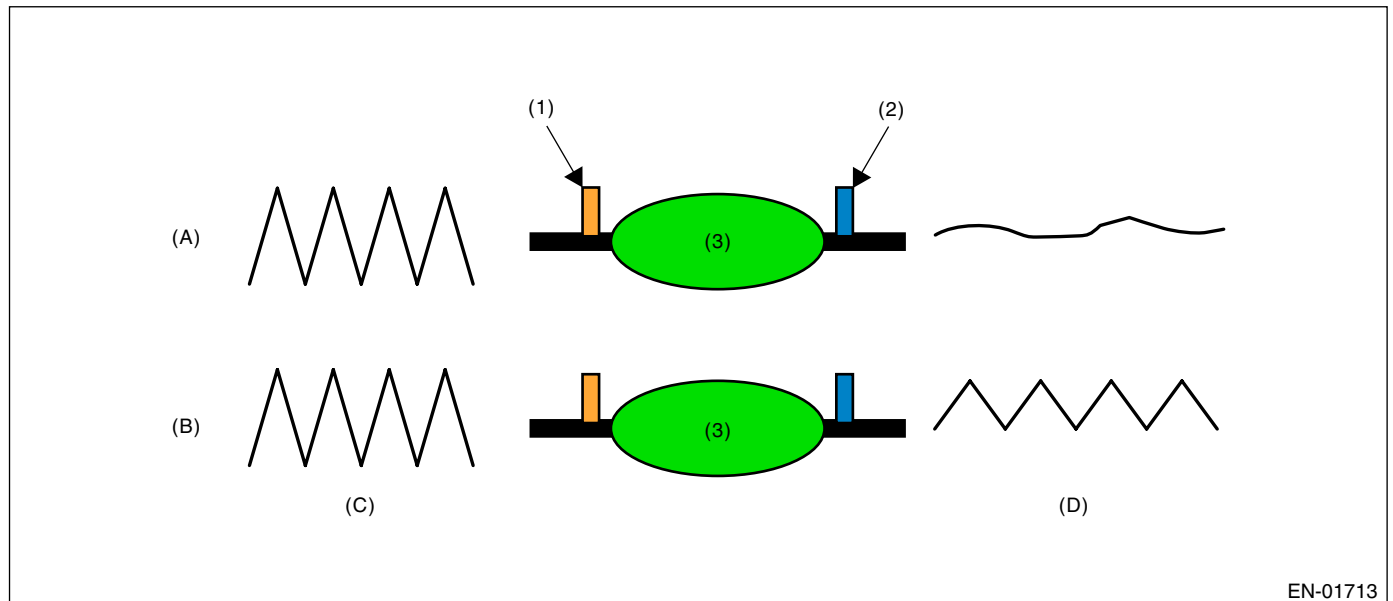
### AZ:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

#### 2. COMPONENT DESCRIPTION



- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalyst

- (A) Normal
- (B) Deterioration

- (C) Front oxygen (A/F) sensor waveform
- (D) Rear oxygen (A/F) sensor waveform

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters                                        | Enable Conditions                |
|-------------------------------------------------------------|----------------------------------|
| Time for keep completing all secondary parameters           | 1.2 seconds or more              |
| Battery voltage                                             | > 10.9 V                         |
| Atmospheric pressure                                        | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Engine coolant temperature                                  | ≥ 65°C (149°F)                   |
| Catalyst warm-up counter on Map 2                           | ≥ 8000                           |
| Misfire detection during 200 engine revs.                   | < 5 times                        |
| Learning value of evaporation gas density                   | < 0.20                           |
| Sub feedback                                                | In operation                     |
| Evaporative system diagnostic                               | Not in operation                 |
| Difference between actual and target time lambda < 0.10     | 1000 milliseconds or more        |
| Vehicle speed                                               | ≥ 85 km/h (53 MPH)               |
| Amount of intake air                                        | 12 — 40 g (0.35 ←→ 1.41 oz)/s    |
| Engine load change every 0.5 engine revs.                   | < 0.03 g (0.001 oz)/rev          |
| Rear O <sub>2</sub> output change from below 600 mV to over | Experienced after fuel cut       |
| After starting engine                                       | ≥ 200 seconds                    |
| Engine speed                                                | 1600 — 3500 rpm                  |

### • Map 2

Add the following value every 512 milliseconds.

### • Catalyst warm-up counter ≤ 9000

|                                      |       |          |             |           |           |           |           |           |           |           |           |           |
|--------------------------------------|-------|----------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Amount of intake air (g (oz)/s)      | 0 (0) | 5 (0.18) | 7.5 (0.265) | 10 (0.35) | 15 (0.53) | 20 (0.71) | 25 (0.88) | 30 (1.06) | 35 (1.23) | 40 (1.41) | 45 (1.59) | 50 (1.76) |
| Integrated value for warm-up counter | -18   | -5       | 3           | 11        | 25        | 40        | 57        | 72        | 87        | 100       | 100       | 100       |

### • Catalyst warm-up counter > 8000

|                                      |       |          |             |           |           |           |           |           |           |           |           |           |
|--------------------------------------|-------|----------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Amount of intake air (g (oz)/s)      | 0 (0) | 5 (0.18) | 7.5 (0.265) | 10 (0.35) | 15 (0.53) | 20 (0.71) | 25 (0.88) | 30 (1.06) | 35 (1.23) | 40 (1.41) | 45 (1.59) | 50 (1.76) |
| Integrated value for warm-up counter | -8    | -4       | -1          | 3         | 6         | 8         | 9         | 11        | 13        | 14        | 14        | 14        |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed of 75 km/h (46.6 MPH) or more after warming up the engine.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

---

#### 5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.

Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.

Regard the A/F response properties and diagnosis value as parameters for judgment value.

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

##### Judgment Value

| Malfunction Criteria                                                                                                                                                          | Threshold Value |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds | $\geq 7.0$      |

**Time Needed for Diagnosis:** 55 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

None

#### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

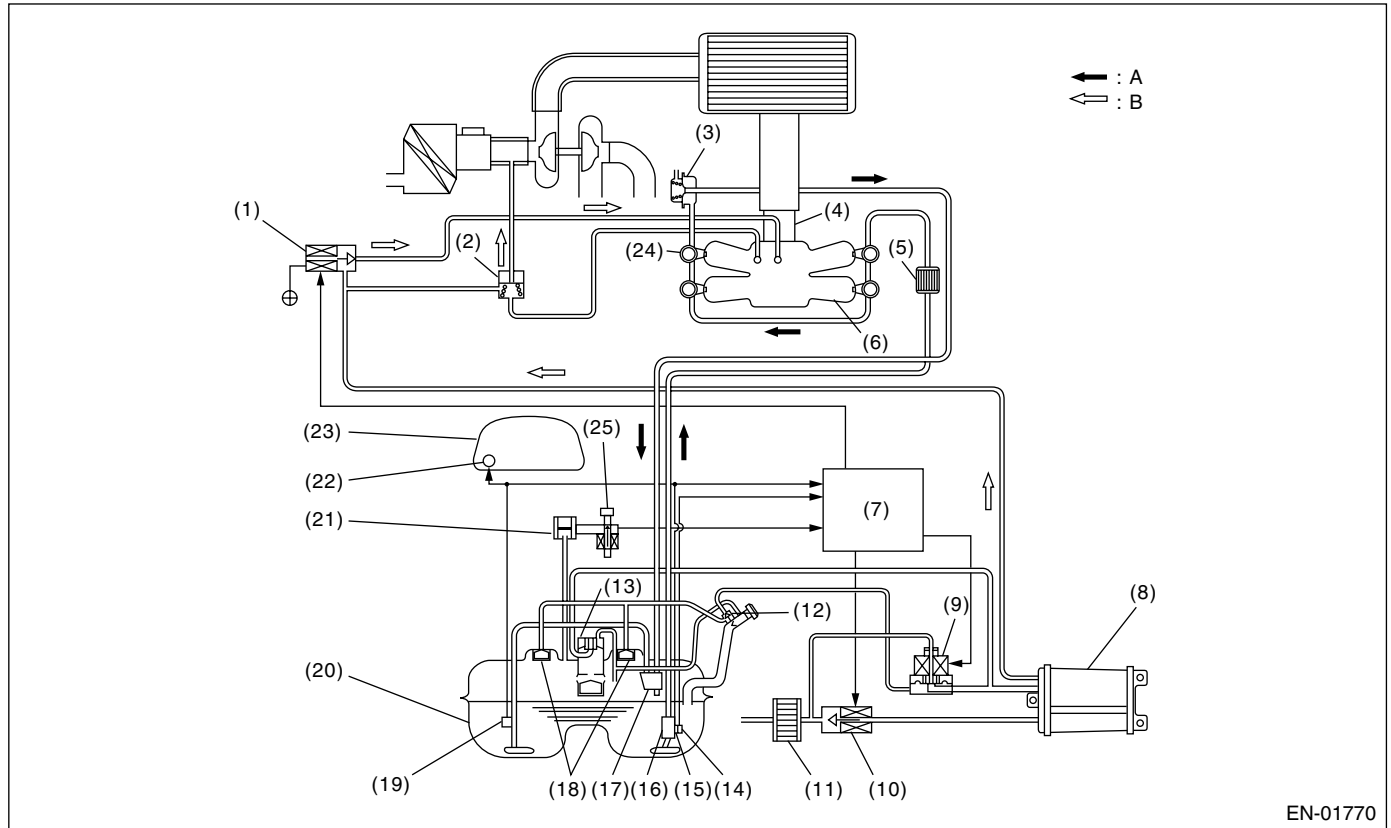
# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



EN-01770

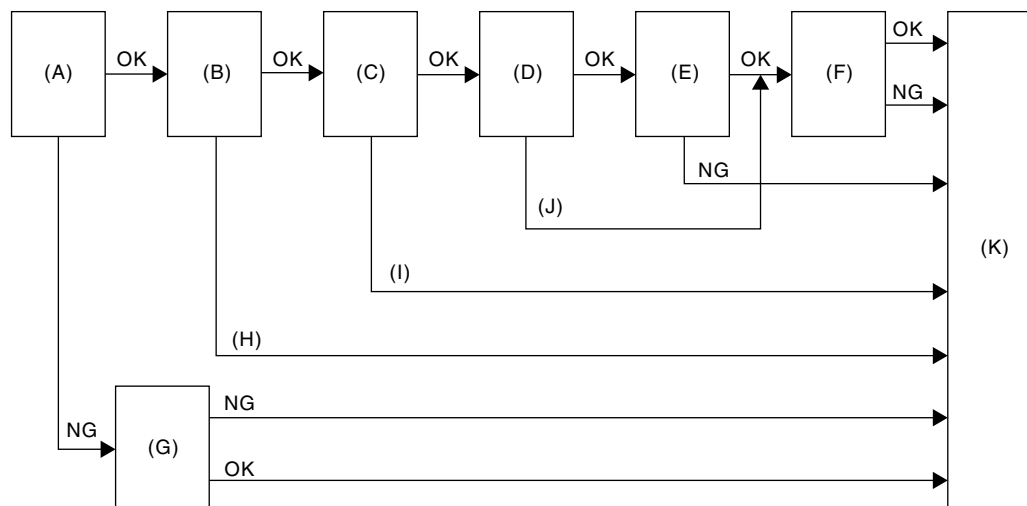
- |                                     |                              |                                             |
|-------------------------------------|------------------------------|---------------------------------------------|
| (1) Purge control solenoid valve    | (10) Drain valve             | (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 meter                             |
| (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               | (25) Tank pressure switching solenoid valve |
| (8) Canister                        | (17) Jet pump                |                                             |
| (9) Pressure control solenoid valve | (18) Fuel cut valve          |                                             |

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure, and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C, mode D and mode E, and 0.02 inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C, mode D and mode E.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## • 0.04-inch Diagnosis



EN-01850

(A) Mode Z  
(B) Mode A  
(C) Mode B  
(D) Mode C

(E) Mode D  
(F) Mode E  
(G) Mode Z Extend  
(H) Cancel

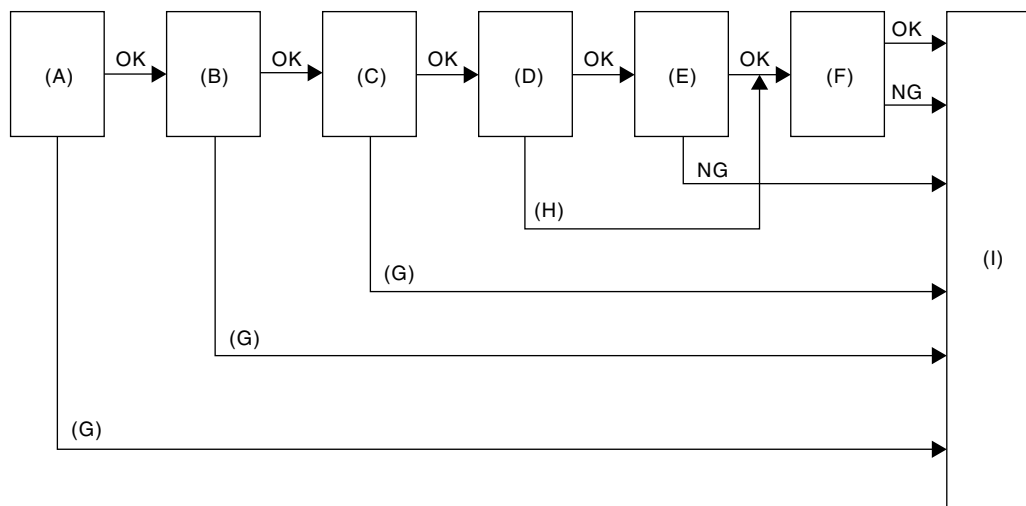
(I) Large leakage diagnosis  
(J) Quick OK judgement  
(K) END

| Mode                                                                                      | Mode Description                                                                                                                                                                     | Diagnosis Period |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Mode Z<br>(CPC abnormal open diagnosis,<br>CCV abnormal close diagnosis)                  | Perform CPC open stick fast and CCV close stick fast diagnosis according to tank pressure change amount after the diagnosis has started.                                             | 3 — 16 seconds   |
| Mode A<br>(Estimated evaporation amount)                                                  | Calculate the tank pressure change amount (P1).                                                                                                                                      | 16 seconds       |
| Mode B<br>(Sealed negative pressure, large<br>leakage judgment)                           | Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.<br>If the tank pressure cannot be reduced, it is diagnosed as large leak. | 4 — 35 seconds   |
| Mode C<br>(Pressure increase check advanced<br>OK judgment)                               | Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.               | 4 — 15 seconds   |
| Mode D<br>(Negative pressure variation mea-<br>surement evaporation leakage<br>diagnosis) | Calculate the tank pressure variation (P2), and obtain the diag-<br>nostic value using P1 of Mode 1. Perform the evaporation leakage<br>diagnosis using the diagnostic value.        | 12 — 16 seconds  |
| Mode E<br>(CCV property abnormal diagnosis)                                               | Perform the CCV property abnormal diagnosis according to the<br>tank pressure change amount after the leak diagnosis has fin-<br>ished.                                              | 4 seconds        |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### • 0.02-inch Diagnosis



EN-01872

(A) Mode Y  
(B) Mode A  
(C) Mode B

(D) Mode C  
(E) Mode D  
(F) Mode E

(G) Cancel  
(H) Quick OK judgement  
(I) END

| Mode                                                                              | Mode Description                                                                                                                                                       | Diagnosis Period |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Mode Y<br>(Tank pressure stabilization)                                           | Return the tank pressure to atmosphere.                                                                                                                                | 15 seconds       |
| Mode A<br>(Estimated evaporation amount)                                          | Calculate the tank pressure change amount (P1).                                                                                                                        | 29 seconds       |
| Mode B<br>(Negative pressure sealed)                                              | Intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.                                                                           | 10 — 20 seconds  |
| Mode C<br>(Pressure increase check advanced OK judgment)                          | Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment. | 5 — 20 seconds   |
| Mode D<br>(Negative pressure variation measurement evaporation leakage diagnosis) | Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.  | 20 — 25 seconds  |
| Mode E<br>(CCV property abnormal diagnosis)                                       | Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leak diagnosis has finished.                                        | 4 seconds        |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## • Mode Table for Evaporative Emission Control System Diagnosis

### • 0.04-inch Diagnosis

| Mode   | Behavior of tank internal pressure under normal conditions                          | Diagnostic item                                              | DTC   |
|--------|-------------------------------------------------------------------------------------|--------------------------------------------------------------|-------|
| Mode Z | Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg)) | CCV is judged to be stuck closed.                            | P1443 |
| Mode A | Pressure is in proportion to amount of evaporative emission.                        |                                                              |       |
| Mode B | Negative pressure is formed due to intake manifold negative pressure                | Large leakage                                                | P0457 |
| Mode C | Target pressure is reached                                                          | EVAP system is judged to have no large leak.                 | None  |
| Mode D | Pressure change is small.                                                           | EVAP system is judged to have large leak [1.0 mm (0.04 in)]. | P0442 |
| Mode E | Return to atmosphere                                                                | CCV property                                                 | P1443 |

### • 0.02-inch Diagnosis

| Mode   | Behavior of tank internal pressure under normal conditions           | Diagnostic item                                                                                              | DTC   |
|--------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------|
| Mode Y | Return to atmosphere                                                 |                                                                                                              |       |
| Mode A | Pressure is in proportion to amount of evaporation gas occurrence.   |                                                                                                              |       |
| Mode B | Negative pressure is formed due to intake manifold negative pressure |                                                                                                              |       |
| Mode C | Target pressure is reached                                           |                                                                                                              |       |
| Mode D | Pressure change is small.                                            | P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in.)]. | P0456 |
| Mode E | Return to atmosphere                                                 | CCV property judgment                                                                                        | P1443 |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

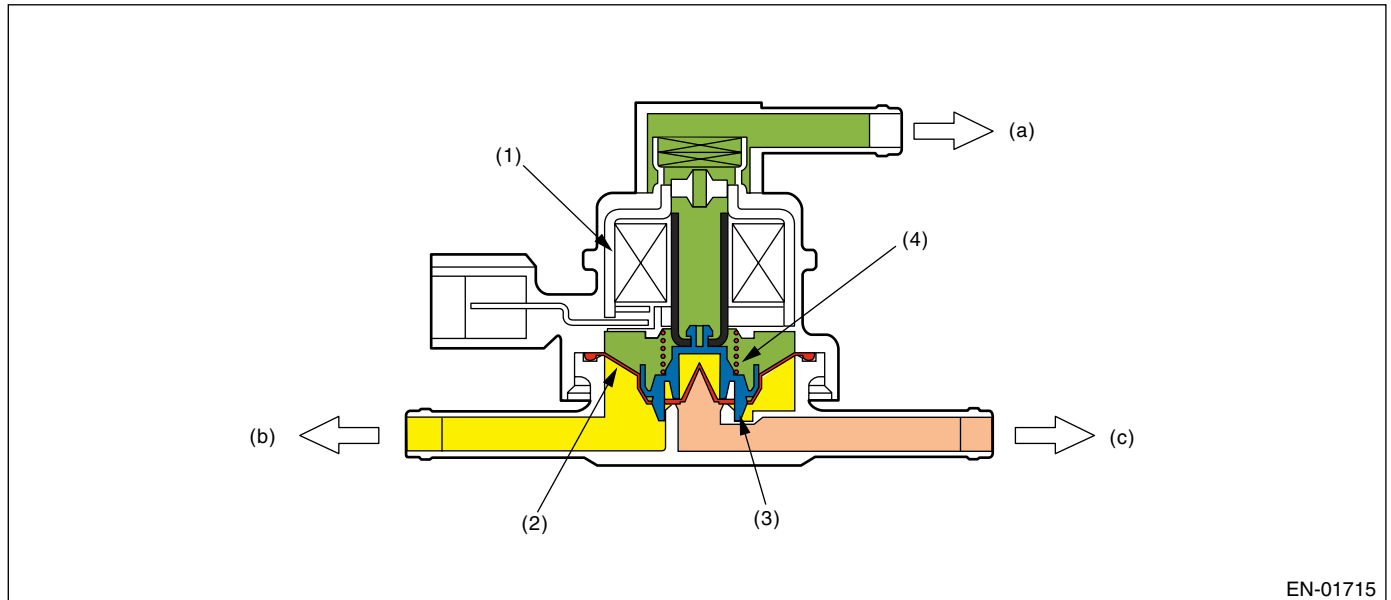
### 2. COMPONENT DESCRIPTION

#### • Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.

Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

Also the valve can be forcibly opened by setting the solenoid to ON.



EN-01715

- (1) Solenoid
- (2) Diaphragm

- (3) Valve
- (4) Spring

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

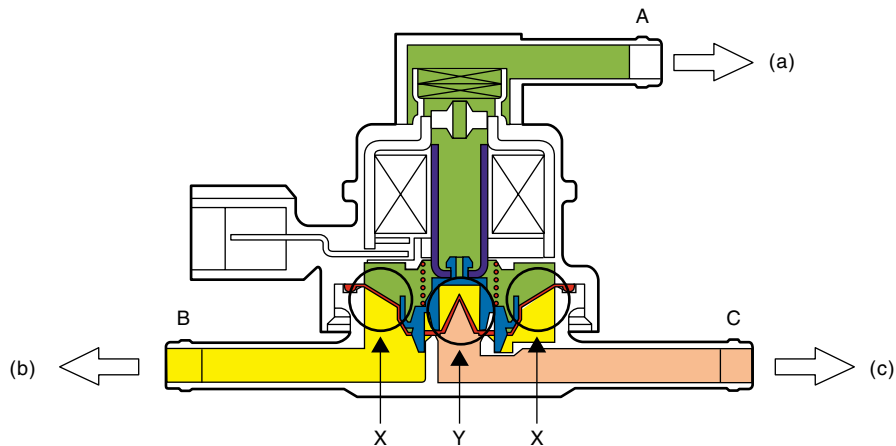
# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## • Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



EN-01716

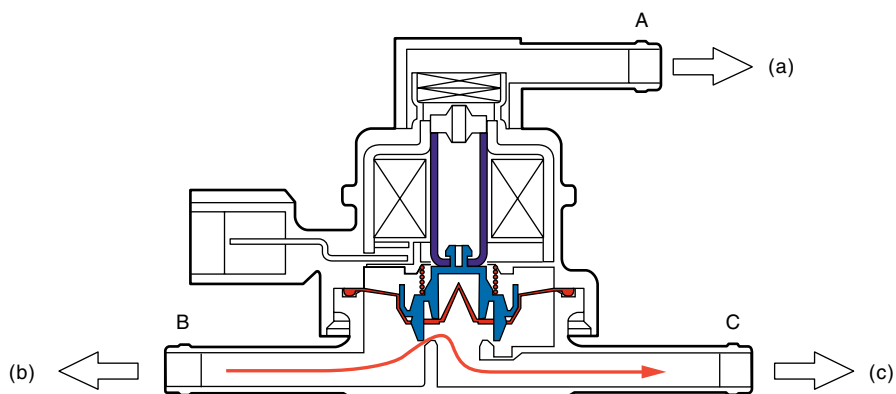
(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

| Condition of pressure  | Flow                  |
|------------------------|-----------------------|
| $A < B$ (solenoid OFF) | $B \rightarrow C$     |
| $B < C$ (solenoid OFF) | $C \rightarrow B$     |
| Solenoid ON            | $B \leftrightarrow C$ |

## • When $A < B$ (Solenoid OFF)



EN-01717

(a) Atmospheric pressure

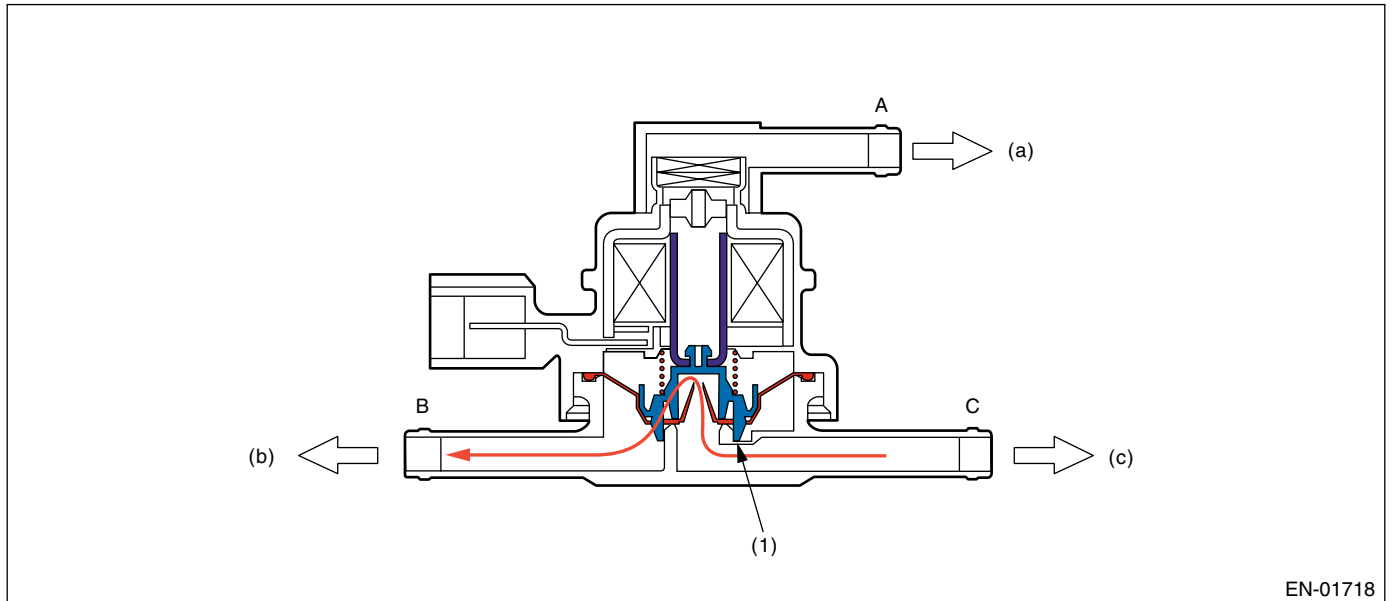
(b) Fuel tank

(c) Canister

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### • When $B < C$ (Solenoid OFF)



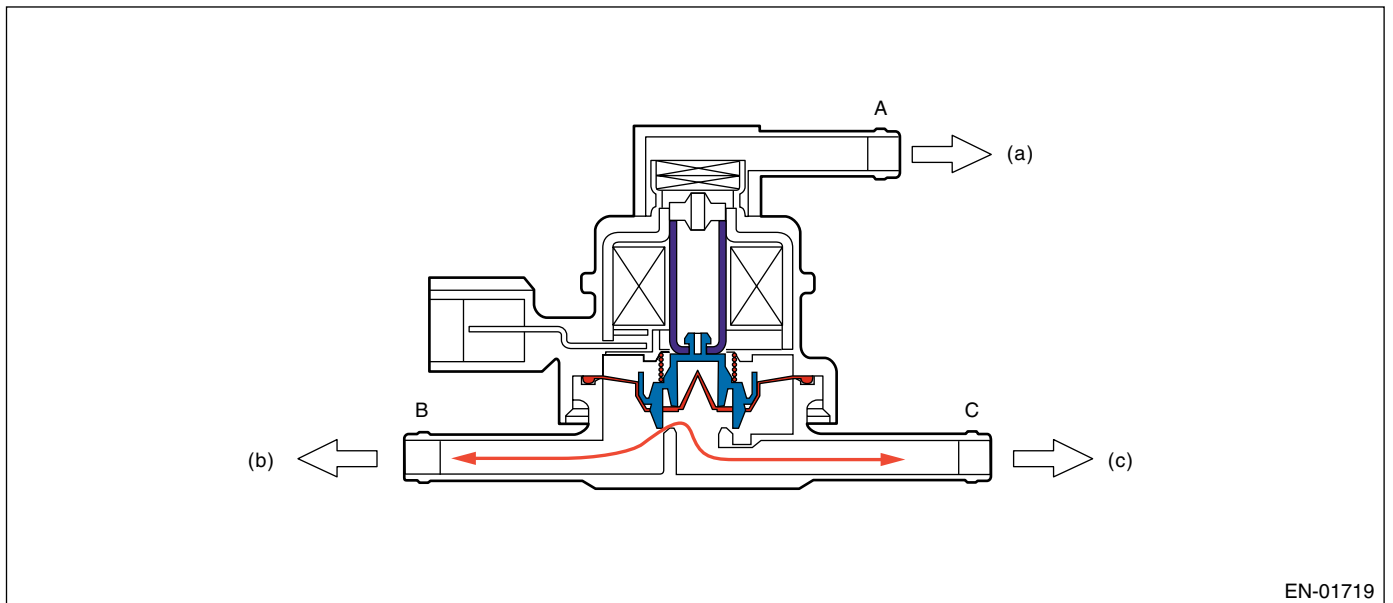
(1) Valve

(a) Atmospheric pressure

(c) Canister

(b) Fuel tank

### • When Solenoid is ON



(a) Atmospheric pressure

(b) Fuel tank

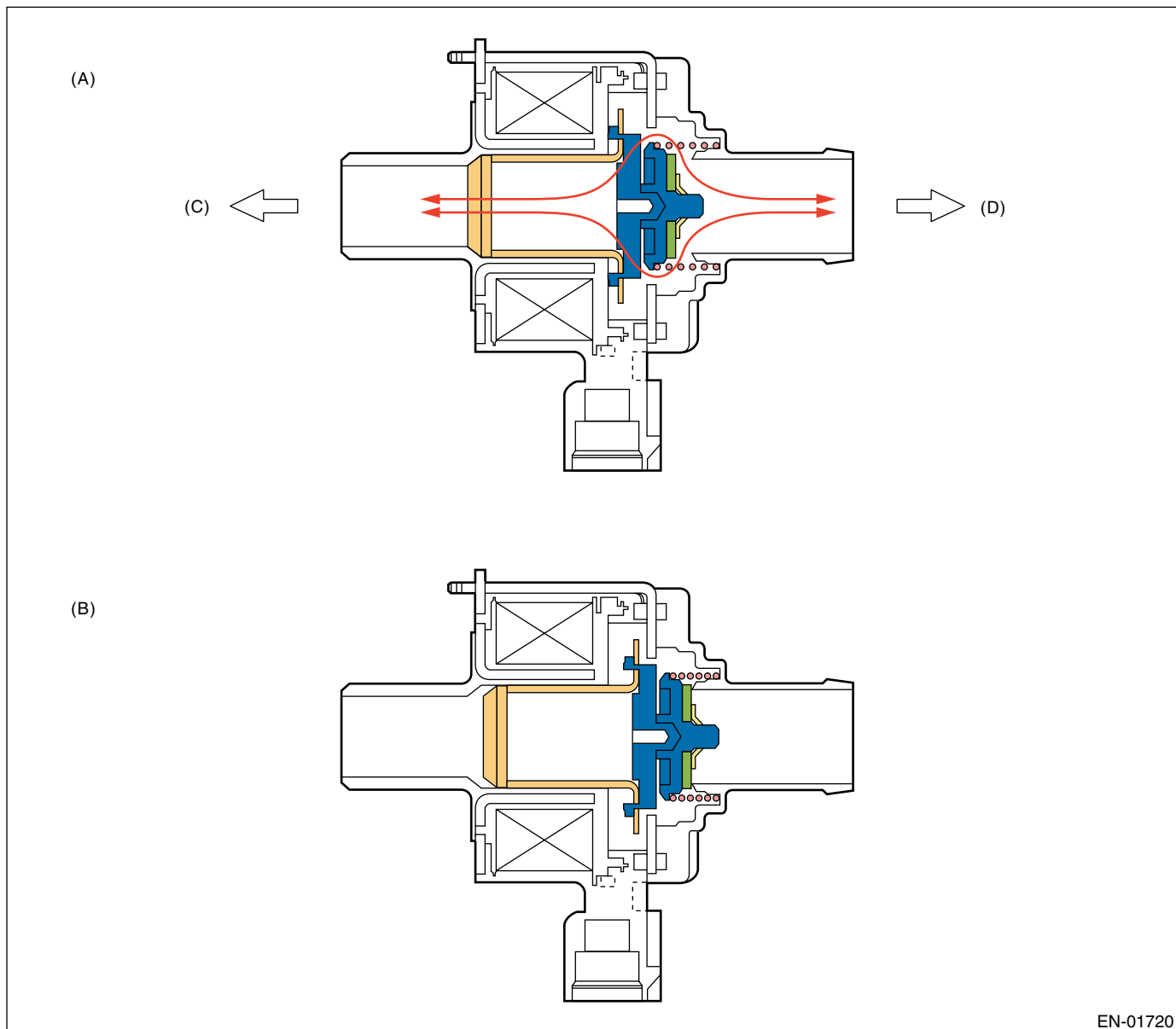
(c) Canister

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## • CCV

CCV controls the ambient air to be introduced to the canister.



EN-01720

(A) Open (Solenoid OFF)

(C) Filter

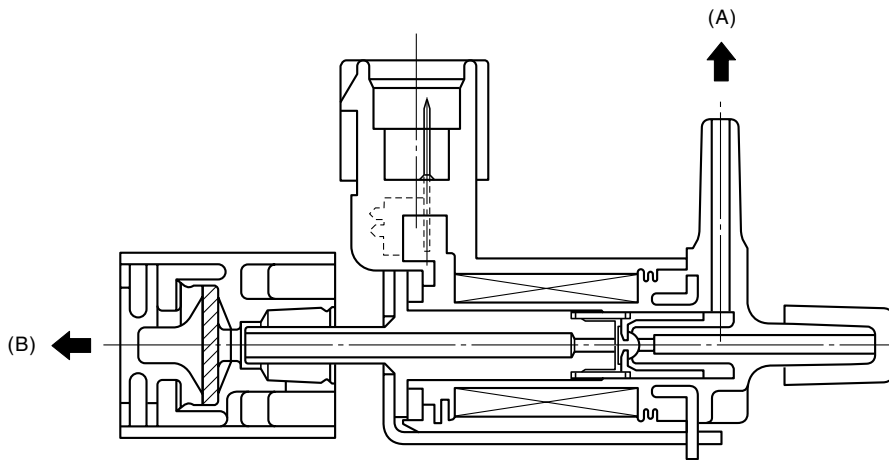
(B) Close (Solenoid ON)

(D) Canister

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### • Tank Pressure Switching Solenoid



EN-01721

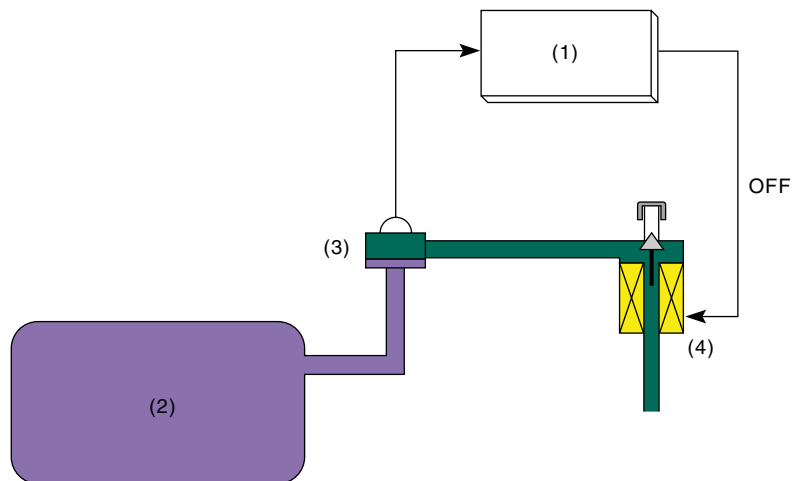
(A) Fuel tank pressure sensor

(B) Atmosphere

### • Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.

Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



EN-01722

(1) Engine control module (ECM)

(2) Fuel tank

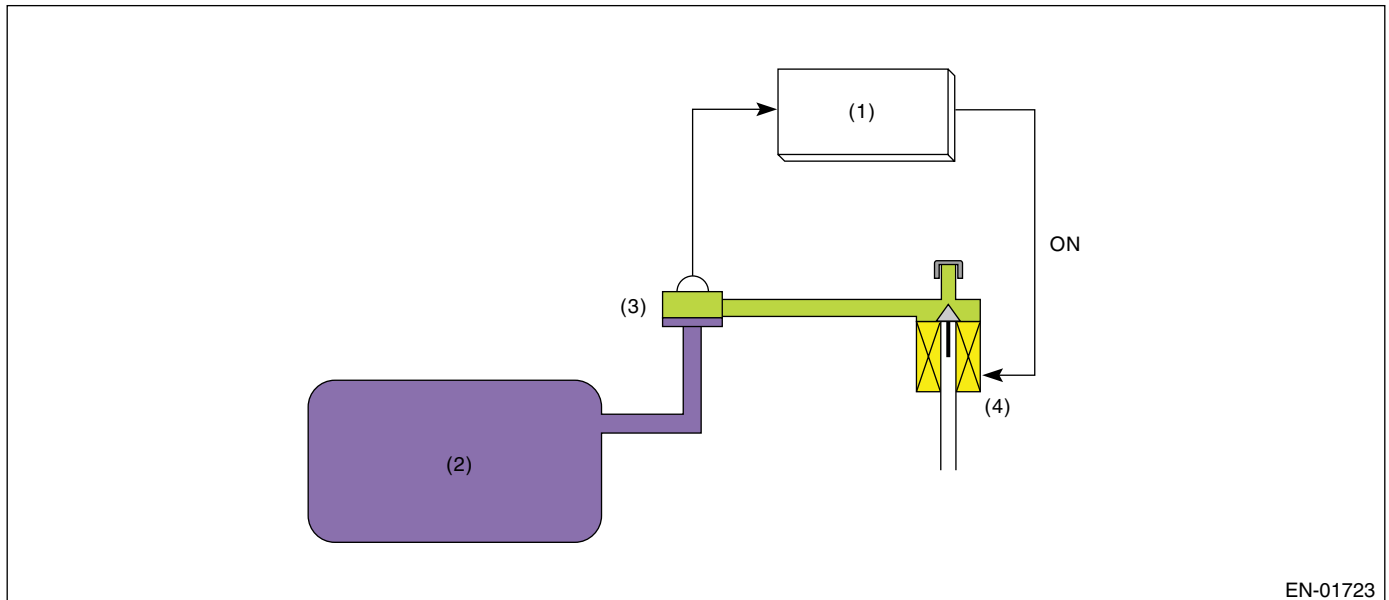
(3) Fuel tank pressure sensor

(4) Atmospheric pressure switching solenoid

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor

- (4) Atmospheric pressure switching solenoid

### NOTE:

ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.

In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

#### 0.04-inch Diagnosis

| Secondary Parameters                                              | Enable Conditions                                                                                                |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Battery voltage                                                   | $\geq 10.9$ V                                                                                                    |
| Barometric pressure                                               | $\geq 75.1$ kPa (563 mmHg, 22.2 inHg)                                                                            |
| Total time of canister purge operation                            | 120 seconds or more                                                                                              |
| After starting engine                                             | 856 seconds or more                                                                                              |
| Learning value of evaporation gas density                         | $\leq 0.04$                                                                                                      |
| Engine speed                                                      | 1050 $\longleftrightarrow$ 6500 rpm                                                                              |
| Fuel tank pressure                                                | $-1.3 \text{ — } 0.91$ kPa ( $-10 \text{ — } 6.8$ mmHg, $-0.39 \text{ — } 0.27$ inHg)                            |
| Intake manifold vacuum (relative pressure)                        | $< -13.3$ kPa ( $-100$ mmHg, $-3.92$ inHg)                                                                       |
| Vehicle speed                                                     | $\geq 32$ km/h (20 MPH)                                                                                          |
| Fuel level                                                        | $9.6 \longleftrightarrow 48$ ℓ (2.54 $\longleftrightarrow$ 12.7 US gal, 2.11 $\longleftrightarrow$ 10.6 Imp gal) |
| Closed air/fuel ratio control                                     | In operation                                                                                                     |
| Fuel temperature                                                  | $-10 \longleftrightarrow 45^\circ\text{C}$ (14 $\longleftrightarrow$ 113°F)                                      |
| Intake air temperature                                            | $\geq -10^\circ\text{C}$ (14°F)                                                                                  |
| Pressure change per second                                        | $< 0.13$ kPa (0.95 mmHg, 0.037 inHg)                                                                             |
| Min. pressure change per second – Max. pressure change per second | $< 0.23$ kPa (1.75 mmHg, 0.07 inHg)                                                                              |
| Fuel level change                                                 | $< 3.0$ ℓ (3.2 US gal, 2.6 Imp gal)/128 milliseconds                                                             |
| Air fuel ratio                                                    | $0.76 \text{ — } 1.25$                                                                                           |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 0.02-inch Diagnosis

| Secondary Parameters                                                                                                     | Enable Conditions                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| (At starting a diagnosis)                                                                                                |                                                                                                                                                      |
| Battery voltage                                                                                                          | $\geq 10.9 \text{ V}$                                                                                                                                |
| Atmospheric pressure                                                                                                     | $\geq 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)                                                                                                        |
| Since last incomplete diagnosis event of 0.02-inch leakage                                                               | $> 120 \text{ seconds}$                                                                                                                              |
| Total time of canister purge operation                                                                                   | 120 second or more                                                                                                                                   |
| After starting engine                                                                                                    | 335 second or more                                                                                                                                   |
| Fuel temperature                                                                                                         | $-10 \longleftrightarrow 35^{\circ}\text{C}$ (14 $\longleftrightarrow$ 95°F)                                                                         |
| Or engine coolant temperature at engine start                                                                            | $< 45^{\circ}\text{C}$ (113°F)                                                                                                                       |
| And time after engine start                                                                                              | $< 2400 \text{ seconds}$                                                                                                                             |
| Fuel level                                                                                                               | 9.6 $\longleftrightarrow$ 48 ℓ (2.54 $\longleftrightarrow$ 12.7 US gal, 2.11 $\longleftrightarrow$ 10.6 Imp gal)                                     |
| Ambient temperature                                                                                                      | $\geq -10^{\circ}\text{C}$ (14°F)                                                                                                                    |
| (Ambient – fuel) temperature                                                                                             | $< 1^{\circ}\text{C}$ (1.8°F)                                                                                                                        |
| Fuel tank pressure below $-3.01 \text{ kPa}$ ( $-22.8 \text{ mmHg}$ , $-0.88 \text{ inHg}$ ) (during same driving cycle) | Up to 2 times                                                                                                                                        |
| Intake manifold vacuum (relative pressure)                                                                               | $< -13.3 \text{ kPa}$ ( $-100 \text{ mmHg}$ , $-3.92 \text{ inHg}$ )                                                                                 |
| Fuel tank pressure                                                                                                       | $-0.7 \text{ — } 0.9 \text{ kPa}$ ( $-5 \text{ — } 7 \text{ mmHg}$ , $-0.20 \text{ — } 0.28 \text{ inHg}$ )                                          |
| Vehicle speed                                                                                                            | $\geq 68 \text{ km/h}$ (42 MPH)                                                                                                                      |
| Closed air/fuel ratio control                                                                                            | In operation                                                                                                                                         |
| Engine speed                                                                                                             | 1500 $\longleftrightarrow$ 3000 rpm                                                                                                                  |
| (During diagnosis)                                                                                                       |                                                                                                                                                      |
| P1                                                                                                                       | $-0.13 \longleftrightarrow 0.13 \text{ kPa}$<br>( $-1 \longleftrightarrow 1 \text{ mmHg}$ ,<br>$-0.04 \longleftrightarrow 0.04 \text{ inHg}$ )       |
| Pressure change per second                                                                                               | $< 0.13 \text{ kPa}$ (0.95 mmHg, 0.037 inHg)                                                                                                         |
| Fuel level change                                                                                                        | 2 $\longleftrightarrow$ 3 ℓ (2.1 $\longleftrightarrow$ 3.2 US gal, 1.8 $\longleftrightarrow$ 2.6 Imp gal)                                            |
| Tank pressure                                                                                                            | $< 1.03 \text{ kPa}$ (7.72 mmHg, 0.037 inHg)                                                                                                         |
| Min. tank pressure change per second –                                                                                   | $< 0.23 \text{ kPa}$ (1.75 mmHg, 0.07 inHg)                                                                                                          |
| Max. tank pressure change per second                                                                                     |                                                                                                                                                      |
| Change of atmospheric pressure during P1 calculation                                                                     | $-0.04 \longleftrightarrow 0.17 \text{ kPa}$<br>( $-0.3 \longleftrightarrow 1.3 \text{ mmHg}$ ,<br>$-0.01 \longleftrightarrow 0.05 \text{ inHg}$ )   |
| Change of atmospheric pressure during P2 calculation                                                                     | $-0.09 \longleftrightarrow 0.17 \text{ kPa}$<br>( $-0.7 \longleftrightarrow 1.3 \text{ mmHg}$ ,<br>$-0.028 \longleftrightarrow 0.051 \text{ inHg}$ ) |

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

---

#### 4. GENERAL DRIVING CYCLE

- **0.04-inch Diagnosis**

- Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

- **0.02-inch Diagnosis**

- Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
- If not judged OK or NG, repeat the diagnosis until judged OK or NG.
- Pay attention to the fuel temperature and fuel level.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • MODE Z (Purge control solenoid valve open malfunction diagnosis, CPC close malfunction diagnosis)

DTC P0457

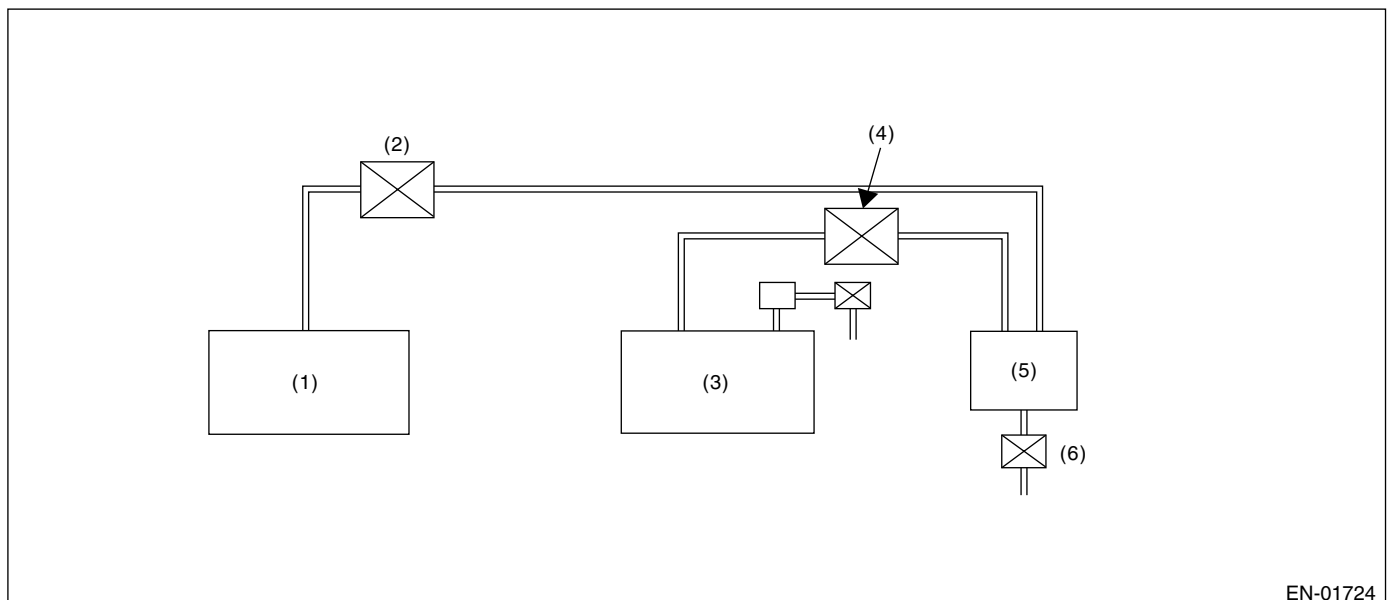
DTC P1443

### • Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CCV and CPC have to operate normally. Therefore, mode Z is used to diagnose the CCV close fixation and CPC open fixation.

If the CCV closed fixation trouble or CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.

If the CCV closed fixation trouble occurred, negative pressure is generated from the engine to pressure control solenoid valve when pressure control solenoid valve is closed and CPC is opened. When this status occurs the valve cannot be opened for the pressure control solenoid valve structure if the negative pressure is larger than electromagnetic force when pressure control solenoid valve solenoid is set to ON in order to open the valve.

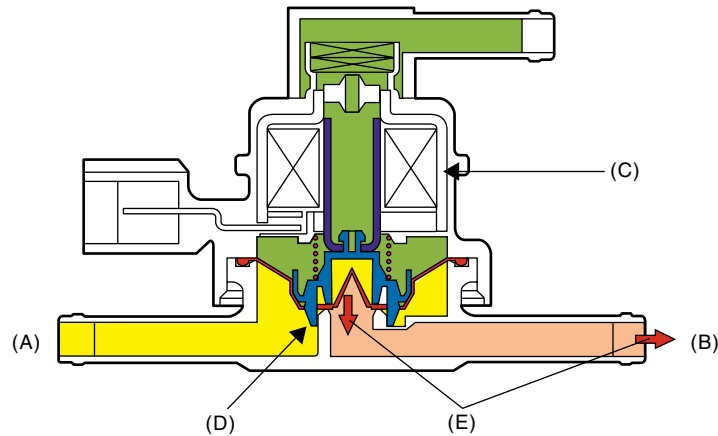


EN-01724

- |                                       |                                           |                     |
|---------------------------------------|-------------------------------------------|---------------------|
| (1) Engine                            | (4) Pressure control solenoid valve close | (6) CCV stuck close |
| (2) Purge control solenoid valve open |                                           |                     |
| (3) Fuel tank                         | (5) Canister                              |                     |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

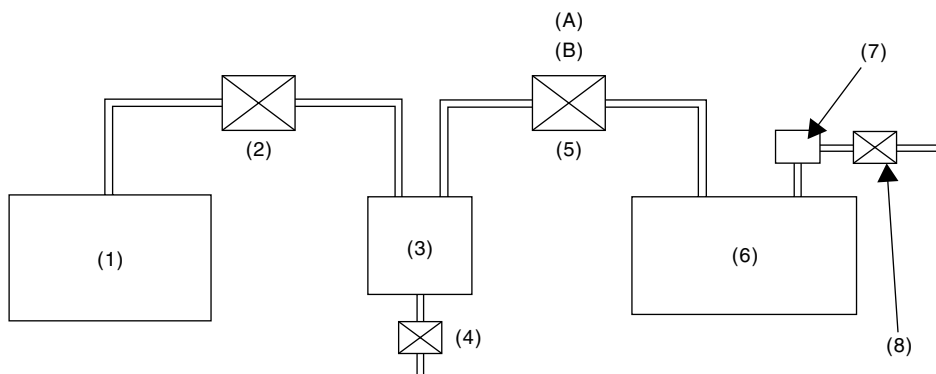


EN-01725

- |                                     |                           |                       |
|-------------------------------------|---------------------------|-----------------------|
| (A) To fuel tank                    | (C) Solenoid ON           | (E) Negative pressure |
| (B) To canister (Negative pressure) | (D) Valve cannot be open. |                       |

### • Diagnostic method

CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



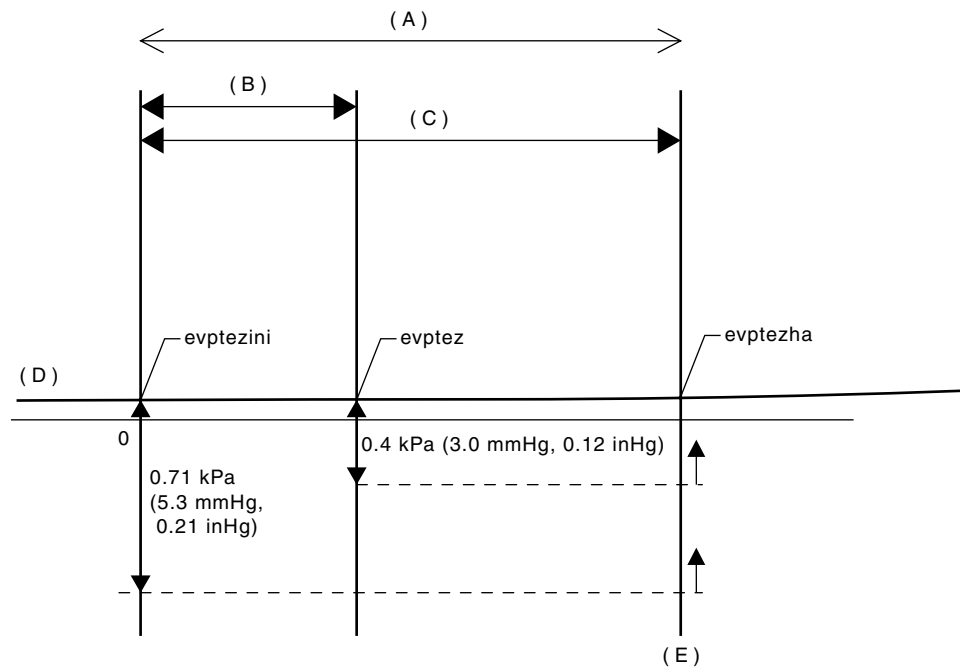
EN-01726

- |                                     |                                            |                                             |
|-------------------------------------|--------------------------------------------|---------------------------------------------|
| (1) Engine                          | (6) Fuel tank                              | (A) Normal condition: mechanical control    |
| (2) Purge control solenoid valve    | (7) Fuel tank pressure sensor              | (B) Under the diagnosis: electronic control |
| (3) Canister                        | (8) Tank pressure switching solenoid valve |                                             |
| (4) Drain valve                     |                                            |                                             |
| (5) Pressure control solenoid valve |                                            |                                             |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## • Normal Operation



EN-02206

(A) Mode Z

(C) 3 seconds

(E) OK judgement

(B) 1 second

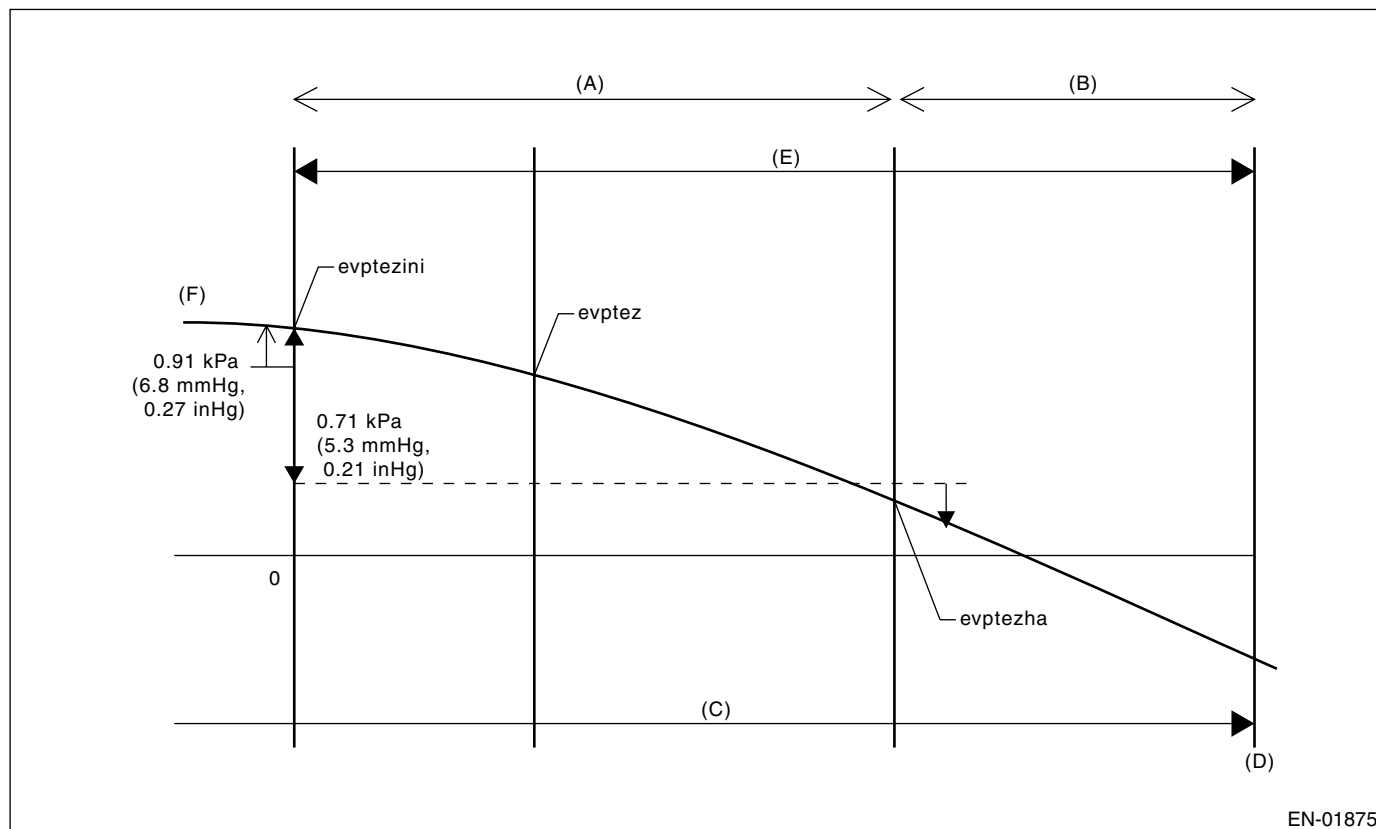
(D) Fuel tank pressure

- $evptez - evptezha \leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$
  - $evptezini - evptezha \leq 0.71 \text{ kPa (5.3 mmHg, 0.21 inHg)}$
- Judge normal when these calculations are completed.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### • Drain Valve close fixation



EN-01875

- |                                              |                        |
|----------------------------------------------|------------------------|
| (A) Mode Z                                   | (D) Judgement          |
| (B) Mode Z extended                          | (E) 16S                |
| (C) Fuel does not waver more than 3 seconds. | (F) Fuel tank pressure |

- $evptezini - evptezha > 0.71 \text{ kPa (5.3 mmHg, 0.21 inHg)}$
  - $evptezini > 0.91 \text{ kPa (6.8 mmHg, 0.27 inHg)}$
- Judge normal when these calculations are completed.

### • Diagnosing Function of CCV [P1443]

CCV functional diagnosis is performed by monitoring the tank pressure variation 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 in 3 seconds after Mode Z started) – (Tank pressure when Mode Z finished) | $\leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$ | P1443 |
| (Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)               | $\leq 0.7 \text{ kPa (5.3 mmHg, 0.21 inHg)}$ | P0457 |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

### • Judgment Value

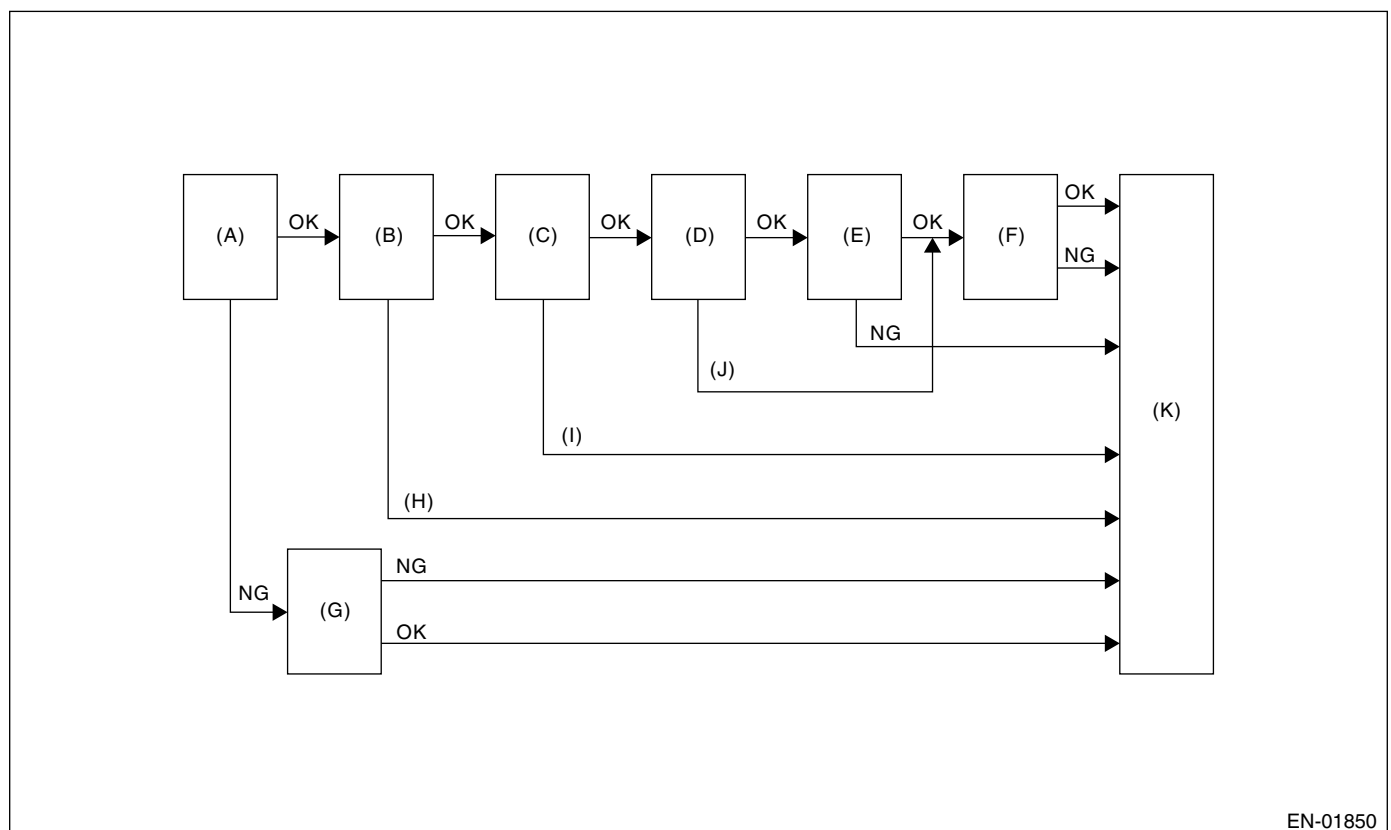
| Malfunction Criteria                                                       | Threshold Value                  | DTC   |
|----------------------------------------------------------------------------|----------------------------------|-------|
| Tank pressure when Mode Z started                                          | > 0.91 kPa (6.8 mmHg, 0.27 inHg) | P1443 |
| (Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished) | > 0.7 kPa (5.3 mmHg, 0.21 inHg)  |       |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

Finish the Evap. diagnosis when making NG judgment for drain valve close fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.



EN-01850

- |            |                   |                             |
|------------|-------------------|-----------------------------|
| (A) Mode Z | (E) Mode D        | (I) Large leakage diagnosis |
| (B) Mode A | (F) Mode E        | (J) Quick OK judgement      |
| (C) Mode B | (G) Mode Z Extend | (K) END                     |
| (D) Mode C | (H) Cancel        |                             |

### • Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.

## Normality Judgment

Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.

Both diagnostic method and judgment value are the same as PCV normality judgment.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

#### • Leak Diagnosis

DTC P0442

DTC P0456

DTC P0457

#### • Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

#### **Mode A: (Estimation of evaporation gas yield)**

The tank pressure variation amount in Mode A is calculated as P1. The tank pressure variation amount in Mode A is calculated as P1. After calculating P1, change to Mode B.

#### **Mode B: (Seal negative pressure)**

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg) (0.04-in diagnosis)

Approx. 0 → -3.05 kPa (0 → -22.9 mmHg, 0 → -0.9 inHg) (0.02-in diagnosis)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.

Judge NG when the malfunction criteria below is completed.

Finish the Evap. diagnosis when judging large leak (10 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (10 to 20 seconds) in 0.02-inch diagnosis.

#### **Abnormality Judgment**

Judge NG (large leak) when the criteria below are completed in the specified time.

#### • Judgment Value

| Malfunction Criteria                                                                                            | Threshold Value                                | DTC   |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------|-------|
| (0.04-inch diagnosis)<br>Time for Mode B<br>(Tank pressure during Mode B) – (Tank pressure when Mode B started) | 10 seconds<br>< -0.5 kPa (-4 mmHg, -0.16 inHg) | P0457 |

#### **Mode C: (Check increasing pressure)**

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 P2 calculation started | Time for immediate OK judgment |
|---------------------|-------------------------------------------|--------------------------------|
| 0.04-inch diagnosis | -1.3 kPa (-9.75 mmHg, -0.38 inHg)         | 15 seconds                     |
| 0.02-inch diagnosis | -3 kPa (-22.5 mmHg, -0.89 inHg)           | 20 seconds                     |

#### **Mode D: (Measurement of negative pressure changes)**

Monitor the pressure variation in the tank in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.

#### • After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## • 0.04-inch Diagnosis

### Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

### • Judgment Value

| Malfunction Criteria                                                                                                                | Threshold Value                                                                | DTC   |
|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------|
| P2 – 1.5 × P1<br>P2: Change of tank pressure within 16 seconds on Mode D<br>P1: Change of tank pressure within 16 seconds on Mode A | > Value on map 7.<br>*Threshold value: Figure (Fuel level vs Tank temperature) | P0442 |

\*1.5: Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

### • Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

| Fuel temperature & Fuel level    | 5°C (41°F)                             | 15°C (59°F)                            | 25°C (77°F)                            | 35°C (95°F)                            | 45°C (113°F)                           |
|----------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 0.31 kPa<br>(2.34 mmHg,<br>0.092 inHg) | 0.31 kPa<br>(2.34 mmHg,<br>0.092 inHg) | 0.33 kPa<br>(2.49 mmHg,<br>0.098 inHg) | 0.35 kPa<br>(2.64 mmHg,<br>0.104 inHg) | 0.37 kPa<br>(2.80 mmHg,<br>0.110 inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal)   | 0.35 kPa<br>(2.64 mmHg,<br>0.104 inHg) | 0.35 kPa<br>(2.65 mmHg,<br>0.104 inHg) | 0.38 kPa<br>(2.84 mmHg,<br>0.112 inHg) | 0.41 kPa<br>(3.08 mmHg,<br>0.121 inHg) | 0.44 kPa<br>(3.28 mmHg,<br>0.129 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 0.39 kPa<br>(2.94 mmHg,<br>0.116 inHg) | 0.39 kPa<br>(2.94 mmHg,<br>0.116 inHg) | 0.42 kPa<br>(3.18 mmHg,<br>0.125 inHg) | 0.47 kPa<br>(3.52 mmHg,<br>0.139 inHg) | 0.50 kPa<br>(3.76 mmHg,<br>0.148 inHg) |
| 40 L (10.6 US gal, 8.8 Imp gal)  | 0.45 kPa<br>(3.35 mmHg,<br>0.132 inHg) | 0.45 kPa<br>(3.35 mmHg,<br>0.132 inHg) | 0.47 kPa<br>(3.49 mmHg,<br>0.137 inHg) | 0.50 kPa<br>(3.74 mmHg,<br>0.147 inHg) | 0.52 kPa<br>(3.88 mmHg,<br>0.153 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.50 kPa<br>(3.76 mmHg,<br>0.148 inHg) | 0.50 kPa<br>(3.76 mmHg,<br>0.148 inHg) | 0.51 kPa<br>(3.80 mmHg,<br>0.150 inHg) | 0.53 kPa<br>(3.95 mmHg,<br>0.156 inHg) | 0.53 kPa<br>(3.99 mmHg,<br>0.157 inHg) |

## • 0.02-inch Diagnosis

### Abnormality Judgment

Judge NG when the criteria below are completed.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### • Judgment Value

| Malfunction Criteria                                                                                                                       | Threshold Value                                                                | DTC   |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------|
| P2 – $1.5 \times P1$<br>P2: Change of tank pressure within 22 seconds on Mode D<br>P1: Change of tank pressure within 22 seconds on Mode A | > Value on map 8.<br>*Threshold value: Figure (Fuel level vs Tank temperature) | P0456 |

### • Map 8 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

| Fuel temperature & Fuel level    | 15°C (59°F)                            | 25°C (77°F)                            | 35°C (95°F)                            | 40°C (104°F)                           |
|----------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 0.34 kPa<br>(2.57 mmHg,<br>0.101 inHg) | 0.37 kPa<br>(2.80 mmHg,<br>0.110 inHg) | 0.44 kPa<br>(3.30 mmHg,<br>0.130 inHg) | 0.73 kPa<br>(5.49 mmHg,<br>0.216 inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal)   | 0.38 kPa<br>(2.83 mmHg,<br>0.111 inHg) | 0.42 kPa<br>(3.12 mmHg,<br>0.123 inHg) | 0.49 kPa<br>(3.70 mmHg,<br>0.146 inHg) | 0.79 kPa<br>(5.92 mmHg,<br>0.233 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 0.41 kPa<br>(3.09 mmHg,<br>0.122 inHg) | 0.46 kPa<br>(3.43 mmHg,<br>0.135 inHg) | 0.55 kPa<br>(4.10 mmHg,<br>0.161 inHg) | 0.85 kPa<br>(6.34 mmHg,<br>0.250 inHg) |
| 40 L (10.6 US gal, 8.8 Imp gal)  | 0.46 kPa<br>(3.46 mmHg,<br>0.136 inHg) | 0.49 kPa<br>(3.66 mmHg,<br>0.144 inHg) | 0.56 kPa<br>(4.18 mmHg,<br>0.165 inHg) | 0.89 kPa<br>(6.70 mmHg,<br>0.264 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.51 kPa<br>(3.83 mmHg,<br>0.151 inHg) | 0.52 kPa<br>(3.89 mmHg,<br>0.153 inHg) | 0.57 kPa<br>(4.25 mmHg,<br>0.167 inHg) | 0.93 kPa<br>(7.00 mmHg,<br>0.276 inHg) |

### Normality Judgment

Judge OK when the criteria below are completed.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

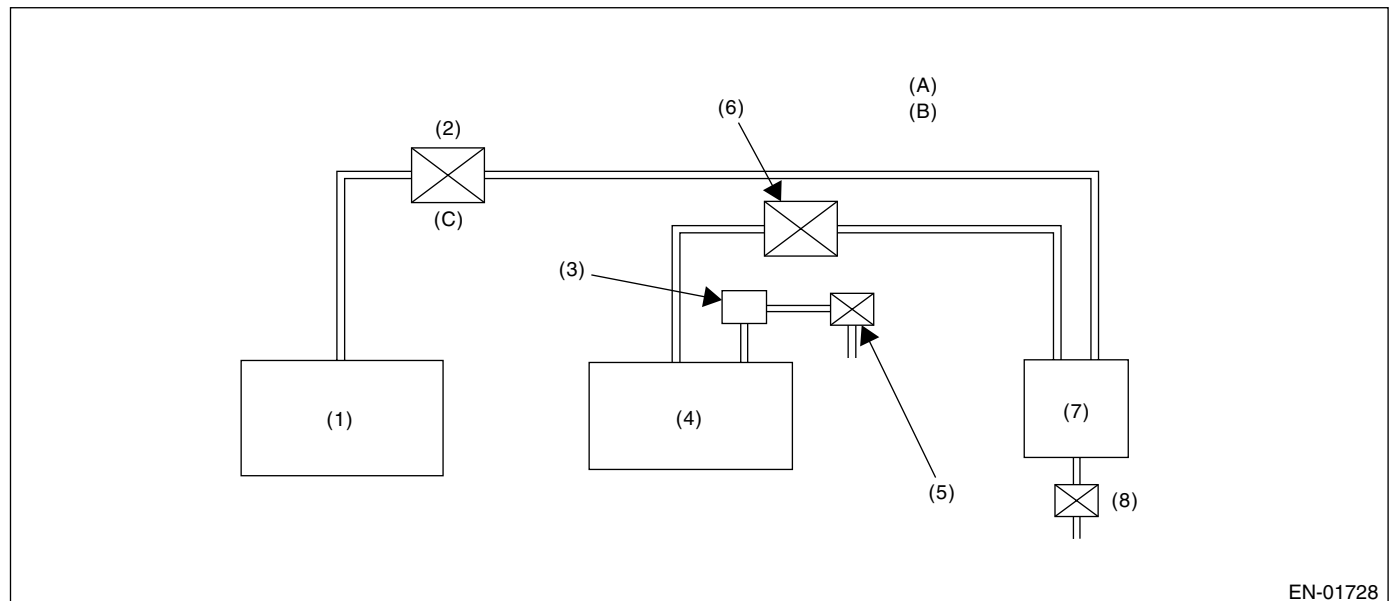
## • Judgment Value

| Malfunction Criteria | Threshold Value   | DTC   |
|----------------------|-------------------|-------|
| P2 – 1.5 × P1        | > Valve on map 9. | P0456 |

## • Map 9.

| Fuel temperature & Fuel level    | 15°C (59°F)                            | 25°C (77°F)                            | 35°C (95°F)                            | 40°C (104°F)                           |
|----------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 0.21 kPa<br>(1.59 mmHg,<br>0.063 inHg) | 0.21 kPa<br>(1.59 mmHg,<br>0.063 inHg) | 0.26 kPa<br>(1.97 mmHg,<br>0.078 inHg) | 0.31 kPa<br>(2.36 mmHg,<br>0.093 inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal)   | 0.28 kPa<br>(2.09 mmHg,<br>0.082 inHg) | 0.28 kPa<br>(2.09 mmHg,<br>0.082 inHg) | 0.33 kPa<br>(2.45 mmHg,<br>0.096 inHg) | 0.37 kPa<br>(2.81 mmHg,<br>0.111 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 0.35 kPa<br>(2.59 mmHg,<br>0.102 inHg) | 0.35 kPa<br>(2.59 mmHg,<br>0.102 inHg) | 0.39 kPa<br>(2.92 mmHg,<br>0.115 inHg) | 0.43 kPa<br>(3.26 mmHg,<br>0.128 inHg) |
| 40 L (10.6 US gal, 8.8 Imp gal)  | 0.30 kPa<br>(2.26 mmHg,<br>0.089 inHg) | 0.30 kPa<br>(2.26 mmHg,<br>0.089 inHg) | 0.35 kPa<br>(2.64 mmHg,<br>0.104 inHg) | 0.40 kPa<br>(3.02 mmHg,<br>0.119 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.26 kPa<br>(1.93 mmHg,<br>0.076 inHg) | 0.26 kPa<br>(1.93 mmHg,<br>0.076 inHg) | 0.31 kPa<br>(2.36 mmHg,<br>0.093 inHg) | 0.37 kPa<br>(2.78 mmHg,<br>0.109 inHg) |

If not judged OK or NG, repeat the diagnosis until judged OK or NG.



EN-01728

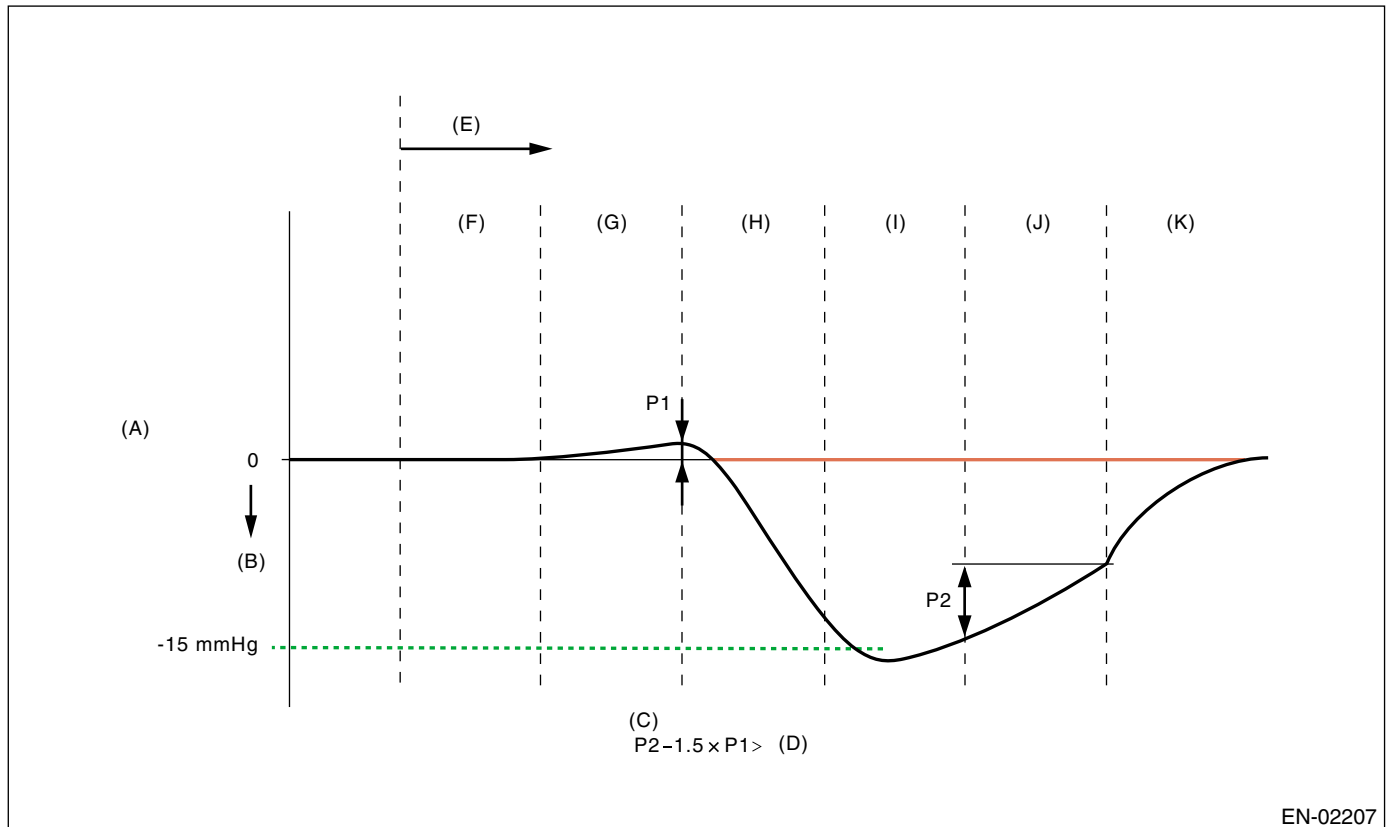
- (1) Engine
- (2) Purge control solenoid valve
- (3) Fuel tank pressure sensor
- (4) Fuel tank
- (5) Atmospheric pressure switching solenoid

- (6) Pressure control solenoid valve
- (7) Canister
- (8) Drain valve

- (A) Normal condition: mechanical control
- (B) Under the diagnosis electronic control
- (C) Duty control

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION



- |                        |                     |            |
|------------------------|---------------------|------------|
| (A) Fuel tank pressure | (E) Diagnosis start | (I) Mode C |
| (B) Negative pressure  | (F) Mode Z          | (J) Mode D |
| (C) Small leakage      | (G) Mode A          | (K) Mode E |
| (D) Threshold value    | (H) Mode B          |            |

### • CCV Property Diagnosis [P1443]

#### Mode E:

The tank pressure must become again as high as the atmospheric air pressure, after the evaporation diagnosis (normal judgment on Mode C or after Mode D). If the tank pressure does not become as high as the atmospheric air pressure, judge that CCV is blocked.

Judge NG when the criteria below are completed.

| Malfunction Criteria                                                                 | Threshold Value                   | DTC   |
|--------------------------------------------------------------------------------------|-----------------------------------|-------|
| Fuel tank pressure difference from the end of EVAP sys. diagnosis to 4 seconds later | < 0.36 kPa (2.72 mmHg, 0.11 inHg) | P1443 |

#### • Time Needed for Diagnosis:

- |            |                  |
|------------|------------------|
| 0.04-inch: | 30 — 100 seconds |
| 0.02-inch: | 30 — 100 seconds |

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

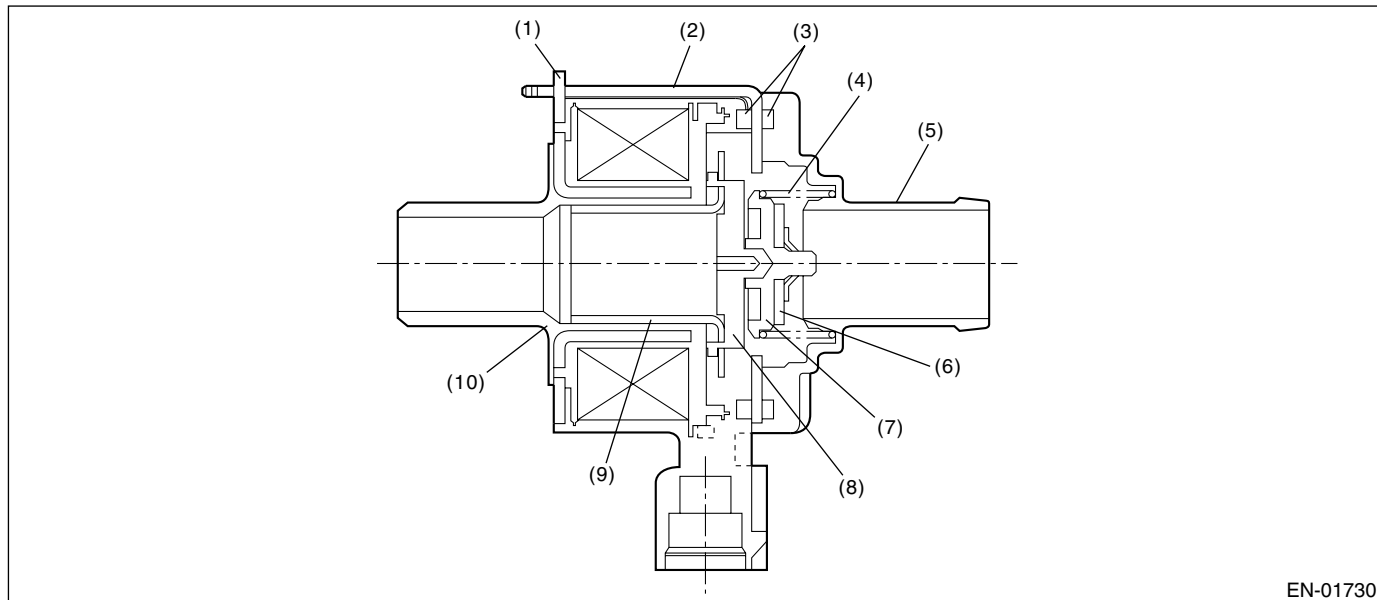
## BB:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



(1) Magnetic plate

(2) Yoke

(3) Packing

(4) Spring

(5) Valve seat

(6) Valve

(7) Plate

(8) Retainer

(9) Movable core

(10) Bobbin

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

### • Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---------------------------------------------------|------------------|
| Ignition switch                                   | ON               |
| Battery voltage                                   | $\geq 10.9$ V    |
| After starting engine                             | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | Low              |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---------------------------------------------------|------------------|
| Ignition switch                                   | ON               |
| Battery voltage                                   | $\geq 10.9$ V    |
| After starting engine                             | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | High             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

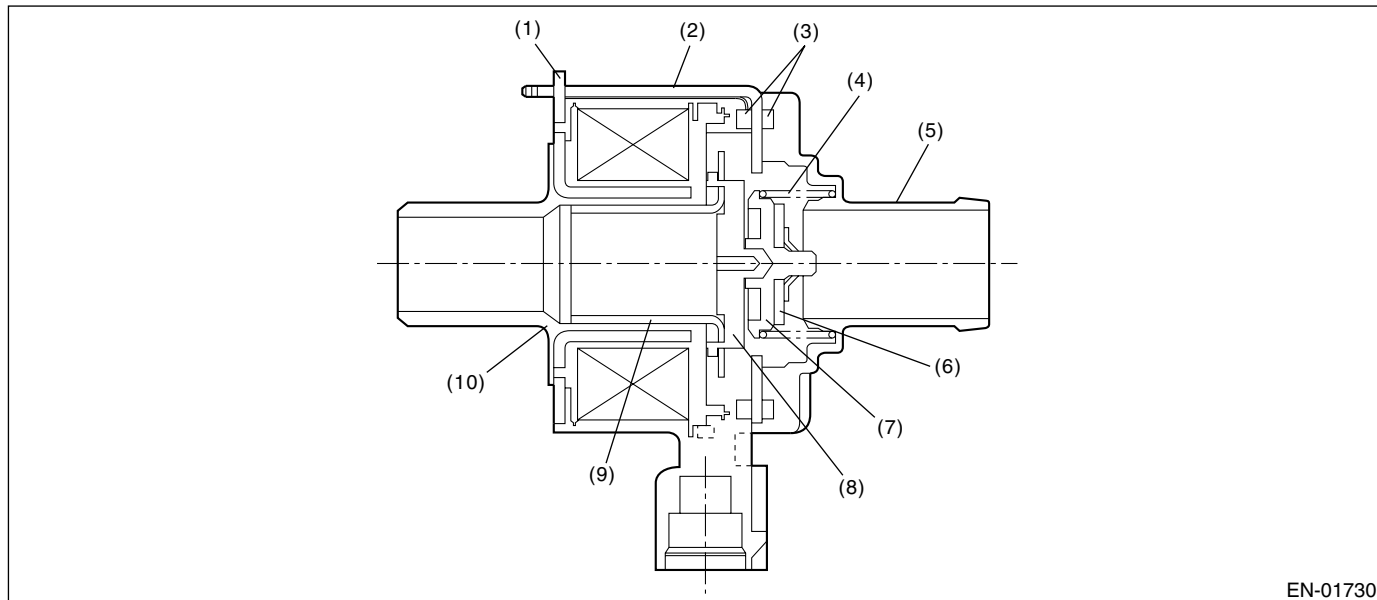
## BC:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



(1) Magnetic plate

(2) Yoke

(3) Packing

(4) Spring

(5) Valve seat

(6) Valve

(7) Plate

(8) Retainer

(9) Movable core

(10) Bobbin

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### • Judgment Value

| Malfunction Criteria                             | Threshold Value  |
|--------------------------------------------------|------------------|
| Ignition switch                                  | ON               |
| Battery voltage                                  | $\geq 10.9$ V    |
| After starting engine                            | 1 second or more |
| Terminal output voltage when ECM sends ON signal | High             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### • Judgment Value

| Malfunction Criteria                             | Threshold Value  |
|--------------------------------------------------|------------------|
| Ignition switch                                  | ON               |
| Battery voltage                                  | $\geq 10.9$ V    |
| After starting engine                            | 1 second or more |
| Terminal output voltage when ECM sends ON signal | Low              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

PCV control: Open the PCV solenoid.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

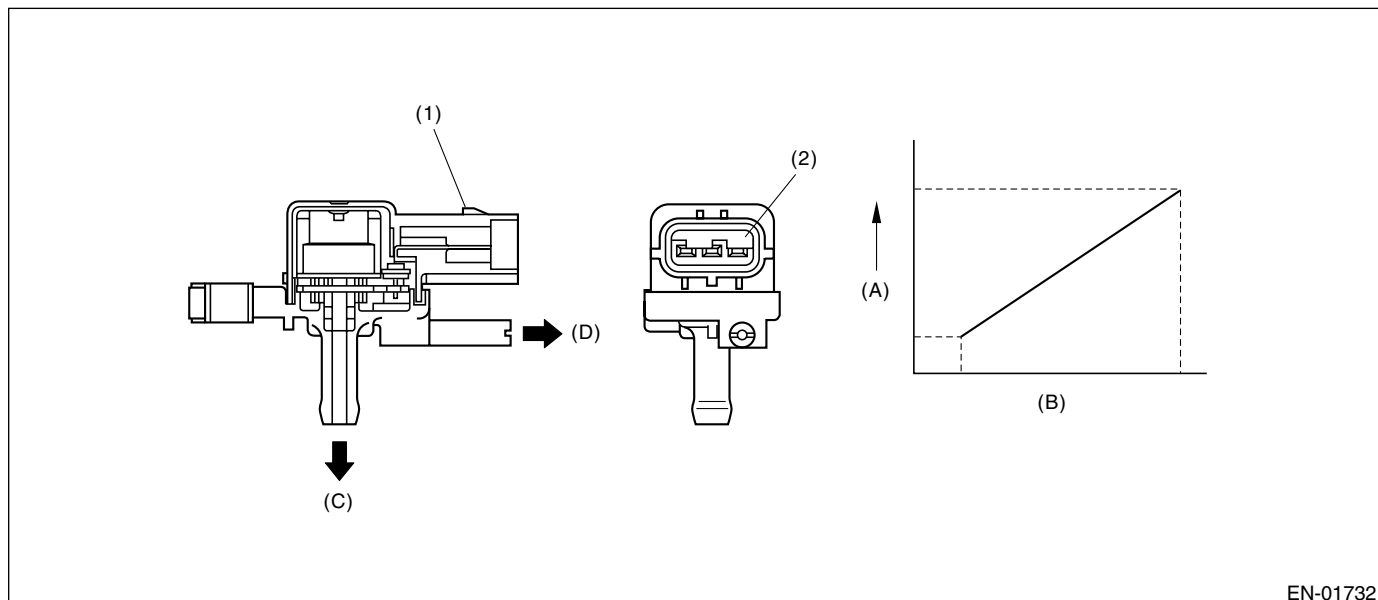
### BD:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

#### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

#### 2. COMPONENT DESCRIPTION



EN-01732

(1) Connector

(2) Terminal

(A) Output voltage

(B) Input voltage

(C) To fuel tank

(D) To atmospheric pressure switching solenoid

#### 3. ENABLE CONDITION

| Secondary Parameters                | Enable Conditions                               |
|-------------------------------------|-------------------------------------------------|
| After starting engine               | 60 second or more                               |
| Fuel level                          | $\geq 18 \text{ l}$ (4.76 US gal, 3.96 Imp gal) |
| Fuel temperature                    | $< 35^{\circ}\text{C}$ ( $95^{\circ}\text{F}$ ) |
| Battery voltage                     | $\geq 10.9 \text{ V}$                           |
| Atmospheric pressure                | $> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)      |
| Engine speed                        | $< 6500 \text{ rpm}$                            |
| Purge control solenoid valve ON/OFF | Experienced                                     |

#### 4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

#### • Judgment Value

| Malfunction Criteria                                                                                                                                                                   | Threshold Value                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Number of times when the difference between the Max. fuel level and the Min., fuel level every 60 seconds is 5 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed) | ≥ 16 times                         |
| Max. – Min. tank pressure (with enable condition completed)                                                                                                                            | < 0.05 kPa (0.375 mmHg, 0.02 inHg) |
| Max. – Min. fuel temperature (with enable condition completed)                                                                                                                         | ≥ 7°C (44.6 °F)                    |

If the fuel level (Max. – Min.) in every 60 seconds is less than 5 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 5 ℓ .

**Time Needed for Diagnosis:** 1 minute × 16 times or more

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### • Judgment Value

| Malfunction Criteria      | Threshold Value                    |
|---------------------------|------------------------------------|
| Max. – Min. tank pressure | ≥ 0.05 kPa (0.375 mmHg, 0.02 inHg) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

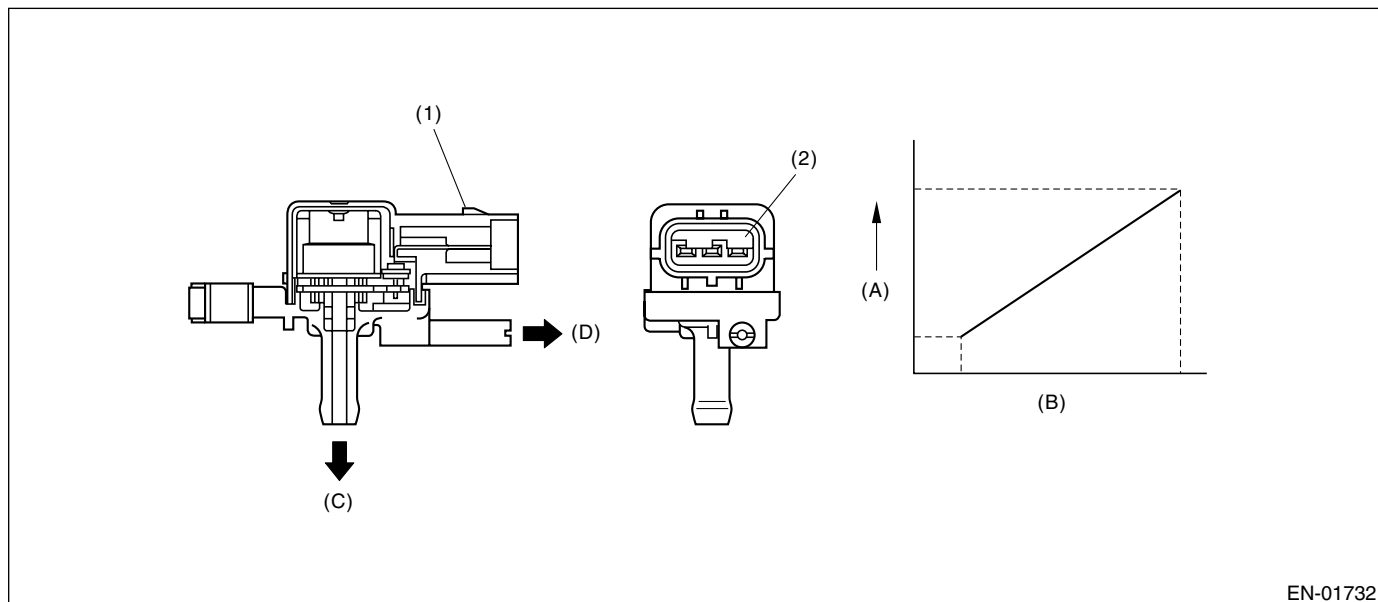
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01732

(1) Connector

(2) Terminal

(A) Output voltage

(B) Input voltage

(C) To fuel tank

(D) To atmospheric pressure switching solenoid

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

#### • Judgment Value

| Malfunction Criteria | Threshold Value                    |
|----------------------|------------------------------------|
| Fuel tank pressure   | < -7.33 kPa (-55 mmHg, -2.17 inHg) |

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### • Judgment Value

| Malfunction Criteria        | Threshold Value                    |
|-----------------------------|------------------------------------|
| Fuel tank pressure          | ≥ -7.33 kPa (-55 mmHg, -2.17 inHg) |
| Feedback lambda coefficient | ≥ 0.9                              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

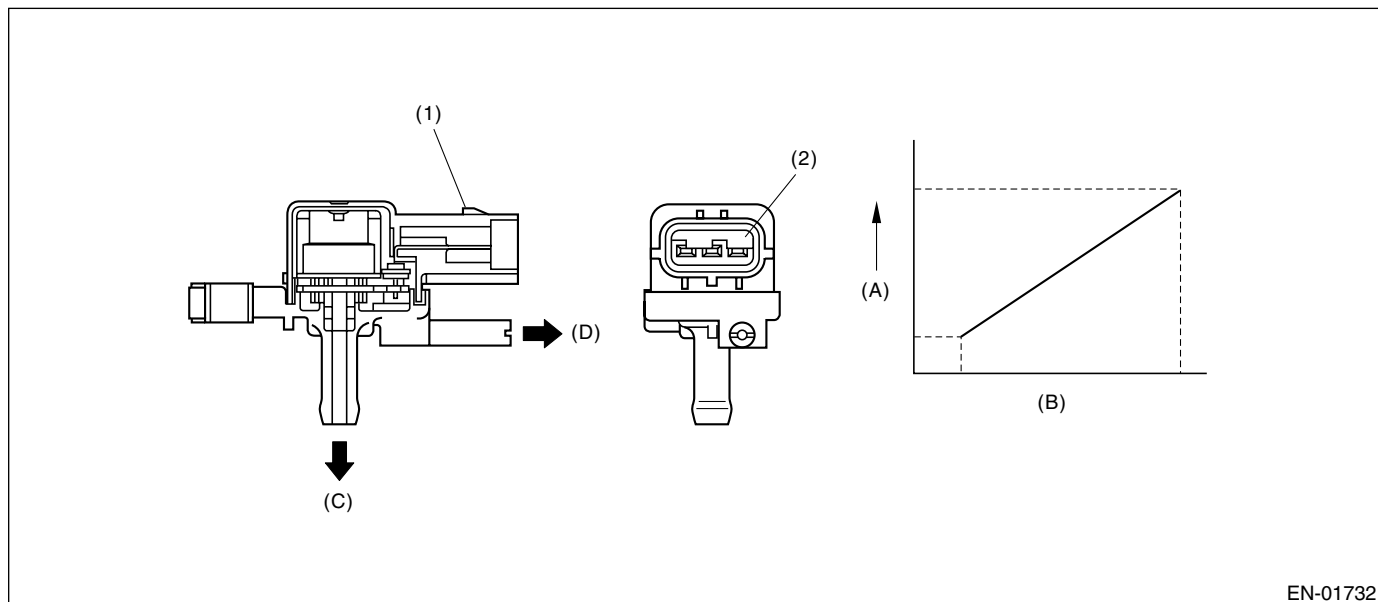
### BF:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.

Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01732

(1) Connector

(2) Terminal

(A) Output voltage

(B) Input voltage

(C) To fuel tank

(D) To atmospheric pressure switching solenoid

#### 3. ENABLE CONDITION

| Secondary Parameters                               | Enable Conditions        |
|----------------------------------------------------|--------------------------|
| Continuous time when all conditions are completed. | $\geq 5$ seconds         |
| Vehicle speed                                      | $\geq 2$ km/h (1.24 MPH) |
| All conditions of EVAP canister purge              | Complete                 |
| Evaporation gas density learning value             | $\leq 0.08$              |
| Main feedback compensation coefficient             | $\geq 0.9$               |
| Battery voltage                                    | $\geq 10.9$ V            |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

### • Judgment Value

| Malfunction Criteria | Threshold Value                       |
|----------------------|---------------------------------------|
| Fuel tank pressure   | $\geq 7.33$ kPa (55 mmHg, 2.17 inHg)  |
| Fuel temperature     | $< 35^{\circ}\text{C}$ (95°F)         |
| Atmospheric pressure | $\geq 75.1$ kPa (563 mmHg, 22.2 inHg) |

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

### • Judgment Value

| Malfunction Criteria | Threshold Value                   |
|----------------------|-----------------------------------|
| Fuel tank pressure   | $< 7.33$ kPa (55 mmHg, 2.17 inHg) |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

---

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

##### **1. OUTLINE OF DIAGNOSIS**

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-128, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

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

##### **1. OUTLINE OF DIAGNOSIS**

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-128, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

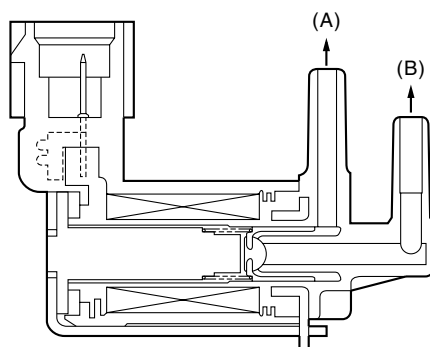
## BI: DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After starting engine | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                          | Threshold Value    |
|-----------------------------------------------|--------------------|
| Continuous time of completing criteria below. | $\geq 2.5$ seconds |
| Duty ratio of 'ON'                            | $< 75\%$           |
| Terminal output voltage                       | Low                |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

### • Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | High            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

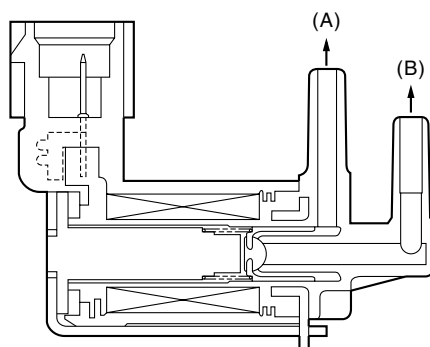
### BJ:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After starting engine | 1 second or more      |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                          | Threshold Value    |
|-----------------------------------------------|--------------------|
| Continuous time of completing criteria below. | $\geq 2.5$ seconds |
| Duty ratio of 'ON'                            | $\geq 25\%$        |
| Terminal output voltage                       | High               |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

### • Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | Low             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

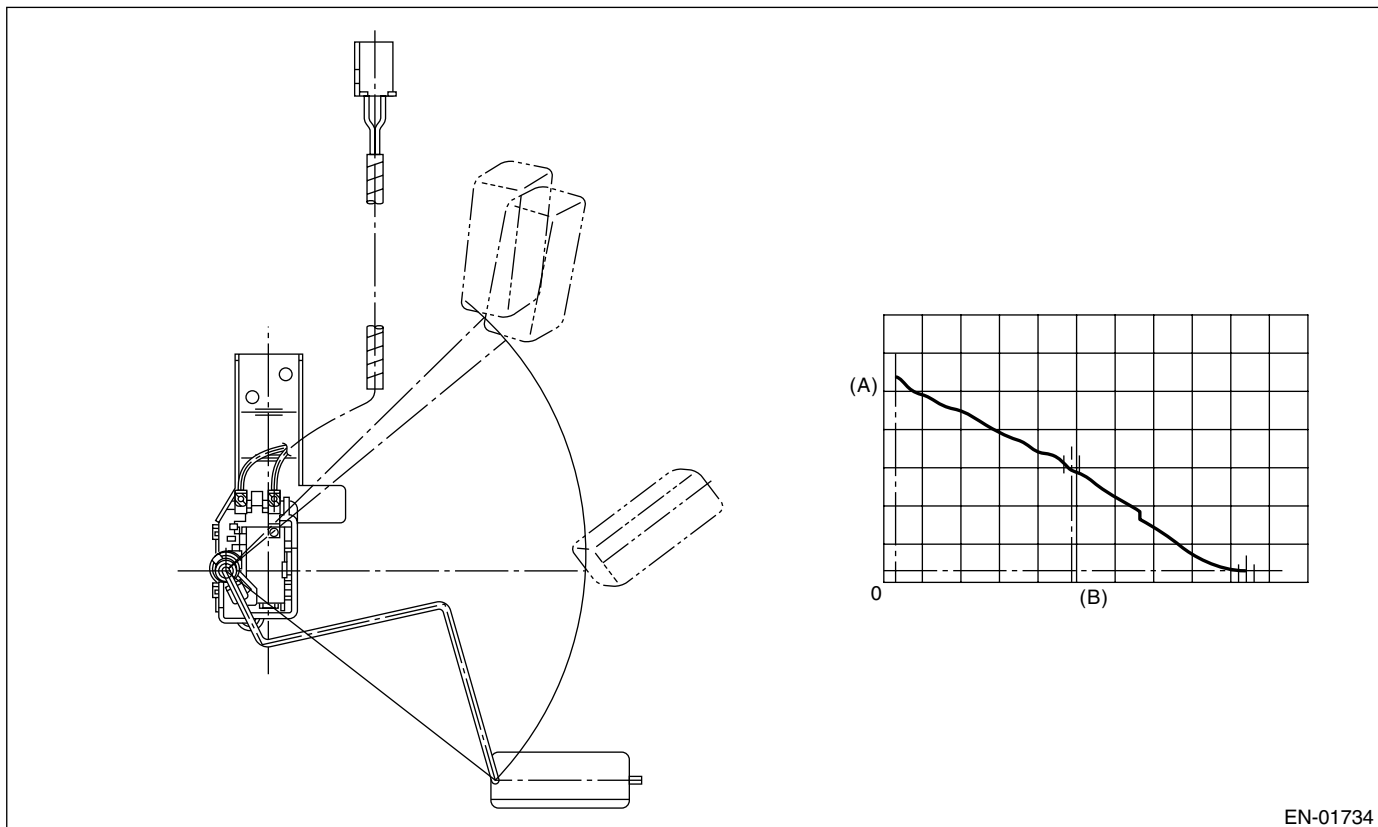
### BK:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.

Judge NG when the fuel level does not vary whereas it seemed to vary in a usual driving speed.

#### 2. COMPONENT DESCRIPTION



EN-01734

(A) Fuel level (L)

(B) Resistance ( $\Omega$ )

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria             | Threshold Value                        |
|----------------------------------|----------------------------------------|
| Accumulated amount of intake air | > 331 kg (729.7 lb)                    |
| Max.– Min. fuel level output     | < 2.6 ℓ (0.69 US gal,<br>0.57 Imp gal) |
| Battery voltage                  | ≥ 10.9 V                               |
| After starting engine            | More than 10 seconds                   |

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria             | Threshold Value                        |
|----------------------------------|----------------------------------------|
| Accumulated amount of intake air | > 331 kg (729.7 lb)                    |
| Max.– Min. fuel level output     | ≥ 2.6 ℓ (0.69 US gal,<br>0.57 Imp gal) |
| Battery voltage                  | ≥ 10.9 V                               |
| After starting engine            | More than 10 seconds                   |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

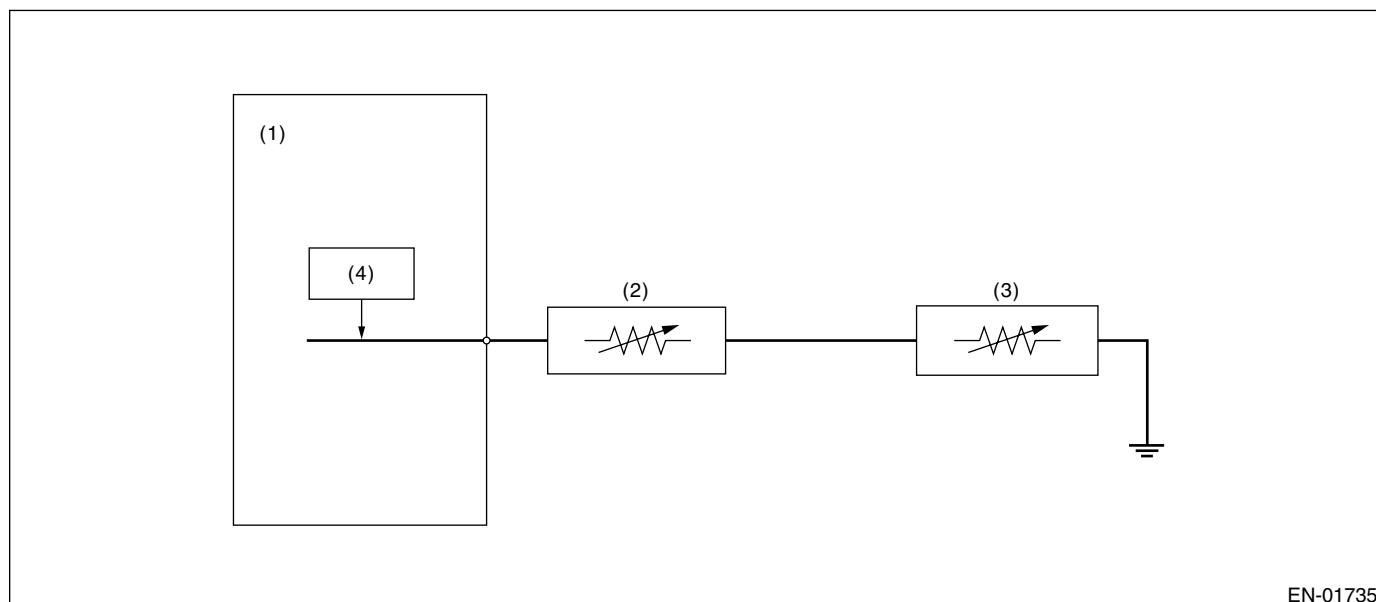
## GENERAL DESCRIPTION

### BL:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

### • Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After starting engine | 3 seconds or more |
| Output voltage        | $< 0.02$ V        |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After starting engine | 3 seconds or more |
| Output voltage        | $\geq 0.02$ V     |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

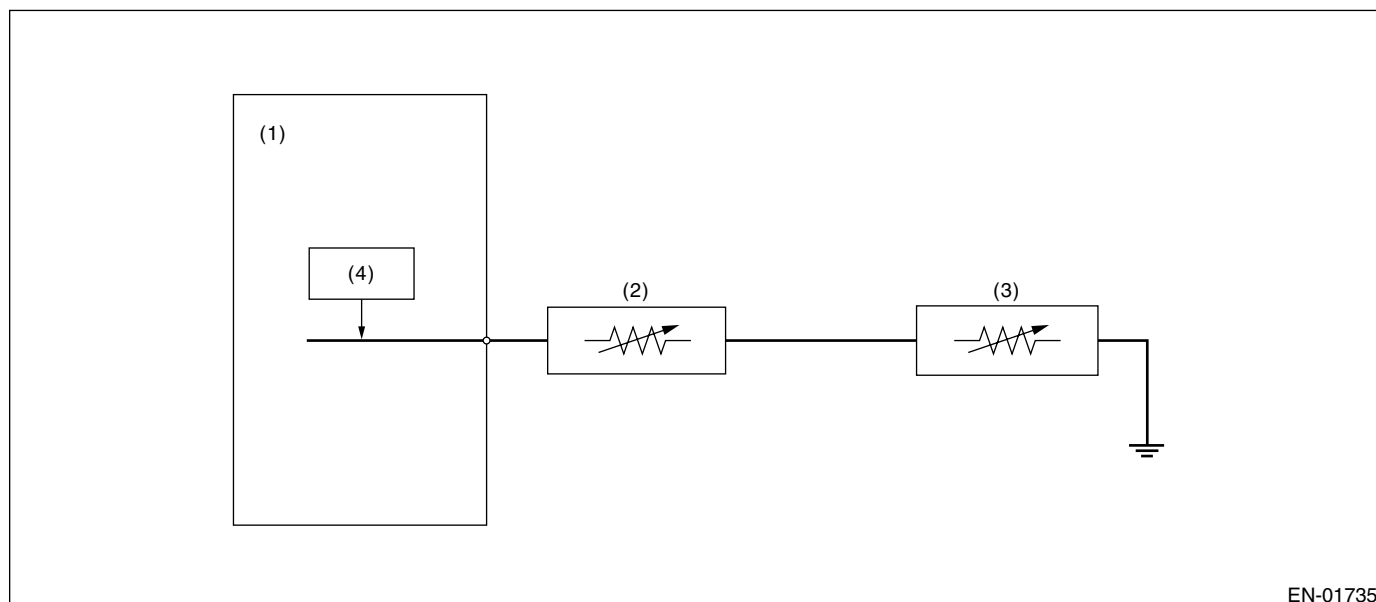
## GENERAL DESCRIPTION

### BM:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM) (3) Fuel sub level sensor  
(2) Fuel level sensor (4) Detecting circuit

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

### • Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After starting engine | 3 seconds or more |
| Output voltage        | $\geq 4.95$ V     |

**Time Needed for Diagnosis:** 10 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After starting engine | 3 seconds or more |
| Output voltage        | $< 4.95$ V        |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

---

#### BN:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

##### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.

Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

##### 2. ENABLE CONDITION

| Secondary Parameters           | Enable Conditions                                       |
|--------------------------------|---------------------------------------------------------|
| Engine speed                   | ≥ 500 rpm                                               |
| After starting engine          | 1 second or more                                        |
| Ignition switch                | ON                                                      |
| Battery voltage                | > 10.9 V                                                |
| Idle switch                    | ON                                                      |
| Fuel level                     | 9 ↔ 51 ℓ (2.4 ↔<br>13.4 US gal, 1.98 ↔<br>11.2 Imp gal) |
| Vehicle speed = 0 km/h (0 MPH) | 10 seconds or more                                      |

##### 3. GENERAL DRIVING CYCLE

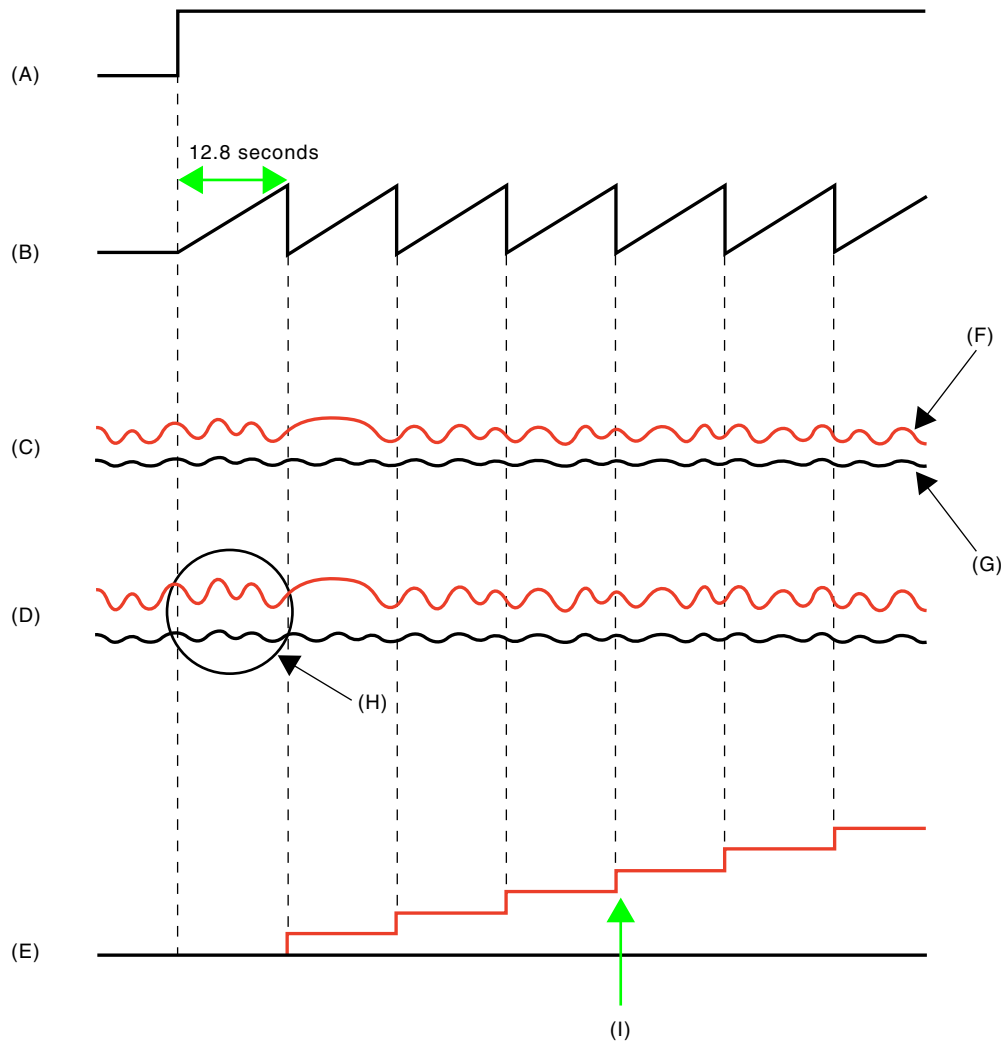
- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 4. DIAGNOSTIC METHOD

Calculate the Max. value (delvfm<sub>x</sub>) and cumulative value (sumv<sub>fl</sub>) 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, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



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- |                                                   |                       |                                                                                                    |
|---------------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------|
| (A) Diagnosis condition                           | (E) Diagnosis counter | (H) Calculate the Max. value (delvfm <sub>x</sub> ) and the cumulative value (sumv <sub>fl</sub> ) |
| (B) Diagnosis time                                | (F) Malfunction       | (I) NG at 4 counts                                                                                 |
| (C) Fuel level sensor at idle                     | (G) Normal            |                                                                                                    |
| (D) Amount of fuel level output voltage variation |                       |                                                                                                    |

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### • Judgment Value

| Malfunction Criteria                                                                                                                                                                                                                                           | Threshold Value |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Integrated times of the condition reaching follows,<br>DELFLMAX $\geq 0.2$ V or SUMFL $\geq 19.2$ V<br>where,<br>DELFLMAX is Max. deviation of sensor output during 12.8 seconds.<br>SUMFL is integrated value of sensor output deviation during 12.8 seconds. | $\geq 4$ times  |

Do not count the diagnosis counter up when the following conditions are completed during 12.8 seconds.

|                                                  |                                         |
|--------------------------------------------------|-----------------------------------------|
| Max – Min of tank pressure during 12.8 seconds   | $\geq 0.05$ kPa (0.375 mmHg, 0.02 inHg) |
| Max – Min of battery voltage during 12.8 seconds | $\geq 0.27$ V                           |

**Time Needed for Diagnosis:** 12.8 seconds  $\times$  4 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                                                                                                                                                      | Threshold Value       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| DELFLMAX<br>SUMFL<br>Where, DELFLMAX is Max. deviation of sensor output during 12.8 seconds.<br>SUMFL is integrated value of sensor output deviation during 12.8 seconds. | $< 0.2$ V<br>$< 15$ V |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## BO:DTC P0483 — COOLING FAN RATIONALITY CHECK —

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

### 2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine Speed         | 500 — 900 rpm     |
| Idle switch          | ON                |
| Vehicle speed        | 0 km/h (0 MPH)    |
| Battery voltage      | ≥ 10.9 V          |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when idling.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

#### • Judgment Value

| Malfunction Criteria       | Threshold Value |
|----------------------------|-----------------|
| Engine coolant temperature | ≥ 98°C (208°F)  |
| Radiator fan               | OFF → ON        |
| Engine coolant temperature | not reduce      |

**Time Needed for Diagnosis:** 5 minutes

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### • Judgment Value

| Malfunction Criteria       | Threshold Value |
|----------------------------|-----------------|
| Radiator fan               | OFF → ON        |
| Engine coolant temperature | reduce          |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### BP:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | < 4000 rpm        |
| Fuel cut in decel.   | In operation      |
| Battery voltage      | ≥ 10.9 V          |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at engine speed of 4000 rpm or less.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

##### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Vehicle speed        | < 1             |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| Vehicle speed                      | ≥ 1             |
| Starter switch                     | OFF             |
| Time after starter switch ON → OFF | ≥ 3 seconds     |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### BQ:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when high vehicle speed (300 km/h (186 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 the diagnosis continuously during fuel cut in deceleration at engine speed of 4000 rpm or less.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

##### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Vehicle speed        | ≥ 300           |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| Vehicle speed                      | < 300           |
| Starter switch                     | OFF             |
| Time after starter switch ON → OFF | ≥ 3 seconds     |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### BR:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.  
Judge NG when actual engine speed is not close to target engine speed during idling.

#### 2. ENABLE CONDITION

| Secondary Parameters                                                  | Enable Conditions                                   |
|-----------------------------------------------------------------------|-----------------------------------------------------|
| Engine coolant temperature                                            | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |
| Battery voltage                                                       | $\geq 10.9\text{ V}$                                |
| Atmospheric pressure                                                  | $> 75.1\text{ kPa}$ (563 mmHg, 22.2 inHg)           |
| Fuel level                                                            | $\geq 9\text{ L}$ (2.38 US gal, 1.98 Imp gal)       |
| After starting engine                                                 | 10 seconds or more                                  |
| Feedback in ISC                                                       | In operation                                        |
| Measured lambda                                                       | $0.90 \longleftrightarrow 1.1$                      |
| After air condition switching ON-OFF, OFF-ON                          | 5 seconds or more                                   |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | $> 5\text{ seconds}$                                |
| After neutral switch ON-OFF event                                     | $> 5\text{ seconds}$                                |
| Vehicle speed                                                         | 0 km/h (0 MPH)                                      |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during idling, 10 seconds after starting and warming up.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds  $\times$  3 times).

##### • Judgment Value

| Malfunction Criteria                                    | Threshold Value     |
|---------------------------------------------------------|---------------------|
| Actual – target engine speed                            | $< -100\text{ rpm}$ |
| Feedback correction for idle air control solenoid valve | Max.                |

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

##### • Judgment Value

| Malfunction Criteria         | Threshold Value        |
|------------------------------|------------------------|
| Actual – target engine speed | $\geq -100\text{ rpm}$ |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

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### 7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.

Knock compensation:

- Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
- AT normal: Knock compensation value = Fixed on 0°CA
- AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
- Not allowed to refresh learning compensation coefficient
- Not allowed to calculate partial learning zone compensation value

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### BS:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.  
Judge NG when actual engine speed is not close to target engine speed during idling.

#### 2. ENABLE CONDITION

| Secondary Parameters                                                  | Enable Conditions                                   |
|-----------------------------------------------------------------------|-----------------------------------------------------|
| Engine coolant temperature                                            | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |
| Battery voltage                                                       | $\geq 10.9\text{ V}$                                |
| Atmospheric pressure                                                  | $> 75.1\text{ kPa}$ (563 mmHg, 22.2 inHg)           |
| Fuel level                                                            | $\geq 9\text{ ℓ}$ (2.38 US gal, 1.98 Imp gal)       |
| After starting engine                                                 | 10 seconds or more                                  |
| Feedback in ISC                                                       | In operation                                        |
| Lambda                                                                | $0.90 \longleftrightarrow 1.1$                      |
| After air condition switching ON-OFF, OFF-ON                          | 5 seconds or more                                   |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | $> 5\text{ seconds}$                                |
| After neutral switch ON-OFF event                                     | $> 5\text{ seconds}$                                |
| Vehicle speed                                                         | 0 km/h (0 MPH)                                      |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during idling, 10 seconds after starting and warming up.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds  $\times$  3 times).

##### • Judgment Value

| Malfunction Criteria                                    | Threshold Value       |
|---------------------------------------------------------|-----------------------|
| Actual – target eng. speed                              | $\geq 200\text{ rpm}$ |
| Feedback correction for idle air control solenoid valve | Min.                  |

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

##### • Judgment Value

| Malfunction Criteria       | Threshold Value    |
|----------------------------|--------------------|
| Actual – target eng. speed | $< 200\text{ rpm}$ |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

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### 7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.

Knock compensation:

- Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
- AT normal: Knock compensation value = Fixed on 0°CA
- AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
- Not allowed to refresh learning compensation coefficient
- Not allowed to calculate partial learning zone compensation value

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### BT:DTC P0512 — STARTER REQUEST CIRCUIT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains to be on.

Judge OFF NG when the engine starts without starter experience.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

##### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Engine speed         | > 500 rpm       |
| Starter 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 completed.

##### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Starter SW           | OFF             |
| Battery voltage      | > 8 V           |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

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

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Battery voltage       | $\geq 10.9$ V         |
| Feedback in ISC       | In operation          |
| Vehicle speed         | $< 4$ km/h (2.49 MPH) |
| After engine starting | 1 seconds or more     |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

#### • Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--------------------------------------------------|-----------------|
| Engine speed – target eng. speed                 | $\geq 1000$ rpm |
| Feedback value for ISC                           | $\leq 0$        |
| Engine speed change every 180 degree engine rev. | $\geq -5$ rpm   |

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

#### • Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

#### • Judgment Value

| Malfunction Criteria             | Threshold Value |
|----------------------------------|-----------------|
| Engine speed – target eng. speed | $< 200$ rpm     |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

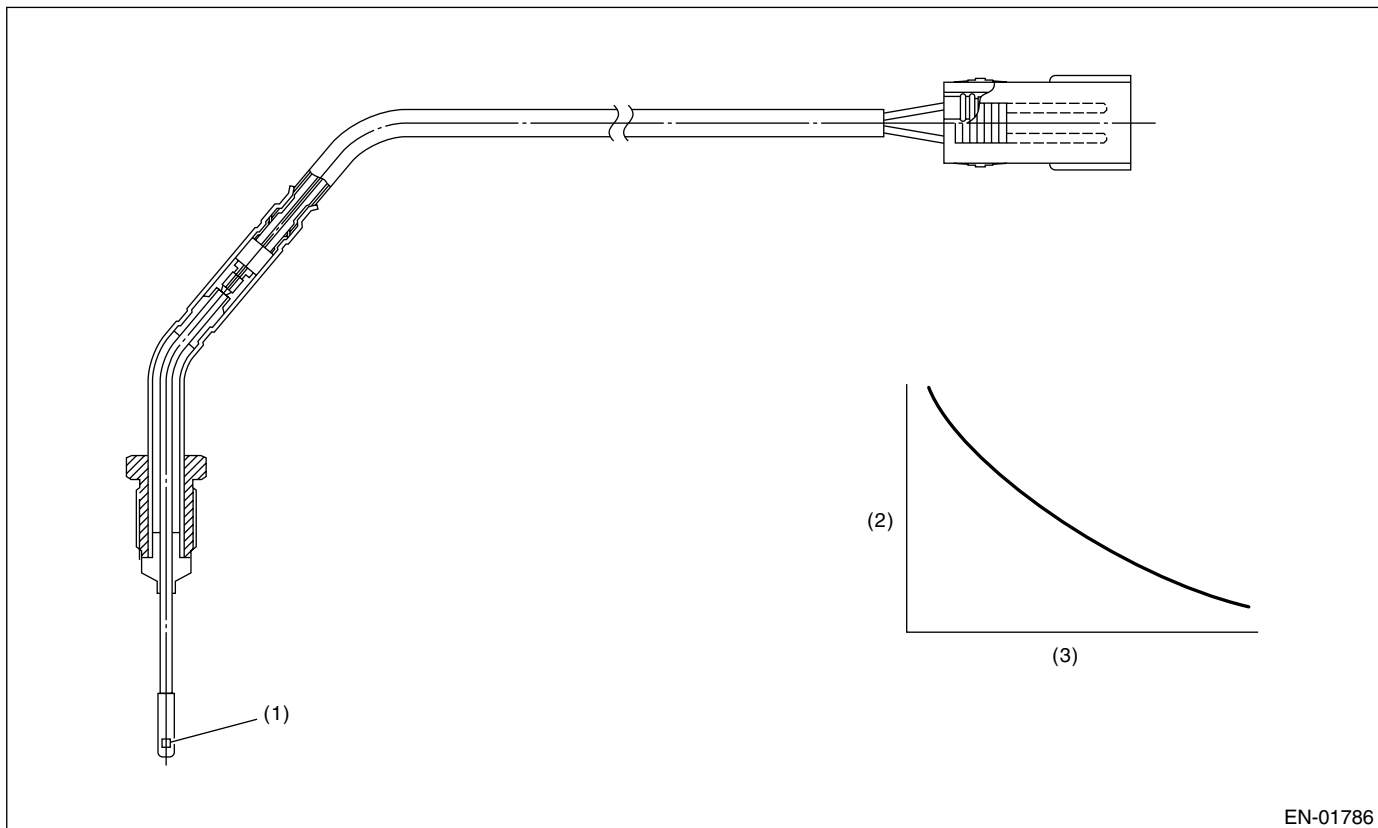
## GENERAL DESCRIPTION

### BV:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of exhaust temperature sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1) Thermistor

(2) Resistance value (kΩ)

(3) Exhaust temperature °C (°F)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge 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     |
|-----------------------|---------------------|
| Sensor output voltage | < 0.15 V            |
| Amount of intake air  | < 100 g (3.53 oz)/s |

**Time Needed for Diagnosis:** 5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria  | Threshold Value |
|-----------------------|-----------------|
| Sensor output voltage | $\geq 0.15$ V   |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

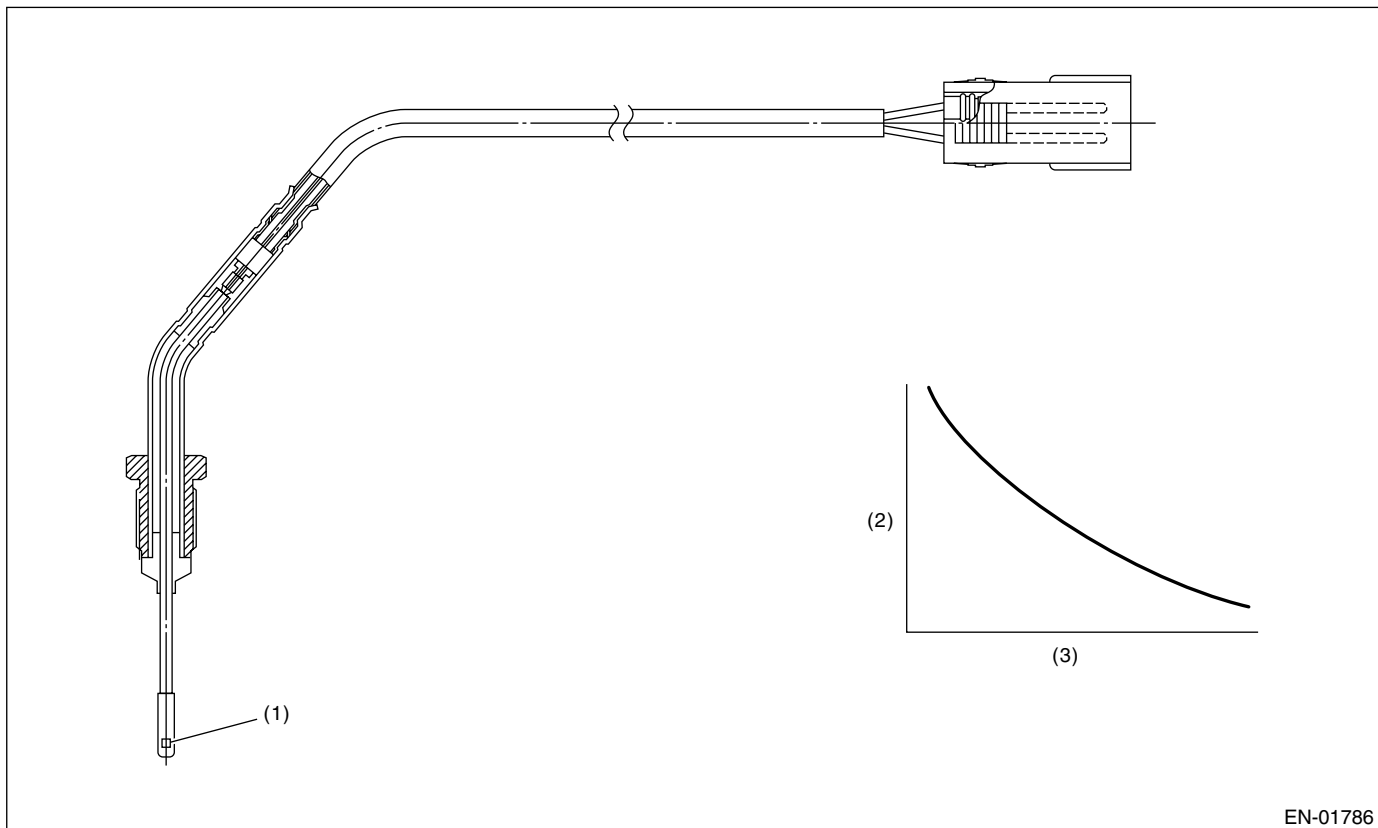
## GENERAL DESCRIPTION

### BW:DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of exhaust temperature sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1) Thermistor

(2) Resistance value (k $\Omega$ )

(3) Exhaust temperature °C (°F)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than the time needed for diagnosis (30 seconds).

### • Judgment Value

| Malfunction Criteria                   | Threshold Value                                     |
|----------------------------------------|-----------------------------------------------------|
| After starting engine                  | 240 seconds or more                                 |
| Engine coolant temperature             | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |
| Vehicle speed                          | $\geq 65 \text{ km/h}$ (40.4 MPH)                   |
| Engine speed                           | $\geq 1800 \text{ rpm}$                             |
| Engine load (gn)                       | $\geq 0.6 \text{ g}$ (0.021 oz)/rev                 |
| Fuel cut event                         | Not in operation                                    |
| After the recovery from fuel cut event | 30 seconds or more                                  |
| Sensor output voltage                  | $\geq 4.72 \text{ V}$                               |

**Time Needed for Diagnosis:** 30 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria  | Threshold Value    |
|-----------------------|--------------------|
| Sensor output voltage | $< 4.72 \text{ V}$ |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### BX:DTC P0600 — CAN COMMUNICATION CIRCUIT—

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of CAN communication.

It judges as NG when CAN communication becomes impossible, the CAN communication with AT becomes impossible, and the data from AT is not normal.

#### 2. COMPONENT DISCRIPTION

CAN connects between ECU and TCU with high speed.

**(Common Specification)**

**CAN PROTOCOL 2.0B (active)**

**Frame format: 11 bit ID Frame (Standard frame)**

**(High Speed CAN)**

**ISO 11898 compliance**

**Communication Speed: 500 kbps**

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery Voltages     | $\geq 10.9$ V     |
| Starter switch       | ON                |
| Engine               | run               |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

#### 5. DIAGNOSTIC METHOD

##### • JUDGMENT OF MALFUNCTION

It judges as NG if any of the following conditions are judged as NG. It judges as OK if all of the following conditions are judged as OK within 1s, and the NG memory is cleared.

##### • Judgement Value

| Malfunction Criteria           | Threshold Value |
|--------------------------------|-----------------|
| Buss off flag or warning flag  | Set             |
| ID cannot be received from TCU | $= 500$ m/s     |

**Time needed for Diagnosis:** 1 time

**Malfunction Indicator Light Illumination:** Illuminates simultaneously when malfunction is detected.

#### 6. DTC CLEAR CONDITION

When the OK driving cycle was completed 40 consecutive times.

When "Clear Memory" was performed.

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

#### 8. FAIL-SAFE

The angle operation of accelerator position sensor demand target throttle opening calculation

#### 9. ECM OPERATING AT DTC SETTING

Store the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## BY:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).

Write zero to all area of RAM. After the zero initialization, judge NG when the result of addition of all values in area of RAM is not zero.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | OFF → ON          |

Perform the diagnosis in the initial routine.

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below is completed, and judge OK when it is not completed.

#### Judgment Value

| Malfunction Criteria                                   | Threshold Value |
|--------------------------------------------------------|-----------------|
| Result of RAM data addition, after zero initialization | Except zero     |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

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## BZ:DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —

### 1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| SUM value of ROM     | Standard value  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only at engine stop)

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

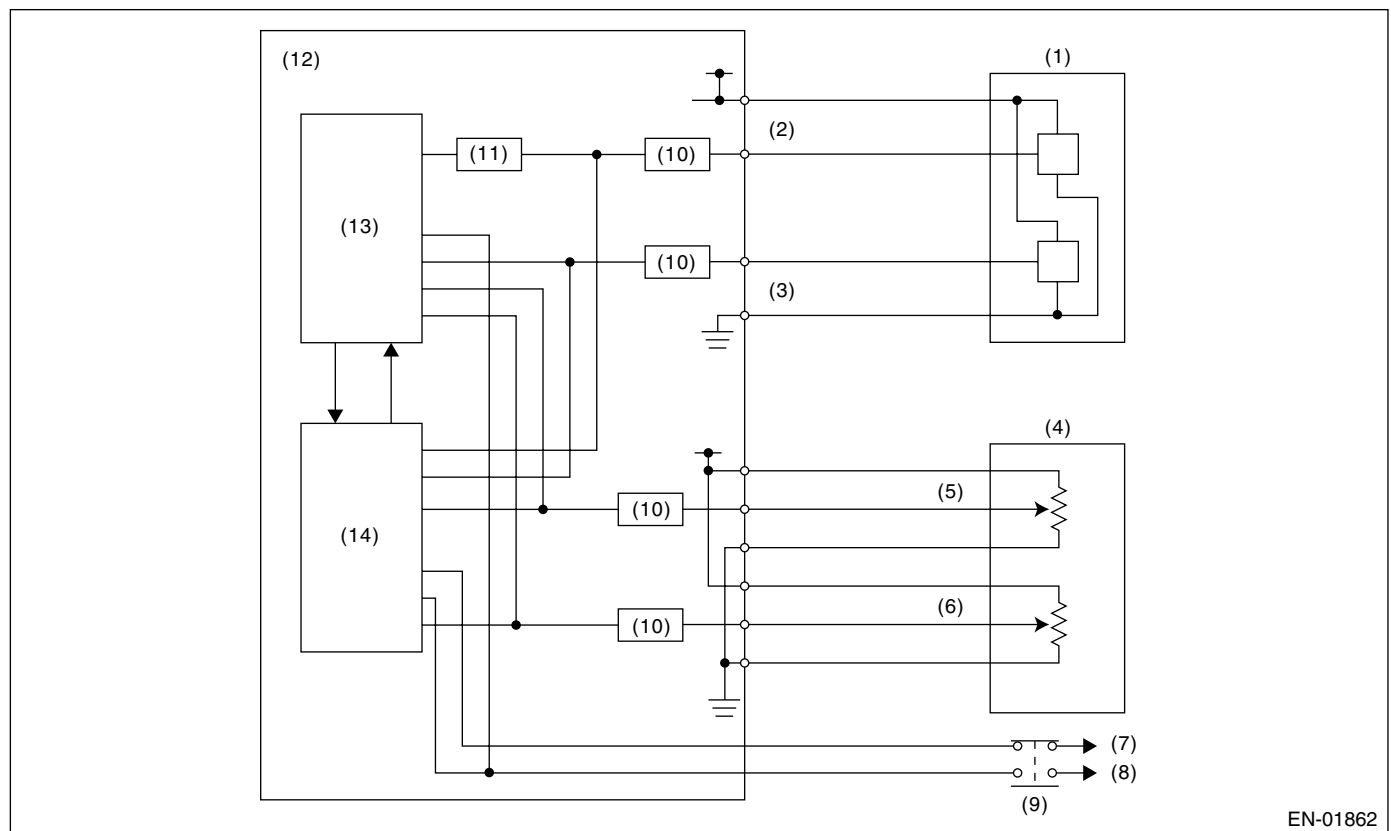
### CA:DTC P0607 — CONTROL MODULE PERFORMANCE —

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

#### 2. COMPONENT DESCRIPTION



EN-01862

- |                                         |                                         |                                  |
|-----------------------------------------|-----------------------------------------|----------------------------------|
| (1) Throttle position sensor            | (6) Accelerator pedal position sensor 2 | (11) Amplifier circuit           |
| (2) Throttle position sensor 1          | (7) Battery                             | (12) Engine control module (ECM) |
| (3) Throttle position sensor 2          | (8) Stop light                          | (13) Sub CPU                     |
| (4) Accelerator pedal position sensor   | (9) Brake switch                        | (14) Main CPU                    |
| (5) Accelerator pedal position sensor 1 | (10) I/F circuit                        |                                  |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters               | Enable Conditions |
|------------------------------------|-------------------|
| (1) Ignition switch                | ON                |
| (2) Ignition switch                | ON                |
| (3) None                           | —                 |
| (4) None                           | —                 |
| (5) Throttle opening angle         |                   |
| (6) Brake SW (with cruise control) | ON                |
| (7) None                           | —                 |
| (8) Cruise control                 | OFF               |

## 4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.  
(5): Always perform the diagnosis continuously on idling.  
(6): Perform the diagnosis when the brake pedal is depressed.  
(7): Always perform the diagnosis continuously.  
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

## 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                                                         | Threshold Value                                                                                    |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| (1) Difference of CPU on reading value of throttle position sensor signal    | Within 0.12 V                                                                                      |
| (2) Difference of CPU on reading value of accelerator position sensor signal | Within 0.07 V                                                                                      |
| (3) WD pulse from sub CPU                                                    | WD pulse occur                                                                                     |
| (4) Communication between CPU                                                | Possible to communicate                                                                            |
| (5) Difference of signal on connection of amplifier                          | Within $\times 4 \pm 0.6$ V                                                                        |
| (6) Cruise control cancel signal at brake ON                                 | Cruise control cancel signal ON                                                                    |
| (7) Brake switch 1, 2 signal                                                 | SW 1 and 2 are matched                                                                             |
| (8) Throttle opening angle directing value                                   | Within the opening angle $+3.4^\circ$ which calculated from accelerator opening angle coefficient. |

### Time Needed for Diagnosis:

- (1) 250 milliseconds  
(2) 250 milliseconds  
(3) 200 milliseconds  
(4) 200 milliseconds  
(5) 24 milliseconds  
(6) 250 milliseconds  
(7) 200 milliseconds  
(8) 250 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## **DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA**

### GENERAL DESCRIPTION

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#### **7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### **8. FAIL SAFE**

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

#### **9. ECM OPERATION AT DTC SETTING**

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

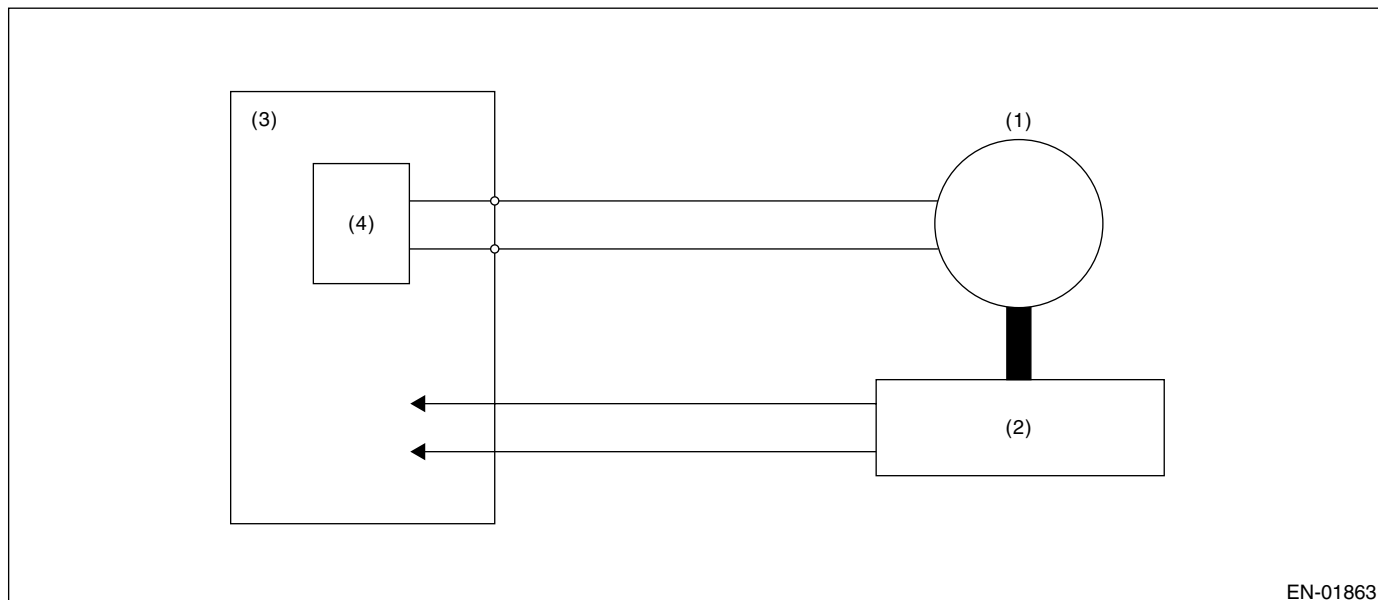
## GENERAL DESCRIPTION

### CB:DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

#### 2. COMPONENT DESCRIPTION



- (1) Motor (3) Engine control module (ECM)  
(2) Throttle position sensor (4) Drive circuit

#### 3. ENABLE CONDITION

| Secondary Parameters                          | Enable Conditions |
|-----------------------------------------------|-------------------|
| Ignition switch                               | ON                |
| Normal operation of electric control throttle | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric control throttle is operating.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                                             | Threshold Value |
|------------------------------------------------------------------|-----------------|
| Difference between target opening angle and actual opening angle | Less than 3.5°  |
| Output duty to drive circuit                                     | Less than 95%   |

##### Time Needed for Diagnosis:

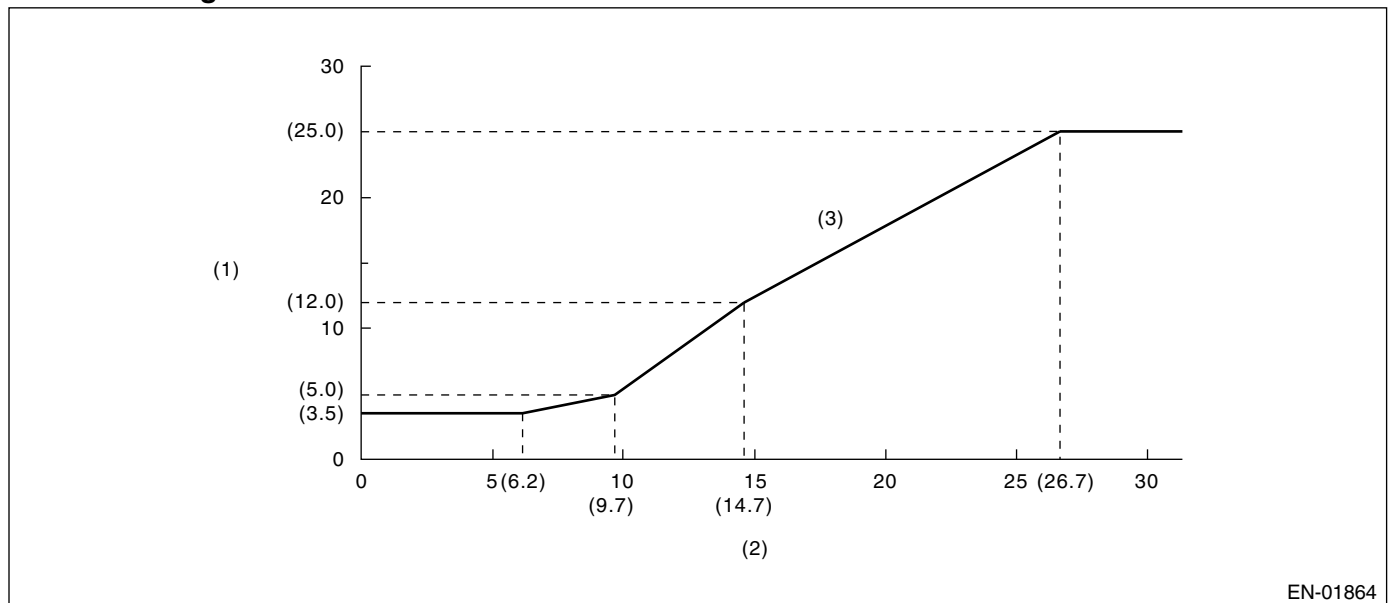
Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)

Output duty to drive circuit: 2000 milliseconds

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## Details of Judgment

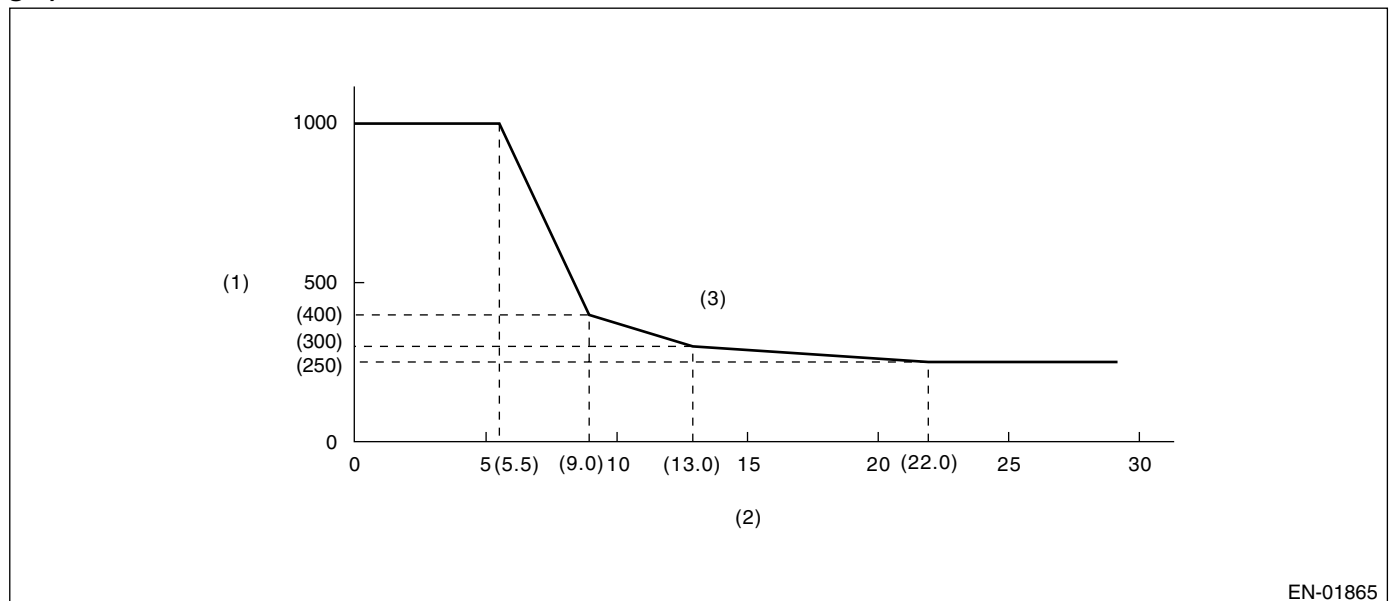


(1) Difference between target opening angle and actual opening angle (°)

(2) Target throttle opening angle (°)

(3) NG area

## Details of Judgment (Always 1000 milliseconds when the actual opening angle ≤ target opening angle)



(1) Judgment time (milliseconds)

(3) NG area

(2) Throttle position sensor 1 opening angle

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# **DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA**

## **GENERAL DESCRIPTION**

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### **6. DTC CLEAR CONDITION**

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stopped)

### **7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stopped)

### **8. FAIL SAFE**

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

### **9. ECM OPERATION AT DTC SETTING**

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## CC:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### • Judgment Value

| Malfunction Criteria                                 | Threshold Value   |
|------------------------------------------------------|-------------------|
| After starting engine                                | 1 seconds or more |
| Engine speed                                         | ≥ 500 rpm         |
| Ignition switch                                      | ON                |
| Battery voltage                                      | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits OFF signal | Low level         |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### • Judgment Value

| Malfunction Criteria                                 | Threshold Value   |
|------------------------------------------------------|-------------------|
| After starting engine                                | 1 seconds or more |
| Engine speed                                         | ≥ 500 rpm         |
| Ignition switch                                      | ON                |
| Battery voltage                                      | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits OFF signal | High level        |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### CD:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### • Judgment Value

| Malfunction Criteria                                | Threshold Value   |
|-----------------------------------------------------|-------------------|
| After starting engine                               | 1 seconds or more |
| Engine speed                                        | ≥ 500 rpm         |
| Ignition switch                                     | ON                |
| Battery voltage                                     | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits ON signal | High level        |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria                                | Threshold Value   |
|-----------------------------------------------------|-------------------|
| After starting engine                               | 1 seconds or more |
| Engine speed                                        | ≥ 500 rpm         |
| Ignition switch                                     | ON                |
| Battery voltage                                     | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits ON signal | Low level         |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## CE:DTC P0700 — AT MIL LIGHT UP REQUEST —

### 1. OUTLINE OF DIAGNOSIS

AT C/U performs CAN communication. It judges as NG if malfunction is detected.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery Voltage      | $\geq 10.9$ V     |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 4. DIAGNOSTIC METHOD

It judges as NG if the following condition malfunctions more than the predetermined time (0.5s). It judges as OK if the following condition does not malfunction, and the NG memory is cleared.

#### Judgement Value

| Malfunction Criteria          | Threshold Value |
|-------------------------------|-----------------|
| MIL light up request from TCU | set             |

**Time needed for diagnosis:** 500 m/seconds

**Malfunction Indicator Light Illumination:** Illuminates simultaneously when malfunction is detected.

### 5. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 consecutive times.
- When "Clear Memory" was performed.

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

### 7. FAIL-SAFE

None

### 8. ECU OPERATING AT DTC SETTING

Store the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

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## CF:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT model) —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After starting engine | 2 seconds or more     |
| Starter switch        | OFF                   |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                                                              | Threshold Value |
|-----------------------------------------------------------------------------------|-----------------|
| Neutral switch signal when park/neutral = "ON" & any other switches = "OFF" on AT | 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 was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## CG: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       | $\geq 10.9$ V     |
| After starting engine | 2 seconds or more |
| Starter switch        | OFF               |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

#### Judgment Value

| Malfunction Criteria                                                    | Threshold Value |
|-------------------------------------------------------------------------|-----------------|
| Neutral switch signal (while changing from a to b below)                | OFF continues   |
| Driving condition change                                                | a) to b)        |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm          |                 |
| b) Vehicle speed $\geq 64$ km/h (40 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 was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Cruise control command: Not allowed to command cruise control

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### CH:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT model) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

#### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After starting engine | 2 seconds or more |
| Starter switch        | OFF               |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

#### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria                                                              | Threshold Value |
|-----------------------------------------------------------------------------------|-----------------|
| Neutral switch signal when park/neutral = "OFF" & any other switches = "ON" on AT | 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 was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## CI: 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       | $\geq 10.9$ V     |
| After starting engine | 2 seconds or more |
| Starter switch        | OFF               |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

#### Judgment Value

| Malfunction Criteria                                                    | Threshold Value |
|-------------------------------------------------------------------------|-----------------|
| Neutral switch signal (while changing from a to b below)                | ON continues    |
| Driving condition change                                                | a) to b)        |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm          |                 |
| b) Vehicle speed $\geq 64$ km/h (40 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 was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

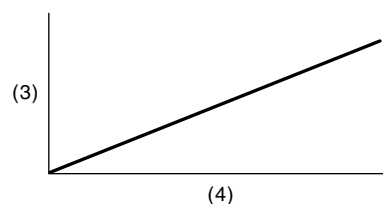
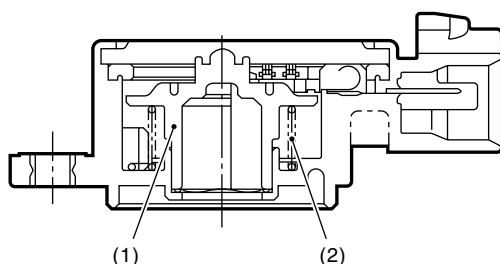
### CJ:DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.

Judge NG when the value is out of standard range.

#### 2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generated valve angle (°)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.167 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

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### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generated valve position

- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

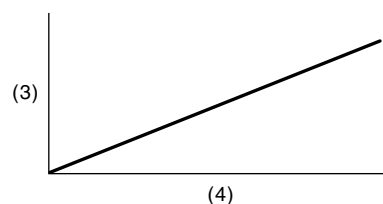
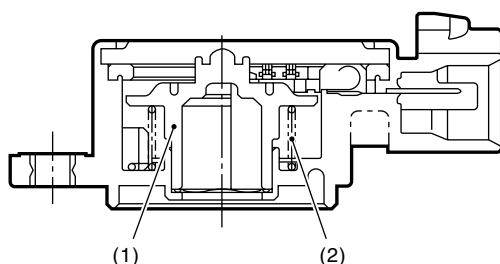
### CK:DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.

Judge NG when the value is out of standard range.

#### 2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generated valve angle (°)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.843$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generated valve position

- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

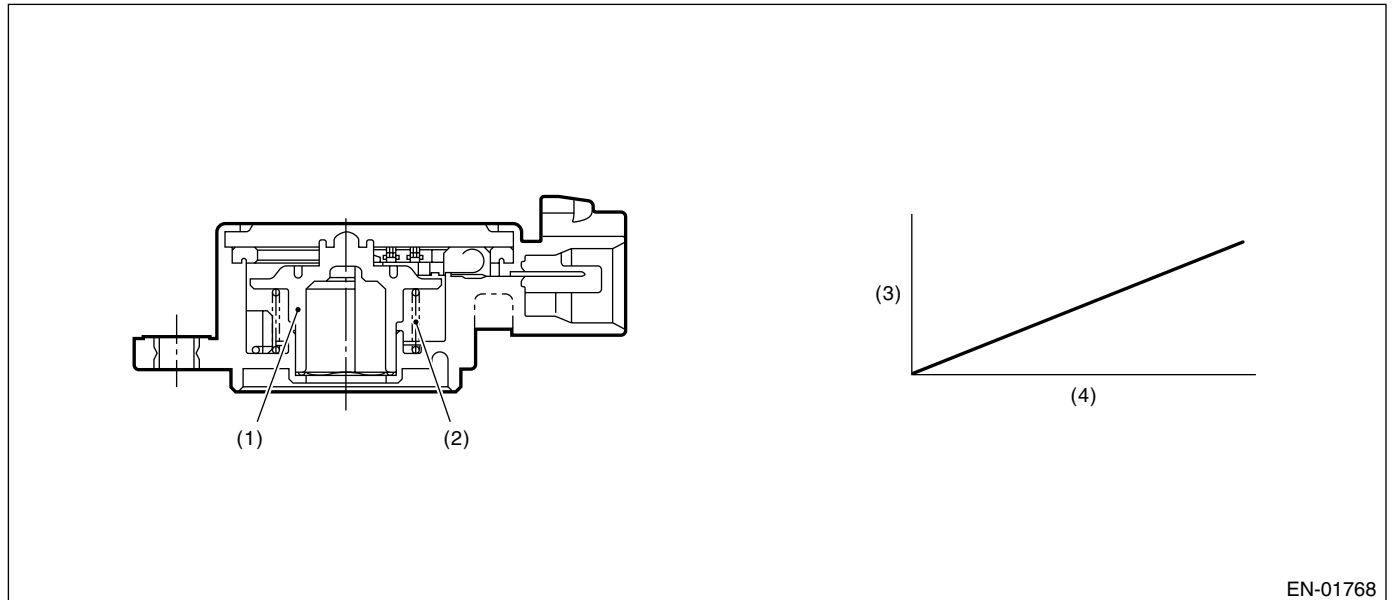
## GENERAL DESCRIPTION

### CL:DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.  
Judge NG when the value is out of standard range.

#### 2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generated valve angle (°)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.167 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

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### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generated valve position

- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

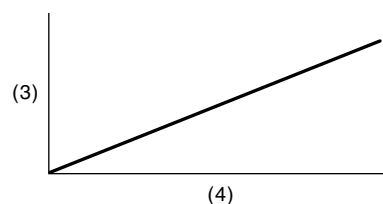
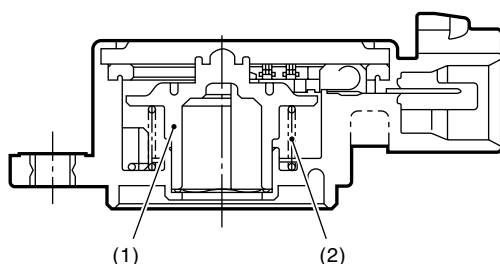
### CM:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.

Judge NG when the value is out of standard range.

#### 2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generated valve angle (°)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.843$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generated valve position

- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### CN:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

#### 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 close driving.

#### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions               |
|----------------------------|---------------------------------|
| Battery voltage            | $\geq 10.9 \text{ V}$           |
| Engine coolant temperature | $\geq 0^{\circ}\text{C}$ (32°F) |
| Ambient temperature        | $\geq 0^{\circ}\text{C}$ (32°F) |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### • Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|----------------------------------------------|---------------------|
| Tumble generated valve angle                 | $\geq 67.4^{\circ}$ |
| 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 malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|----------------------------------------------|---------------------|
| Tumble generated valve angle                 | $< 67.4^{\circ}$    |
| Tumble generated valve "close" signal output | 2.2 seconds or more |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Tumble generated valve opening

- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the 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)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## CO:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

### 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            | $\geq 10.9 \text{ V}$           |
| Engine coolant temperature | $\geq 0^{\circ}\text{C}$ (32°F) |
| Ambient temperature        | $\geq 0^{\circ}\text{C}$ (32°F) |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### • Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---------------------------------------------|---------------------|
| Tumble generated valve angle                | $< 67.4^{\circ}$    |
| 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 malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### • Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---------------------------------------------|---------------------|
| Tumble generated valve angle                | $\geq 67.4^{\circ}$ |
| Tumble generated valve "open" signal output | 2.2 seconds or more |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Tumble generated valve opening

- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the 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)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### CP:DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —

#### 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            | $\geq 10.9 \text{ V}$           |
| Engine coolant temperature | $\geq 0^{\circ}\text{C}$ (32°F) |
| Ambient temperature        | $\geq 0^{\circ}\text{C}$ (32°F) |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### • Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|----------------------------------------------|---------------------|
| Tumble generated valve angle                 | $\geq 67.4^{\circ}$ |
| 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 malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|----------------------------------------------|---------------------|
| Tumble generated valve angle                 | $< 67.4^{\circ}$    |
| Tumble generated valve "close" signal output | 2.2 seconds or more |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Tumble generated valve opening

- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the 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)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## CQ:DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —

### 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            | $\geq 10.9 \text{ V}$           |
| Engine coolant temperature | $\geq 0^{\circ}\text{C}$ (32°F) |
| Ambient temperature        | $\geq 0^{\circ}\text{C}$ (32°F) |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### • Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---------------------------------------------|---------------------|
| Tumble generated valve angle                | $< 67.4^{\circ}$    |
| 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 malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### • Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---------------------------------------------|---------------------|
| Tumble generated valve angle                | $\geq 67.4^{\circ}$ |
| Tumble generated valve "open" signal output | 2.2 seconds or more |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Tumble generated valve opening

- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the 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)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

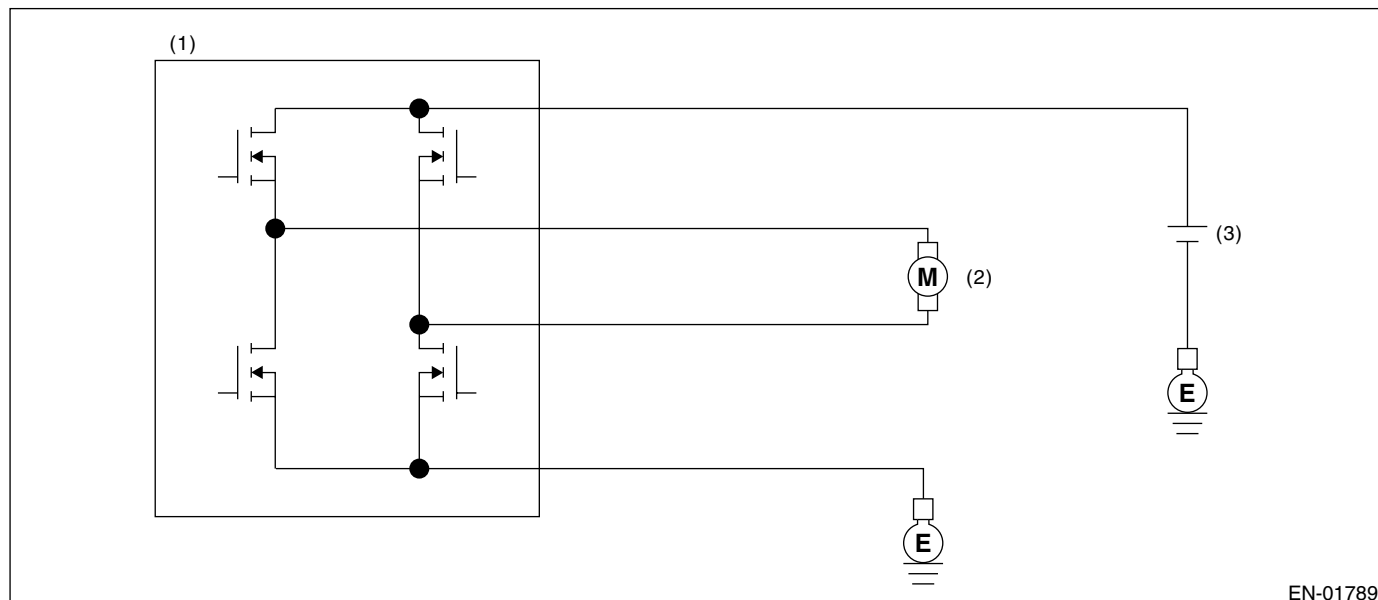
### CR:DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

#### 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                         | $\geq 10.9$ V           |
| ECM output signal                       | before set ON → OFF     |
| Tumble generated valve ON signal output | 20 milliseconds or more |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 10 seconds 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 malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

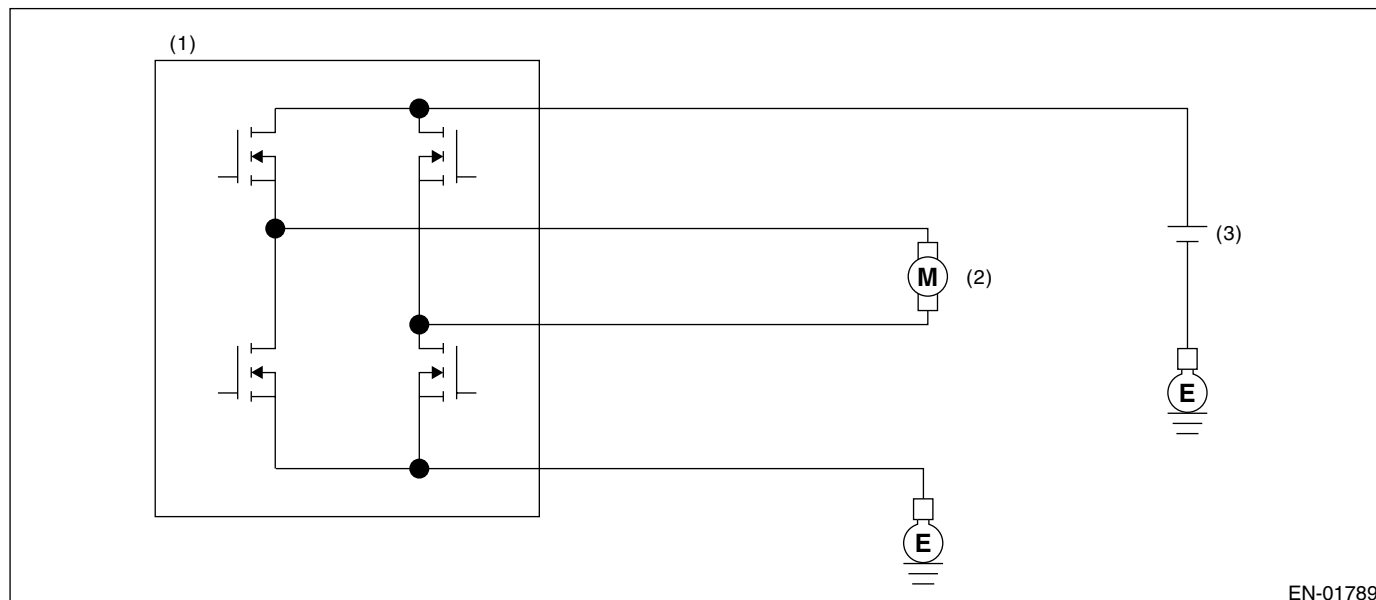
### CS:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

#### 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



EN-01789

(1) Engine control module (ECM)

(2) Tumble generated valve

(3) Battery

#### 3. ENABLE CONDITION

| Secondary Parameters                    | Enable Conditions       |
|-----------------------------------------|-------------------------|
| Battery voltage                         | $\geq 10.9$ V           |
| ECM output signal                       | before set ON → OFF     |
| Tumble generated valve ON signal output | 20 milliseconds or more |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 10 seconds 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 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

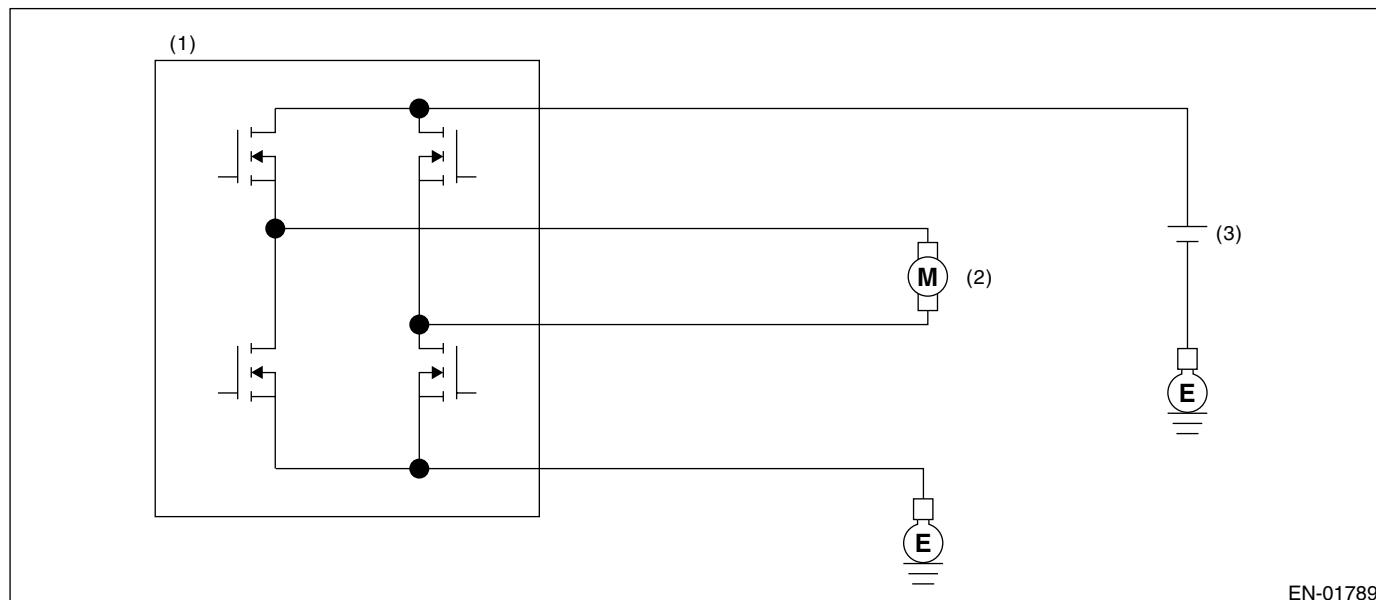
### CT:DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —

#### 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



EN-01789

(1) Engine control module (ECM)

(2) Tumble generated valve

(3) Battery

#### 3. ENABLE CONDITION

| Secondary Parameters                    | Enable Conditions       |
|-----------------------------------------|-------------------------|
| Battery voltage                         | $\geq 10.9$ V           |
| ECM output signal                       | before set ON → OFF     |
| Tumble generated valve ON signal output | 20 milliseconds or more |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 10 seconds 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 malfunction occurs.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

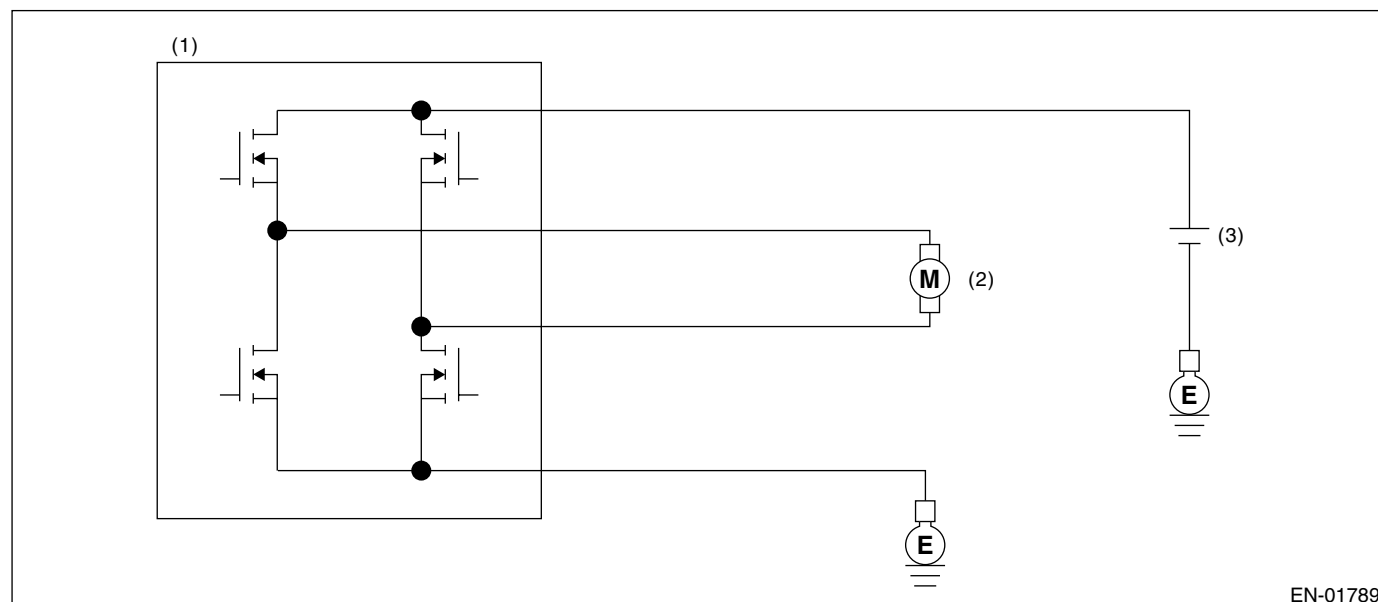
### CU:DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —

#### 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



EN-01789

(1) Engine control module (ECM)

(2) Tumble generated valve

(3) Battery

#### 3. ENABLE CONDITION

| Secondary Parameters                    | Enable Conditions       |
|-----------------------------------------|-------------------------|
| Battery voltage                         | $\geq 10.9$ V           |
| ECM output signal                       | before set ON → OFF     |
| Tumble generated valve ON signal output | 20 milliseconds or more |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 10 seconds 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 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### CV:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | < 0.118 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $\geq 0.118$ V  |

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## CW:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $\geq 4.936$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $< 4.936$ V     |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### CX:DTC P1152 — O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.

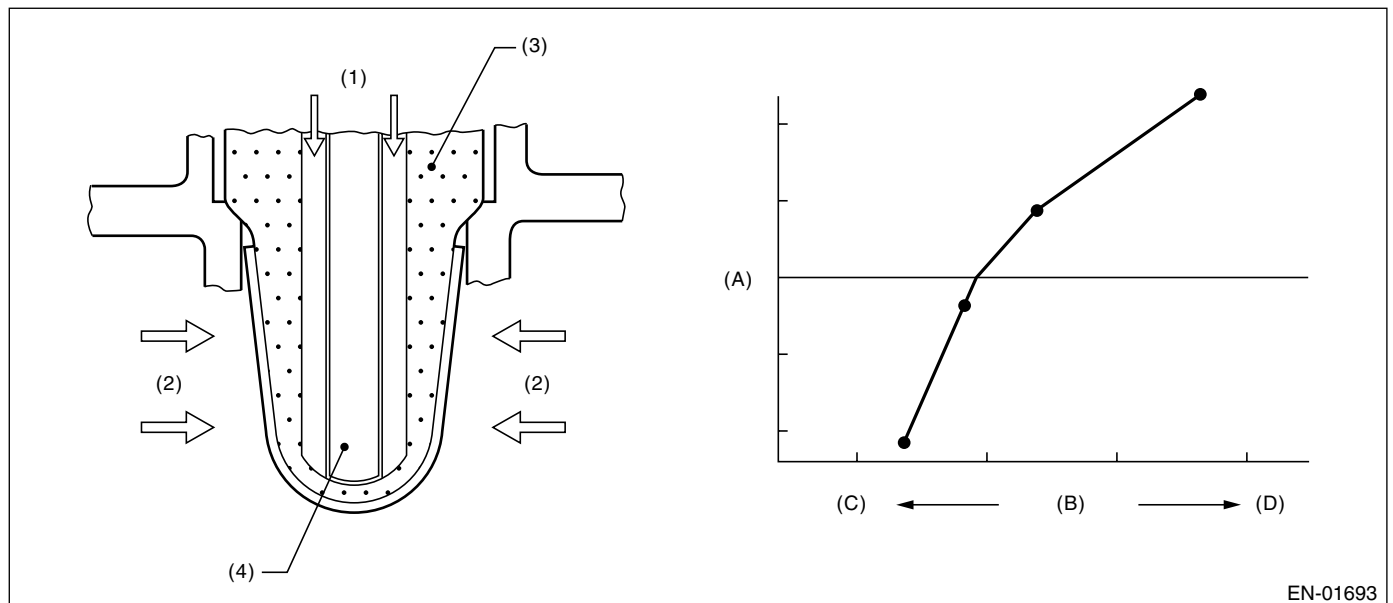
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**Lambda value = Actual air fuel ratio/Theoretical air fuel ratio**

Lambda > 1: Lean

Lambda < 1: Rich

#### 2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

### 3. ENABLE CONDITION

| Secondary Parameters                                        | Enable Conditions                   |
|-------------------------------------------------------------|-------------------------------------|
| All secondary parameters to be in enable conditions         | 4 seconds or more                   |
| Battery voltage                                             | > 10.9 V                            |
| Atmospheric pressure                                        | > 75.1 kPa (563 mmHg, 22.2 inHg)    |
| Rear oxygen sensor sub feedback                             | In operation                        |
| Rear oxygen sensor output voltage – feedback target voltage | –0.2 V $\longleftrightarrow$ 0.1 V  |
| or                                                          |                                     |
| rear oxygen sensor sub feedback compensation coefficient    | On Min.                             |
| or                                                          |                                     |
| rear oxygen sensor sub feedback compensation coefficient    | On Max.                             |
| After starting engine                                       | 60 seconds or more                  |
| Engine coolant temperature                                  | $\geq 75^{\circ}\text{C}$ (167°F)   |
| Vehicle speed                                               | $\geq 20$ km/h (12 MPH)             |
| Amount of intake air                                        | $\geq 6$ g (0.21 oz)/s              |
| Load change during 0.5 engine rev.                          | $\leq 0.01$ g (0.0003 oz)/rev       |
| Impedance of front oxygen (A/F) sensor                      | 0 $\longleftrightarrow$ 50 $\Omega$ |
| Learning value of evaporation gas density                   | $\leq 0.2$                          |
| 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 since 60 seconds after starting the engine.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                                                                                | Threshold Value |
|-----------------------------------------------------------------------------------------------------|-----------------|
| Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit | $\leq 0.85$     |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

---

#### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### CY:DTC P1153 — O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

#### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.

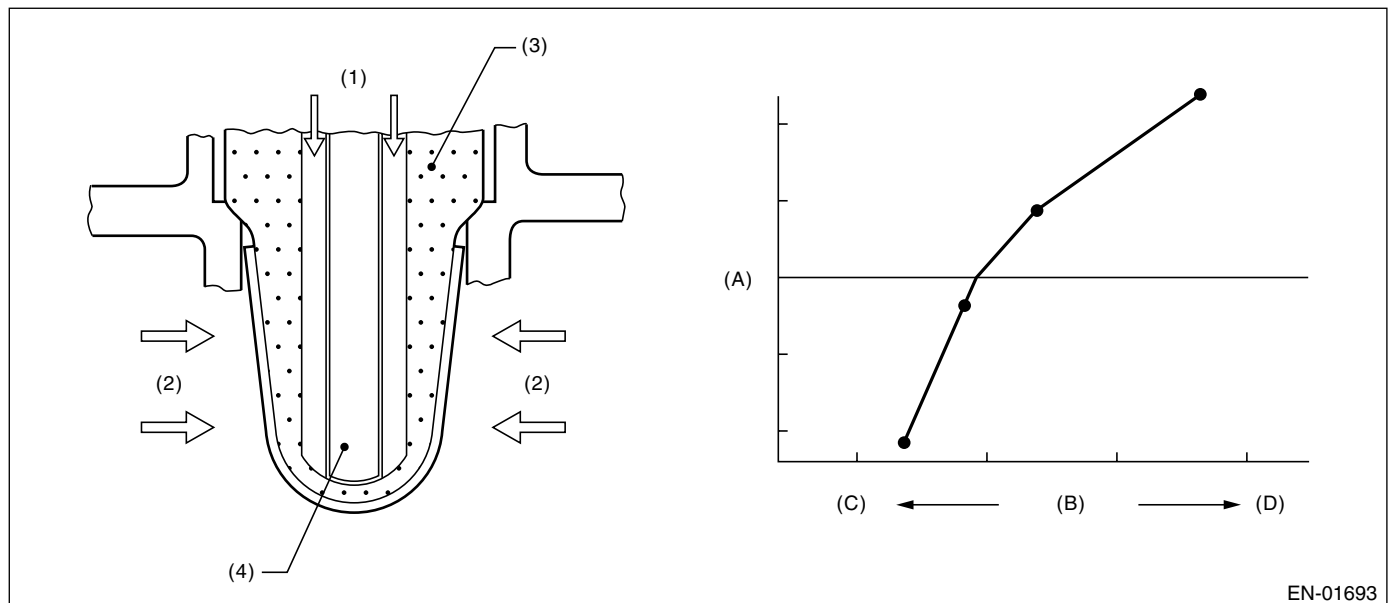
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**Lambda value = Actual air fuel ratio/Theoretical air fuel ratio**

Lambda > 1: Lean

Lambda < 1: Rich

#### 2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters                                        | Enable Conditions                |
|-------------------------------------------------------------|----------------------------------|
| All secondary parameters to be in enable conditions         | 4 seconds or more                |
| Battery voltage                                             | > 10.9 V                         |
| Atmospheric pressure                                        | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback                             | In operation                     |
| Rear oxygen sensor output voltage – feedback target voltage | –0.2 V ↔ 0.1 V                   |
| or                                                          |                                  |
| rear oxygen sensor sub feedback compensation coefficient    | On Min.                          |
| or                                                          |                                  |
| rear oxygen sensor sub feedback compensation coefficient    | On Max.                          |
| After engine starting                                       | 60 seconds or more               |
| Engine coolant temperature                                  | ≥ 75°C (167°F)                   |
| Vehicle speed                                               | ≥ 20 km/h (12 MPH)               |
| Amount of intake air                                        | ≥ 6 g (0.21 oz)/s                |
| Load change during 0.5 engine rev.                          | ≤ 0.01 g (0.0003 oz)/rev         |
| Impedance of front oxygen (A/F) sensor                      | 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 since 60 seconds after starting the engine.

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria                                                                                             | Threshold Value |
|------------------------------------------------------------------------------------------------------------------|-----------------|
| Output lambda when rear O <sub>2</sub> sensor sub feedback compensation coefficient value being at not low limit | ≥ 1.15          |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

---

#### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

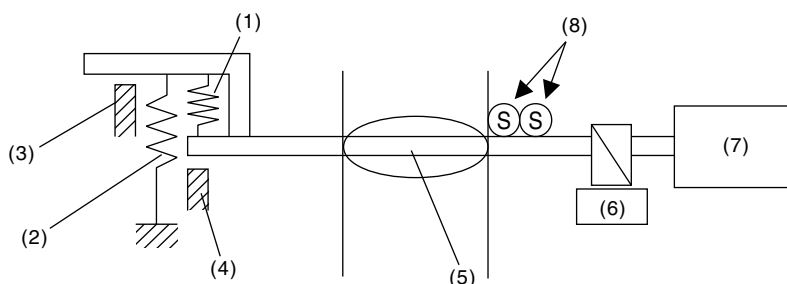
## GENERAL DESCRIPTION

### CZ:DTC P1160 — RETURN SPRING FAILURE —

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

#### 2. COMPONENT DESCRIPTION



EN-01866

- |                          |                         |                                  |
|--------------------------|-------------------------|----------------------------------|
| (1) Opener spring        | (4) Full closed stopper | (7) DC motor                     |
| (2) Return spring        | (5) Throttle valve      | (8) Main and sub throttle sensor |
| (3) Intermediate stopper | (6) Gear                |                                  |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Throttle opening     | OFF               |
| Motor continuity     | OFF               |

#### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### • Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--------------------------------------------------|-----------------|
| Opening variation after continuity is set to OFF | $\geq 2^\circ$  |

**Time Needed for Diagnosis:** 600 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

### 8. FAIL SAFE

Fix the throttle opening to 6°.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DA:DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS)

#### 1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Exhaust temperature method)

Judge NG when the exhaust temperature is high.

#### 2. ENABLE CONDITION

| Secondary Parameters                                   | Enable Conditions                                                              |
|--------------------------------------------------------|--------------------------------------------------------------------------------|
| All secondary parameters approval continuation time    | 1 second or more                                                               |
| Intake manifold pressure change during 0.5 engine rev. | < 16.0 kPa (120 mmHg, 4.72 inHg) (MT)<br>< 14.7 kPa (110 mmHg, 4.33 inHg) (AT) |
| Engine speed change                                    | < 500 rpm/32 milliseconds                                                      |
| Throttle position change during 16 milliseconds        | < 10°                                                                          |
| Fuel shut-off function                                 | Not in operation                                                               |
| Atmospheric pressure                                   | ≥ 75.1 kPa (563 mmHg, 22.2 inHg)                                               |
| Fuel level                                             | ≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)                                            |
| Air conditioner                                        | No switching ON ↔ OFF                                                          |
| Radiator fan                                           | No switching ON ↔ OFF                                                          |
| Power steering switch                                  | No switching ON ↔ OFF                                                          |
| Starter                                                | ON, OFF, or change from ON to OFF                                              |
| Evaporative system leak check                          | Not in operation                                                               |
| Engine speed                                           | 500 — 6700 rpm                                                                 |
| Intake manifold pressure                               | > Map3 or more                                                                 |
| Battery voltage                                        | ≥ 8 V                                                                          |
| Engine coolant temperature                             | ≥ 111°C (232°F)                                                                |
| Intake air temperature                                 | ≥ 101°C (214°F)                                                                |
| Heavy quality fuel judgement                           | Does not execute.                                                              |
| VDC and AT control                                     | Is not torque controlling.                                                     |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## Map3

- MT

### Vehicle Speed < 64.4 km/h (40 MPH)

| rpm             | 700            | 1000           | 1500           | 2000           | 2500           | 3000           | 3500             | 4000           | 4500             | 5000           | 5500             | 6000           | 6500             | 6700           |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|
| kPa             | 25.1           | 24.8           | 25.6           | 23.3           | 26.3           | 25.9           | 28.9             | 30.0           | 31.7             | 33.0           | 37.1             | 41.9           | 47.0             | 51.1           |
| (mmHg,<br>inHg) | (188,<br>7.40) | (186,<br>7.32) | (192,<br>7.56) | (175,<br>6.89) | (197,<br>7.76) | (194,<br>7.64) | (216.5,<br>8.52) | (225,<br>8.86) | (237.5,<br>9.35) | (248,<br>9.76) | (278.5,<br>11.0) | (314,<br>12.4) | (352.5,<br>13.9) | (383,<br>15.1) |

### Vehicle Speed ≥ 64.4 km/h (40 MPH)

| rpm             | 700            | 1000           | 1500             | 2000             | 2500             | 3000             | 3500             | 4000           | 4500             | 5000             | 5500             | 6000             | 6500           | 6700           |
|-----------------|----------------|----------------|------------------|------------------|------------------|------------------|------------------|----------------|------------------|------------------|------------------|------------------|----------------|----------------|
| kPa             | 25.5           | 25.1           | 30.4             | 35.6             | 38.5             | 40.4             | 41.1             | 40.8           | 44.8             | 47.3             | 49.1             | 50.9             | 52.8           | 52.8           |
| (mmHg,<br>inHg) | (191,<br>7.52) | (188,<br>7.40) | (227.7,<br>8.96) | (267.4,<br>10.5) | (288.9,<br>11.4) | (302.9,<br>11.9) | (308.6,<br>12.1) | (306,<br>12.0) | (335.8,<br>13.2) | (354.5,<br>14.0) | (368.2,<br>14.5) | (381.9,<br>15.0) | (396,<br>15.6) | (396,<br>15.6) |

- AT

### Vehicle Speed ≥ 64.4 km/h (40 MPH)

| rpm             | 700            | 1000           | 1500           | 2000           | 2500           | 3000           | 3500             | 4000           | 4500             | 5000           | 5500             | 6000             | 6500              | 6700            |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|----------------|------------------|----------------|------------------|------------------|-------------------|-----------------|
| kPa             | 26.3           | 24.8           | 23.6           | 25.5           | 27.3           | 26.1           | 29.5             | 31.3           | 32.7             | 33.3           | 38.2             | 33.6             | 49.5              | 51.5            |
| (mmHg,<br>inHg) | (197,<br>7.76) | (186,<br>7.32) | (177,<br>6.97) | (191,<br>7.52) | (205,<br>8.07) | (196,<br>7.72) | (221.5,<br>8.72) | (235,<br>9.25) | (245.5,<br>9.67) | (250,<br>9.84) | (286.5,<br>11.3) | (252.3,<br>9.93) | (371.5,<br>14.62) | (386,<br>15.20) |

## 3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution.
- Always perform the diagnosis continuously.

## 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below continue 200 engine revs. (400 ignitions) in a row.

### Judgment Value

| Malfunction Criteria | Threshold Value   |
|----------------------|-------------------|
| Exhaust temperature  | > 1050°C (1922°F) |

**Time Needed for Diagnosis:** 200 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DB:DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of exhaust temperature sensor output property.

Judge NG when the exhaust temperature remains high or low whereas it seemed to vary from the viewpoint of driving condition.

#### 2. ENABLE CONDITION

| Secondary Parameters                       | Enable Conditions                                   |
|--------------------------------------------|-----------------------------------------------------|
| After starting engine                      | 240 seconds or more                                 |
| Engine coolant temperature at engine start | $\leq 40^{\circ}\text{C}$ ( $104^{\circ}\text{F}$ ) |
| Engine coolant temperature                 | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |
| Intake air temperature at engine start     | $\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ )   |
| Estimate ambient temperature               | $\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ )   |
| Engine speed                               | $\geq 2400$ rpm                                     |
| Engine load                                | $\geq 0.85$ g (0.030 oz)/rev                        |
| Lambda value                               | $0.75 \leftrightarrow 1.25$                         |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at more than 2400 rpm of engine speed in 240 seconds and more after starting the engine in cool condition.

Pay attention to the coolant temperature at engine starting.

#### 4. DIAGNOSTIC METHOD

Judge NG when one of the malfunction criteria below is completed, and judge OK and clear the NG when all of the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria                          | Threshold Value                                       |
|-----------------------------------------------|-------------------------------------------------------|
| Min. exhaust temperature from engine starting | $\geq 700^{\circ}\text{C}$ ( $1292^{\circ}\text{F}$ ) |
| Max. exhaust temperature from engine starting | $< 500^{\circ}\text{C}$ ( $932^{\circ}\text{F}$ )     |

**Time Needed for Diagnosis:** 0 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

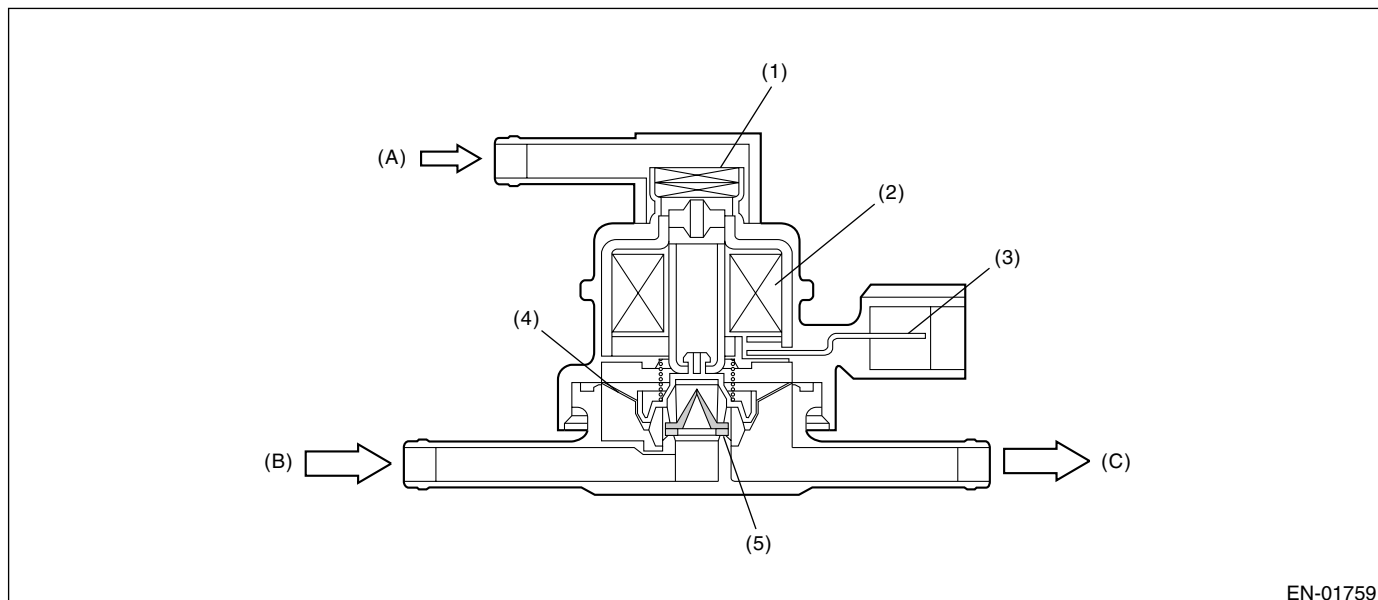
## GENERAL DESCRIPTION

### DC:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



- |                        |               |                          |
|------------------------|---------------|--------------------------|
| (1) Filter             | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil               | (5) Valve     | (B) Shut off valve       |
| (3) Connector terminal |               | (C) To fuel tank         |

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions    |
|-----------------------|----------------------|
| Ignition switch       | ON                   |
| Battery voltage       | $\geq 10.9\text{ V}$ |
| After starting engine | 1 second or more     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|----------------------------------------------|-----------------|
| Terminal voltage when ECM outputs off signal | Low             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

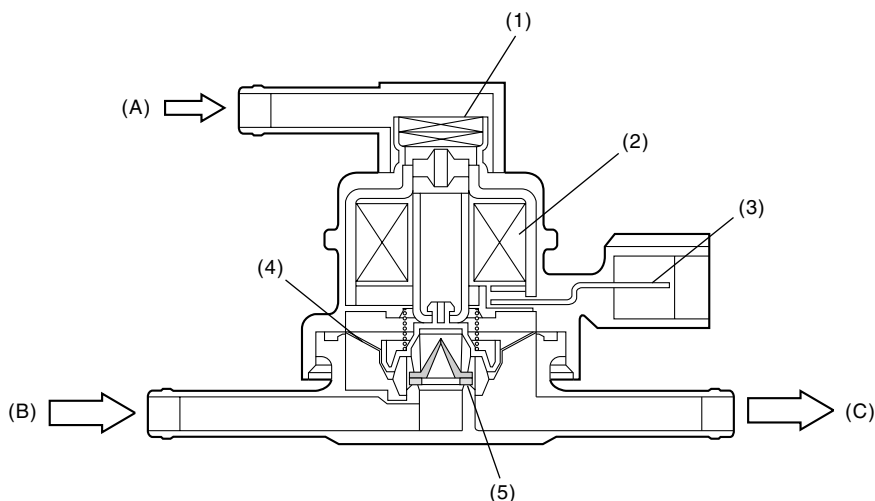
### DD:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



EN-01759

(1) Filter

(2) Coil

(3) Connector terminal

(4) Diaphragm

(5) Valve

(A) Atmospheric pressure

(B) Shut off valve

(C) To fuel tank

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After starting engine | 1 second or more      |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|----------------------------------------------|-----------------|
| Terminal voltage when ECM outputs off signal | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA**

### **GENERAL DESCRIPTION**

---

## **DE:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —**

### **1. OUTLINE OF DIAGNOSIS**

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-128, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

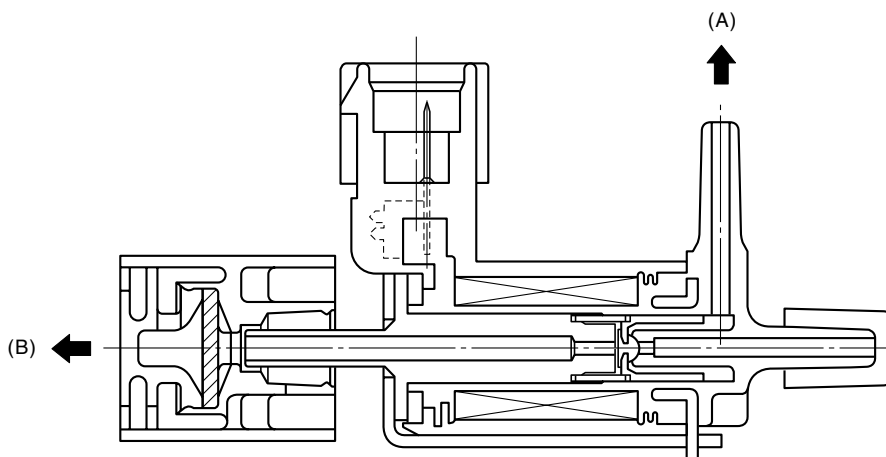
## DF:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.

Judge NG when the ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01721

(A) Fuel tank pressure sensor

(B) Ambient air

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

### • Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---------------------------------------------------|------------------|
| Battery voltage                                   | $\geq 10.9$ V    |
| After starting engine                             | 1 second or more |
| Terminal output voltage when ECM sent OFF signals | Low              |
| Ignition switch                                   | ON               |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---------------------------------------------------|------------------|
| Battery voltage                                   | $\geq 10.9$ V    |
| After starting engine                             | 1 second or more |
| Terminal output voltage when ECM sent OFF signals | High             |
| Ignition switch                                   | ON               |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### GENERAL DESCRIPTION

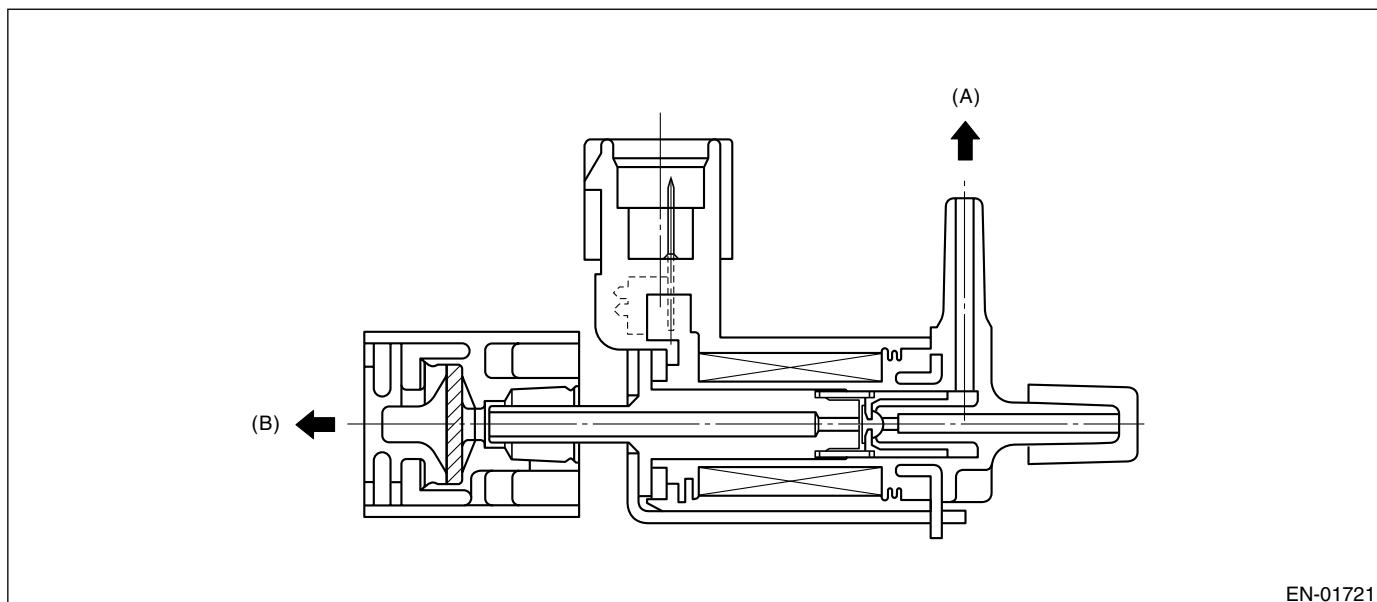
## DG:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.

Judge NG when the ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor

(B) Ambient air

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

### • Judgment Value

| Malfunction Criteria                             | Threshold Value  |
|--------------------------------------------------|------------------|
| Battery voltage                                  | $\geq 10.9$ V    |
| After starting engine                            | 1 second or more |
| Terminal output voltage when ECM sent ON signals | High             |
| Ignition switch                                  | ON               |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---------------------------------------------------|------------------|
| Battery voltage                                   | $\geq 10.9$ V    |
| After starting engine                             | 1 second or more |
| Terminal output voltage when ECM sent OFF signals | Low              |
| Ignition switch                                   | ON               |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DH:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —

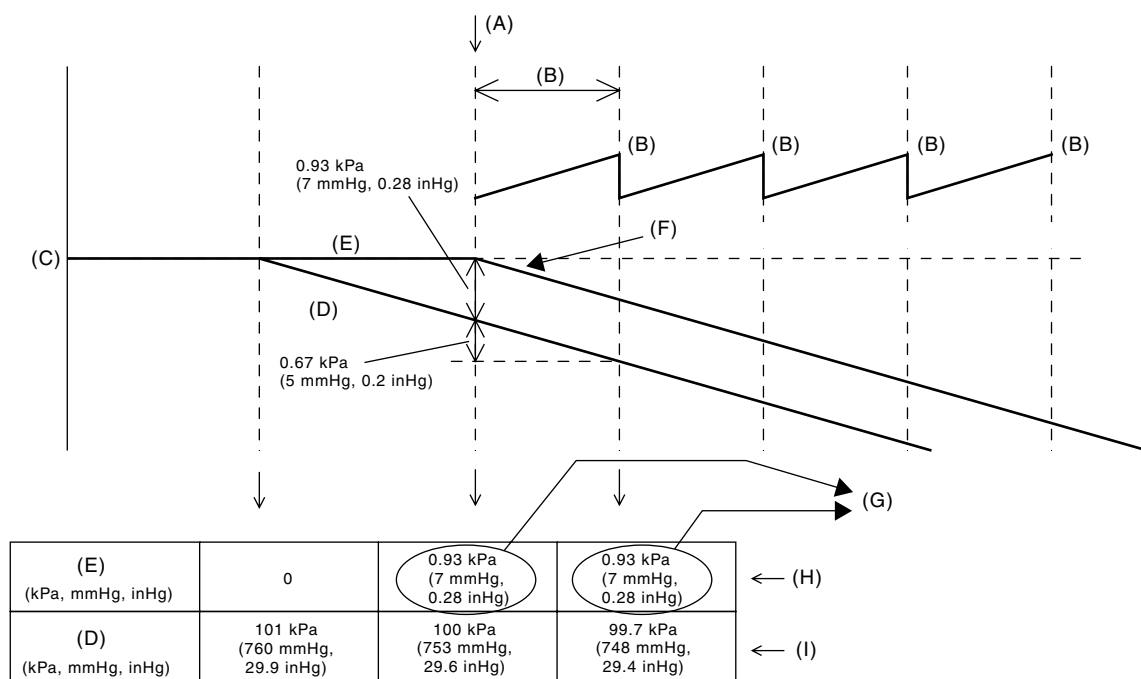
#### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.

The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

#### • Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg)) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.



EN-01878

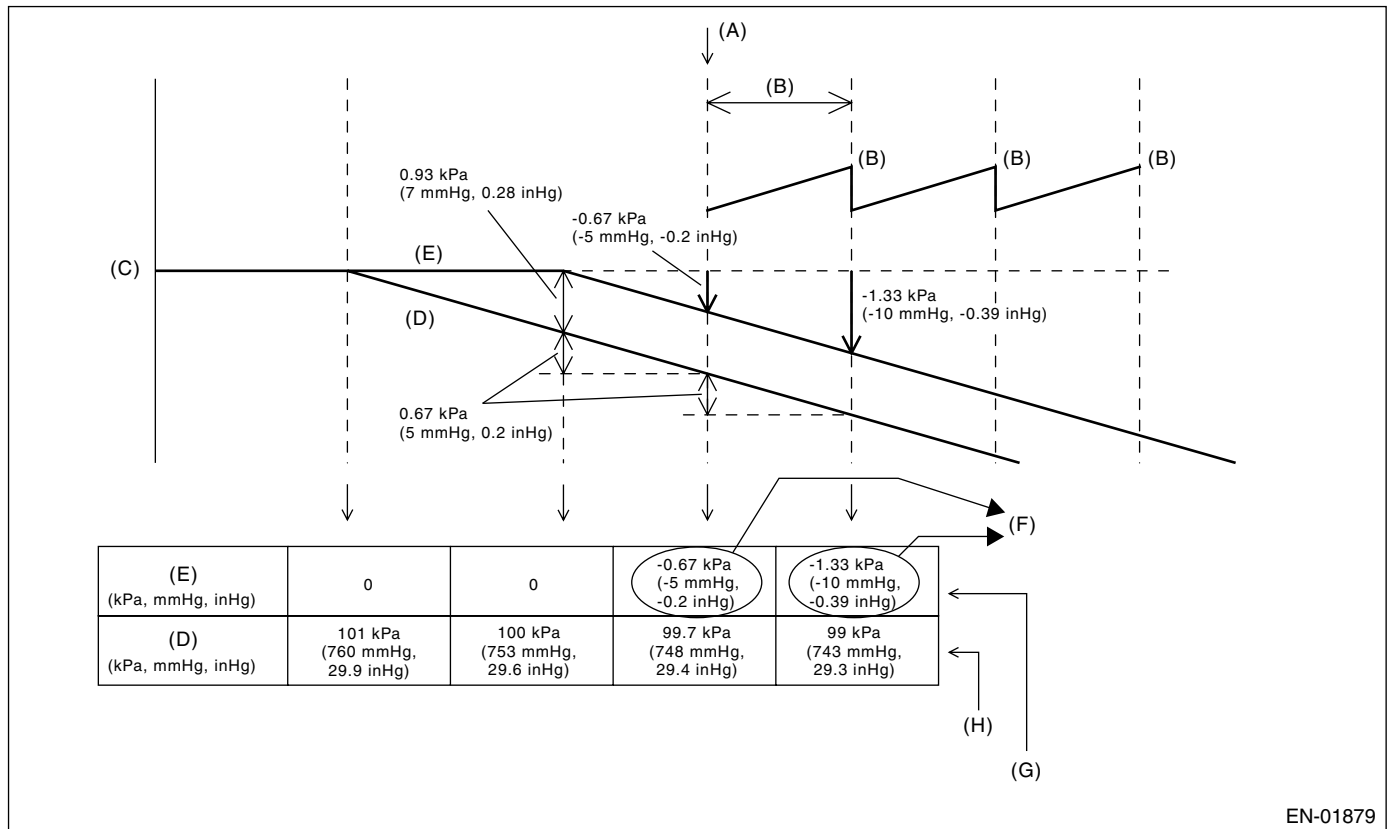
- |                                      |                                                      |                                                                         |
|--------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------|
| (A) Enable conditions are completed. | (F) PCV function reduces the tank pressure           | (H) The tank pressure is relative pressure against atmospheric pressure |
| (B) 80S                              | (G) Judge OK when the tank pressure does not change. | (I) Change of atmospheric pressure                                      |
| (C) Pressure                         |                                                      |                                                                         |
| (D) Atmospheric pressure             |                                                      |                                                                         |
| (E) Tank pressure                    |                                                      |                                                                         |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## • Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



EN-01879

- (A) Enable conditions are completed.
- (B) 80S
- (C) Pressure
- (D) Atmospheric pressure
- (E) Tank pressure
- (F) Judge NG temporarily the tank pressure changes once, and then judge NG the tank pressure changes five consecutive times

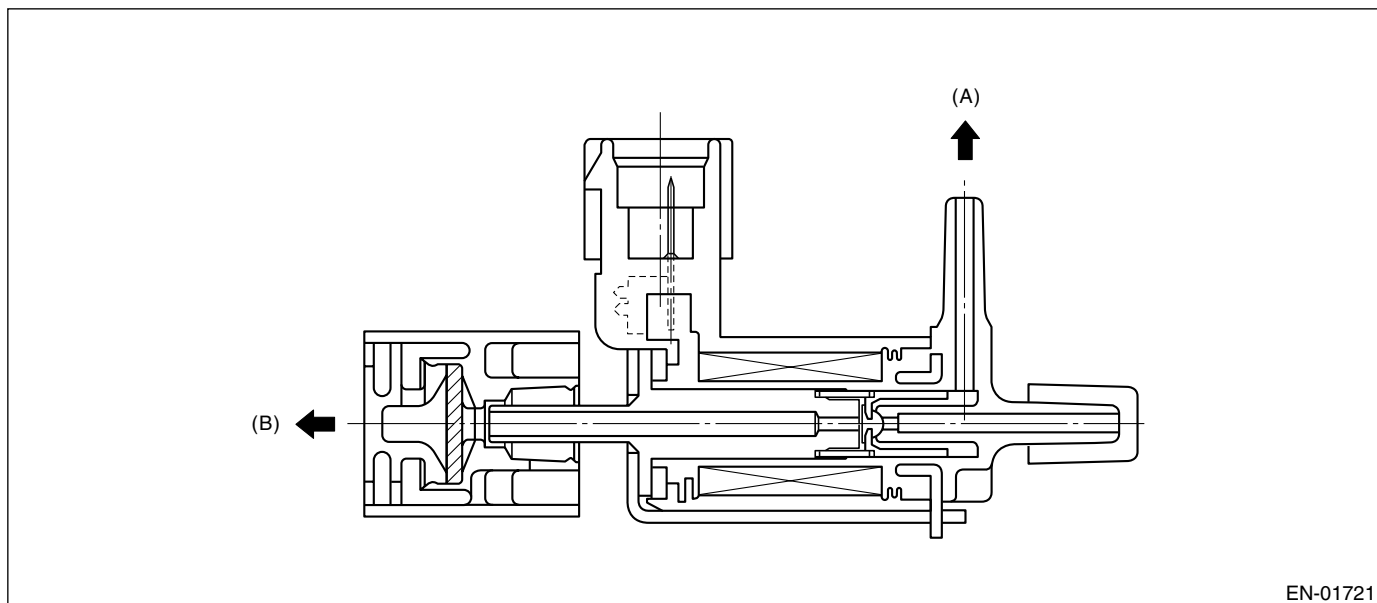
- (G) The tank pressure is relative pressure against atmospheric pressure. Ordinary, part of pressure comparison is atmospheric pressure 760 mmHg (29.9 inHg).

- (H) Atmospheric pressure is absolute pressure.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### 2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor

(B) Ambient air

### 3. ENABLE CONDITION

| Secondary Parameter          | Enable Condition                                                                                                       |
|------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Battery voltage              | $\geq 10.9 \text{ V}$                                                                                                  |
| Fuel level                   | $9 \leftrightarrow 51 \text{ l (2.38} \leftrightarrow 13.3 \text{ US gal, 1.98} \leftrightarrow 11.2 \text{ Imp gal)}$ |
| Evaporation system diagnosis | Not in operation                                                                                                       |
| After starting engine        | 80 seconds or more                                                                                                     |
| Fuel tank pressure           | $< -0.67 \text{ kPa (-5 mmHg, -0.2 inHg)}$ or $> -0.93 \text{ kPa (7 mmHg, 0.28 inHg)}$                                |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

### • Judgment Value

| Malfunction Criteria                    | Threshold Value                                    |
|-----------------------------------------|----------------------------------------------------|
| Atmospheric air change in 80 seconds    | $\geq 0.67$ kPa (4.5 mmHg, 0.2 inHg)               |
| Fuel tank pressure change in 80 seconds | $\geq 0.67$ kPa (4.5 mmHg, 0.2 inHg)               |
| Fuel level change                       | $< 3 \text{ } \emptyset$ (3.2 US gal, 2.6 Imp gal) |

**Time Needed for Diagnosis:** 80 seconds  $\times$  5 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

### • Judgment Value

| Malfunction Criteria                    | Threshold Value                      |
|-----------------------------------------|--------------------------------------|
| Atmospheric air change in 80 seconds    | $\geq 0.67$ kPa (4.5 mmHg, 0.2 inHg) |
| Fuel tank pressure change in 80 seconds | $< 0.67$ kPa (4.5 mmHg, 0.2 inHg)    |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

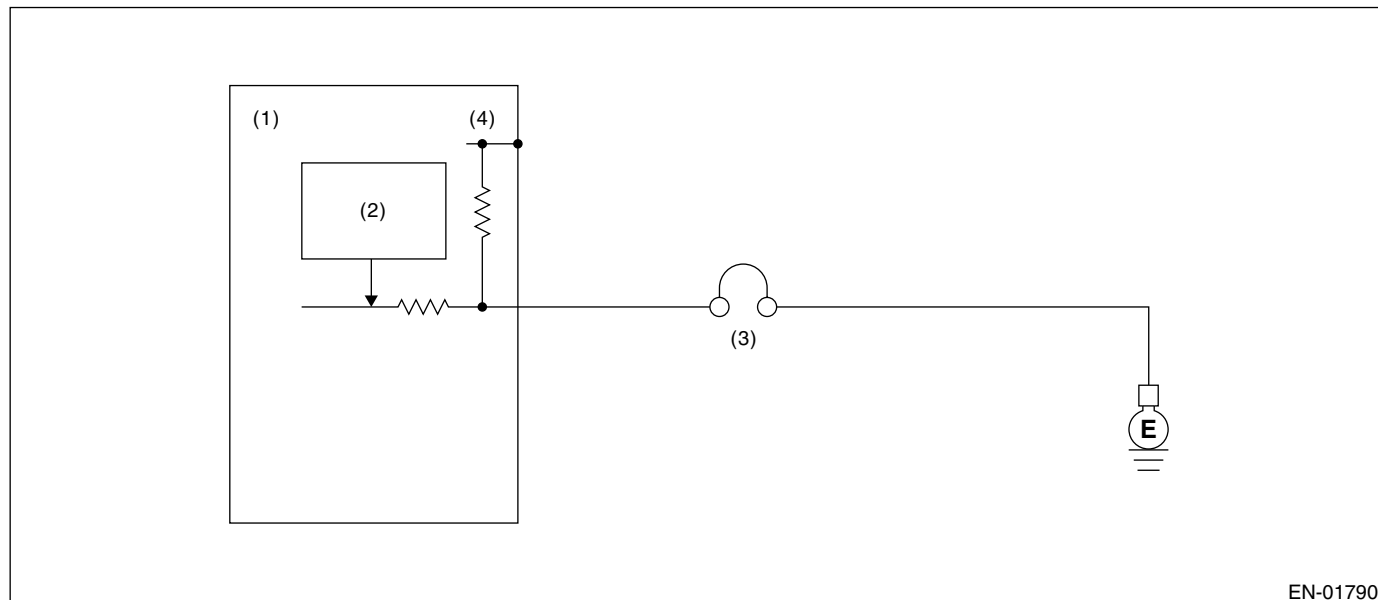
## GENERAL DESCRIPTION

### DI: DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —

#### 1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.  
Judge NG when the diagnosis terminal voltage is high.

#### 2. COMPONENT DESCRIPTION



EN-01790

- |                                 |                             |
|---------------------------------|-----------------------------|
| (1) Engine control module (ECM) | (3) PCV diagnosis connector |
| (2) Detecting circuit           | (4) 5 V                     |

#### 3. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| None                |                  |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSIS METHOD

### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.5 seconds.

### • Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--------------------------------------------------|-----------------|
| Battery voltage                                  | > 10.9 V        |
| Engine speed                                     | ≥ 500 rpm       |
| Positive crankcase ventilation diagnosis voltage | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

### • Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--------------------------------------------------|-----------------|
| Battery voltage                                  | > 10.9 V        |
| Engine speed                                     | ≥ 500 rpm       |
| Positive crankcase ventilation diagnosis voltage | Low             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DJ:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge OFF NG when the malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria                                                                                                                                                                                                                                 | Threshold Value                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Vehicle speed<br>It took more than 0.8 seconds at engine starting, and then it turned after engine starting.<br>Starter ON signal<br>Engine speed after the engine speed of 500 rpm or less has continued for 0.8 seconds or more<br>Battery voltage | < 1 km/h (0.62 MPH)<br><br>Not detected<br>≥ 500 rpm<br>> 8 V |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria                                  | Threshold Value                       |
|-------------------------------------------------------|---------------------------------------|
| Starter ON<br>Starter ON diagnosis<br>Battery voltage | Experienced<br>Not diagnosis<br>> 8 V |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## DK:DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of high exhaust gas temperature.  
Judge NG when the exhaust gas becomes too high.

### 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 NG when the continuous time of completing the malfunction criteria below becomes more than 8.2 seconds.

#### • Judgment Value

| Malfunction Criteria | Threshold Value   |
|----------------------|-------------------|
| Fuel cut event       | Not in operation  |
| After fuel cut       | ≥ 1 milliseconds  |
| Exhaust temperature  | ≥ 1050°C (1922°F) |

**Time Needed for Diagnosis:** 8.2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 8.2 seconds.

#### • Judgment Value

| Malfunction Criteria | Threshold Value  |
|----------------------|------------------|
| Exhaust temperature  | < 550°C (1022°F) |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DL:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.

Judge NG when the back-up voltage becomes smaller than the battery voltage.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| None                |                  |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### • Judgment Value

| Malfunction Criteria     | Threshold Value                       |
|--------------------------|---------------------------------------|
| Voltage of back-up power | $< \text{Battery voltage} \times 0.7$ |
| Battery voltage          | $\geq 10.9 \text{ V}$                 |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

##### • Judgment Value

| Malfunction Criteria            | Threshold Value                          |
|---------------------------------|------------------------------------------|
| Voltage of back-up power supply | $\geq \text{Battery voltage} \times 0.7$ |
| Battery voltage                 | $\geq 10.9 \text{ V}$                    |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## DM:DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition      |
|---------------------|-----------------------|
| Battery voltage     | $\geq 10.9 \text{ V}$ |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### • Judgment Value

| Malfunction Criteria        | Threshold Value     |
|-----------------------------|---------------------|
| OCV control duty            | $\geq 99.61\%$      |
| OCV control present current | $< 0.306 \text{ A}$ |

**Time Needed for Diagnosis:** 2000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### • Judgment Value

| Malfunction Criteria                                       | Threshold Value       |
|------------------------------------------------------------|-----------------------|
| Target current value of OCV                                | $\geq 0.14\%$         |
| Target current value of OCV – Control current value of OCV | $\geq 0.08 \text{ A}$ |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°C A) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°C A) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DN:DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition      |
|---------------------|-----------------------|
| Battery voltage     | $\geq 10.9 \text{ V}$ |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### • Judgment Value

| Malfunction Criteria        | Threshold Value        |
|-----------------------------|------------------------|
| OCV control duty            | $< 0.39\%$             |
| OCV control present current | $\geq 0.306 \text{ A}$ |

**Time Needed for Diagnosis:** 2000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### • Judgment Value

| Malfunction Criteria                                       | Threshold Value    |
|------------------------------------------------------------|--------------------|
| Target current value of OCV – Control current value of OCV | $< 0.08 \text{ A}$ |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

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### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DO:DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition      |
|---------------------|-----------------------|
| Battery voltage     | $\geq 10.9 \text{ V}$ |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### • Judgment Value

| Malfunction Criteria        | Threshold Value     |
|-----------------------------|---------------------|
| OCV control duty            | $\geq 99.61\%$      |
| OCV control present current | $< 0.306 \text{ A}$ |

**Time Needed for Diagnosis:** 2000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### • Judgment Value

| Malfunction Criteria                                       | Threshold Value       |
|------------------------------------------------------------|-----------------------|
| Target current value of OCV                                | $\geq 0.14\%$         |
| Target current value of OCV – Control current value of OCV | $\geq 0.08 \text{ A}$ |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DP:DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition      |
|---------------------|-----------------------|
| Battery voltage     | $\geq 10.9 \text{ V}$ |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### • Judgment Value

| Malfunction Criteria        | Threshold Value        |
|-----------------------------|------------------------|
| OCV control duty            | $< 0.39\%$             |
| OCV control present current | $\geq 0.306 \text{ A}$ |

**Time Needed for Diagnosis:** 2000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### • Judgment Value

| Malfunction Criteria                                       | Threshold Value    |
|------------------------------------------------------------|--------------------|
| Target current value of OCV – Control current value of OCV | $< 0.08 \text{ A}$ |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°C A) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°C A) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DQ:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

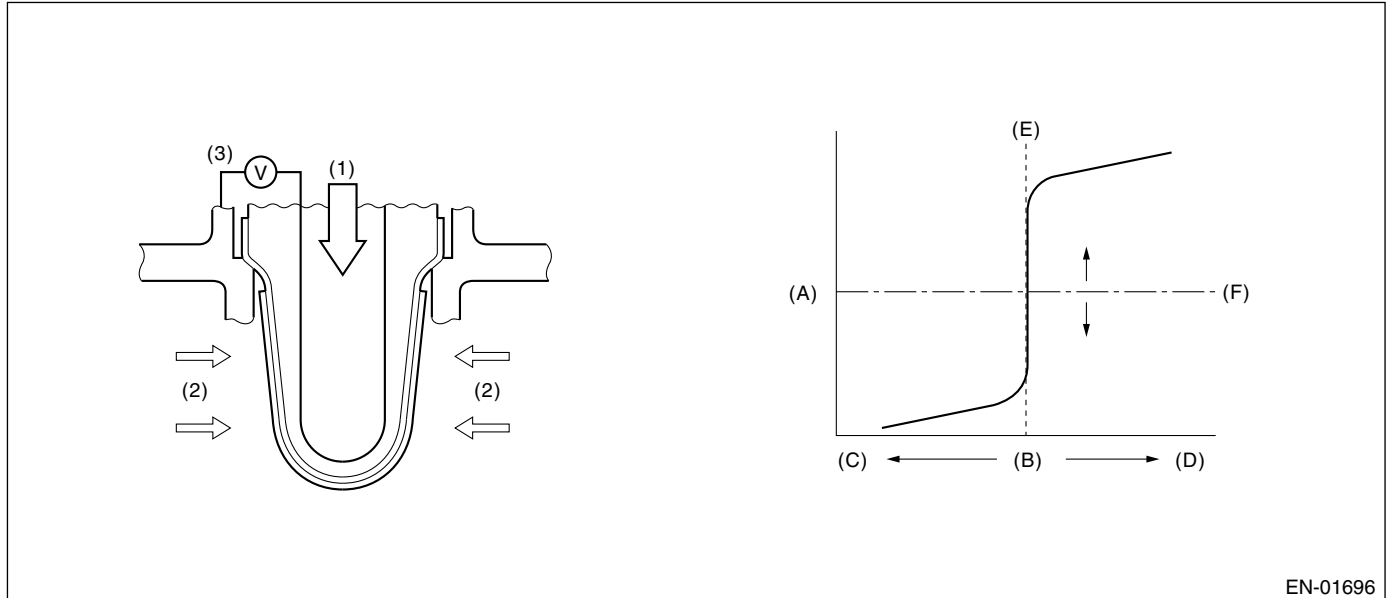
#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Sub feedback control amount sticks to lean sides during sub feedback control.

Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

#### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions                     |
|----------------------|---------------------------------------|
| Main feedback        | In operation                          |
| Sub feedback         | In operation                          |
| Amount of intake air | $\geq 15 \text{ g (0.53 oz)/sec}$     |
| Sub feedback         | Sticks to the limit value (lean side) |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH) or more.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to lean side and cumulative deviation (sumdelo2) of rear oxygen sensor voltage and target voltage.

Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.

#### • Judgment Value

| Malfunction Criteria                                                                                                                   | Threshold Value |
|----------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| sumdelo2 = sumdelo2 + (rvo2 - rsl)<br>rvo2 = sensing voltage of O <sub>2</sub> sensor<br>rsl = target voltage of O <sub>2</sub> sensor | < -2500 V       |

**Time Needed for Diagnosis:** 300 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

### DR:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

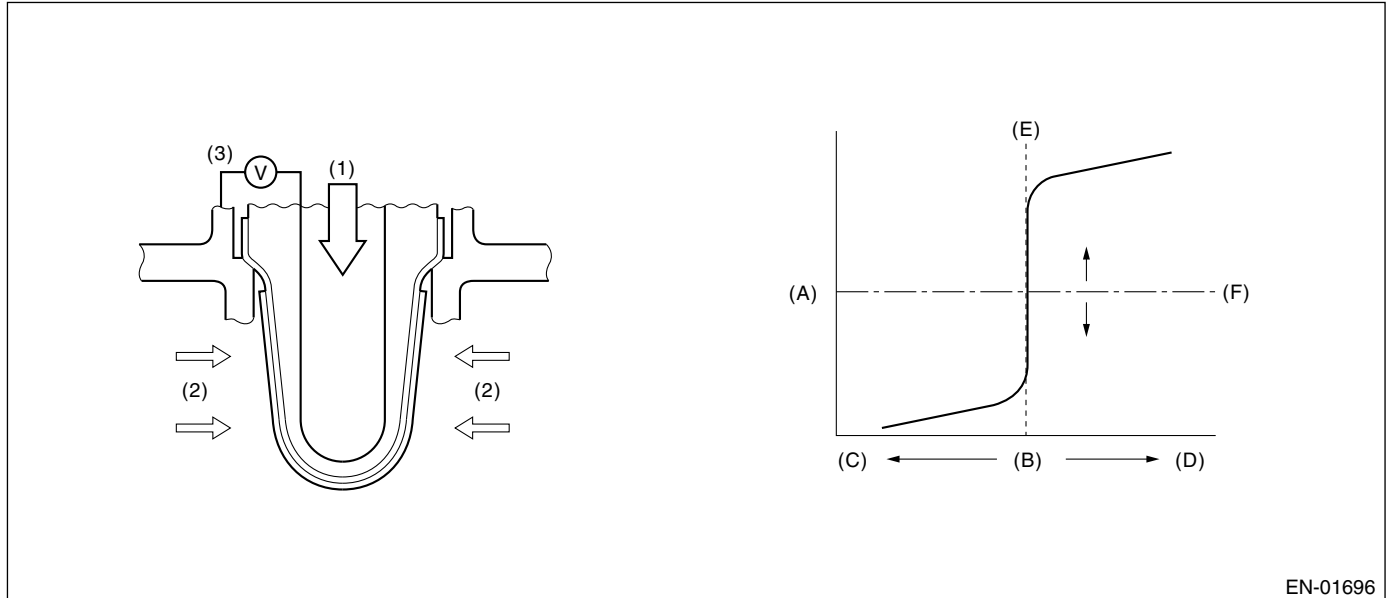
#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Sub feedback control amount sticks to rich sides during sub feedback control.

Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

#### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions                     |
|----------------------|---------------------------------------|
| Main feedback        | In operation                          |
| Sub feedback         | In operation                          |
| Amount of intake air | $\geq 15 \text{ g (0.53 oz)/sec}$     |
| Sub feedback         | Sticks to the limit value (rich side) |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH) or more.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich side and cumulative deviation (sumdelo2) of rear oxygen sensor voltage and target voltage.

Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.

### • Judgment Value

| Malfunction Criteria                                                                                                                   | Threshold Value |
|----------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| sumdelo2 = sumdelo2 + (rvo2 - rsl)<br>rvo2 = sensing voltage of O <sub>2</sub> sensor<br>rsl = target voltage of O <sub>2</sub> sensor | > 1500 V        |

**Time Needed for Diagnosis:** 300 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

### • Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

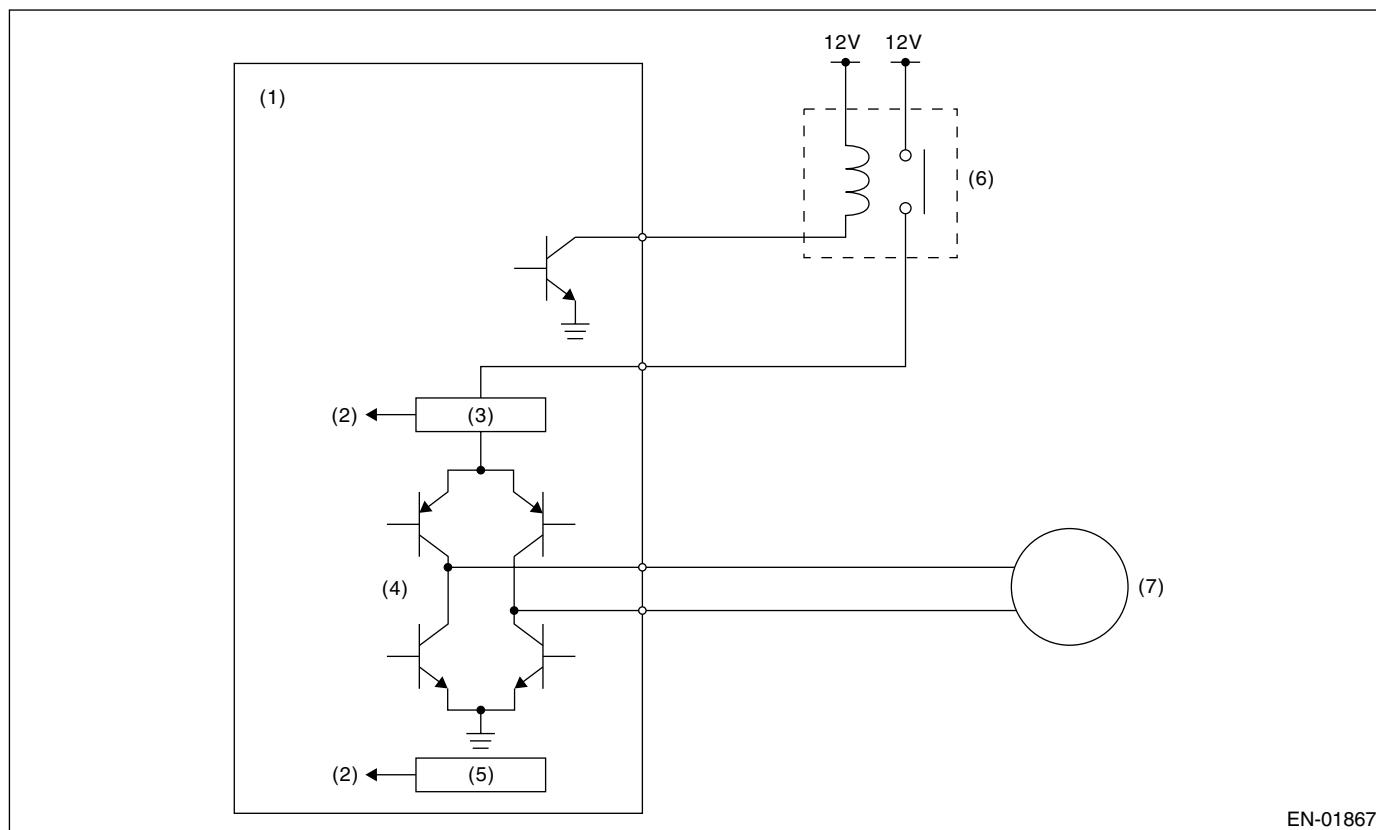
## GENERAL DESCRIPTION

### DS:DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

#### 2. COMPONENT DESCRIPTION



EN-01867

- |                                   |                                       |           |
|-----------------------------------|---------------------------------------|-----------|
| (1) Engine control unit (ECM)     | (4) Drive circuit                     | (7) Motor |
| (2) Detection circuit             | (5) Temperature detection circuit     |           |
| (3) Overcurrent detection circuit | (6) Electronic control throttle relay |           |

#### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions |
|----------------------------------------------|-------------------|
| Under control of electronic control throttle | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### • Judgment Value

| Malfunction Criteria            | Threshold Value                    |
|---------------------------------|------------------------------------|
| Motor current                   | $\leq 8$ A                         |
| Drive circuit inner temperature | $\leq 175^{\circ}\text{C}$ (347°F) |

### Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2000 milliseconds (OK judgment)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

## 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

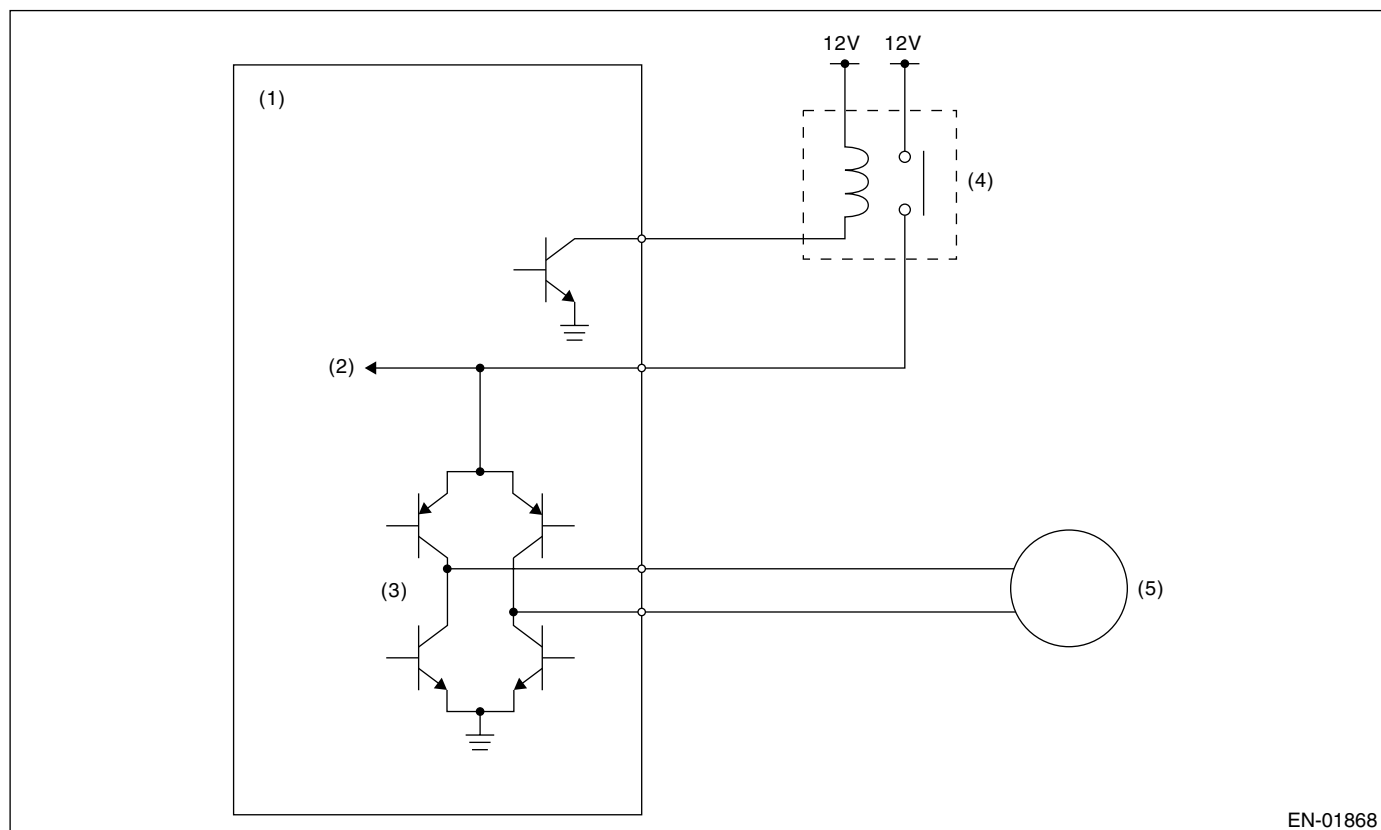
## GENERAL DESCRIPTION

### DT:DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to ON.

#### 2. COMPONENT DESCRIPTION



EN-01868

(1) Engine control module (ECM)

(3) Drive circuit

(5) Motor

(2) Voltage detection circuit

(4) Electronic control throttle relay

#### 3. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|------------------------------------------|-------------------|
| Electronic control throttle relay output | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### • Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Motor power voltage  | $\geq 5$ V      |

#### Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

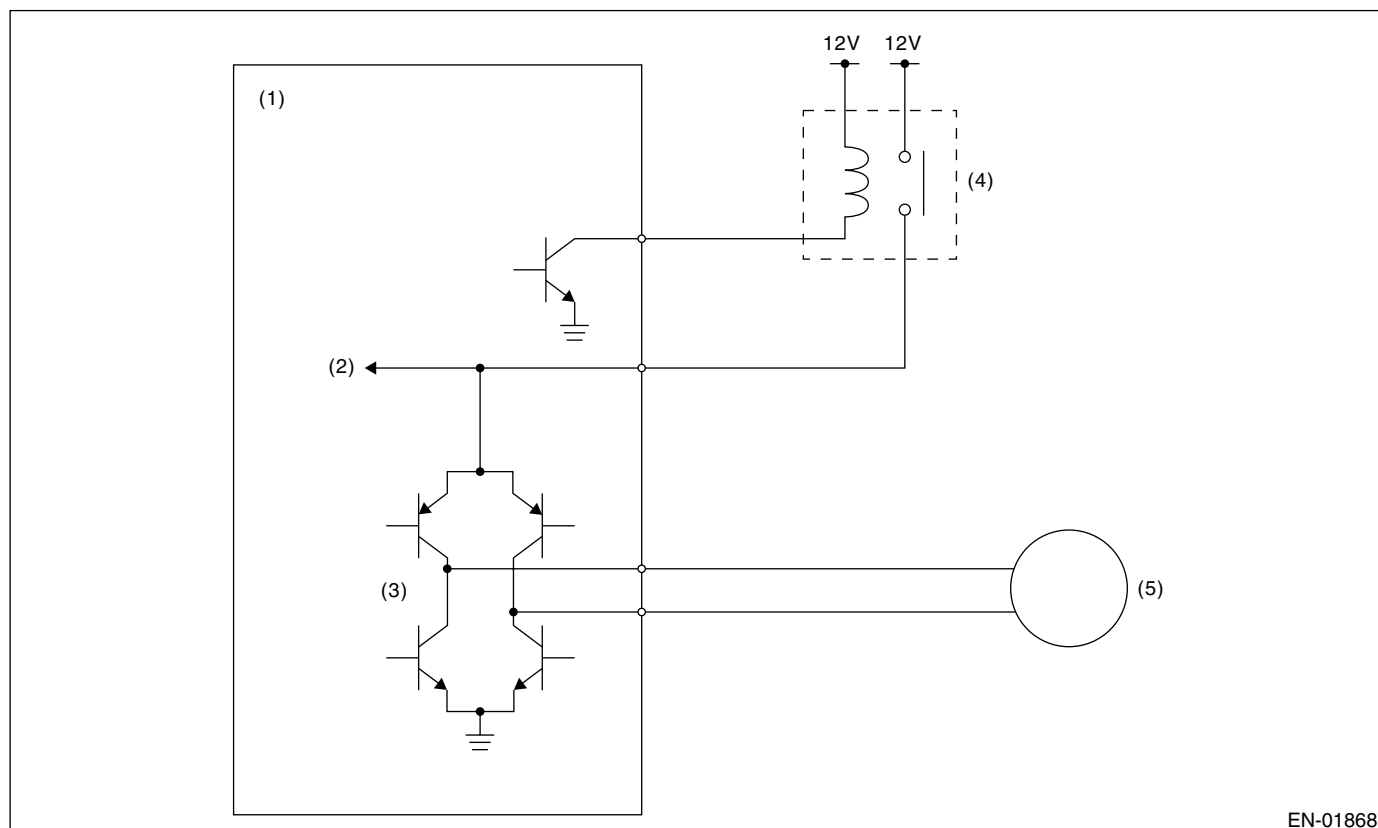
## GENERAL DESCRIPTION

### DU:DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the power for electronic throttle control system is not supplied even when ECM sets the electric throttle control relay to OFF.

#### 2. COMPONENT DESCRIPTION



EN-01868

- |                                 |                                       |           |
|---------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (3) Drive circuit                     | (5) Motor |
| (2) Voltage detection circuit   | (4) Electronic throttle control relay |           |

#### 3. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|------------------------------------------|-------------------|
| Electronic throttle control relay output | OFF               |

#### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Motor power voltage  | $\leq 5$ V      |

##### Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

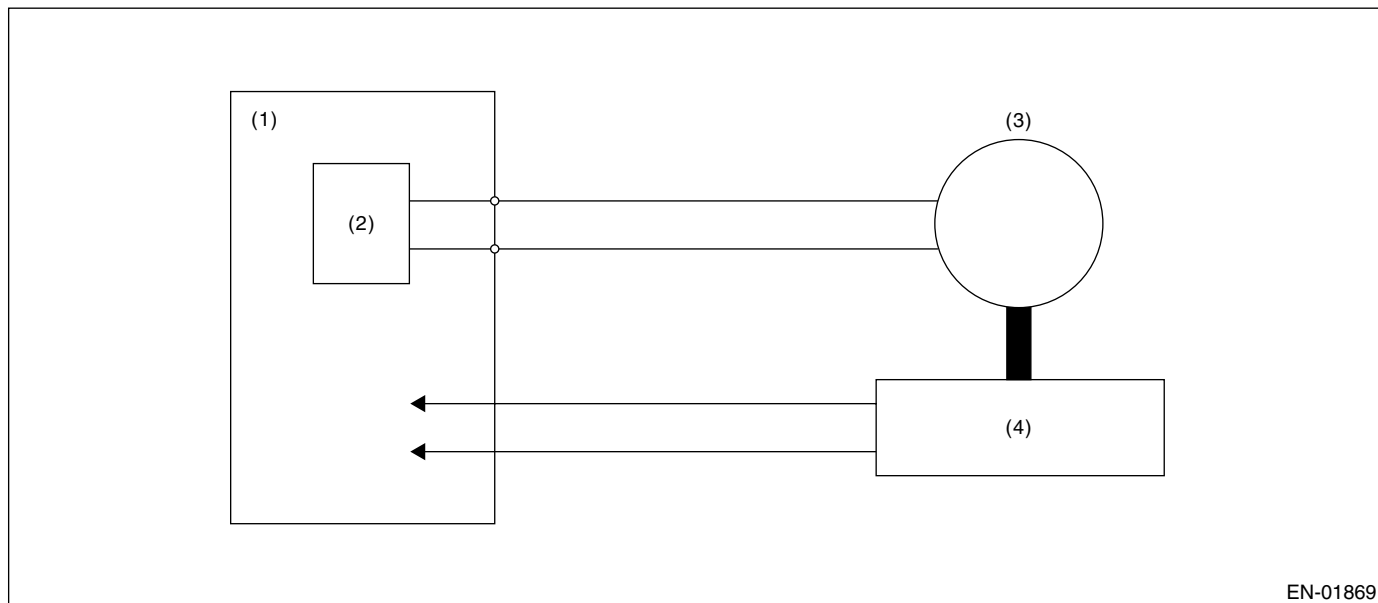
## GENERAL DESCRIPTION

### DV:DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot conducted or abnormal value is detected.

#### 2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Motor

(2) Drive circuit

(4) Throttle position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters                      | Enable Conditions |
|-------------------------------------------|-------------------|
| Ignition switch                           | ON → OFF          |
| Ignition switch (after clear memory only) | OFF → ON          |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### • Judgment Value

| Malfunction Criteria                                | Threshold Value        |
|-----------------------------------------------------|------------------------|
| Throttle sensor voltage at all close point learning | 0.41 — 0.79 V          |
| Time for all close point learning completion        | Within 80 milliseconds |

**Time Needed for Diagnosis:** None

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

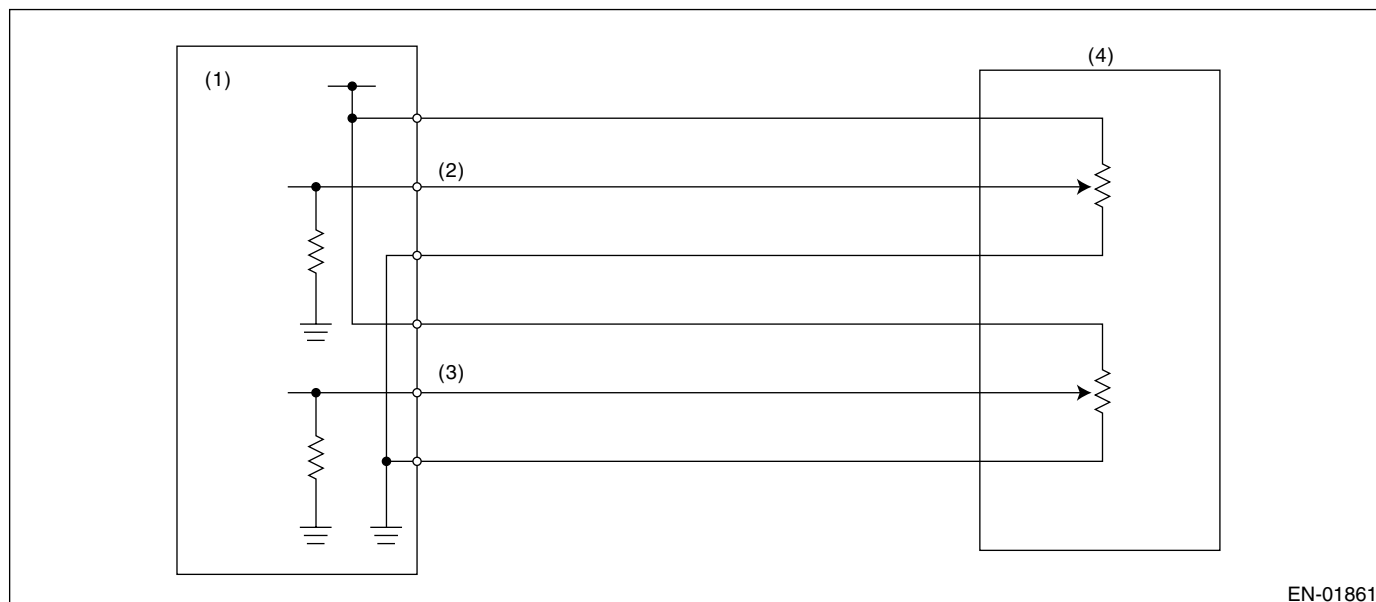
## GENERAL DESCRIPTION

### DW:DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)  
(2) Accelerator pedal position sensor 1 signal.  
(3) Accelerator pedal position sensor 2 signal.  
(4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 0.308$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

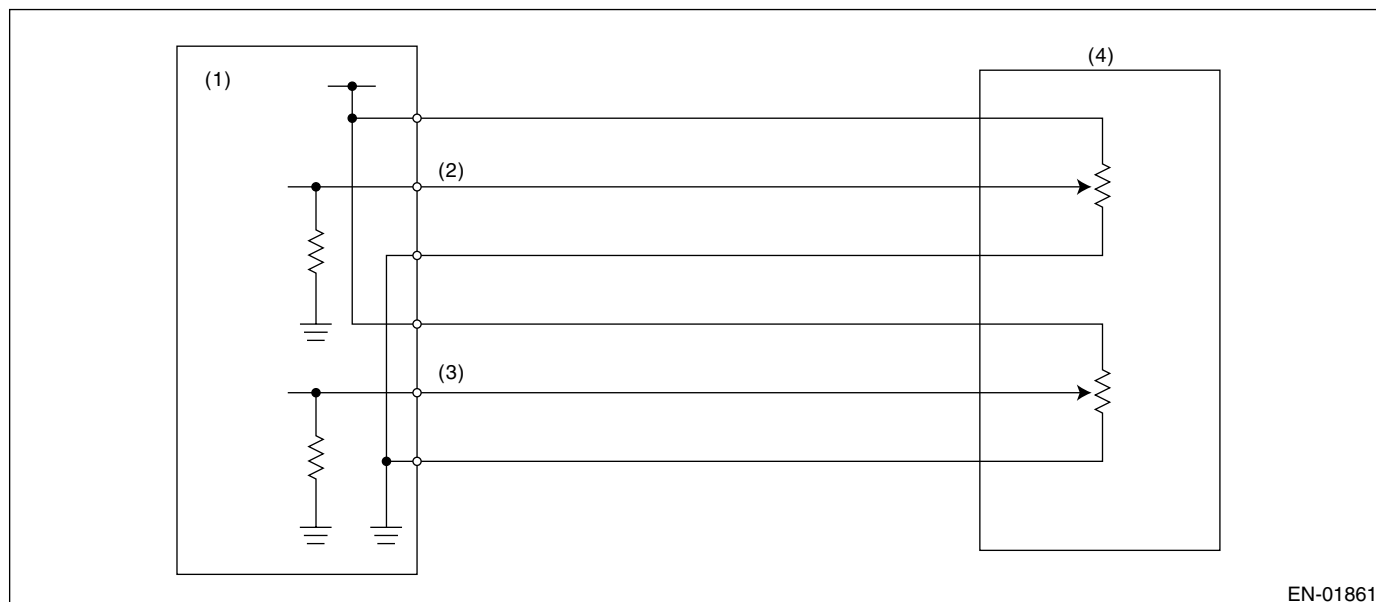
## GENERAL DESCRIPTION

### DX:DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)  
(2) Accelerator pedal position sensor 1 signal.  
(3) Accelerator pedal position sensor 2 signal.  
(4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 4.856$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

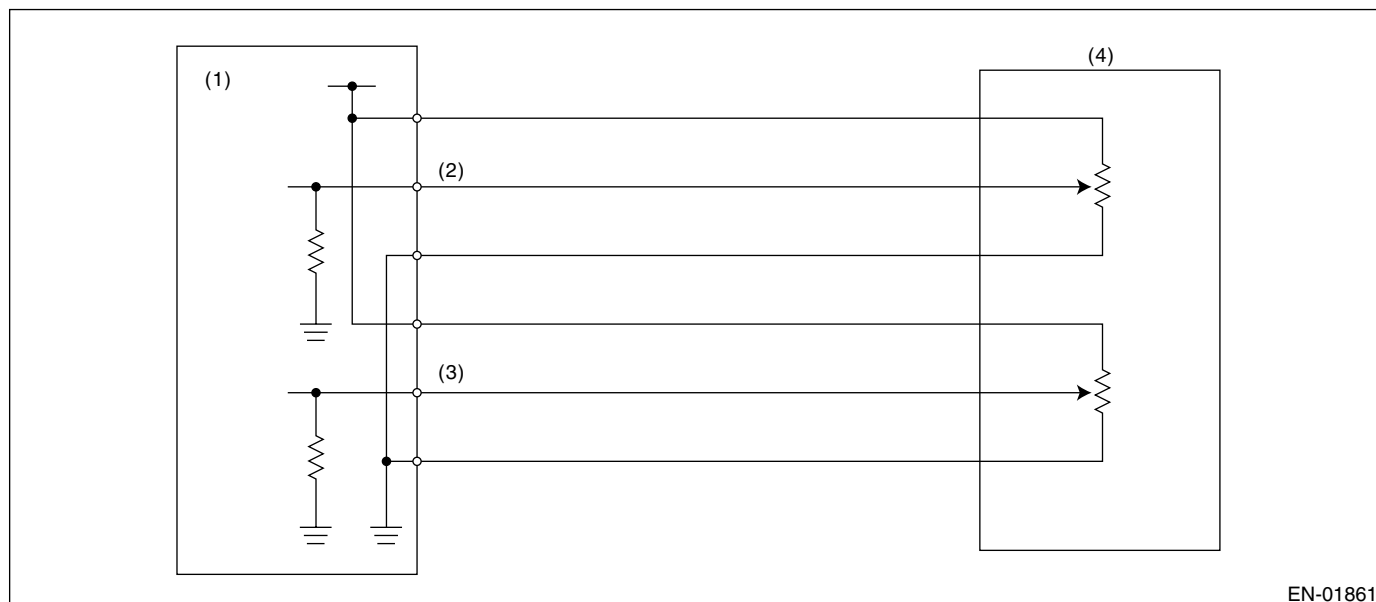
### DY:DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Accelerator pedal position sensor 1 signal.

(3) Accelerator pedal position sensor 2 signal.

(4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 0.308$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## GENERAL DESCRIPTION

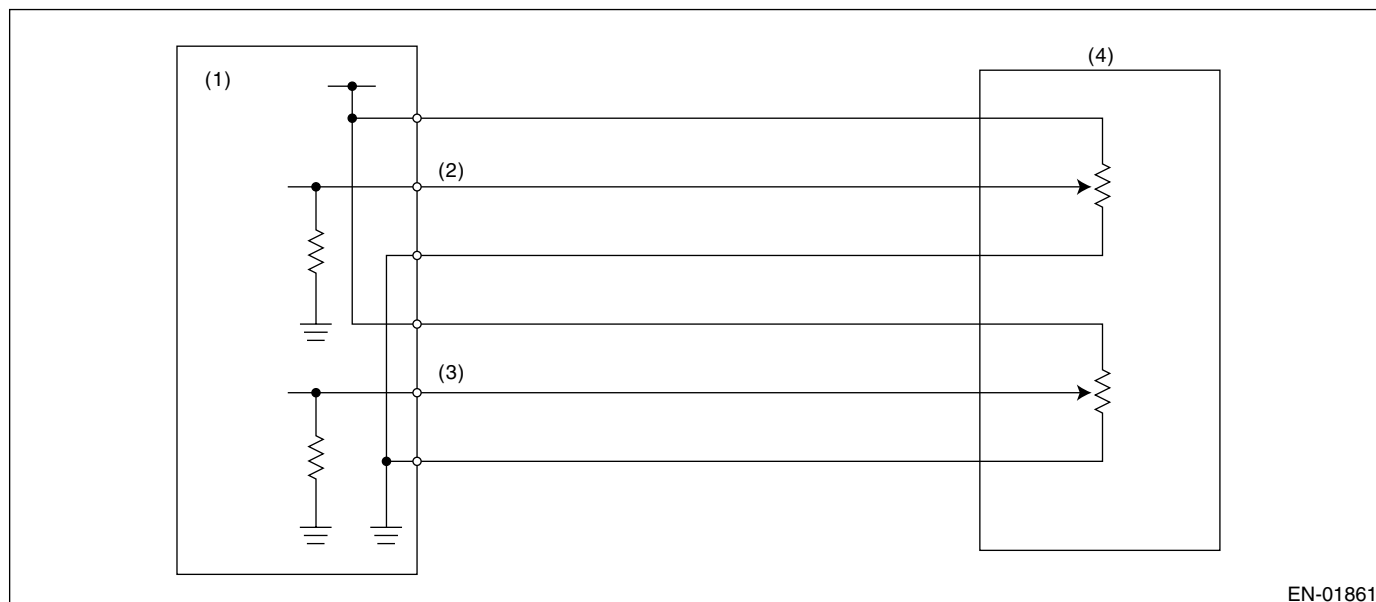
### DZ:DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)  
(2) Accelerator pedal position sensor 1 signal.

- (3) Accelerator pedal position sensor 2 signal.  
(4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value        |
|------------------------|------------------------|
| Sensor 1 input voltage | $\geq 0.308 \text{ V}$ |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

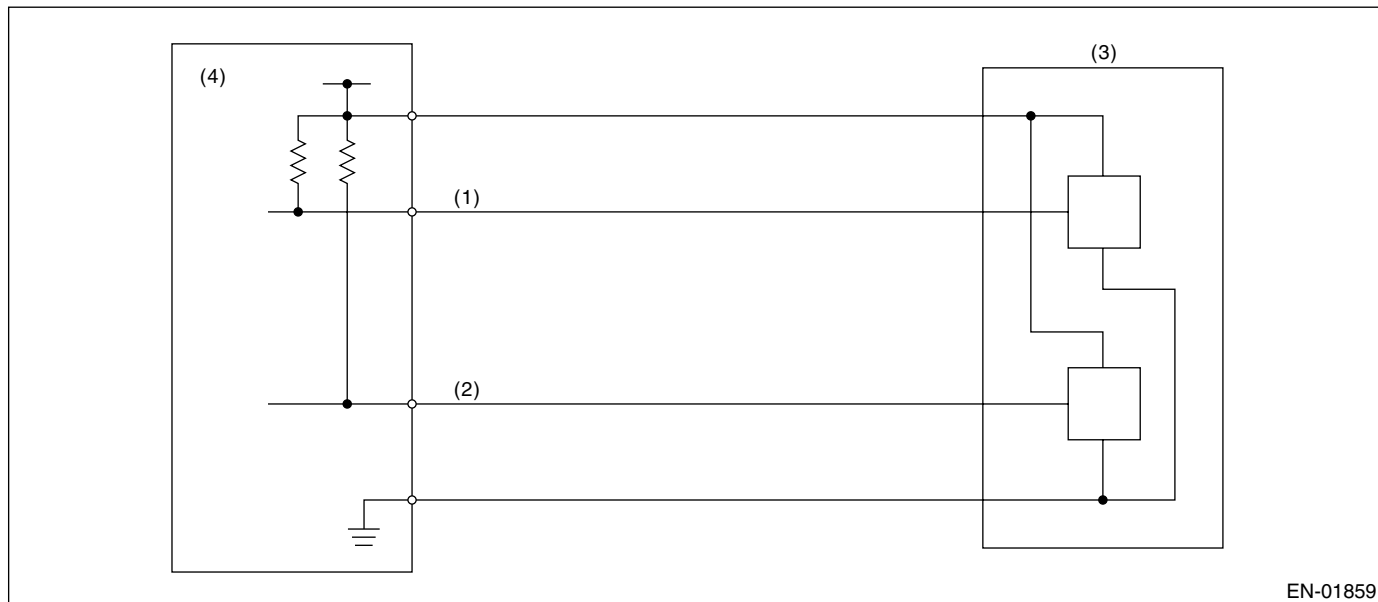
## GENERAL DESCRIPTION

### EA:DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

#### 2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal.

(3) Throttle position sensor

(2) Throttle position sensor 2 signal.

(4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

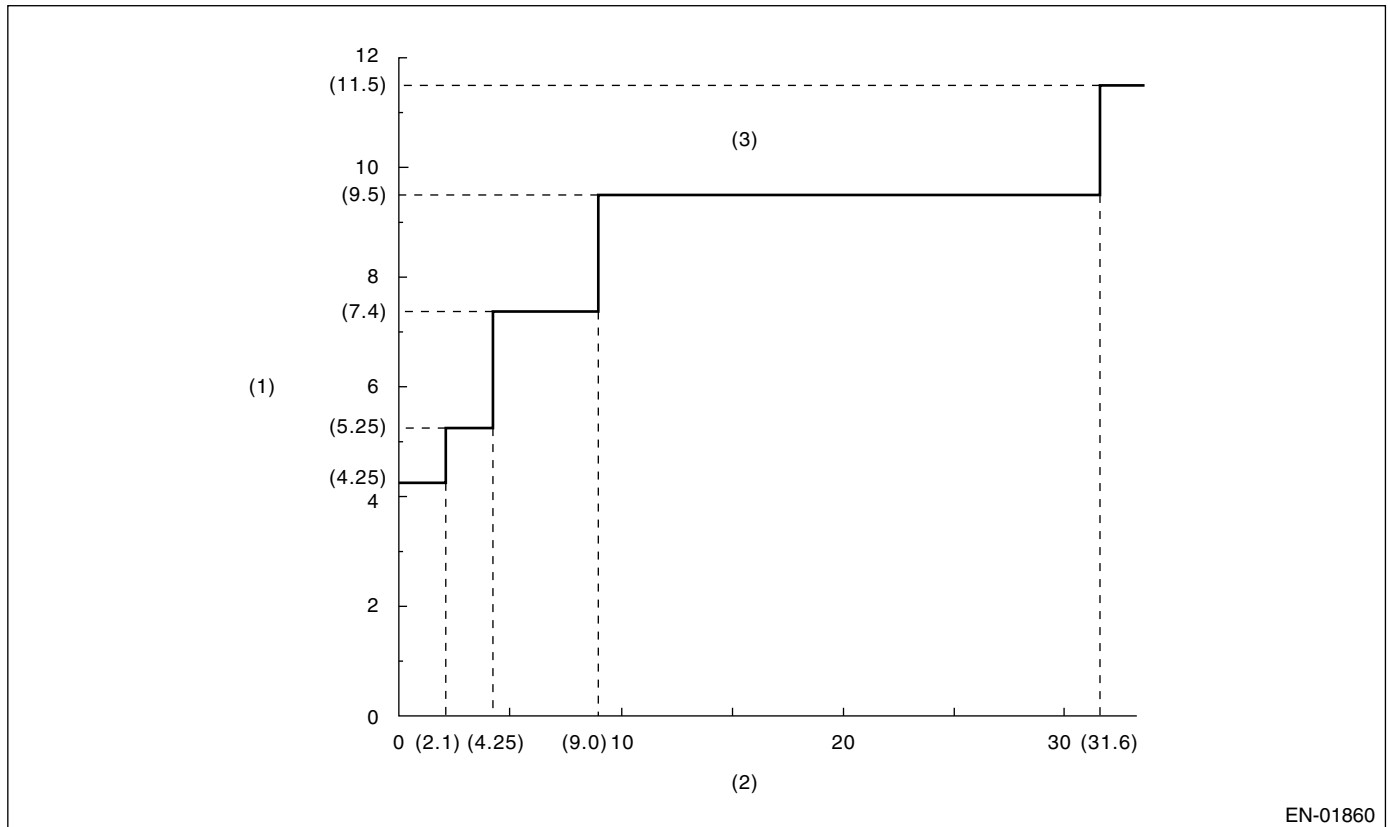
##### Judgment Value

| Malfunction Criteria                  | Threshold Value |
|---------------------------------------|-----------------|
| Signal difference between two sensors | $\leq 4.25$     |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## Details of Judgment Value



EN-01860

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

**Time Needed for Diagnosis:** 212 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

## 8. FAIL SAFE

Stop the continuity to ETC motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

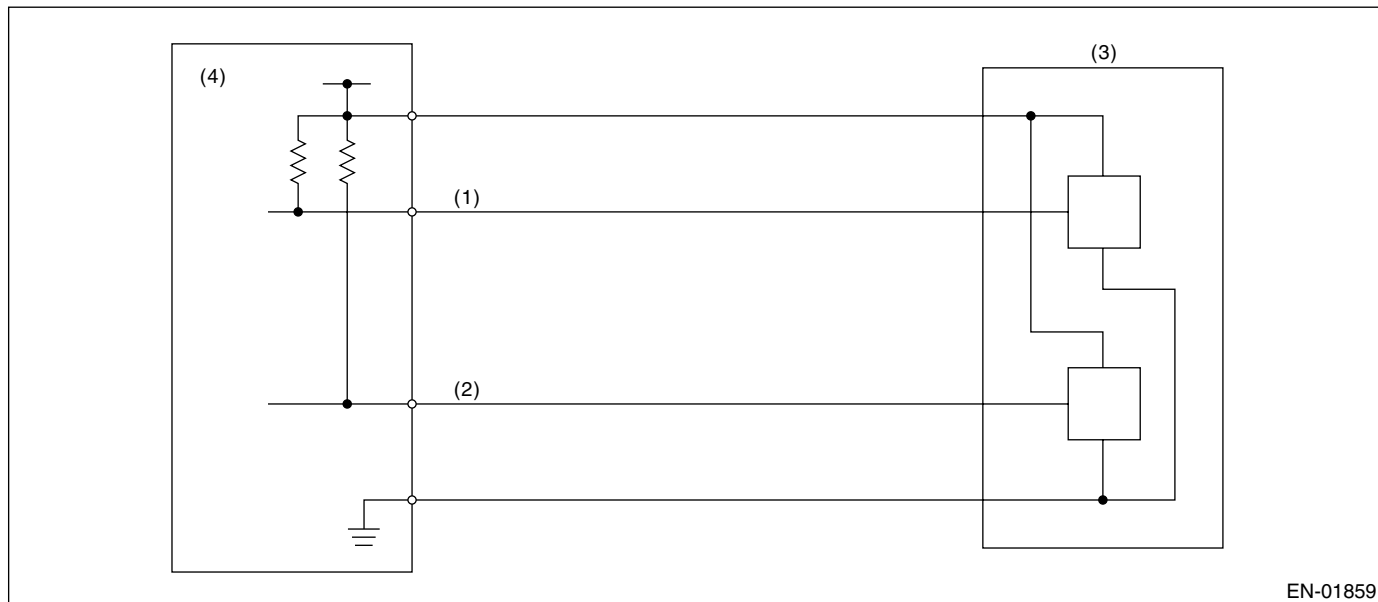
### GENERAL DESCRIPTION

## EB:DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal.

- (3) Accelerator pedal position sensor 2 signal.
- (4) Accelerator pedal position sensor

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

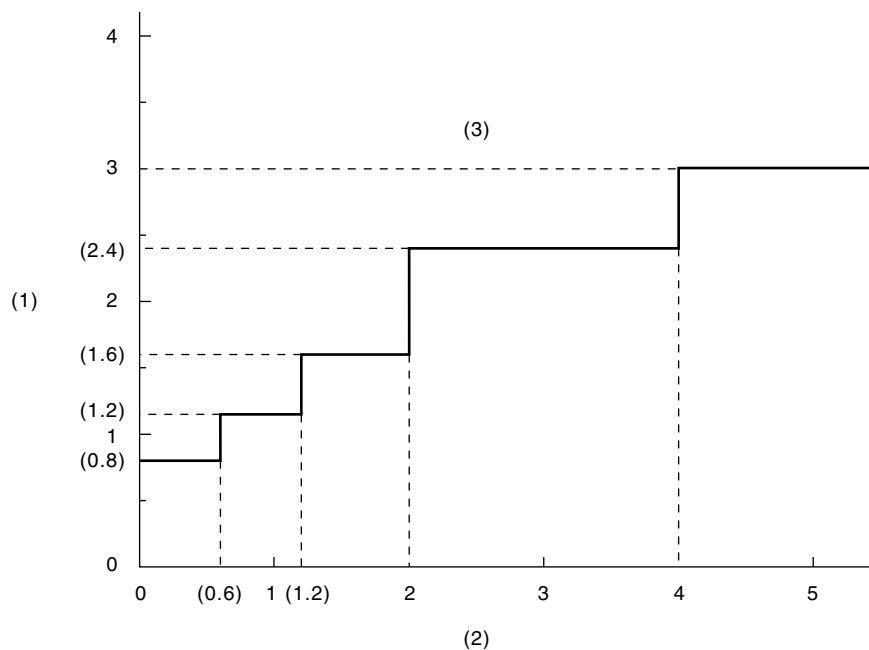
#### Judgment Value

| Malfunction Criteria                  | Threshold Value  |
|---------------------------------------|------------------|
| Signal difference between two sensors | $\leq 0.8^\circ$ |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

## Details of Judgment Value



EN-01870

(1) Sensor output difference (°)

(2) Accelerator pedal position sensor  
2 opening angle (°)

(3) NG area

### Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA**

GENERAL DESCRIPTION

---

**MEMO:**

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

## GENERAL DESCRIPTION

### 1. List of Diagnostic Trouble Code (DTC)

#### A: LIST

| DTC   | Item                                                                     | Index                                                                                                                                                                 |
|-------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0011 | A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)  | <Ref. to GD(H4DOTC)-10, DTC P0011 — "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0021 | A Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)  | <Ref. to GD(H4DOTC)-13, DTC P0021 — "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                            | <Ref. to GD(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 | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance | <Ref. to GD(H4DOTC)-24, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, 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)-30, 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)-32, 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)-34, 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)-36, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P0111 | Intake Air Temperature Circuit Range/Performance                         | <Ref. to GD(H4DOTC)-38, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0112 | Intake Air Temperature Circuit Low Input                                 | <Ref. to GD(H4DOTC)-40, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0113 | Intake Air Temperature Circuit High Input                                | <Ref. to GD(H4DOTC)-42, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0117 | Engine Coolant Temperature Circuit Low Input                             | <Ref. to GD(H4DOTC)-44, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                |
| P0118 | Engine Coolant Temperature Circuit High Input                            | <Ref. to GD(H4DOTC)-46, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                               |

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

## GENERAL DESCRIPTION

| DTC   | Item                                                                             | Index                                                                                                                                                                      |
|-------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      | <Ref. to GD(H4DOTC)-48, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     | <Ref. to GD(H4DOTC)-50, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control                    | <Ref. to GD(H4DOTC)-52, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | <Ref. to GD(H4DOTC)-56, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0129 | Atmospheric Pressure Sensor Circuit Range/Performance                            | <Ref. to GD(H4DOTC)-58, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                                      |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | <Ref. to GD(H4DOTC)-60, DTC P0131 — O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | <Ref. to GD(H4DOTC)-62, DTC P0132 — O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | <Ref. to GD(H4DOTC)-64, DTC P0133 — O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | <Ref. to GD(H4DOTC)-68, DTC P0134 — O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | <Ref. to GD(H4DOTC)-70, DTC P0137 — O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | <Ref. to GD(H4DOTC)-72, DTC P0138 — O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | <Ref. to GD(H4DOTC)-74, DTC P0139 — O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0171 | System too Lean (Bank 1)                                                         | <Ref. to GD(H4DOTC)-78, 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 Input                      | <Ref. to GD(H4DOTC)-92, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input                     | <Ref. to GD(H4DOTC)-94, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0230 | Fuel Pump Primary Circuit                                                        | <Ref. to GD(H4DOTC)-96, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                                        |

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

## GENERAL DESCRIPTION

| DTC   | Item                                                                  | Index                                                                                                                                                            |
|-------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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)-110, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                           |
| P0303 | Cylinder 3 misfire detected                                           | <Ref. to GD(H4DOTC)-110, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                           |
| P0304 | Cylinder 4 misfire detected                                           | <Ref. to GD(H4DOTC)-110, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                           |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)            | <Ref. to GD(H4DOTC)-112, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>            |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)           | <Ref. to GD(H4DOTC)-114, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P0335 | Crankshaft Position Sensor "A" Circuit                                | <Ref. to GD(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.>                         |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                   | <Ref. to GD(H4DOTC)-124, 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)-128, 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)-152, 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)-154, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>      |
| P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance | <Ref. to GD(H4DOTC)-156, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input         | <Ref. to GD(H4DOTC)-158, 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)-160, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

GENERAL DESCRIPTION

| DTC   | Item                                                                   | Index                                                                                                                                                             |
|-------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | <Ref. to GD(H4DOTC)-162, 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)-162, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | <Ref. to GD(H4DOTC)-164, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | <Ref. to GD(H4DOTC)-166, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0461 | Fuel Level Sensor Circuit Range/Performance                            | <Ref. to GD(H4DOTC)-168, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | <Ref. to GD(H4DOTC)-170, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0463 | Fuel Level Sensor Circuit High Input                                   | <Ref. to GD(H4DOTC)-172, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0464 | Fuel Level Sensor Circuit Intermittent                                 | <Ref. to GD(H4DOTC)-174, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0483 | Cooling Fan Rationality Check                                          | <Ref. to GD(H4DOTC)-177, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                          |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                 | <Ref. to GD(H4DOTC)-178, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                         | <Ref. to GD(H4DOTC)-180, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P0506 | Idle Control System RPM Lower Than Expected                            | <Ref. to GD(H4DOTC)-182, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0507 | Idle Control System RPM Higher Than Expected                           | <Ref. to GD(H4DOTC)-184, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0512 | Starter Request Circuit                                                | <Ref. to GD(H4DOTC)-186, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                                |
| P0519 | Idle Control System Malfunction (Fail-Safe)                            | <Ref. to GD(H4DOTC)-187, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0545 | Exhaust Gas Temperature Sensor Circuit Low — Bank 1 —                  | <Ref. to GD(H4DOTC)-188, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0546 | Exhaust Gas Temperature Sensor Circuit High — Bank 1 —                 | <Ref. to GD(H4DOTC)-190, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0600 | CAN Communication Circuit                                              | <Ref. to GD(H4DOTC)-192, DTC P0600 — CAN COMMUNICATION CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                              |
| P0604 | Internal Control Module Random Access Memory (RAM) Error               | <Ref. to GD(H4DOTC)-193, 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)-194, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0607 | Control Module Performance                                             | <Ref. to GD(H4DOTC)-196, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                             |

## LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

### GENERAL DESCRIPTION

| DTC   | Item                                                        | Index                                                                                                                                                  |
|-------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)        | <Ref. to GD(H4DOTC)-200, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P0691 | Cooling Fan 1 Control Circuit Low                           | <Ref. to GD(H4DOTC)-203, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0692 | Cooling Fan 1 Control Circuit High                          | <Ref. to GD(H4DOTC)-204, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P0700 | AT MIL Light up Request                                     | <Ref. to GD(H4DOTC)-205, DTC P0700 — AT MIL LIGHT UP REQUEST —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                     |
| P0851 | Neutral Switch Input Circuit Low (AT model)                 | <Ref. to GD(H4DOTC)-206, DTC P0851 — 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)-207, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                 |
| P0852 | Neutral Switch Input Circuit High (AT model)                | <Ref. to GD(H4DOTC)-208, DTC P0852 — 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)-208, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P1086 | Tumble Generated Valve Position Sensor 2 Circuit Low        | <Ref. to GD(H4DOTC)-210, DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P1087 | Tumble Generated Valve Position Sensor 2 Circuit High       | <Ref. to GD(H4DOTC)-212, DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>       |
| P1088 | Tumble Generated Valve Position Sensor 1 Circuit Low        | <Ref. to GD(H4DOTC)-214, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P1089 | Tumble Generated Valve Position Sensor 1 Circuit High       | <Ref. to GD(H4DOTC)-216, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>       |
| P1090 | Tumble Generated Valve System 1 (Valve Open)                | <Ref. to GD(H4DOTC)-218, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P1091 | Tumble Generated Valve System 1 (Valve Close)               | <Ref. to GD(H4DOTC)-219, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P1092 | Tumble Generated Valve System 2 (Valve Open)                | <Ref. to GD(H4DOTC)-220, DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P1093 | Tumble Generated Valve System 2 (Valve Close)               | <Ref. to GD(H4DOTC)-221, DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P1094 | Tumble Generated Valve Signal 1 Circuit Malfunction (Open)  | <Ref. to GD(H4DOTC)-222, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1095 | Tumble Generated Valve Signal 1 Circuit Malfunction (Short) | <Ref. to GD(H4DOTC)-224, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P1096 | Tumble Generated Valve Signal 2 Circuit Malfunction (Open)  | <Ref. to GD(H4DOTC)-226, DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1097 | Tumble Generated Valve Signal 2 Circuit Malfunction (Short) | <Ref. to GD(H4DOTC)-228, DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

GENERAL DESCRIPTION

| DTC   | Item                                                                   | Index                                                                                                                                                   |
|-------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| P1110 | Atmospheric Pressure Sensor Circuit Malfunction (Low Input)            | <Ref. to GD(H4DOTC)-230, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1111 | Atmospheric Pressure Sensor Circuit Malfunction (High Input)           | <Ref. to GD(H4DOTC)-231, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)  | <Ref. to GD(H4DOTC)-232, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank1 Sensor1) | <Ref. to GD(H4DOTC)-236, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P1160 | Return Spring Failure                                                  | <Ref. to GD(H4DOTC)-240, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                        |
| P1301 | Misfire Detected (High Temperature Exhaust Gas)                        | <Ref. to GD(H4DOTC)-242, DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>              |
| P1312 | Exhaust Gas Temperature Sensor Malfunction                             | <Ref. to GD(H4DOTC)-244, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                  | <Ref. to GD(H4DOTC)-246, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High                     | <Ref. to GD(H4DOTC)-248, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P1443 | Vent Control Solenoid Valve Function Problem                           | <Ref. to GD(H4DOTC)-250, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                 |
| P1446 | Fuel Tank Sensor Control Valve Circuit Low                             | <Ref. to GD(H4DOTC)-252, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P1447 | Fuel Tank Sensor Control Valve Circuit High                            | <Ref. to GD(H4DOTC)-254, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |
| P1448 | Fuel Tank Sensor Control Valve Range/Performance                       | <Ref. to GD(H4DOTC)-256, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem              | <Ref. to GD(H4DOTC)-260, 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)-262, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                             |
| P1544 | Exhaust Gas Temperature Too High                                       | <Ref. to GD(H4DOTC)-263, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                             |
| P1560 | Back-Up Voltage Circuit Malfunction                                    | <Ref. to GD(H4DOTC)-264, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                      | <Ref. to GD(H4DOTC)-265, 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)-268, 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)-270, DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>            |

## LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

### GENERAL DESCRIPTION

| DTC   | Item                                                              | Index                                                                                                                                                          |
|-------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P2093 | OCV Solenoid Valve Signal A Circuit Short (Bank 2)                | <Ref. to GD(H4DOTC)-272, DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |
| P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                    | <Ref. to GD(H4DOTC)-274, 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)-276, 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)-278, 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)-280, 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)-282, 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)-284, 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)-286, 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)-288, 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)-290, 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)-292, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P2135 | Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Rationality | <Ref. to GD(H4DOTC)-294, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2138 | Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Rationality | <Ref. to GD(H4DOTC)-296, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.> |

## LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

GENERAL DESCRIPTION

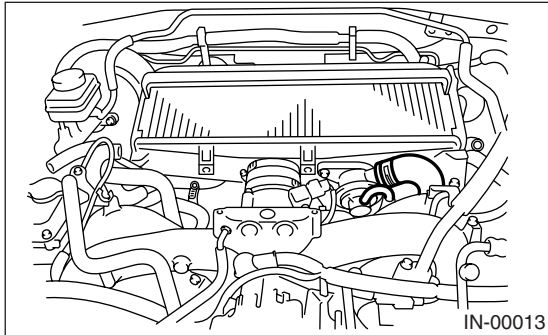
---

MEMO:

### 7. Air By-pass Valve

#### A: REMOVAL

1) Disconnect the air by-pass hoses from air by-pass valve.



2) Remove the air by-pass valve from intercooler.



#### B: INSTALLATION

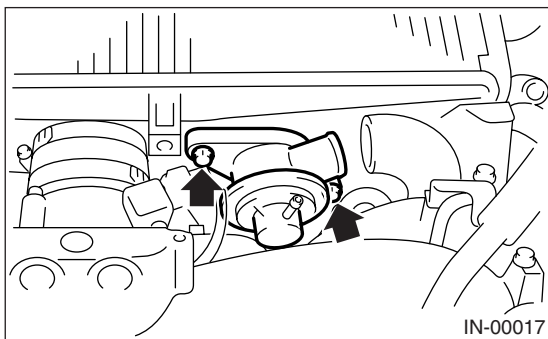
Install in the reverse order of removal.

NOTE:

Install the O-ring in proper position.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.6 ft-lb)**



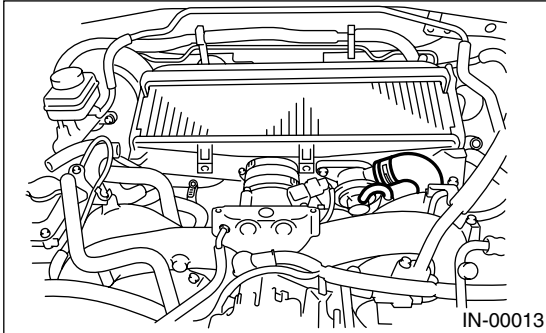
## AIR BYPASS VALVE

INTAKE (INDUCTION)

### 7. Air Bypass Valve

#### A: REMOVAL

1) Disconnect air bypass hose from air bypass valve.



2) Remove air bypass valve from intercooler.



#### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Be careful pinching of O-ring.

**Tightening torque:**

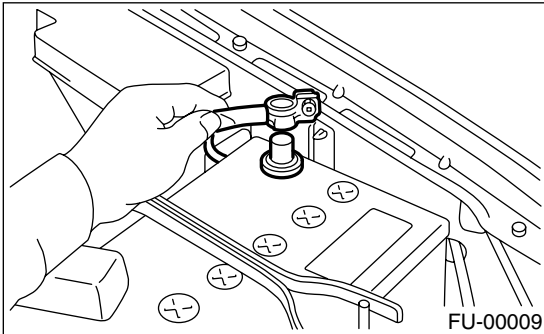
**16 N·m (1.6 kgf-m, 11.6 ft-lb)**



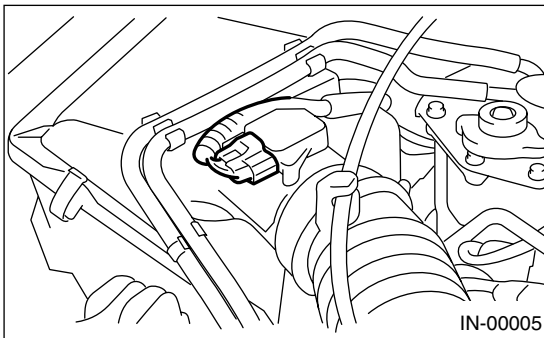
## 2. Air Cleaner

### A: REMOVAL

1) Disconnect the ground cable from battery.

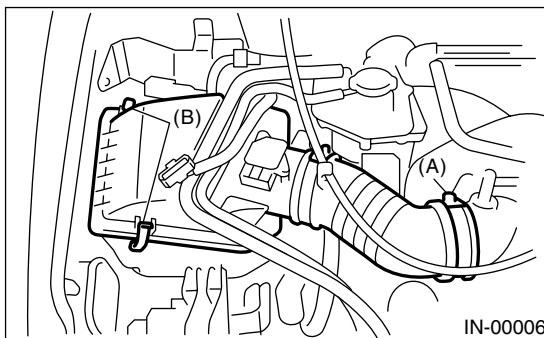


2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects the air intake boot and intake duct.

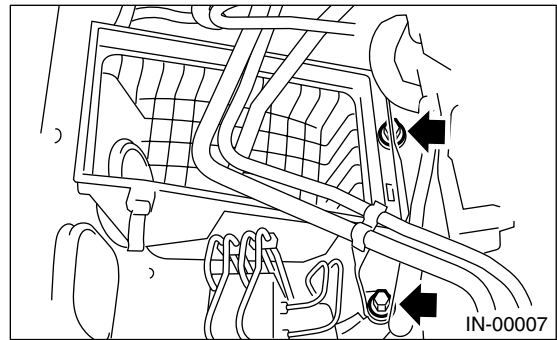
4) Remove the clip (B) from air cleaner upper cover.



5) Remove the air cleaner upper cover.

6) Remove the air cleaner element.

7) Remove the air cleaner lower case.

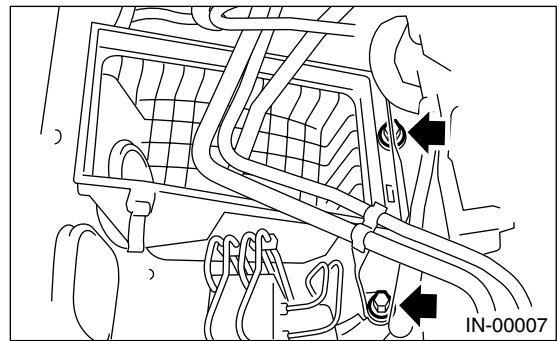


### B: INSTALLATION

Install in the reverse order of removal.

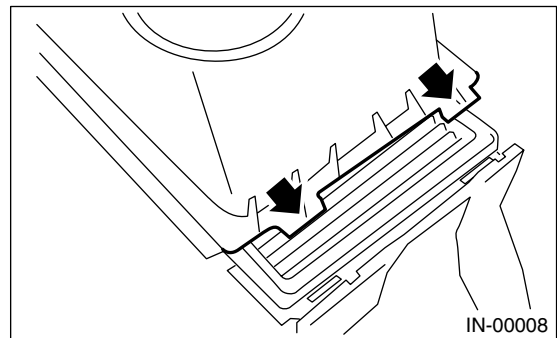
**Tightening torque:**

**33 N·m (3.4 kgf-m, 24.6 ft-lb)**



### NOTE:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



### C: INSPECTION

Replace it if excessively damaged or dirty.

## AIR INTAKE DUCT

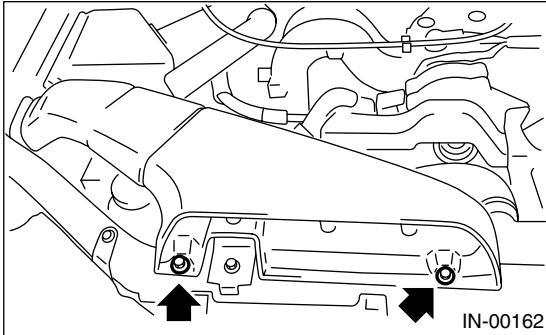
INTAKE (INDUCTION)

---

### 3. Air Intake Duct

#### A: REMOVAL

Remove the bolts which install the air intake duct on front side of body.

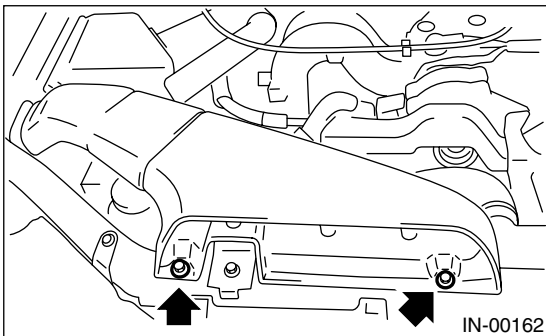


#### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



#### C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in air intake duct.

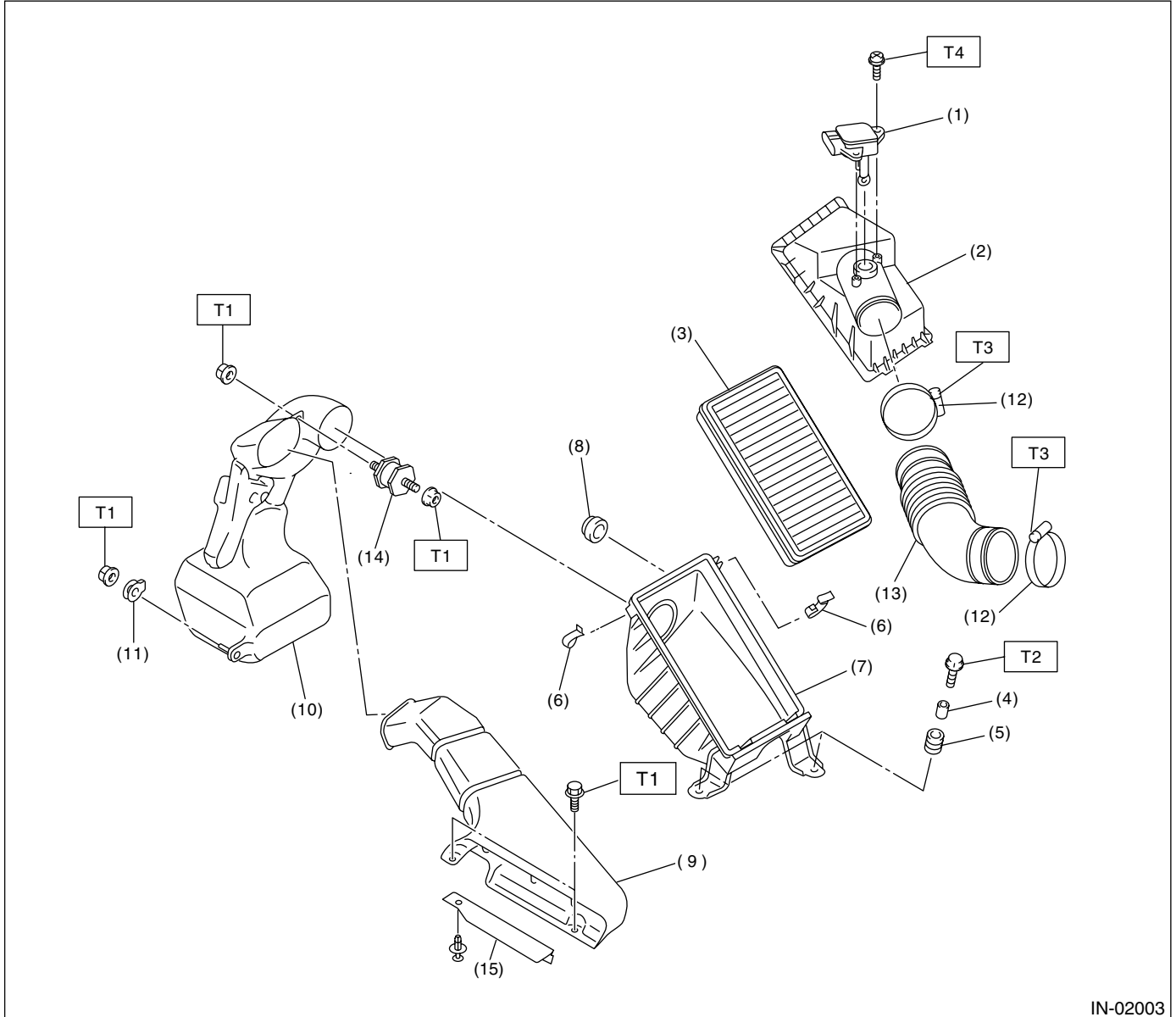
# GENERAL DESCRIPTION

INTAKE (INDUCTION)

## 1. General Description

### A: COMPONENT

#### 1. AIR CLEANER



IN-02003

- |                                                     |                             |
|-----------------------------------------------------|-----------------------------|
| (1) Mass air flow and intake air temperature sensor | (8) Cushion                 |
| (2) Air cleaner upper cover                         | (9) Air intake duct         |
| (3) Air cleaner element                             | (10) Resonator chamber ASSY |
| (4) Spacer                                          | (11) Cushion                |
| (5) Cushion                                         | (12) Clamp                  |
| (6) Clip                                            | (13) Air intake boot        |
| (7) Air cleaner lower case                          | (14) Cushion                |
|                                                     | (15) Plate                  |

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

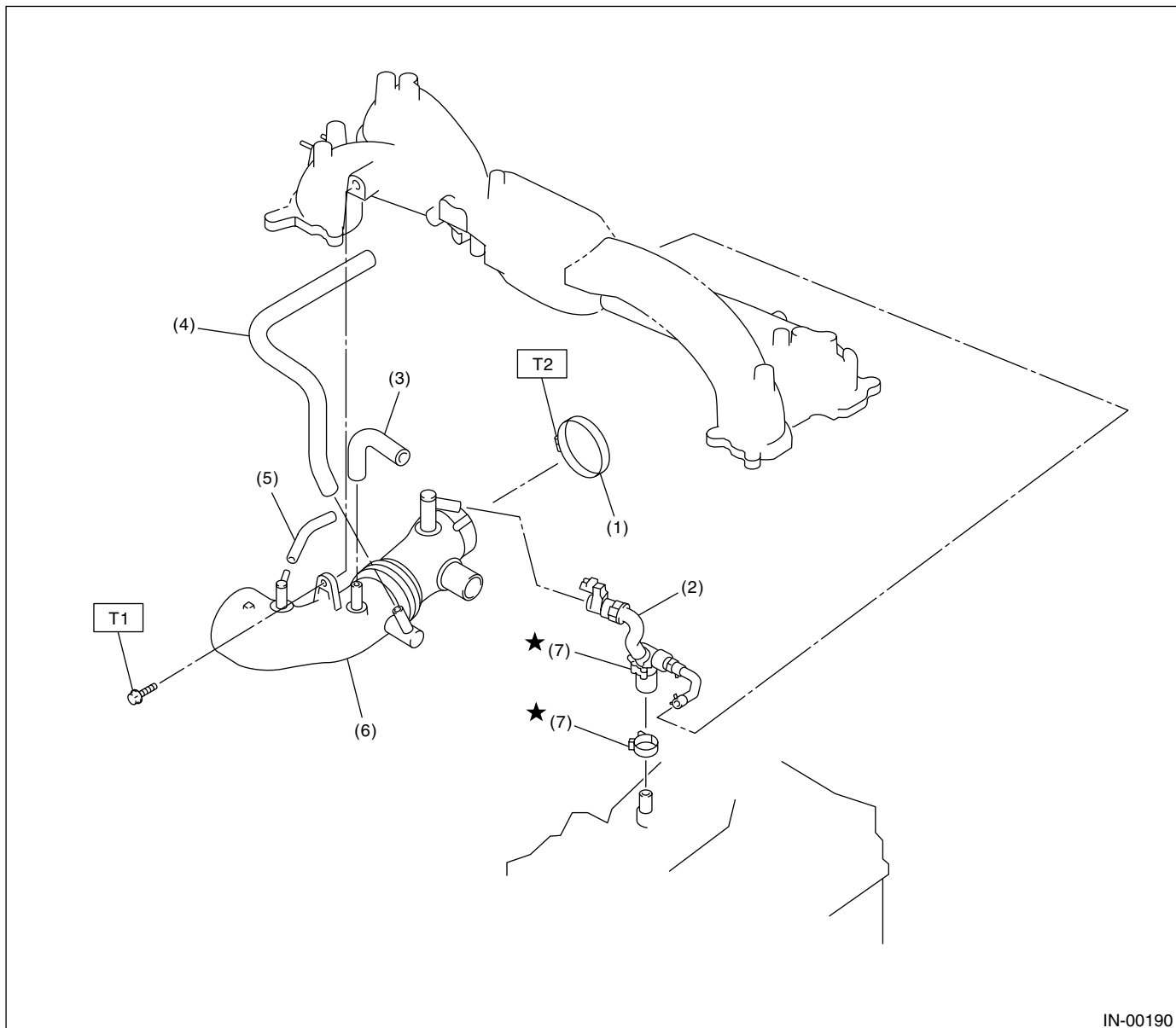
**T1: 7.5 (0.76, 5.5)**

**T2: 33 (3.4, 24.6)**

**T3: 2.5 (0.25, 1.8)**

**T4: 1.0 (0.10, 1)**

## 2. INTAKE DUCT



IN-00190

- |                       |                       |
|-----------------------|-----------------------|
| (1) Clamp             | (5) Air bypass hose C |
| (2) PCV hose ASSY     | (6) Intake duct       |
| (3) Air bypass hose A | (7) Clamp             |
| (4) Air bypass hose B |                       |

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

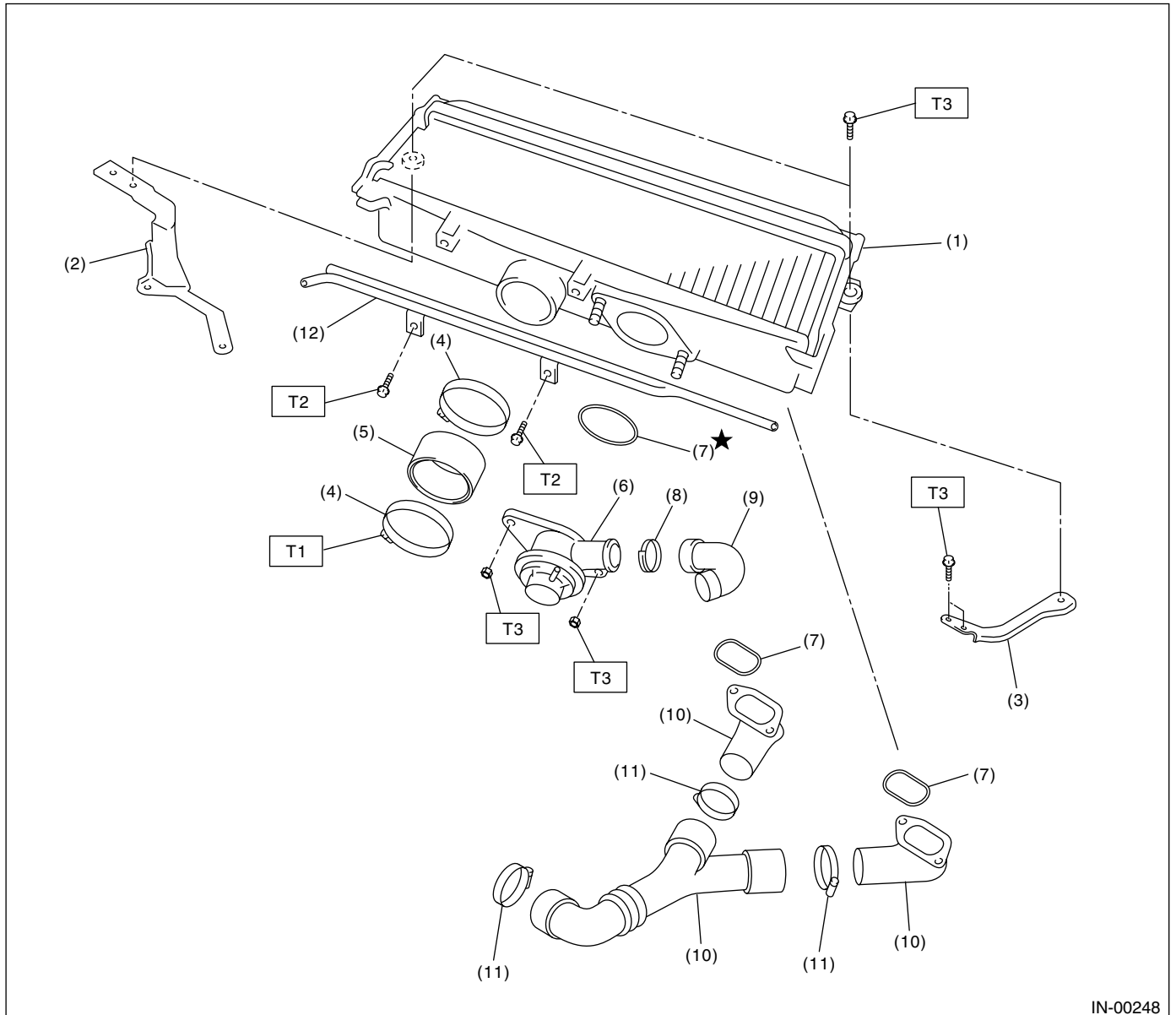
**T1: 19 (1.9, 13.7)**

**T2: 3 (0.3, 2.2)**

## GENERAL DESCRIPTION

INTAKE (INDUCTION)

### 3. INTERCOOLER



IN-00248

- |                            |                       |
|----------------------------|-----------------------|
| (1) Intercooler            | (7) O-ring            |
| (2) Intercooler bracket RH | (8) Clamp             |
| (3) Intercooler bracket LH | (9) Air bypass hose A |
| (4) Clamp                  | (10) Intercooler duct |
| (5) Air intake duct        | (11) Clamp            |
| (6) Air bypass valve       | (12) PCV pipe         |

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

**T1: 3 (0.3, 2.2)**

**T2: 6.1 (0.62, 4.2)**

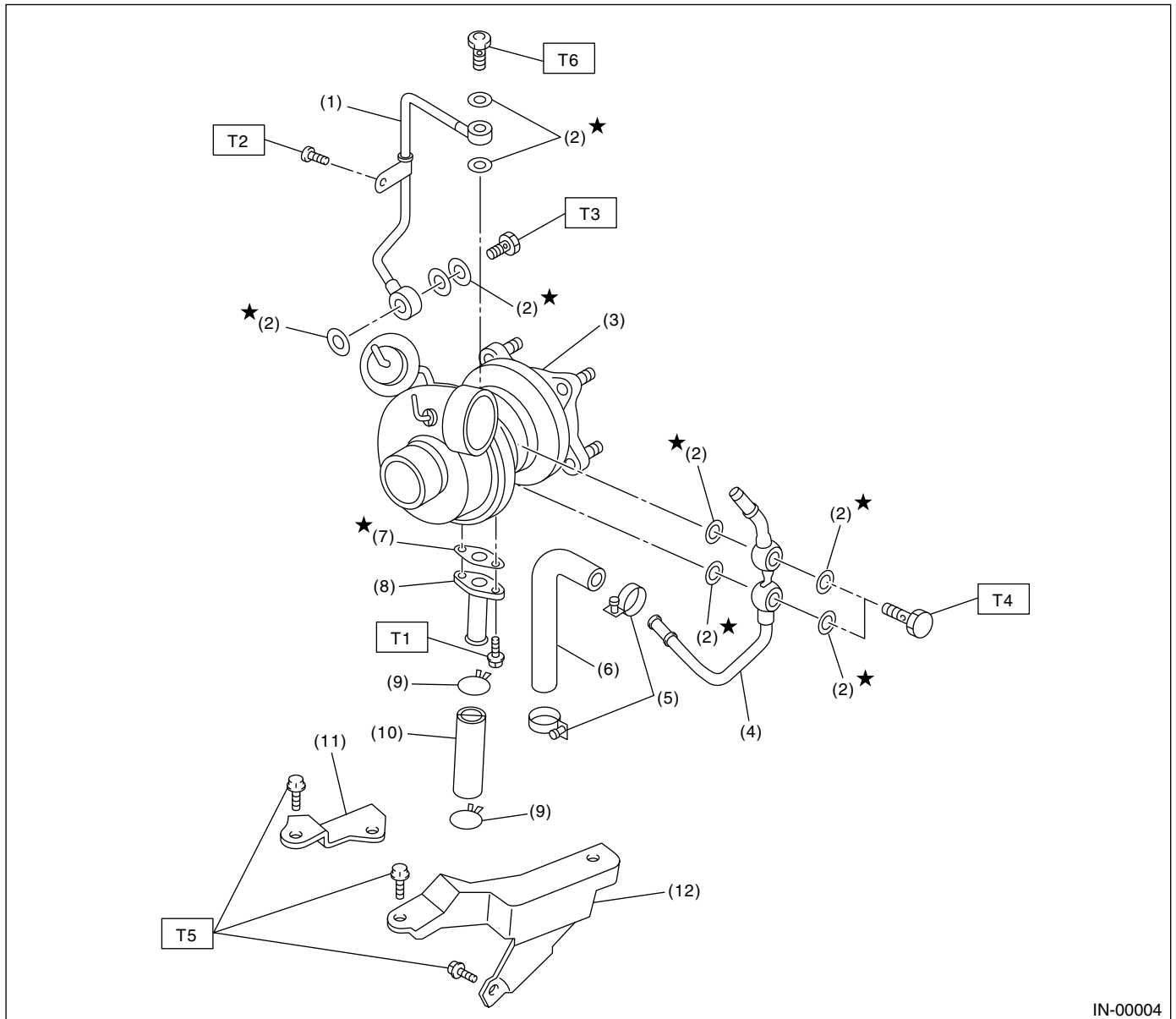
**T3: 16 (1.6, 11.6)**

IN(H4DOTC)-4

# GENERAL DESCRIPTION

INTAKE (INDUCTION)

## 4. TURBOCHARGER



IN-00004

- |                         |                              |
|-------------------------|------------------------------|
| (1) Oil inlet pipe      | (8) Oil outlet pipe          |
| (2) Metal gasket        | (9) Clip                     |
| (3) Turbocharger        | (10) Oil outlet hose         |
| (4) Water pipe          | (11) Turbocharger bracket RH |
| (5) Clamp               | (12) Turbocharger bracket LH |
| (6) Engine coolant hose |                              |
| (7) Gasket              |                              |

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

***T1: 4.4 (0.45, 3.3)***

***T2: 4.9 (0.50, 3.6)***

***T3: 29 (3.0, 21.7)***

***T4: 33 (3.4, 24.6)***

***T5: 33 (3.4, 24.6)***

***T6: 16 (1.6, 11.6)***

**IN(H4DOTC)-5**

## GENERAL DESCRIPTION

### INTAKE (INDUCTION)

---

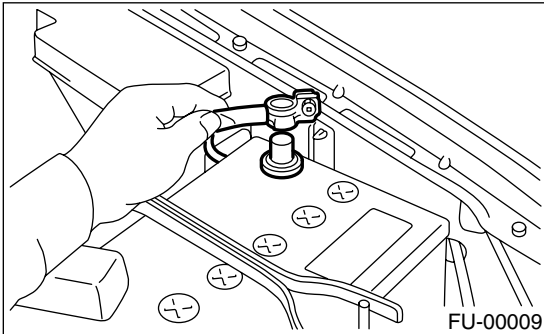
#### **B: CAUTION**

- Wear working 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 or 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 safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

## 4. Intake Duct

### A: REMOVAL

1) Disconnect the ground cable from battery.



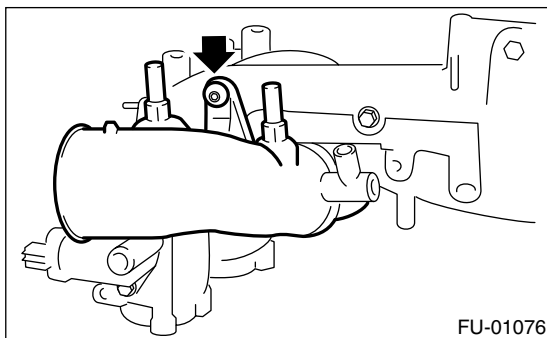
2) Remove the intake manifold.

<Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>

3) Remove the sensor, engine harness and fuel pipe attached to intake manifold.

<Ref. to FU(H4DOTC)-20, DISASSEMBLY, Intake Manifold.>

4) Remove the intake duct from intake manifold.

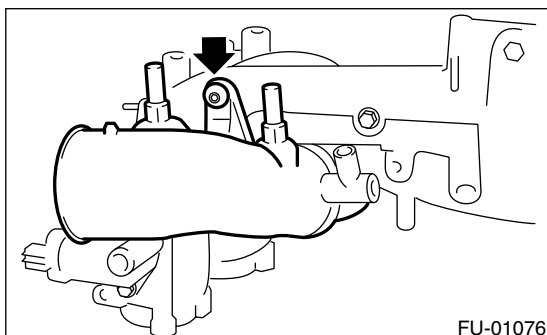


### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



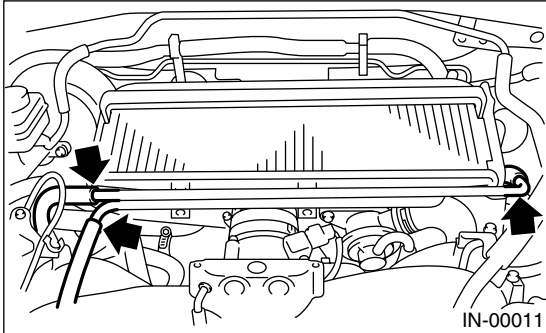
## INTERCOOLER

### INTAKE (INDUCTION)

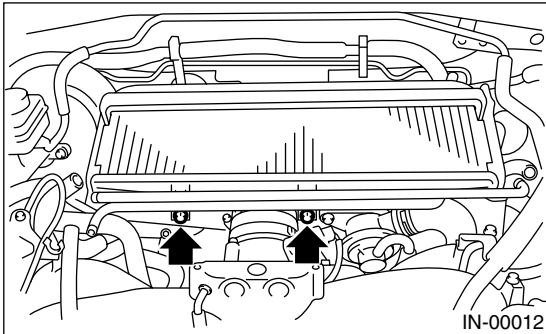
## 5. Intercooler

### A: REMOVAL

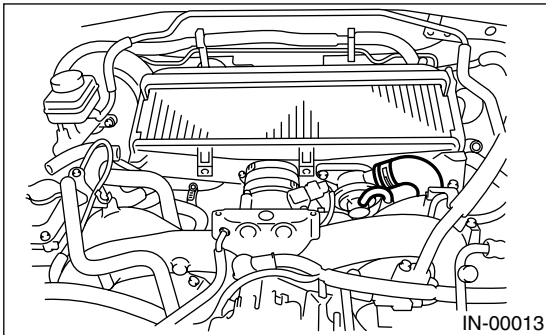
1) Disconnect PCV hose from PCV pipe.



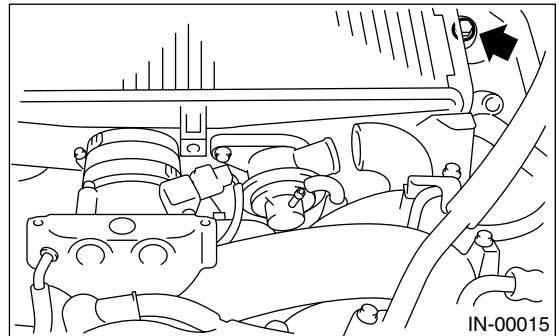
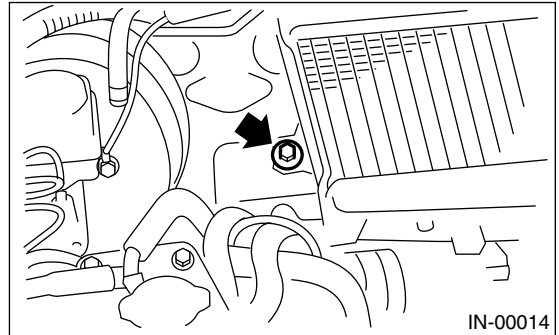
2) Remove PCV pipe from intercooler.



3) Disconnect hose from air bypass valve.

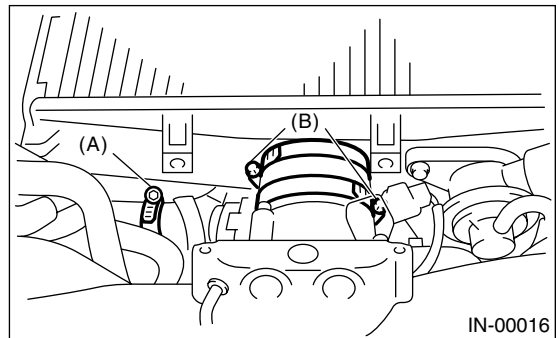


4) Remove bolt which secure intercooler to bracket.



5) Loosen clamp (A) which connects turbocharger and intercooler duct.

6) Loosen clamp (B) which connects throttle body and intercooler.



7) Disconnect intercooler duct from turbocharger.

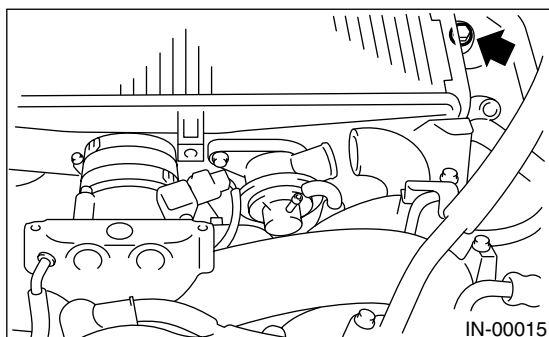
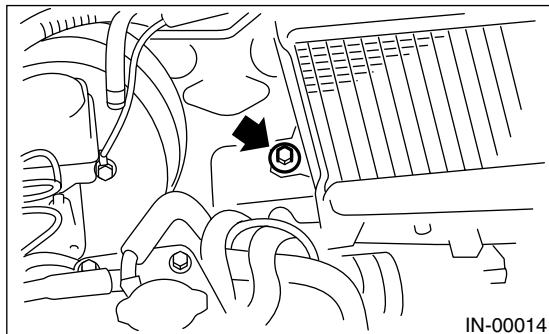
8) Remove intercooler from throttle body.

### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.6 ft-lb)**

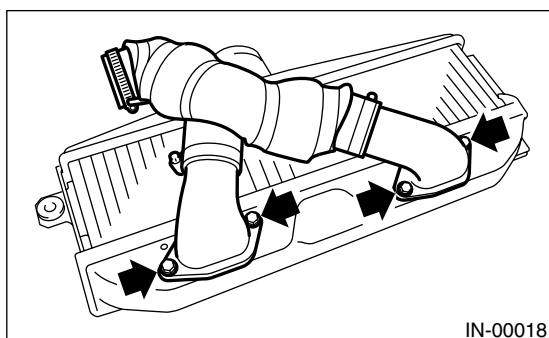


### C: DISASSEMBLY

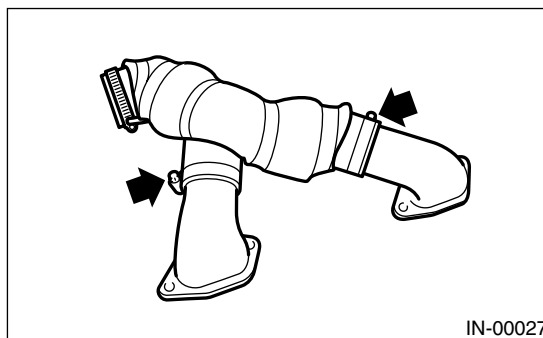
1) Remove air bypass valve from intercooler.



2) Remove intercooler duct from intercooler.



3) Separate duct.



### D: ASSEMBLY

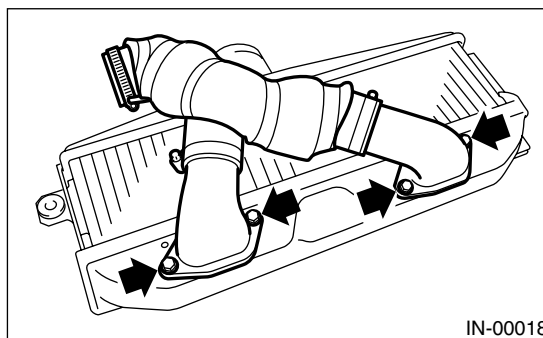
To assemble, reverse order of disassembly.

**NOTE:**

Be careful pinching of O-ring.

**Tightening torque:**

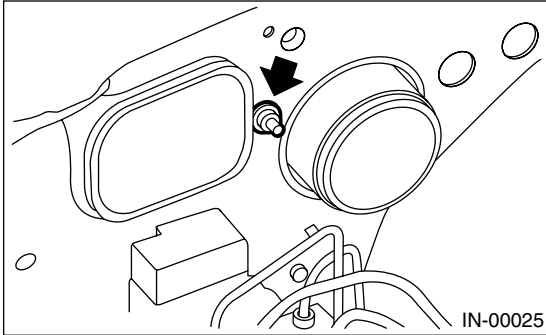
**16 N·m (1.6 kgf-m, 11.6 ft-lb)**



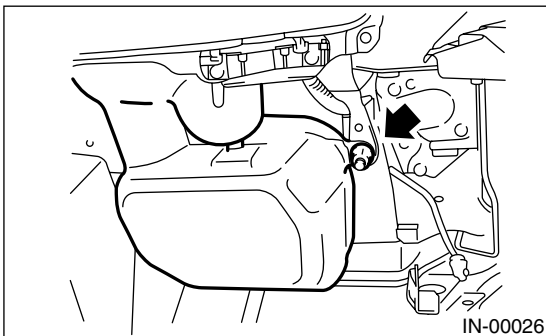
## 8. Resonator Chamber

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
- 3) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
- 4) Remove the resonator chamber mounting bolt on right side of engine compartment.



- 5) Remove the front right tire, and lift up the vehicle.
- 6) Remove the front mudguard RH.
- 7) Remove the resonator chamber from the inside front fender.

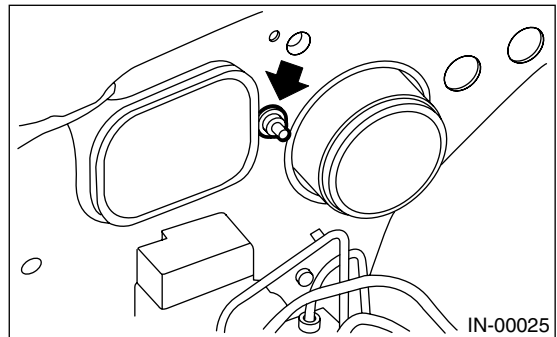
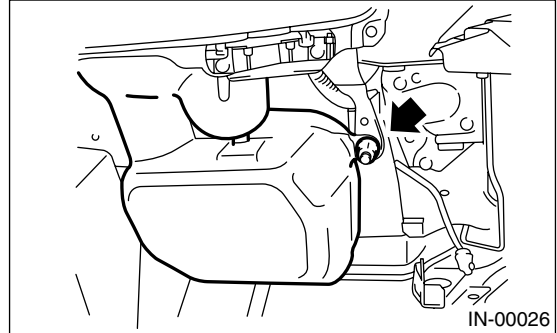


### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



### C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in resonator chamber.

## RESONATOR CHAMBER

INTAKE (INDUCTION)

---

**MEMO:**

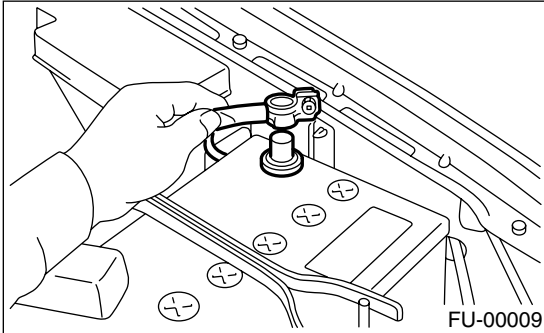
# TURBOCHARGER

## INTAKE (INDUCTION)

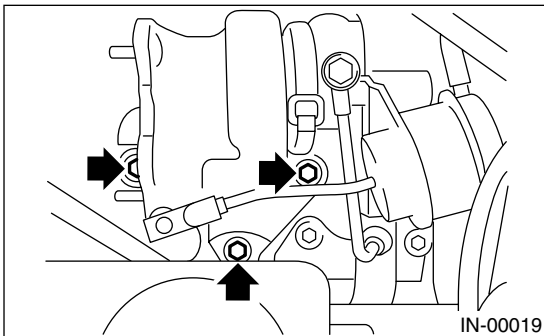
### 6. Turbocharger

#### A: REMOVAL

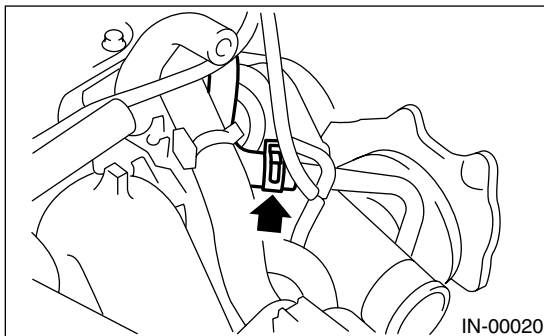
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



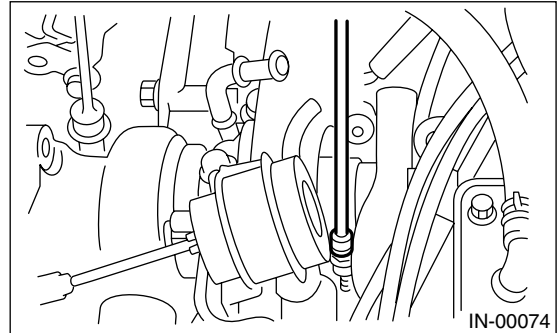
- 3) Remove the center exhaust pipe.  
<Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
- 4) Lower the vehicle.
- 5) Separate the turbocharger joint pipe from turbocharger.



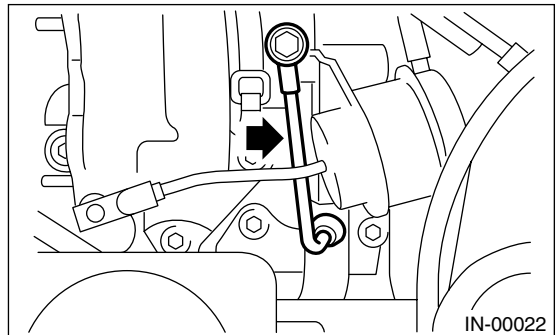
- 6) Disconnect the engine coolant hose which is connected to coolant filler tank.



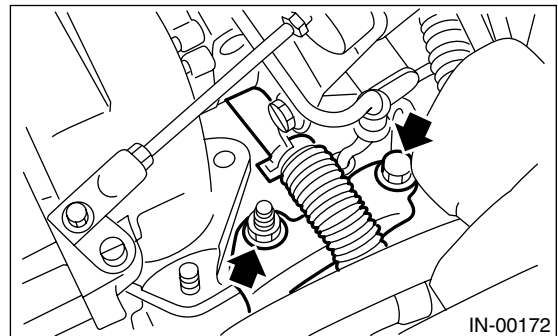
- 7) Loosen the clamp which secures the turbocharger to intake duct.



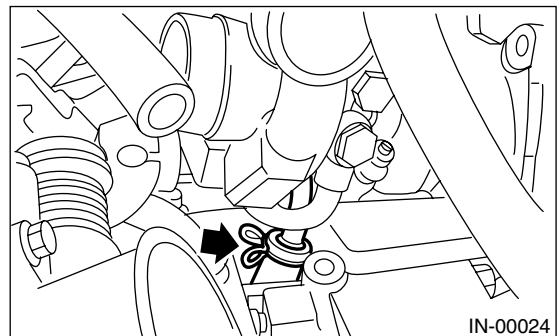
- 8) Remove the bolt which secures the bracket of oil pipe to turbocharger.
- 9) Remove the oil pipe from turbocharger.



- 10) Disconnect the engine coolant hose.
- 11) Remove the turbocharger bracket.



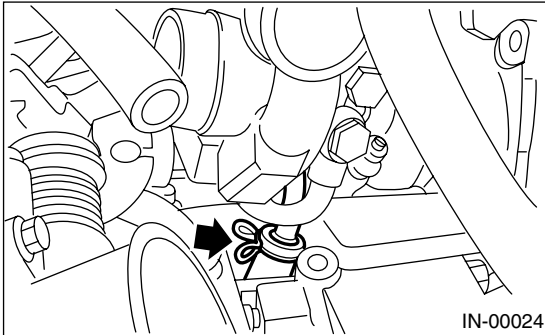
- 12) Disconnect the oil outlet hose from pipe.



- 13) Take out the turbocharger from engine compartment.

## B: INSTALLATION

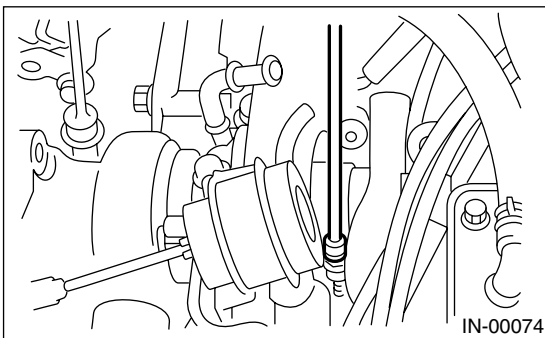
- 1) Connect the oil outlet hose to outlet pipe.



- 2) Install the turbocharger to intake duct.

**Tightening torque:**

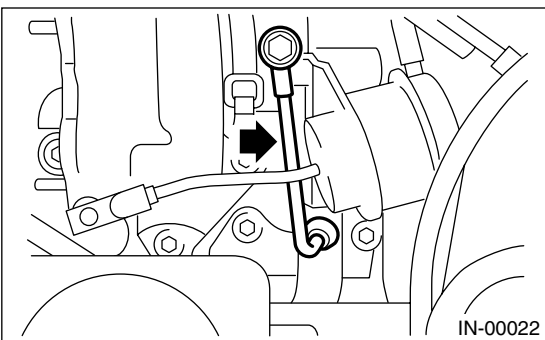
**3 N·m (0.3 kgf-m, 2.2 ft-lb)**



- 3) Install the oil pipe to turbocharger.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.6 ft-lb)**



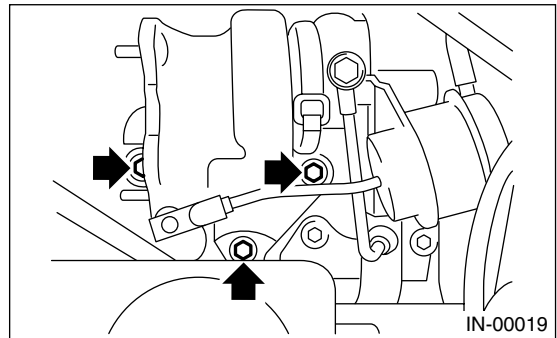
- 4) Install the joint pipe to turbocharger.

**NOTE:**

Replace the gasket with a new one.

**Tightening torque:**

**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

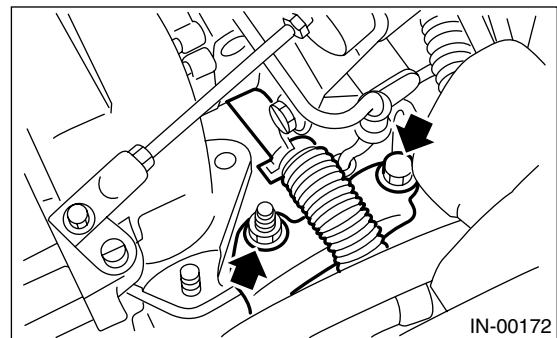


- 5) Connect the engine coolant hose.

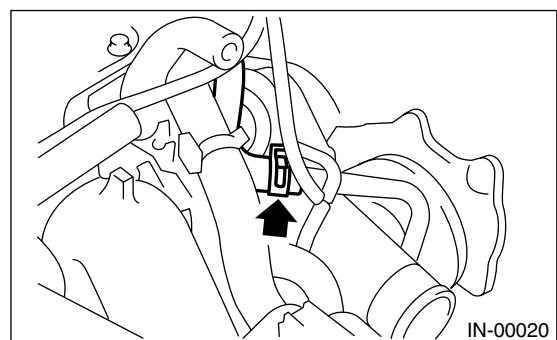
- 6) Install the turbocharger bracket.

**Tightening torque:**

**33 N·m (3.4 kgf-m, 24.6 ft-lb)**



- 7) Connect the engine coolant hose which is connected to coolant filler tank.



- 8) Lift-up the vehicle.

- 9) Install the center exhaust pipe.

<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>

## 1. General Description

### A: SPECIFICATION

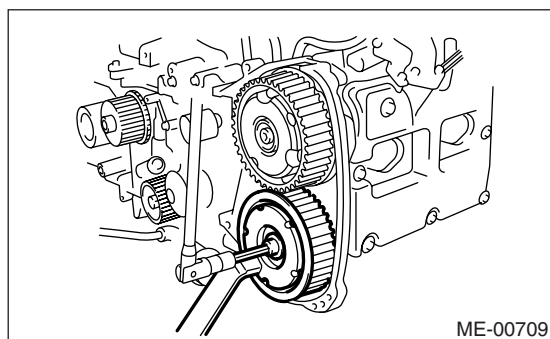
Specifications for Turbo model is included in LU(H4SO) section. <Ref. to LU(H4SO)-2, General Description.>

## 16. Cam Sprocket

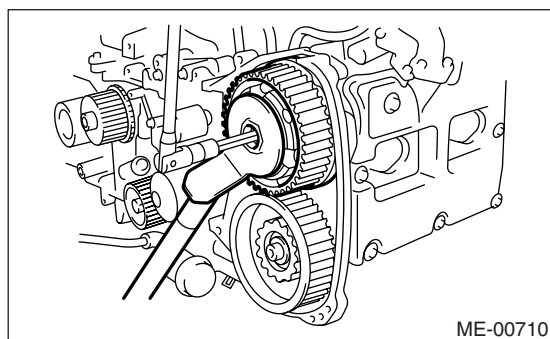
### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-48, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-50, REMOVAL, Timing Belt Assembly.>
- 5) Remove the cam sprockets. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



ST 499977500 CAMSHAFT SPROCKET WRENCH



### B: INSTALLATION

- 1) Install the cam sprocket. To lock the camshaft, use ST.

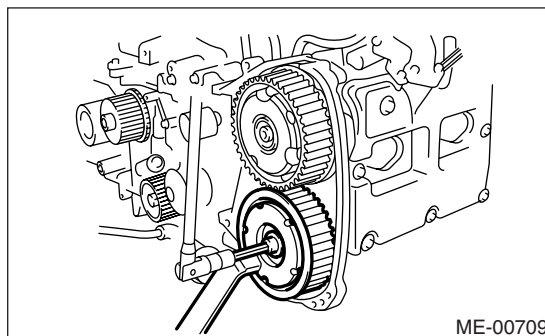
#### NOTE:

Do not confuse cam sprockets (RH) and (LH) during installation.

ST 499207400 CAMSHAFT SPROCKET WRENCH

#### Tightening torque:

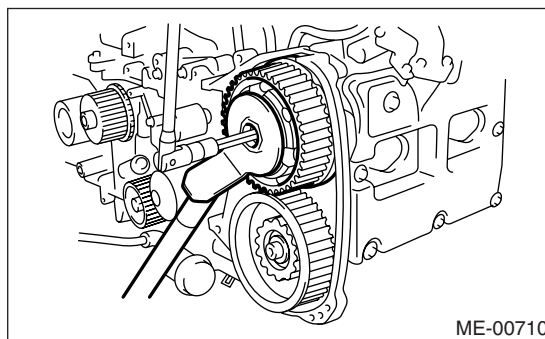
**98 N·m (10 kgf-m, 72.4 ft-lb)**



ST 499977500 CAMSHAFT SPROCKET WRENCH

#### Tightening torque:

**29.5 N·m (3.0 kgf-m, 21.8 ft-lb), and then tighten 45° furthermore**



- 2) Install the timing belt assembly. <Ref. to ME(H4DOTC)-52, INSTALLATION, Timing Belt Assembly.>
- 3) Install the timing belt cover. <Ref. to ME(H4DOTC)-49, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-48, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

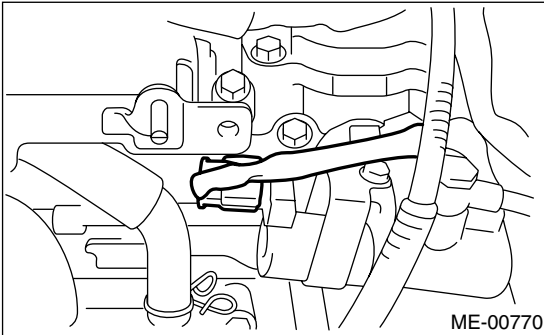
## **C: INSPECTION**

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

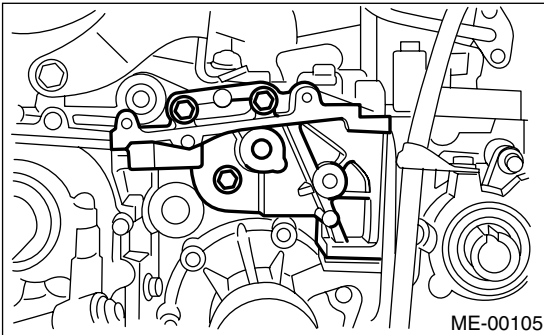
## 18. Camshaft

### A: REMOVAL

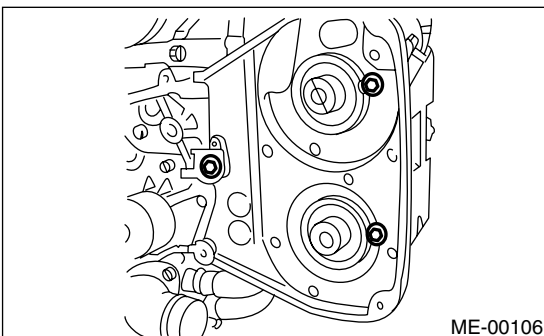
- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
- 6) Remove the crankshaft sprocket. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Sprocket.>
- 7) Disconnect the variable valve timing solenoid valve assembly connector.



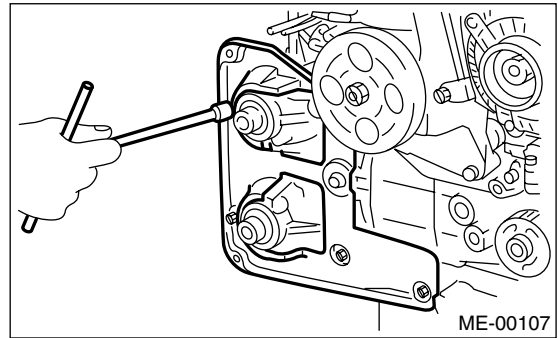
- 8) Remove the tensioner bracket.



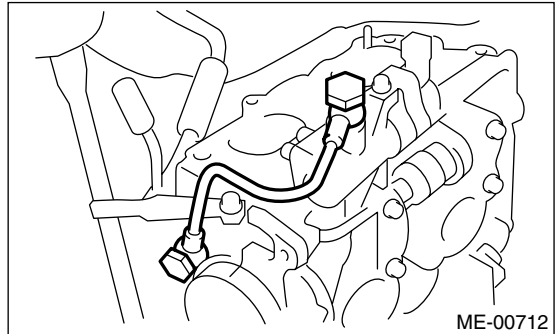
- 9) Remove the timing belt cover No. 2 (LH).



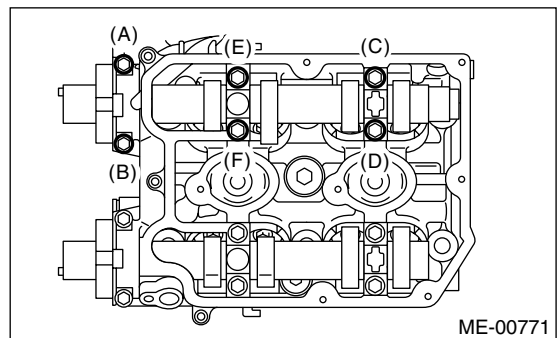
- 10) Remove the timing belt cover No.2 (RH).



- 11) Remove the spark plug cord.
- 12) Remove the oil level gauge guide. (LH side)
- 13) Remove the rocker cover and gasket.
- 14) Remove the oil pipe.



- 15) Loosen the variable valve timing solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.

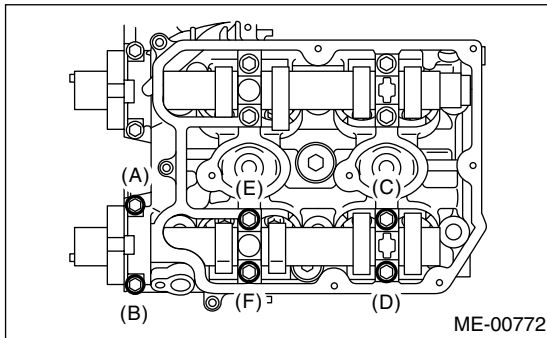


- 16) Remove the variable valve timing solenoid valve assembly, intake camshaft cap, and camshaft.

# CAMSHAFT

## MECHANICAL

17) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



18) Remove the exhaust camshaft cap and camshaft.

### NOTE:

Arrange the camshaft caps in order so that they can be installed in their original positions.

19) Similarly, remove the camshafts (RH) and related parts.

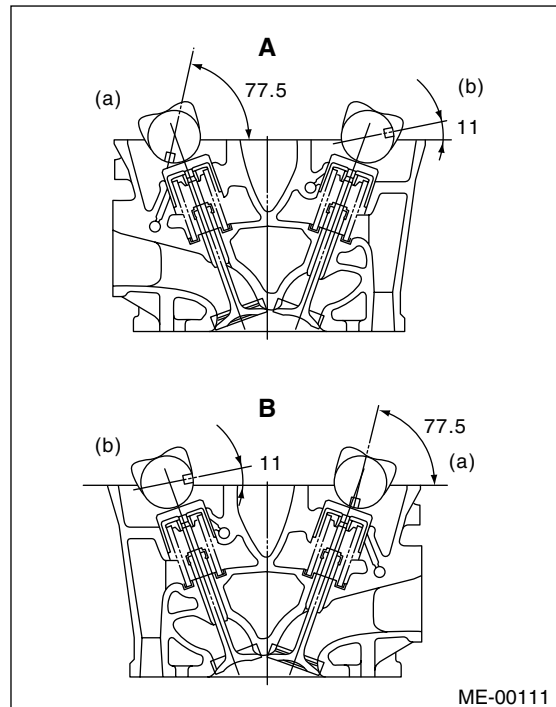
## B: INSTALLATION

1) Camshaft installation: Apply engine oil to cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with "base circle" of cam lobe.

### NOTE:

- When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
- Camshaft (RH) need not be rotated when set at position shown in the figure. Intake camshaft (LH):

Rotate 80° clockwise. Exhaust camshaft (LH): Rotate 45° counterclockwise.



- A Cylinder head (LH)
- B Cylinder head (RH)
- (a) Intake camshaft
- (b) Exhaust camshaft

2) Camshaft cap and variable valve timing solenoid valve assembly installation:

- (1) Apply fluid packing sparingly to cap mating surface.

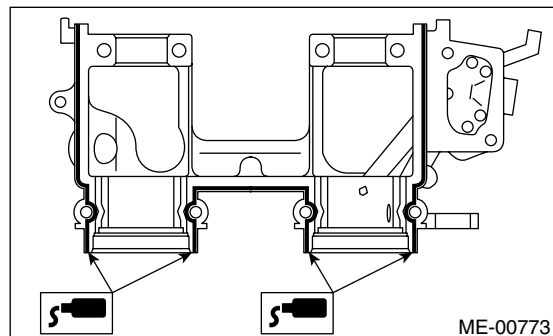
### NOTE:

Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward the oil seal, resulting in oil leaks.

### Fluid packing:

Part No. 004403007

**THREE BOND 1215 or equivalent**



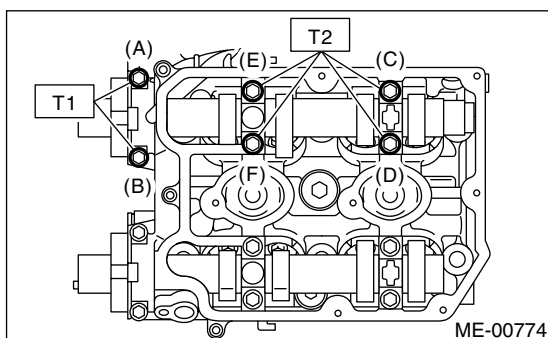
- (2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).

(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 ft-lb)**

**T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)**

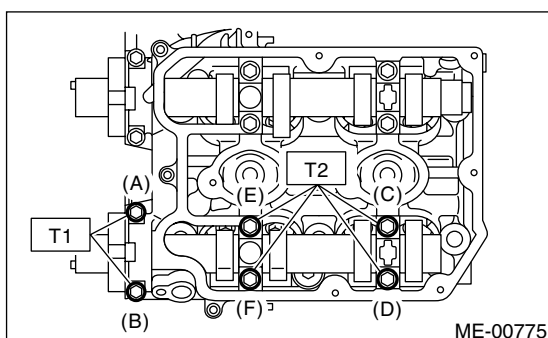


(4) Similarly, tighten cap on the exhaust side. After tightening cap, ensure the camshaft rotates only slightly while holding it at "base" circle.

**Tightening torque:**

**T1: 10 N·m (1.0 kgf-m, 7 ft-lb)**

**T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)**



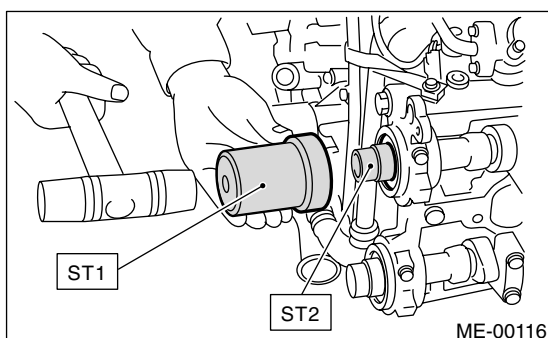
3) Camshaft oil seal installation: Apply grease to new oil seal lips and press onto front end of camshaft by using ST1 and ST2.

**NOTE:**

Use a new oil seal.

ST1 499587600 OIL SEAL GUIDE

ST2 499597200 OIL SEAL GUIDE



4) Rocker cover installation:

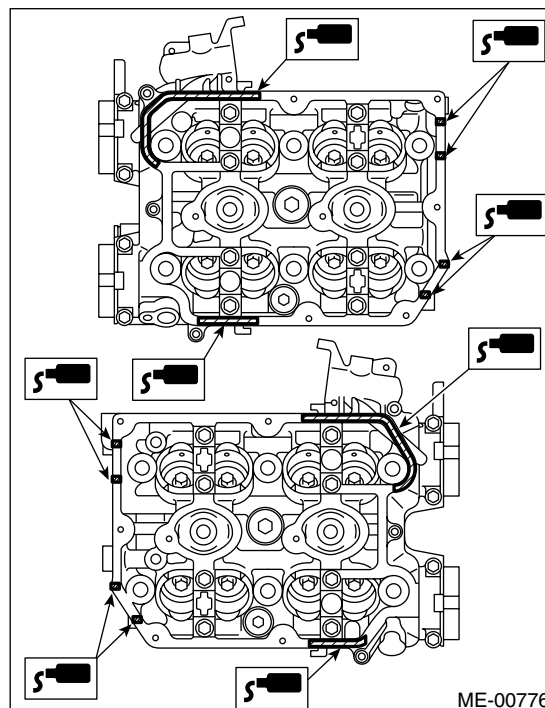
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.

(2) Apply fluid packing to the specified point of cylinder head.

**Fluid packing:**

**Part No. 004403007**

**THREE BOND 1215 or equivalent**

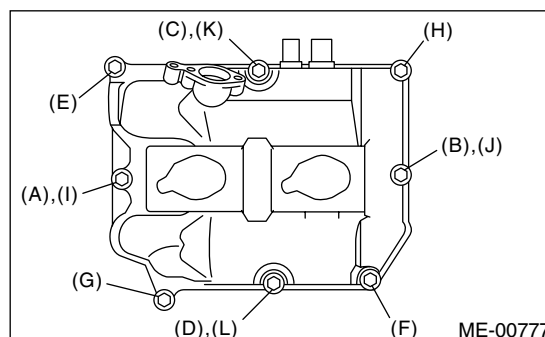


(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

(4) Tighten the rocker cover tightening bolt in alphabetical sequence shown in the figure, and then tighten to specified torque.

**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



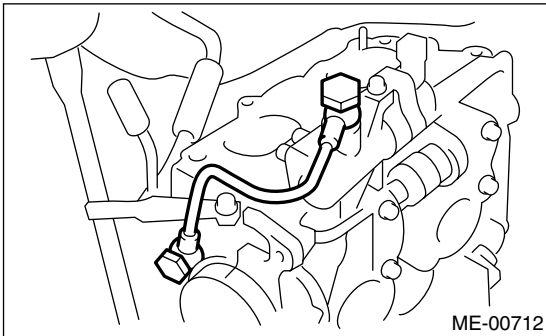
5) Install the oil pipe.

## CAMSHAFT

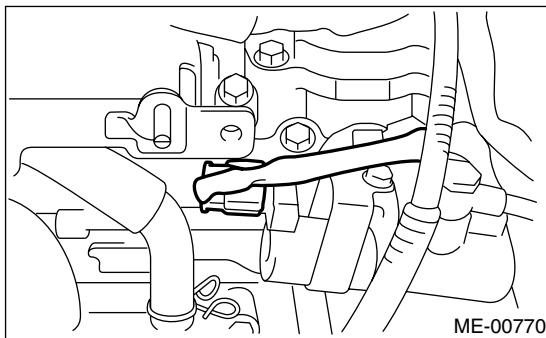
### MECHANICAL

#### **Tightening torque:**

**29 N·m (3.0 kgf-m, 21.4 ft-lb)**



6) Connect the variable valve timing solenoid valve connector.



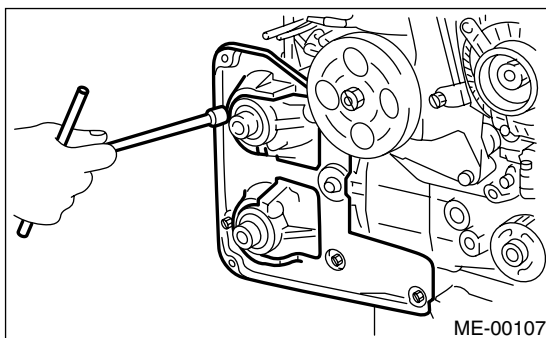
7) Install the spark plug cord.

8) Similarly, install the parts on right-hand side.

9) Install the timing belt cover No. 2 (RH).

#### **Tightening torque:**

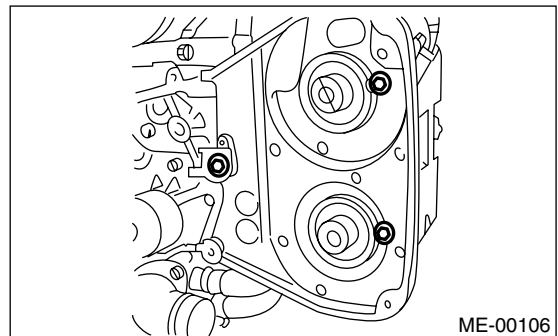
**5 N·m (0.5 kgf-m, 3.6 ft-lb)**



10) Install the timing belt cover No. 2 (LH).

#### **Tightening torque:**

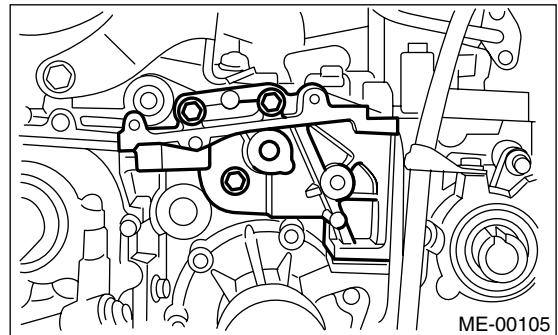
**5 N·m (0.5 kgf-m, 3.6 ft-lb)**



11) Install the tensioner bracket.

#### **Tightening torque:**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**



12) Install the crankshaft sprocket. **<Ref. to ME(H4DOTC)-58, INSTALLATION, CRANKSHAFT SPROCKET.>**

13) Install the camshaft sprockets. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>

14) Install the timing belt assembly. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>

15) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>

16) Install the crankshaft pulley. **<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>**

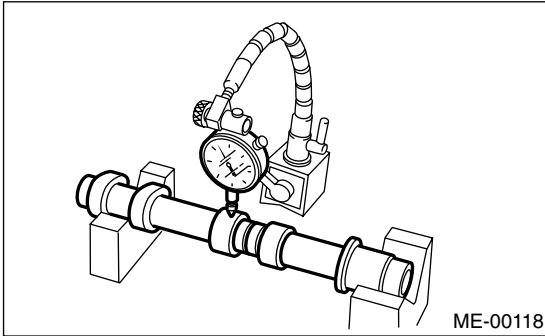
17) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

## C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

### Limit:

**0.020 mm (0.0008 in)**



2) Check the journal for damage and wear. Replace if faulty.

3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

|          | Camshaft journal                           |                                            |
|----------|--------------------------------------------|--------------------------------------------|
|          | Front                                      | Center, rear                               |
| Standard | 37.946 — 37.963 mm<br>(1.4939 — 1.4946 in) | 29.946 — 29.963 mm<br>(1.1790 — 1.1796 in) |

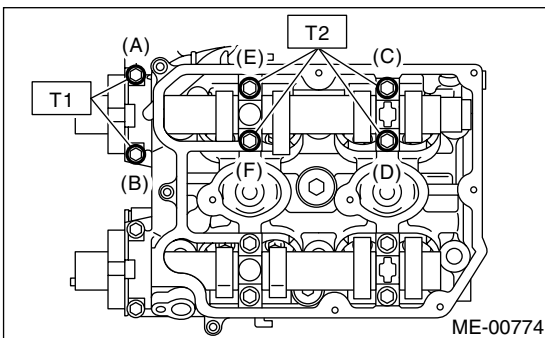
4) Measurement of the camshaft journal oil clearance:

- (1) Clean the bearing caps and camshaft journals.
- (2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
- (3) Place a plastigauge across each of the camshaft journals.
- (4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

### Tightening torque:

**T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)**

**T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)**



(5) Remove the bearing caps.

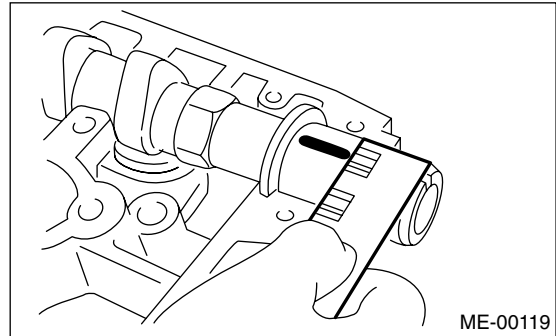
(6) Measure the widest point of plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

### Standard:

**0.037 — 0.072 mm (0.0015 — 0.0028 in)**

### Limit:

**0.10 mm (0.0039 in)**



(7) Completely remove the plastigauge.

5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H, replace if the limit has been exceeded.

### Cam height: H

#### Standard:

##### Intake:

**46.55 — 46.65 mm (1.833 — 1.837 in)**

##### Exhaust:

**46.75 — 46.85 mm (1.841 — 1.844 in)**

#### Limit:

##### Intake:

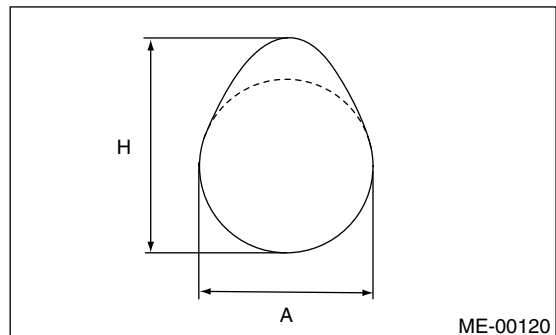
**46.45 mm (1.829 in)**

##### Exhaust:

**46.65 mm (1.837 in)**

### Cam base circle diameter A:

**37.0 mm (1.457 in)**



## CAMSHAFT

### MECHANICAL

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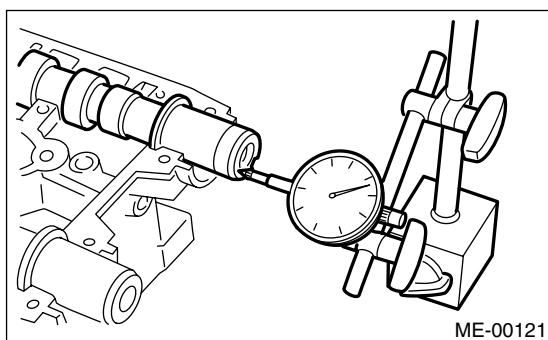
6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

**Standard:**

***0.068 — 0.116 mm (0.0027 — 0.0046 in)***

**Limit:**

***0.14 mm (0.0055 in)***



## 2. Compression

### A: INSPECTION

#### CAUTION:

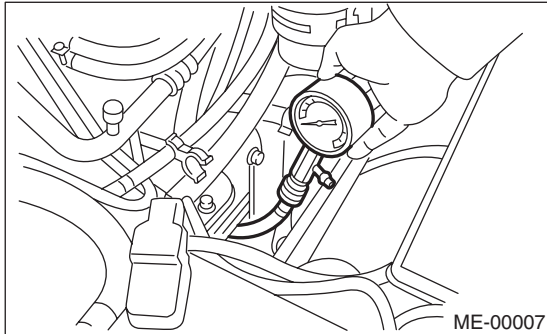
**After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.**

- 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)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(H4DOTC)-5, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Hold the compression gauge tight against 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 starter motor, and then 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<sup>2</sup>, 142 — 171 psi)**

##### **Limit**

**882 kPa (9.0 kgf/cm<sup>2</sup>, 128 psi)**

##### **Difference between cylinders**

**Less than 49 kPa (0.5 kgf/cm<sup>2</sup>, 7 psi)**

## 23.Connecting Rod

### A: REMOVAL AND INSTALLATION

For operations related to connecting rod, refer to  
“20. Cylinder Block.” <Ref. to ME(H4DOTC)-74,  
REMOVAL, Cylinder Block.> <Ref. to  
ME(H4DOTC)-78, INSTALLATION, Cylinder  
Block.>

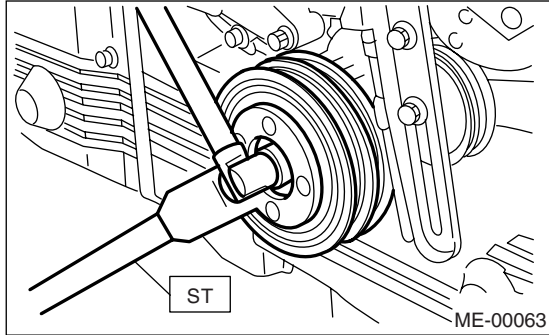
## 13.Crank Pulley

### A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>

2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH



3) Remove the crank pulley.

### B: INSTALLATION

1) Install the crank pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crank pulley thread using an air gun.

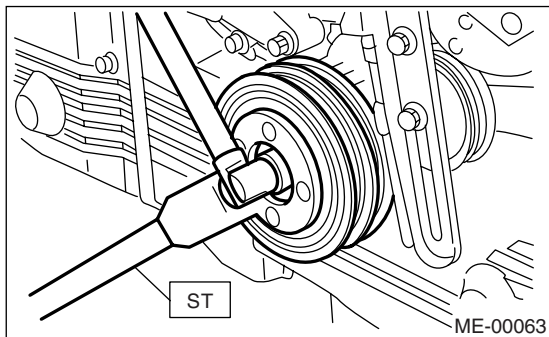
(2) Apply engine oil to the crank pulley bolt seat and thread.

(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) Confirm that the tightening angle of crank pulley bolt is 65 degrees or more. If the tightening angle of crank pulley bolt is less than 65 degrees, conduct the following procedures.

#### CAUTION:

**If the tightening angle of crank pulley bolt is less than 65 degrees, the bolt should be damaged. In this case, the bolt must be replaced.**

(1) Replace the crank pulley bolts and clean them.

#### Crank pulley bolt:

**12369AA011**

(2) Clean the crankshaft thread using an air gun.

(3) Apply engine oil to the crank pulley bolt seat and thread.

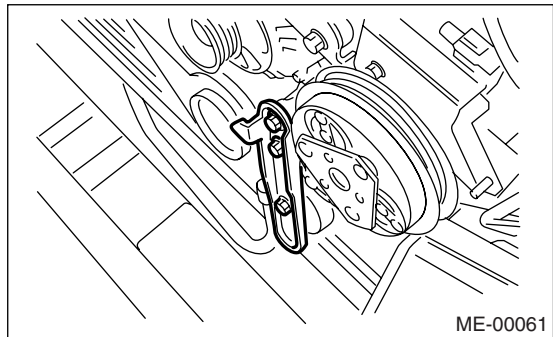
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).

(5) Tighten the crank pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

#### NOTE:

Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

### C: INSPECTION

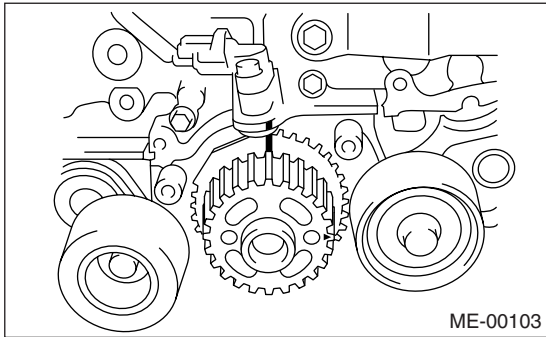
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(H4DOTC)-46, INSPECTION, V-belt.>

## 17.Crank Sprocket

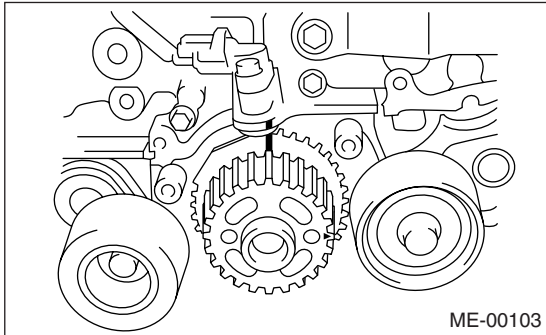
### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-48, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-50, REMOVAL, Timing Belt Assembly.>
- 5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-58, REMOVAL, Cam Sprocket.>
- 6) Remove the crank sprocket.



### B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the cam sprocket. <Ref. to ME(H4DOTC)-58, INSTALLATION, Cam Sprocket.>
- 3) Install the timing belt assembly. <Ref. to ME(H4DOTC)-52, INSTALLATION, Timing Belt Assembly.>
- 4) Install the timing belt cover. <Ref. to ME(H4DOTC)-49, INSTALLATION, Timing Belt Cover.>
- 5) Install the crank pulley. <Ref. to ME(H4DOTC)-48, INSTALLATION, Crank Pulley.>
- 6) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

### C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

## 24.Crankshaft

### A: REMOVAL AND INSTALLATION

For operations related to crankshaft, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-74, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-78, INSTALLATION, Cylinder Block.>

# CYLINDER BLOCK

MECHANICAL

## 20. Cylinder Block

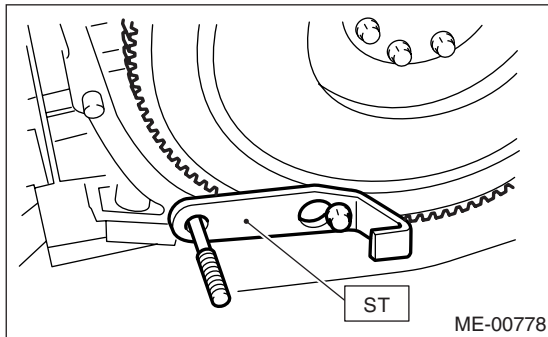
### A: REMOVAL

#### NOTE:

Before conducting this procedure, drain the engine oil completely if applicable.

- 1) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 2) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
- 3) Remove the crank pulley. <Ref. to ME(H4DOTC)-48, REMOVAL, Crank Pulley.>
- 4) Remove the timing belt cover. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Cover.>
- 5) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-50, REMOVAL, Timing Belt Assembly.>
- 6) Remove the cam sprocket. <Ref. to ME(H4DOTC)-58, REMOVAL, Cam Sprocket.>
- 7) Remove the crank sprocket. <Ref. to ME(H4DOTC)-60, REMOVAL, Crank Sprocket.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the cylinder head assembly. <Ref. to ME(H4DOTC)-67, REMOVAL, Cylinder Head Assembly.>
- 10) Remove the clutch disc and cover. <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
- 11) Remove the flywheel. <Ref. to CL-13, REMOVAL, Flywheel.>

ST 498497100 CRANKSHAFT STOPPER

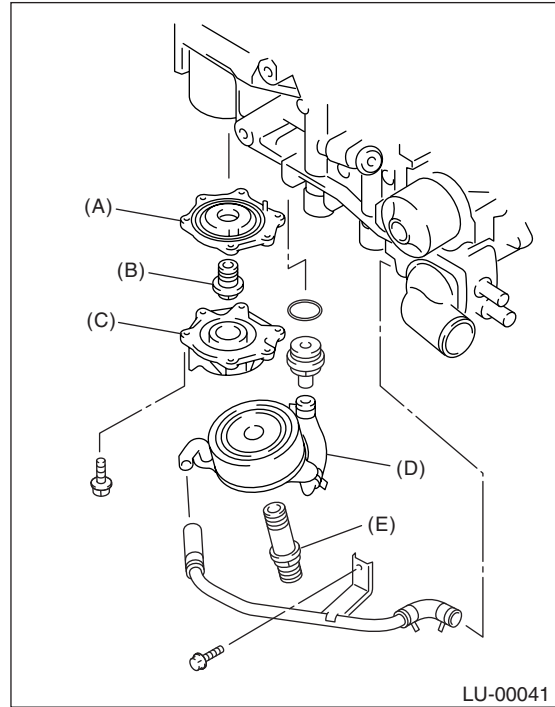


- 12) Remove the oil separator cover.
- 13) Remove the water by-pass pipe for heater.
- 14) Remove the oil filter.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

- 15) Remove the oil cooler.



- (A) Adapter (1)
- (B) Adapter connector
- (C) Adapter (2)
- (D) Oil cooler
- (E) Oil cooler connector

- 16) Removal of oil pan:

- (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

Do not use a screwdriver or similar tool in place of oil pan cutter.

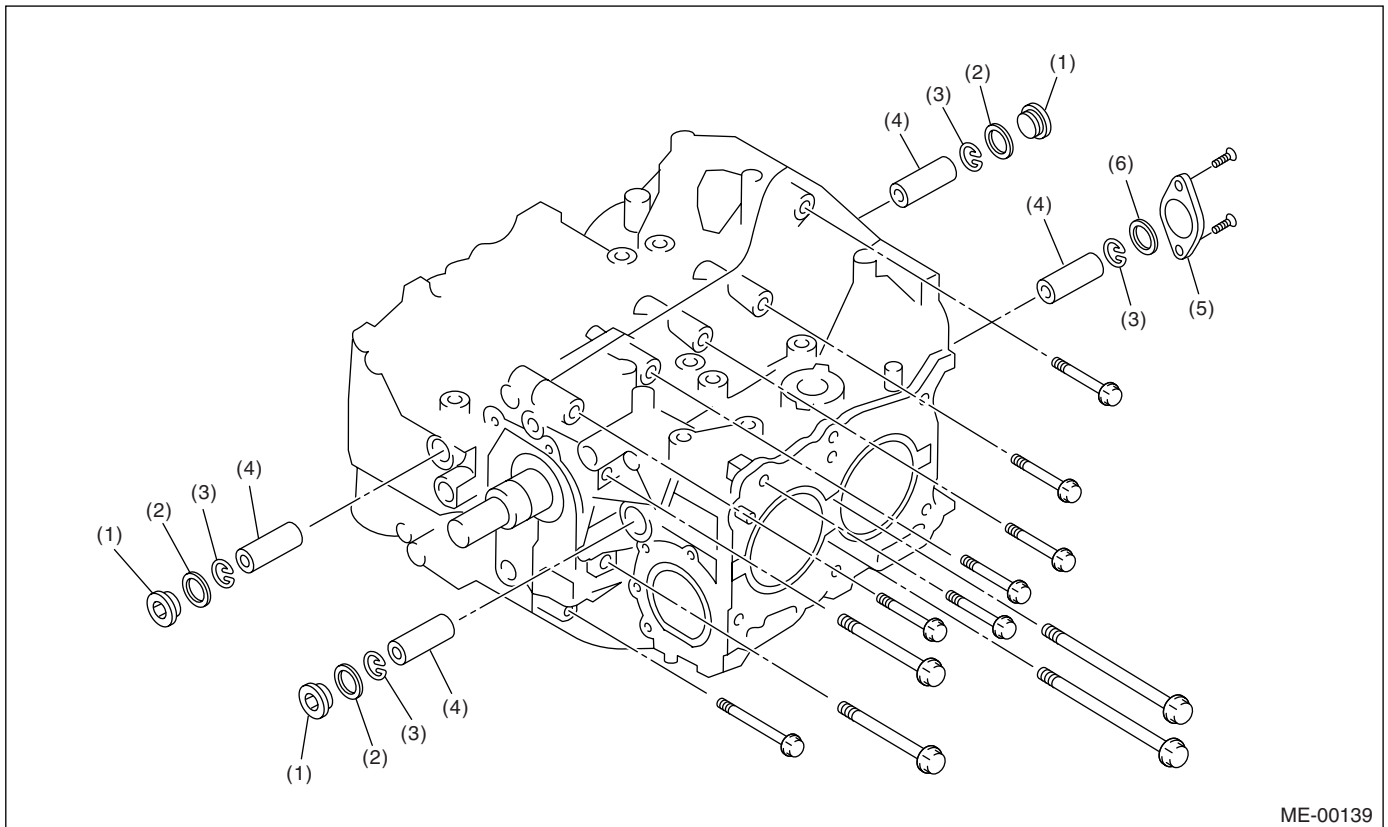
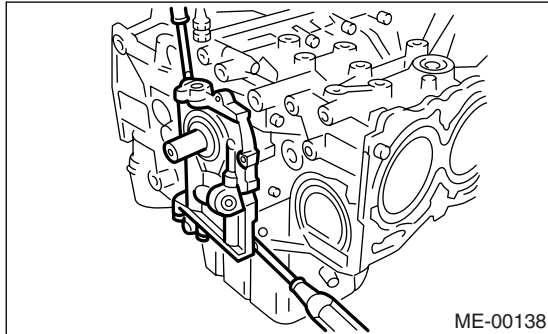
- 17) Remove the oil strainer stay.
  - 18) Remove the oil strainer.
  - 19) Remove the baffle plate.
  - 20) Remove the water pipes.
  - 21) Remove the water pump.
  - 22) Remove the oil pump from cylinder block.
- Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

# CYLINDER BLOCK

MECHANICAL

## CAUTION:

Be careful not to scratch the mating surface of cylinder block and oil pump.



- (1) Service hole plug
- (2) Gasket

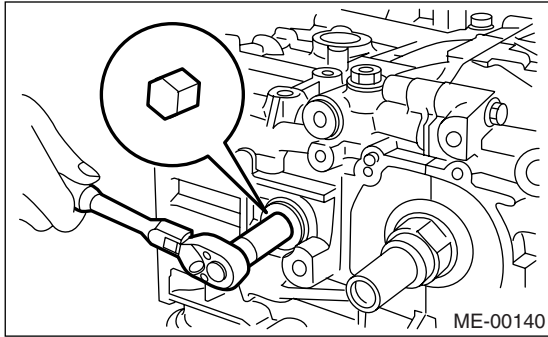
- (3) Circlip
- (4) Piston pin

- (5) Service hole cover
- (6) O-ring

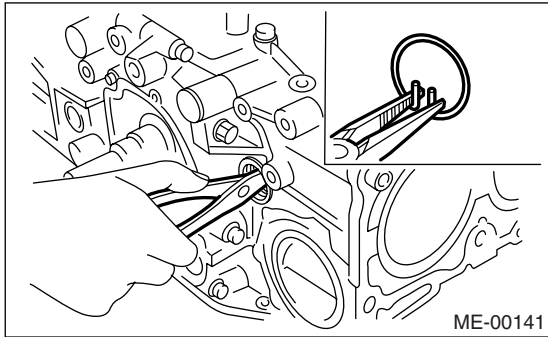
## CYLINDER BLOCK

### MECHANICAL

23) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



24) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders using needle nose plier.

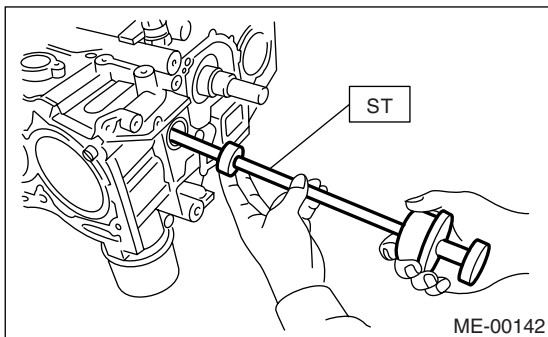


25) Draw out the piston pin from #1 and #2 pistons using ST.

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 the cylinder block on the side of #2 and #4 cylinders.

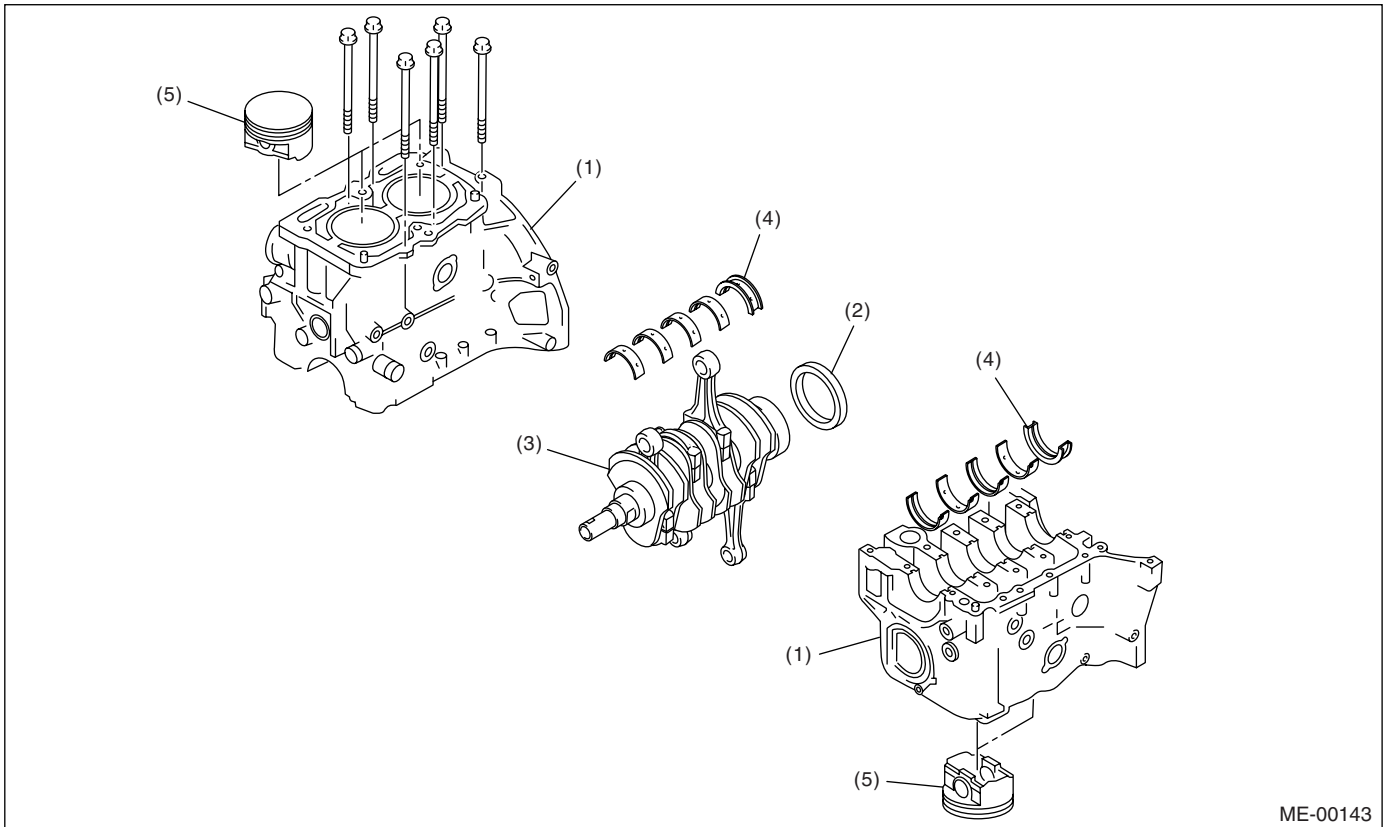
28) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.

29) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.

30) Separate the cylinder blocks (LH) and (RH).

#### NOTE:

When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



ME-00143

(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) Draw out each piston from cylinder block using a wooden bar or hammer handle.

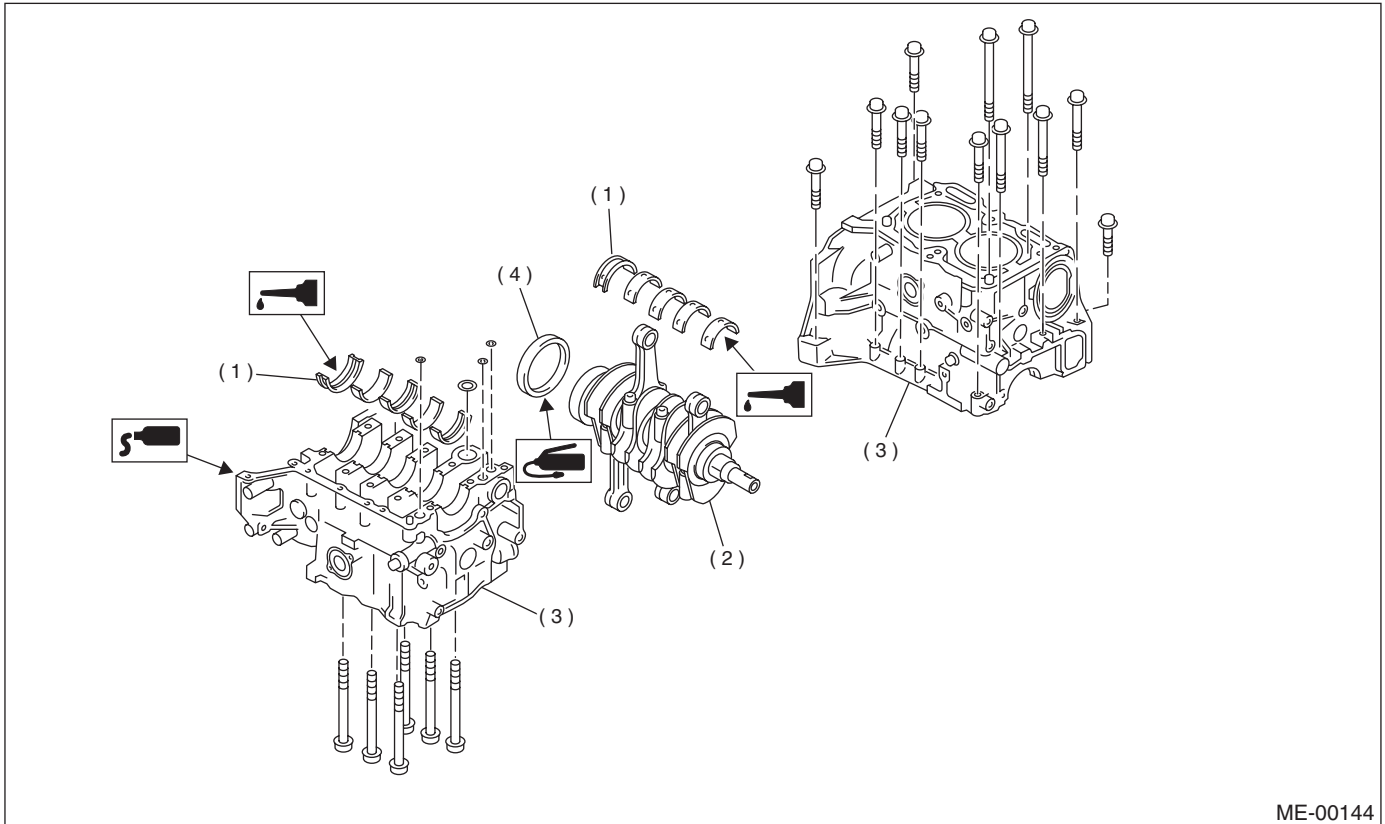
**CAUTION:**

**Do not confuse the combination of piston and cylinder.**

# CYLINDER BLOCK

MECHANICAL

## B: INSTALLATION



(1) Crankshaft bearing

(3) Cylinder block

(4) Rear oil seal

(2) Crankshaft

### CAUTION:

- Remove oil in the mating surface of bearing and cylinder block before installation.
- Apply a coat of engine oil to crankshaft pins.

1) Install crankshaft bearings on the cylinder block, apply a coat of engine oil to crankshaft bearings, and position the crankshaft on #2 and #4 cylinder block.

2) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

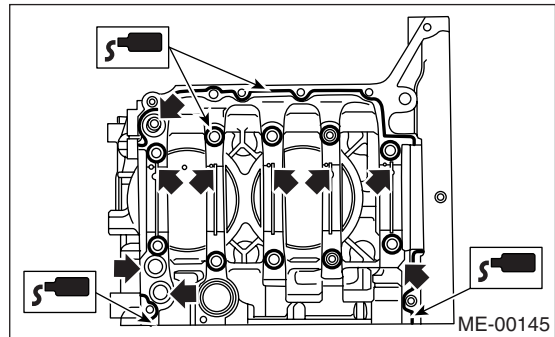
### Liquid gasket:

**Part No. 004403007**

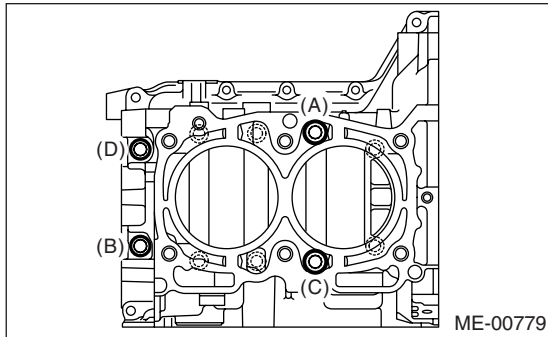
**THREE BOND 1215 or equivalent**

### CAUTION:

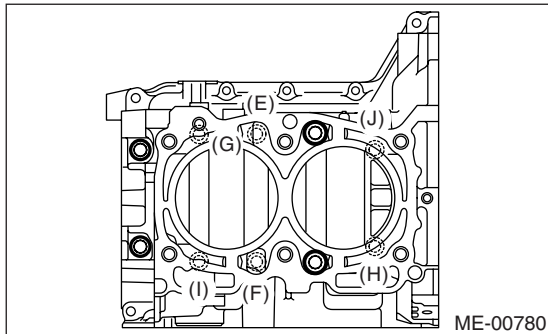
Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



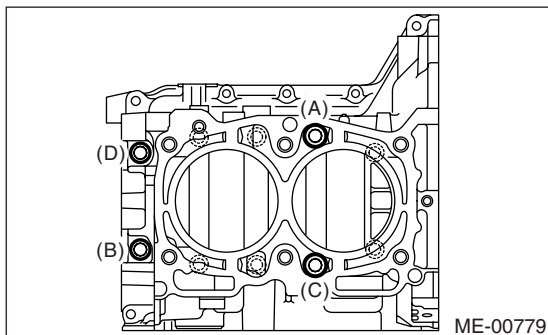
3) Apply engine oil to washers and thread of bolts.  
4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

**Tightening torque:****10 N·m (1.0 kgf-m, 7.2 ft-lb)**

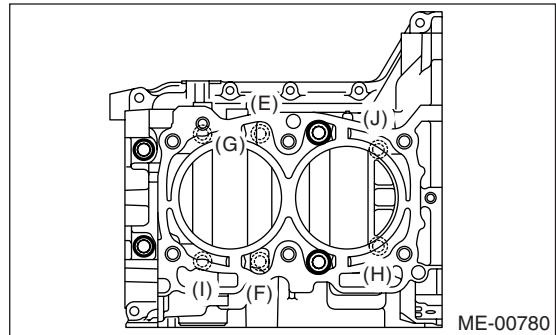
5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

**Tightening torque:****10 N·m (1.0 kgf-m, 7.2 ft-lb)**

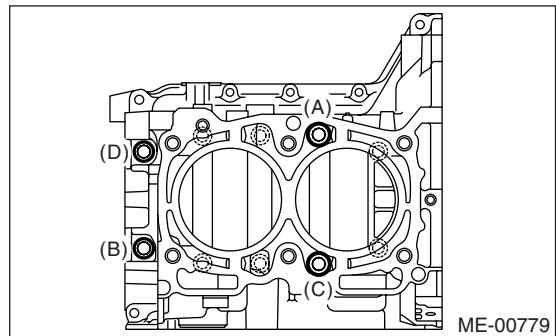
6) Further tighten the LH side bolts (A — D) in alphabetical sequence.

**Tightening torque:****(A), (C): 20 N·m (2.0 kgf-m, 14.8 ft-lb)****(B), (D): 15 N·m (1.5 kgf-m, 10.8 ft-lb)**

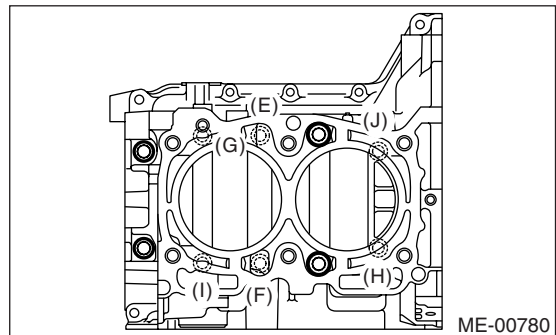
7) Further tighten the RH side bolts (E — J) in alphabetical sequence.

**Tightening torque:****(E), (F), (G), (I): 20 N·m (2.0 kgf-m, 14.8 ft-lb)****(H), (J): 18 N·m (1.8 kgf-m, 13.3 ft-lb)**

8) Further tighten the LH side bolts (A — D) by 90° in alphabetical sequence.



9) Further tighten the RH side bolts (E — J) by 90° in alphabetical sequence.



10) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

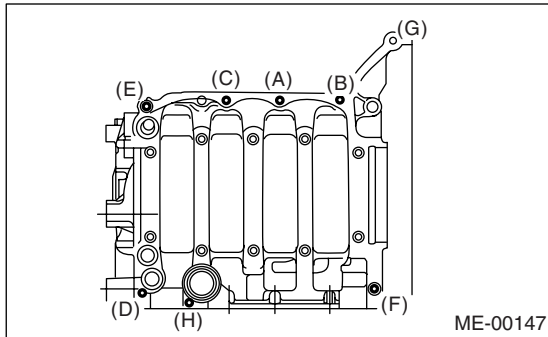
# CYLINDER BLOCK

## MECHANICAL

### Tightening torque:

(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)

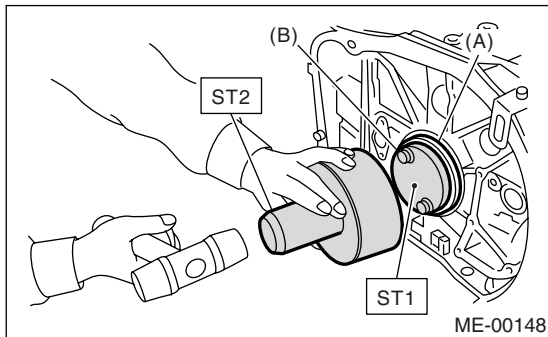
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



11) Install the rear oil seal using ST1 and ST2.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

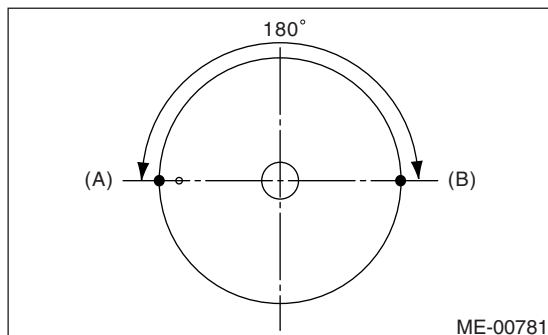


(A) Rear oil seal

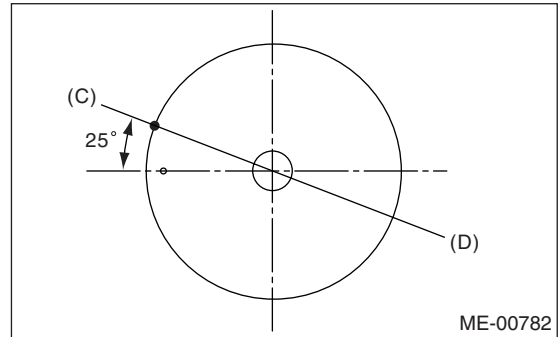
(B) Flywheel attaching bolt

12) Position the top ring gap at (A) or (B) in the figure.

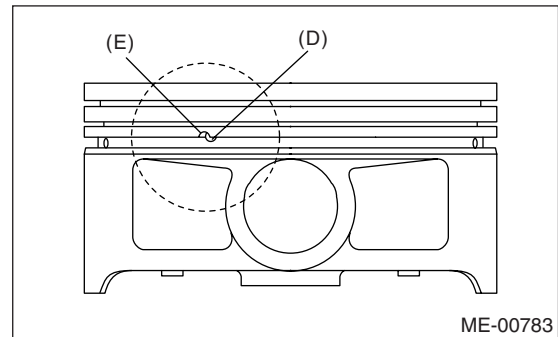
13) Position the second ring gap at 180° on the reverse side for the top ring gap.



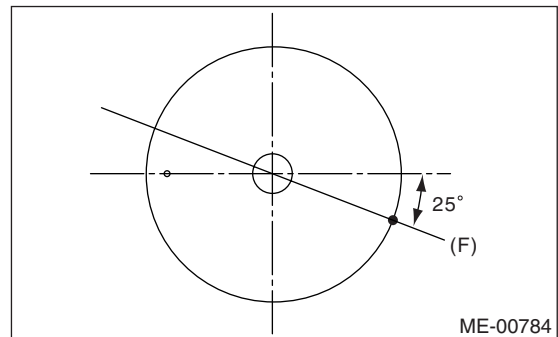
14) Position the upper rail gap at (C) in the figure.



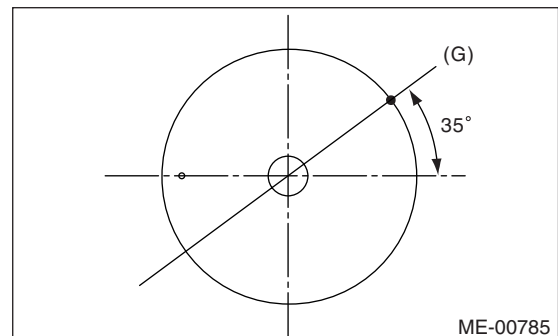
15) Align upper rail spin stopper (D) with piston side surface hole (E).



16) Position the expander gap at (F) in the figure.



17) Position the lower rail gap at (G) in the figure.



### CAUTION:

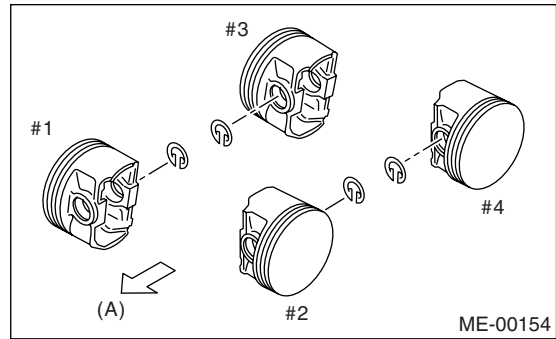
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

18) Install the circlip.

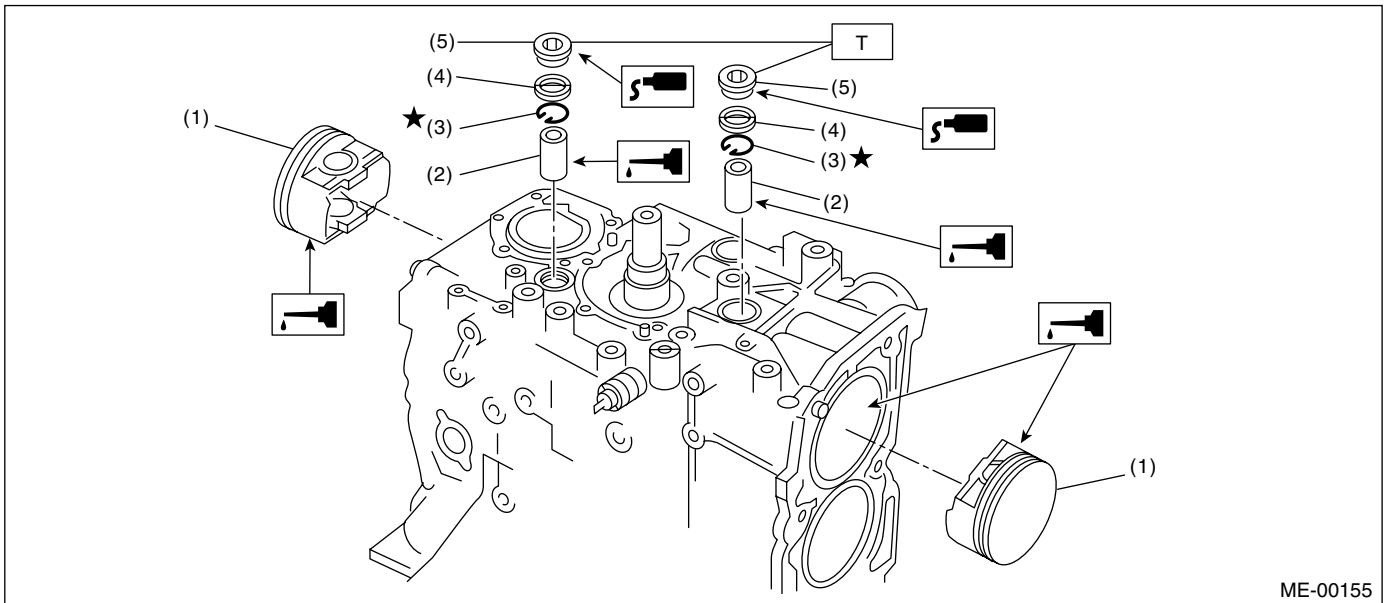
Install the circlips in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

**NOTE:**

Use new circlips.



(A) Front side



- |                |                       |
|----------------|-----------------------|
| (1) Piston     | (4) Gasket            |
| (2) Piston pin | (5) Service hole plug |
| (3) Circlip    |                       |

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

**T: 70 (7.1, 51.4)**

19) Installing the piston:

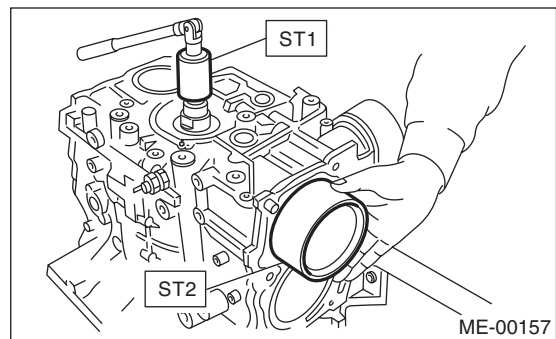
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.

(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE

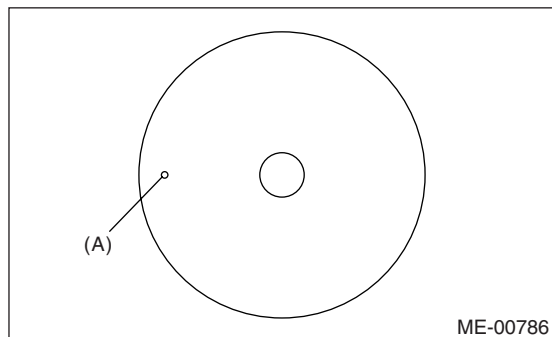


# CYLINDER BLOCK

## MECHANICAL

### CAUTION:

**Piston front mark faces towards the front of the engine.**

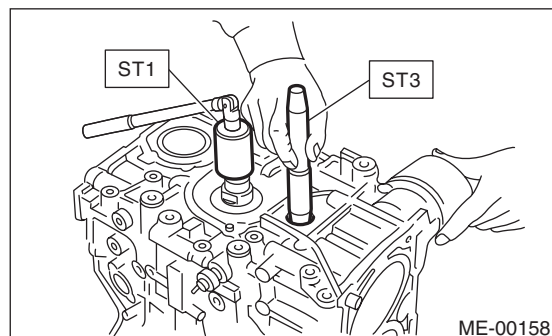


(A) Front mark

### 20) Installing piston pin:

- (1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE

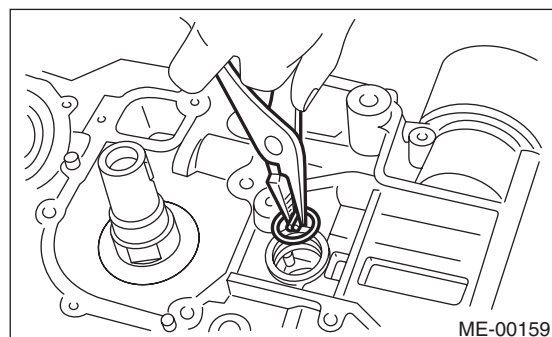


- (2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.

- (3) Using the needle nose plier, install the circlip.

### NOTE:

Use new circlips.

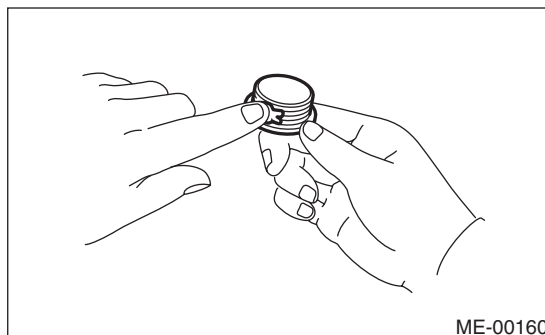


- (4) Apply liquid gasket around the service hole plug.

### Liquid gasket:

**Part No. 004403007**

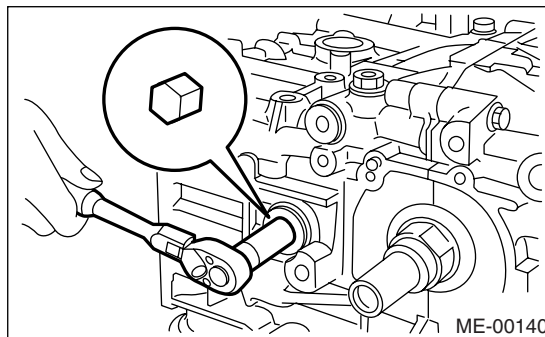
**THREE BOND 1215 or equivalent**

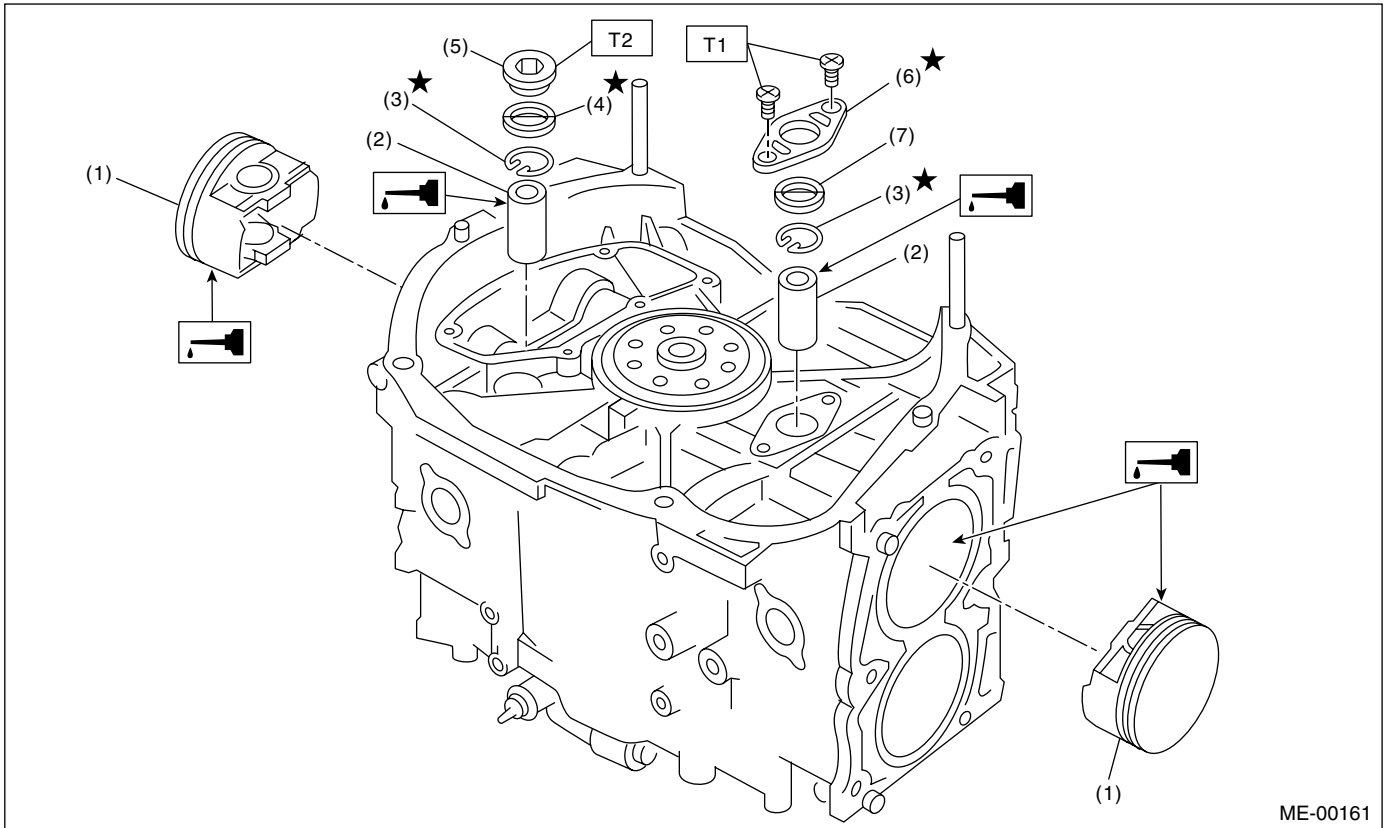


- (5) Install the service hole plug and gasket.

### NOTE:

Use a new gasket.





ME-00161

- |                |                        |
|----------------|------------------------|
| (1) Piston     | (5) Service hole plug  |
| (2) Piston pin | (6) Service hole cover |
| (3) Circlip    | (7) O-ring             |
| (4) Gasket     |                        |

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

**T1: 6.4 (0.65, 4.7)**

**T2: 70 (7.1, 51.4)**

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

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 matching surfaces, and then install the oil pan.

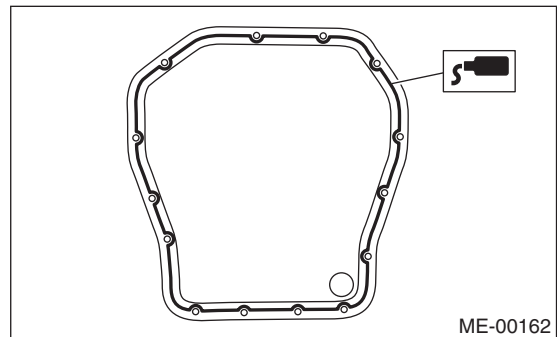
**Liquid gasket:**

**Part No. 004403007**

**THREE BOND 1215 or equivalent**

**Tightening torque:**

**5 N-m (0.5 kgf-m, 3.6 ft-lb)**



ME-00162

## CYLINDER BLOCK

### MECHANICAL

26) Apply liquid gasket to the matching surfaces, and then install the oil separator cover.

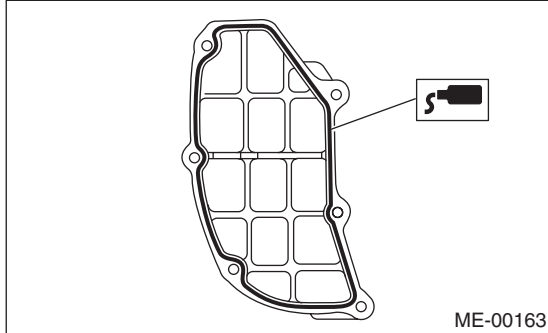
**Liquid gasket:**

**Part No. 004403007**

**THREE BOND 1215 or equivalent**

**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



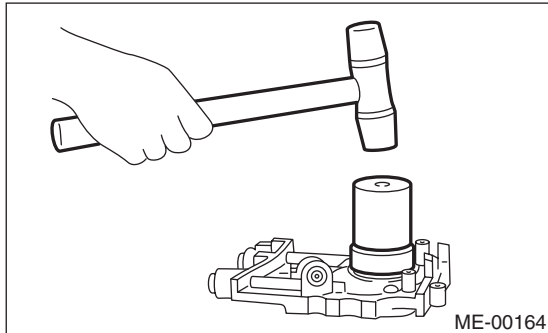
27) Install the flywheel. <Ref. to CL-13, INSTALLATION, Flywheel.>

28) Install the clutch disc and cover. <Ref. to CL-11, INSTALLATION, Clutch Disc and Cover.>

29) Installation of oil pump:

(1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER

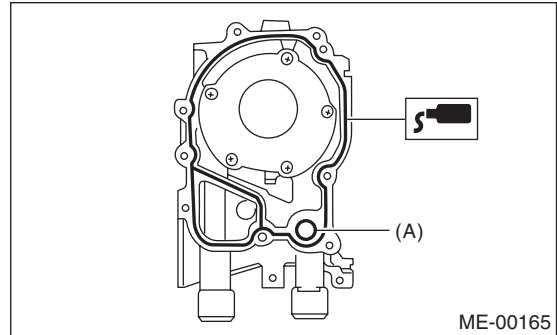


(2) Apply liquid gasket to the matching surface of oil pump.

**Liquid gasket:**

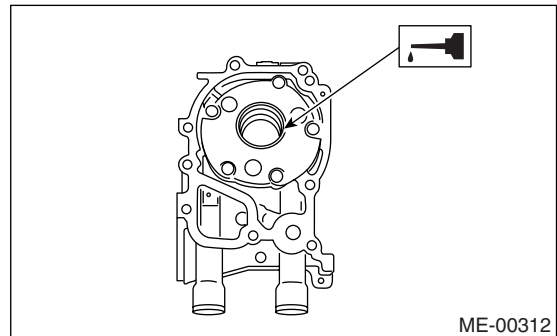
**Part No. 004403007**

**THREE BOND 1215 or equivalent**



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

**NOTE:**

- 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.

30) Install the water pump and gasket.

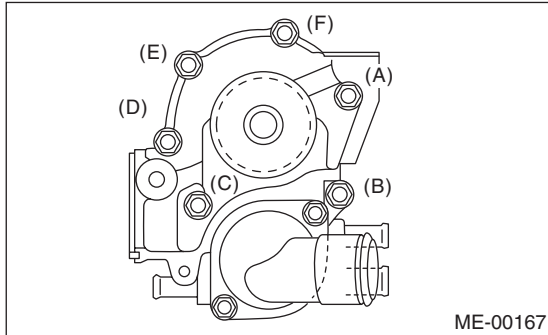
**Tightening torque:**

**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 the bolts in two stages in alphabetical sequence as shown in the figure.



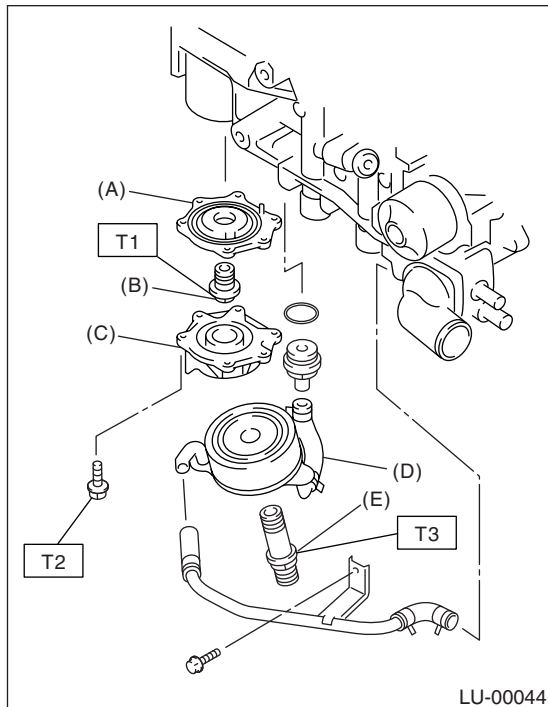
- 31) Install the water by-pass pipe for heater.  
 32) Install the oil cooler.

**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

- 33) Get an engine oil filter and apply a thin coat of engine oil to the seal rubber.  
 34) Install the oil filter by turning it by hand, being careful not to damage the seal rubber.

Tighten the oil filter 68 mm (2.68 in) or 65 mm (2.56 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

**CAUTION:**

- Do not tighten excessively or oil may leak.
- Be careful not to use the oil filter 80 mm (3.15 in) in diameter to turbo model.

35) Install the water by-pass pipe between oil cooler and water pump.

36) Install the water pipe.

**CAUTION:**

**Always use a new O-ring.**

37) Install the cylinder head assembly. <Ref. to ME(H4DOTC)-67, INSTALLATION, Cylinder Head Assembly.>

38) Install the oil level gauge guide and tighten the attaching bolt (LH side).

39) Install the rocker cover.

40) Install the crank sprocket. <Ref. to ME(H4DOTC)-60, INSTALLATION, Crank Sprocket.>

41) Install the cam sprocket. <Ref. to ME(H4DOTC)-58, INSTALLATION, Cam Sprocket.>

42) Install the timing belt assembly. <Ref. to ME(H4DOTC)-52, INSTALLATION, Timing Belt Assembly.>

43) Install the timing belt cover. <Ref. to ME(H4DOTC)-49, INSTALLATION, Timing Belt Cover.>

44) Install the crank pulley. <Ref. to ME(H4DOTC)-48, INSTALLATION, Crank Pulley.>

45) Install the generator and A/C compressor brackets on cylinder head.

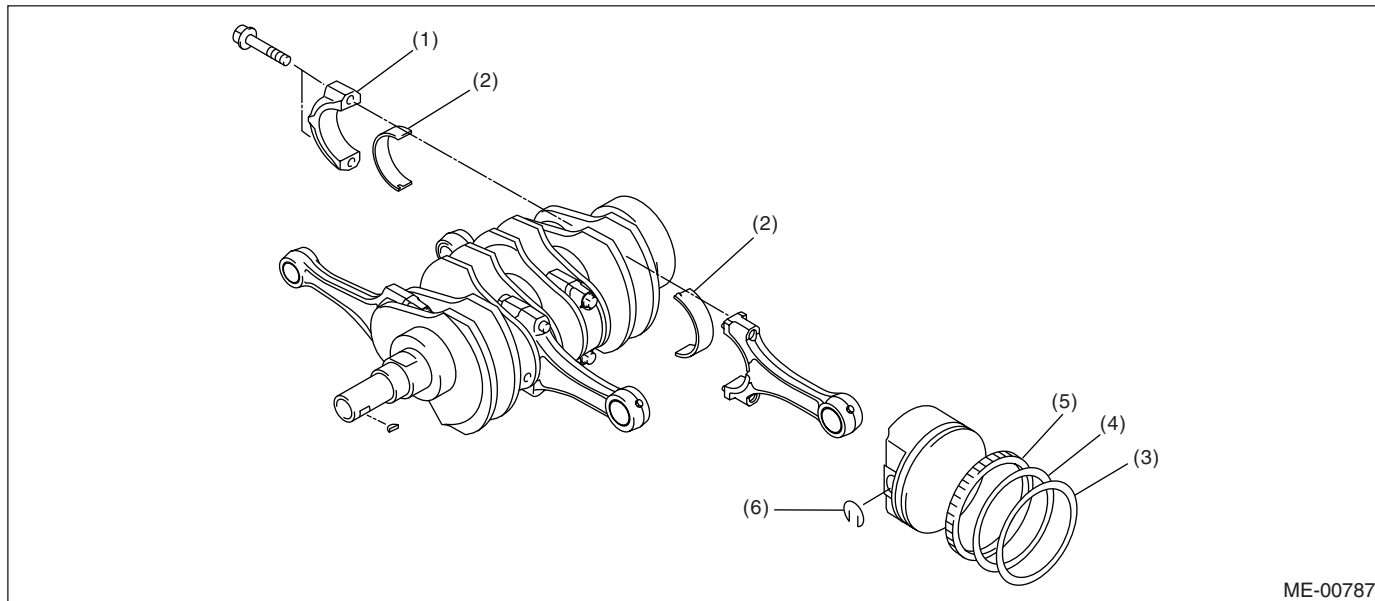
46) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

47) Install the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

# CYLINDER BLOCK

MECHANICAL

## C: DISASSEMBLY



ME-00787

(1) Connecting rod cap

(3) Top ring

(5) Oil ring

(2) Connecting rod bearing

(4) Second ring

(6) Circlip

1) Remove the connecting rod cap.

2) Remove the connecting rod bearing.

### CAUTION:

**Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.**

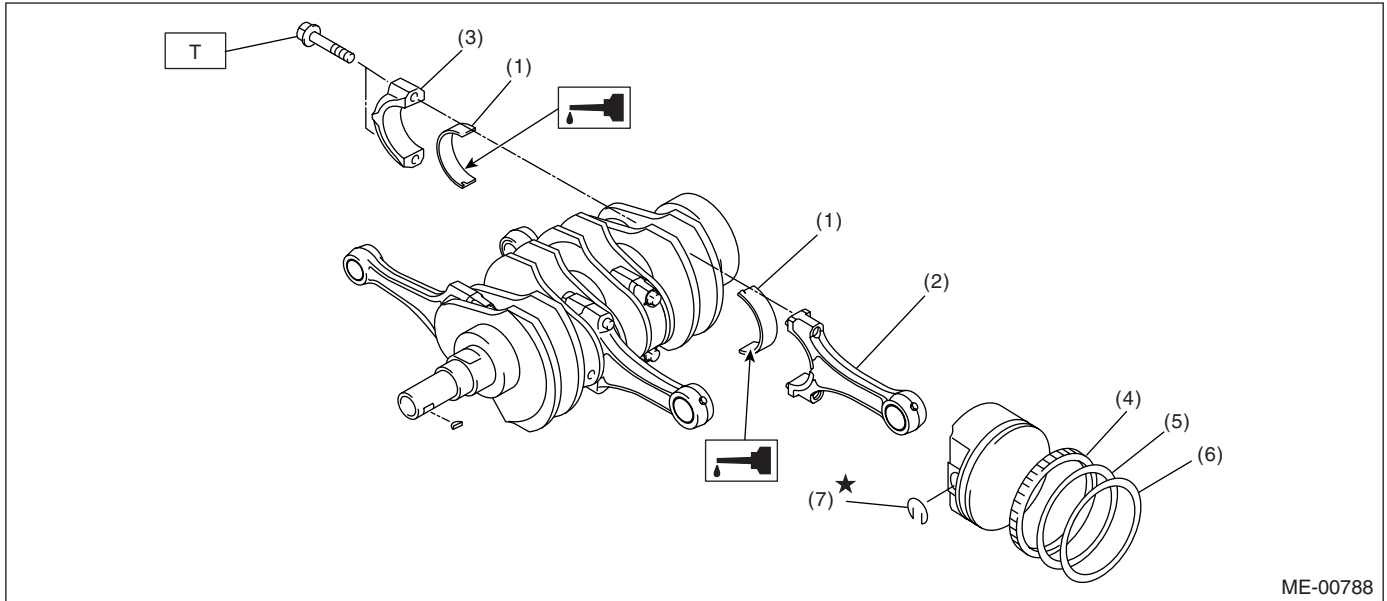
3) Remove the piston rings using the piston ring expander.

4) Remove the oil ring by hand.

### CAUTION:

**Arrange the removed piston rings in proper order to prevent confusion.**

5) Remove the circlip.

**D: ASSEMBLY**

ME-00788

- |                            |                 |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod         | (6) Top ring    |
| (3) Connecting rod cap     | (7) Circlip     |
| (4) Oil ring               |                 |

---

**Tightening torque: N·m (kgf-m, ft-lb)**
**T: 52 (5.3, 38.4)**


---

- 1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
- 2) Install the connecting rod on crankshaft.

**NOTE:**

Position each connecting rod with the side marked facing forward.

- 3) Install the connecting rod cap with connecting rod nut.

Ensure 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.
- 4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

**E: INSPECTION****1. CYLINDER BLOCK**

- 1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
- 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:**
**0.05 mm (0.0020 in)**
**Grinding limit:**
**0.1 mm (0.004 in)**
**Standard height of cylinder block:**
**201.0 mm (7.91 in)**
**2. CYLINDER AND PISTON**

- 1) The cylinder bore size is stamped on cylinder block's front upper surface.

**NOTE:**

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

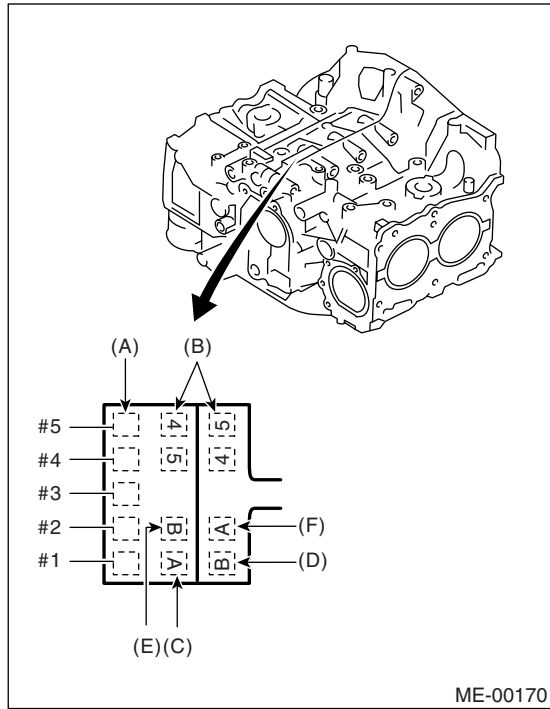
# CYLINDER BLOCK

## MECHANICAL

### 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 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)**

#### Limit

**0.050 mm (0.0020 in)**

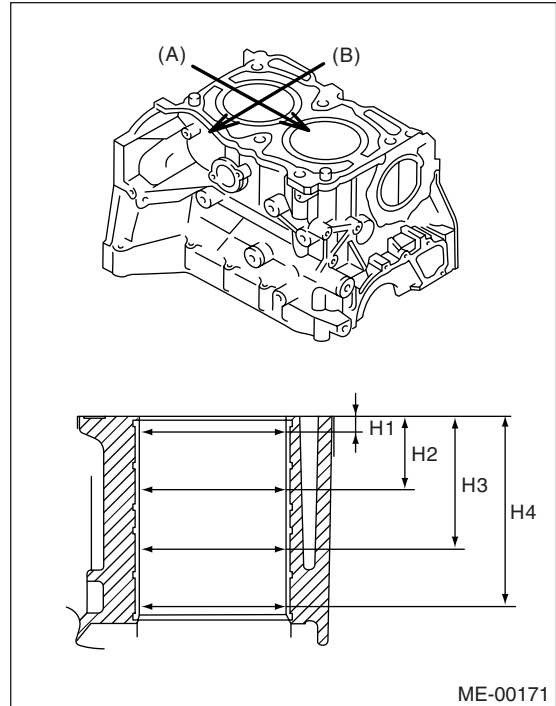
### Out-of-roundness:

#### Standard

**0.010 mm (0.0004 in)**

#### Limit

**0.050 mm (0.0020 in)**



- (A) Piston pin direction
- (B) Thrust direction
- H1: 10 mm (0.39 in)
- H2: 45 mm (1.77 in)
- H3: 80 mm (3.15 in)
- H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

### NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

### Piston grade point H:

**38.2 mm (1.50 in)**

## Piston outer diameter:

### Standard

**A: 99.505 — 99.515 mm**  
(3.9175 — 3.9179 in)

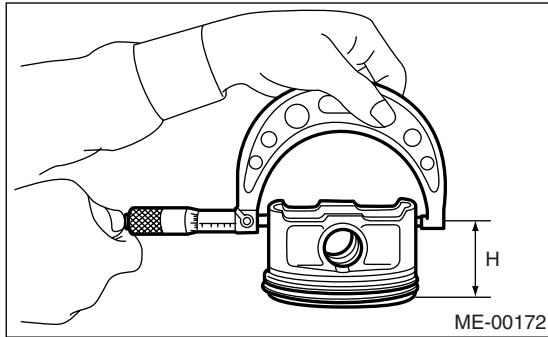
**B: 99.495 — 99.505 mm**  
(3.9171 — 3.9175 in)

### 0.25 mm (0.0098 in) oversize

**99.745 — 99.765 mm**  
(3.9270 — 3.9278 in)

### 0.50 mm (0.0197 in) oversize

**99.995 — 100.015 mm**  
(3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

### NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

## Cylinder to piston clearance at 20°C (68°F):

### Standard

**-0.010 — 0.010 mm (-0.0004 — 0.0004 in)**

### Limit

**0.030 mm (0.0012 in)**

6) Boring and honing:

- (1) If the 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, reboring it to use an oversize piston.

### CAUTION:

**When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.**

- (2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

### NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

## Limit of cylinder enlarging (boring):

**0.5 mm (0.020 in)**

## 3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-87, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

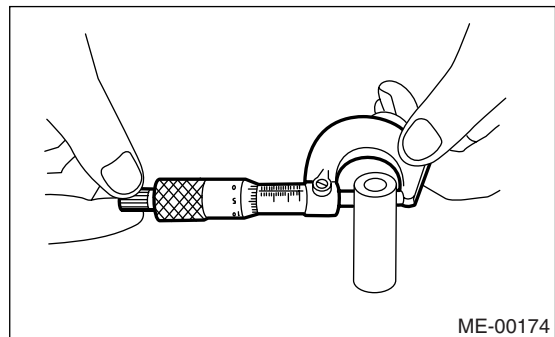
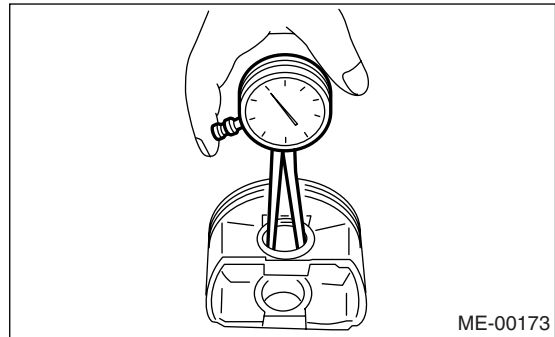
## Standard clearance between piston pin and hole in piston:

### Standard

**0.004 — 0.008 mm (0.0002 — 0.0003 in)**

### Limit

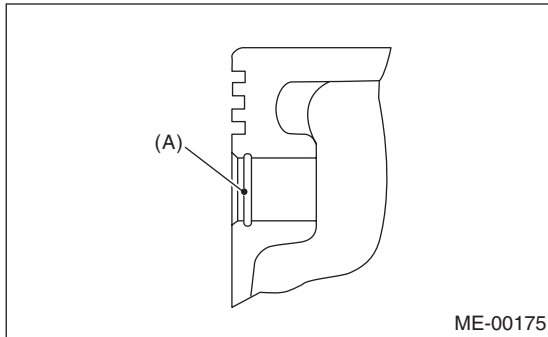
**0.020 mm (0.0008 in)**



# CYLINDER BLOCK

## MECHANICAL

4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that the piston pin can lightly move.



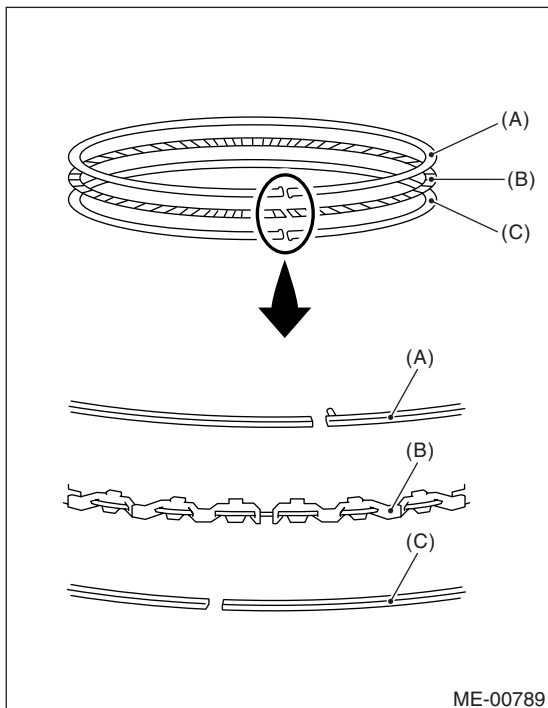
5) Check the piston pin circlip for distortion, cracks and wear.

### 4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

#### CAUTION:

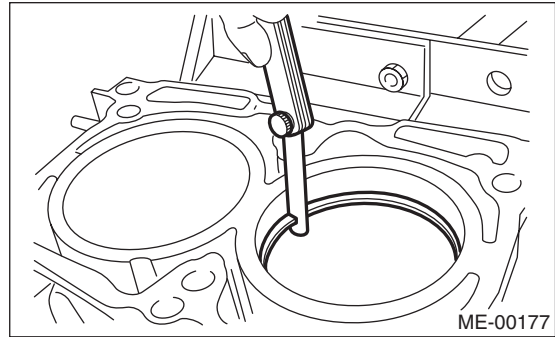
- Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
- Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



- (A) Upper rail  
(B) Expander  
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

|                 |               | Unit: mm (in)                    |             |
|-----------------|---------------|----------------------------------|-------------|
|                 |               | Standard                         | Limit       |
| Piston ring gap | Top ring      | 0.20 — 0.25<br>(0.0079 — 0.0098) | 1.0 (0.039) |
|                 | Second ring   | 0.37 — 0.52<br>(0.015 — 0.020)   | 1.0 (0.039) |
|                 | Oil ring rail | 0.20 — 0.50<br>(0.0079 — 0.0197) | 1.5 (0.059) |

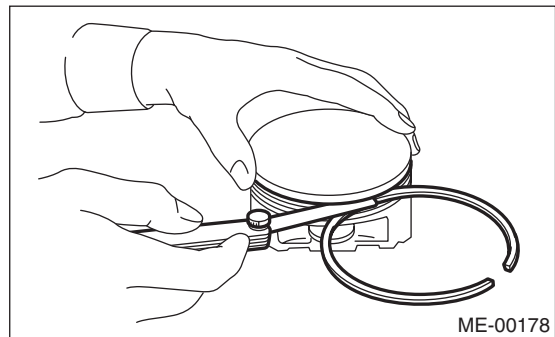


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

#### NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

|                                                      |             | Unit: mm (in)                      |               |
|------------------------------------------------------|-------------|------------------------------------|---------------|
|                                                      |             | Standard                           | Limit         |
| Clearance between piston ring and piston ring groove | Top ring    | 0.040 — 0.080<br>(0.0016 — 0.0031) | 0.15 (0.0059) |
|                                                      | Second ring | 0.030 — 0.070<br>(0.0012 — 0.0028) | 0.15 (0.0059) |

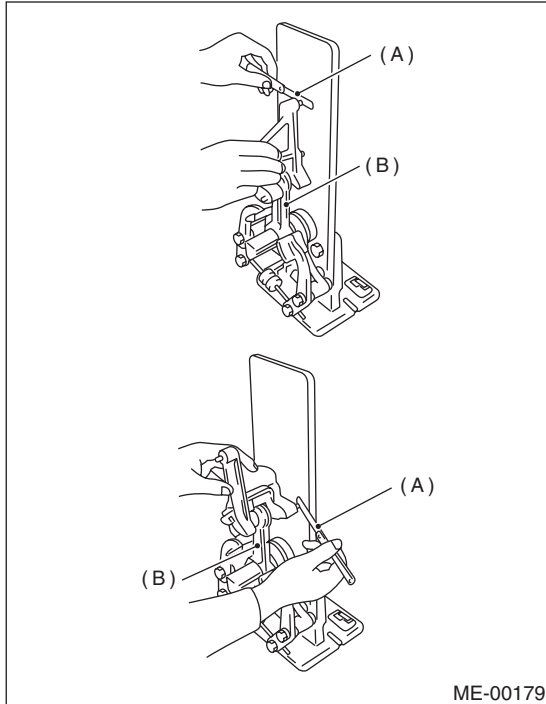


## 5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

**Limit of bend or twist per 100 mm (3.94 in) in length:**

**0.10 mm (0.0039 in)**



(A) Thickness gauge

(B) Connecting rod

- 3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

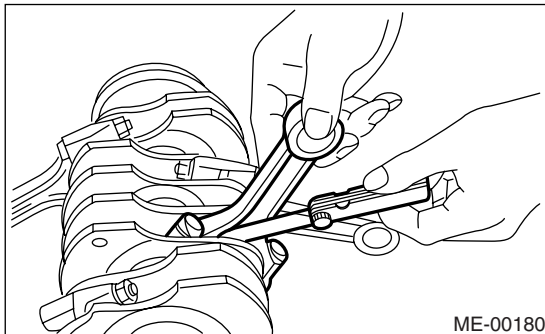
**Connecting rod side clearance:**

**Standard**

**0.070 — 0.330 mm (0.0028 — 0.0130 in)**

**Limit**

**0.40 mm (0.016 in)**



- 4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

- 5) Measure the oil clearance on individual connecting rod bearings by means of plastigage. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

**Connecting rod oil clearance:**

**Standard**

**0.017 — 0.045 mm (0.0007 — 0.0018 in)**

**Limit**

**0.05 mm (0.0020 in)**

| Unit: mm (in)                 |                                       |                                      |
|-------------------------------|---------------------------------------|--------------------------------------|
| Bearing                       | Bearing size<br>(Thickness at center) | Outer diameter of<br>crank pin       |
| Standard                      | 1.490 — 1.502<br>(0.0587 — 0.0591)    | 51.984 — 52.000<br>(2.0466 — 2.0472) |
| 0.03<br>(0.0012)<br>undersize | 1.504 — 1.512<br>(0.0592 — 0.0595)    | 51.954 — 51.970<br>(2.0454 — 2.0461) |
| 0.05<br>(0.0020)<br>undersize | 1.514 — 1.522<br>(0.0596 — 0.0599)    | 51.934 — 51.950<br>(2.0447 — 2.0453) |
| 0.25<br>(0.0098)<br>undersize | 1.614 — 1.622<br>(0.0635 — 0.0639)    | 51.734 — 51.750<br>(2.0368 — 2.0374) |

# CYLINDER BLOCK

## MECHANICAL

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

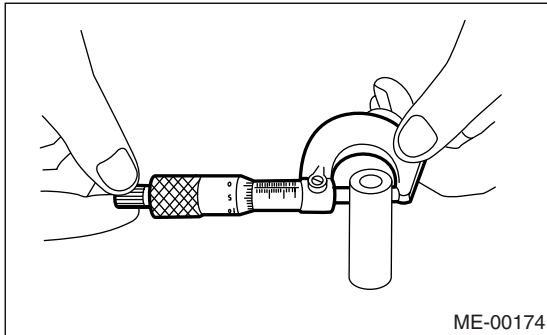
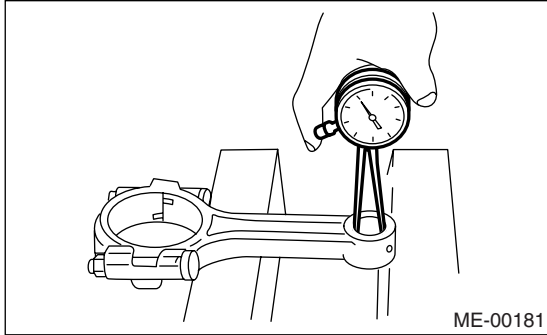
### **Clearance between piston pin and bushing:**

#### **Standard**

**0 — 0.022 mm (0 — 0.0009 in)**

#### **Limit**

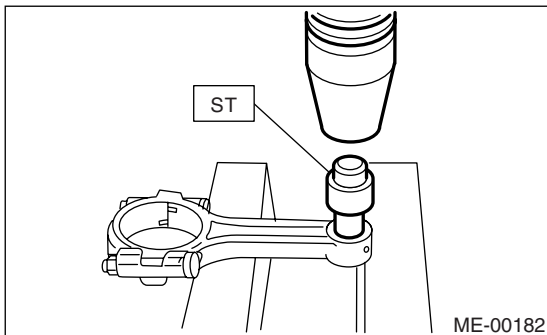
**0.030 mm (0.0012 in)**



7) Replacement procedure is as follows:

- (1) Remove the bushing from connecting rod with ST and press.
- (2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
- (4) After the completion of reaming, clean the bushing to remove chips.

## **6. CRANKSHAFT AND CRANKSHAFT BEARING**

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.

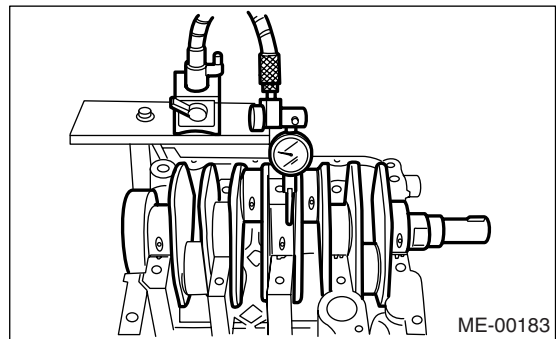
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

### **NOTE:**

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

### **Crankshaft bend limit:**

**0.035 mm (0.0014 in)**



3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

### **Crank pin and crank journal:**

#### **Out-of-roundness**

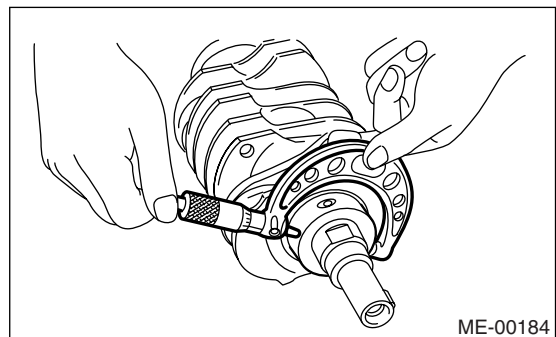
**0.005 mm (0.0002 in) or less**

#### **Taper limit**

**0.07 mm (0.0028 in)**

#### **Grinding limit**

**0.250 mm (0.0098 in)**



# CYLINDER BLOCK

MECHANICAL

|                            |                                       | Unit: mm (in)                        |                                      |                                      |
|----------------------------|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                            |                                       | Crank journal diameter               |                                      | Crank pin outer diameter             |
|                            |                                       | #1, #3, #5                           | #2, #4                               |                                      |
| Standard                   | Journal O.D.                          | 59.992 — 60.008<br>(2.3619 — 2.3625) | 59.992 — 60.008<br>(2.3619 — 2.3625) | 51.984 — 52.000<br>(2.0466 — 2.0472) |
|                            | Bearing size<br>(Thickness at center) | 1.998 — 2.011<br>(0.0787 — 0.0792)   | 2.000 — 2.013<br>(0.0787 — 0.0793)   | 1.490 — 1.502<br>(0.0587 — 0.0591)   |
| 0.03 (0.0012)<br>undersize | Journal O.D.                          | 59.962 — 59.978<br>(2.3607 — 2.3613) | 59.962 — 59.978<br>(2.3607 — 2.3613) | 51.954 — 51.970<br>(2.0454 — 2.0461) |
|                            | Bearing size<br>(Thickness at center) | 2.017 — 2.020<br>(0.0794 — 0.0795)   | 2.019 — 2.022<br>(0.0795 — 0.0796)   | 1.504 — 1.512<br>(0.0592 — 0.0595)   |
| 0.05 (0.0020)<br>undersize | Journal O.D.                          | 59.942 — 59.958<br>(2.3599 — 2.3605) | 59.942 — 59.958<br>(2.3599 — 2.3605) | 51.934 — 51.950<br>(2.0447 — 2.0453) |
|                            | Bearing size<br>(Thickness at center) | 2.027 — 2.030<br>(0.0798 — 0.0799)   | 2.029 — 2.032<br>(0.0799 — 0.0800)   | 1.514 — 1.522<br>(0.0596 — 0.0599)   |
| 0.25 (0.0098)<br>undersize | Journal O.D.                          | 59.742 — 59.758<br>(2.3520 — 2.3527) | 59.742 — 59.758<br>(2.3520 — 2.3527) | 51.734 — 51.750<br>(2.0368 — 2.0374) |
|                            | Bearing size<br>(Thickness at center) | 2.127 — 2.130<br>(0.0837 — 0.0839)   | 2.129 — 2.132<br>(0.0838 — 0.0839)   | 1.614 — 1.622<br>(0.0635 — 0.0639)   |

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

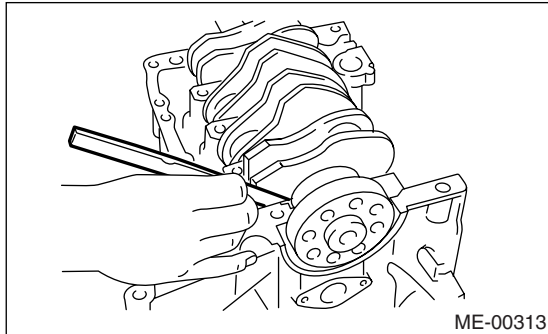
## Crankshaft side clearance:

### Standard

**0.030 — 0.115 mm (0.0012 — 0.0045 in)**

### Limit

**0.25 mm (0.0098 in)**



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigage. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

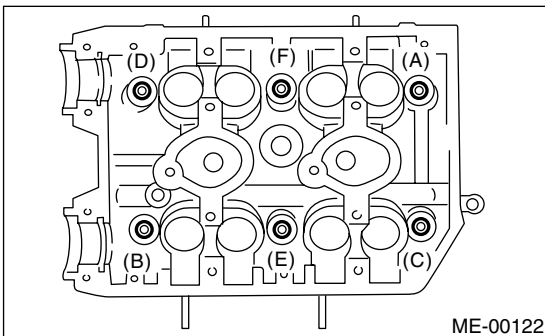
| Unit: mm (in)            |       |                                  |
|--------------------------|-------|----------------------------------|
| Crankshaft oil clearance |       |                                  |
| #1                       | STD   | 0.003 — 0.030 (0.00012 — 0.0012) |
|                          | Limit | 0.040 (0.0016)                   |
| #2                       | STD   | 0.012 — 0.033 (0.0004 — 0.0012)  |
|                          | Limit | 0.045 (0.0018)                   |
| #3                       | STD   | 0.003 — 0.030 (0.00012 — 0.0012) |
|                          | Limit | 0.040 (0.0016)                   |
| #4                       | STD   | 0.012 — 0.033 (0.0004 — 0.0012)  |
|                          | Limit | 0.045 (0.0018)                   |
| #5                       | STD   | 0.010 — 0.031 (0.0004 — 0.0012)  |
|                          | Limit | 0.040 (0.0016)                   |

## 19. Cylinder Head Assembly

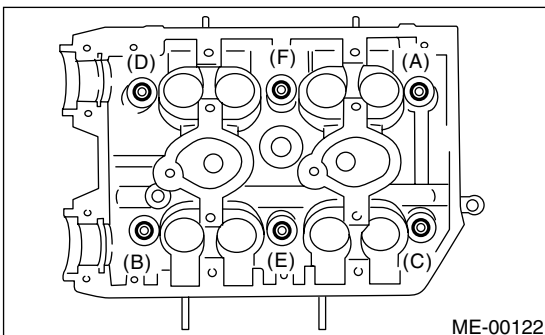
### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-57, REMOVAL, Camshaft Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU(H4DOTC)-15, 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)-59, REMOVAL, Camshaft.>
- 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



- 10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



- 11) Remove the cylinder head gasket.

#### NOTE:

Do not scratch the mating surface of cylinder head and cylinder block.

- 12) Similarly, remove the cylinder head (RH).

### B: INSTALLATION

- 1) Install the cylinder head and gaskets on cylinder block.

#### NOTE:

- Use new cylinder head gaskets.
  - Be careful not to scratch the mating surface of cylinder head and cylinder block.
- 2) Tighten the cylinder head bolts.
    - (1) Apply a coat of engine oil to the washers and bolt threads.
    - (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
    - (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
    - (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
    - (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
    - (6) Tighten all bolts 80 to 90° in alphabetical sequence.
    - (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

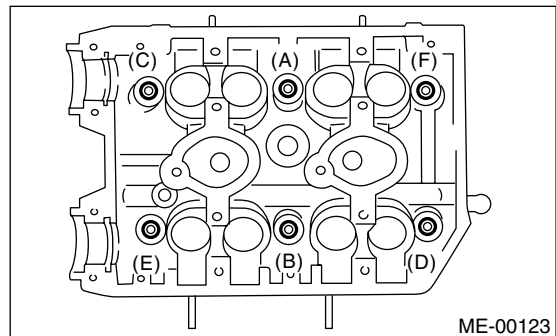
#### NOTE:

Do not tighten the bolts by more than 45°.

- (8) Further tighten all bolts (A) and (B) by 40 to 45°.

#### NOTE:

Ensure that the total "re-tightening angle" in the previous two steps do not exceed 90°.



- 3) Install the camshaft. <Ref. to ME(H4DOTC)-60, 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 camshaft sprocket. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>
- 7) Install the timing belt assembly. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>

## CYLINDER HEAD ASSEMBLY

### MECHANICAL

---

8) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>

9) Install the crankshaft pulley. <Ref. to **ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.**>

10) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

### C: DISASSEMBLY

1) Remove the valve lifters.

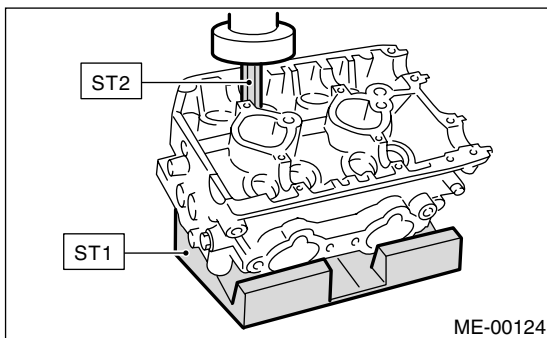
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE

ST2 499718000 VALVE SPRING REMOVER

#### NOTE:

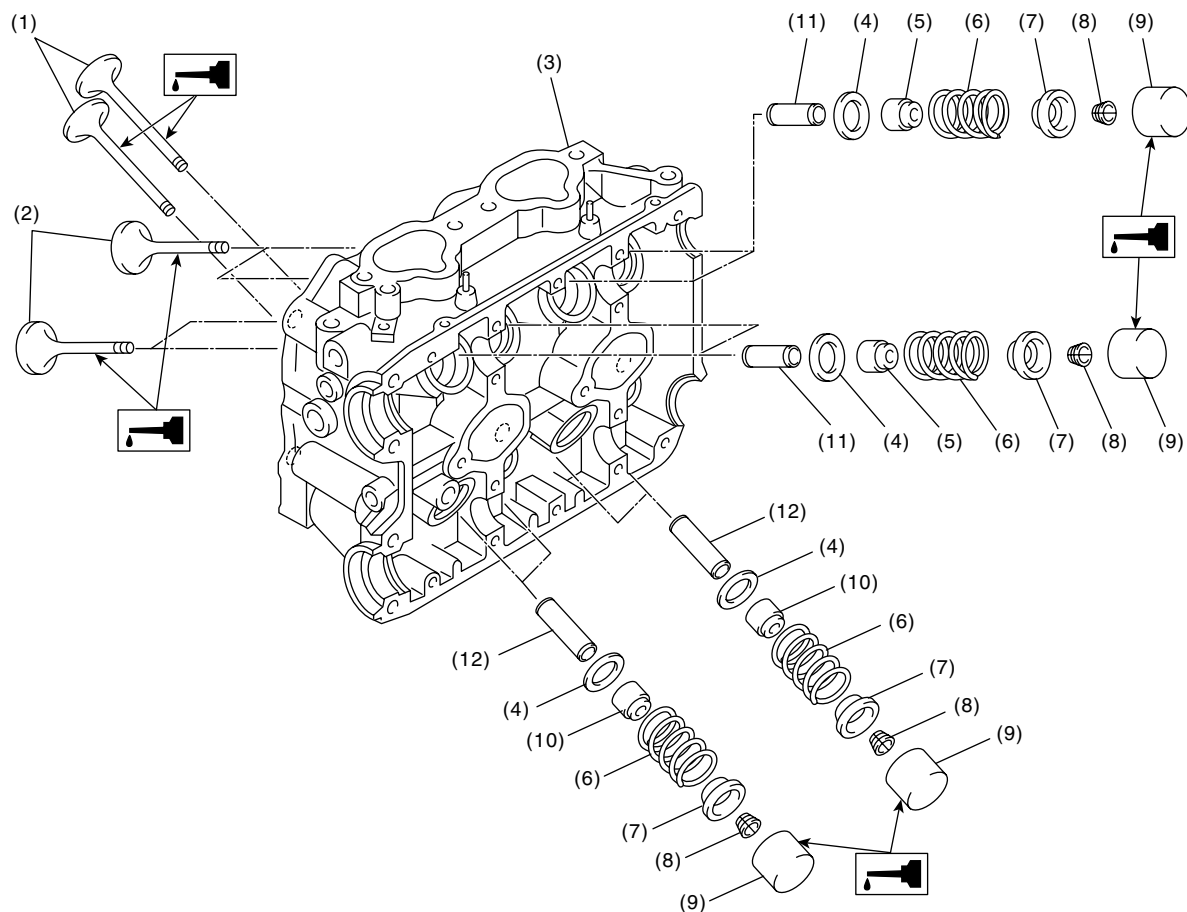
- Keep the removed parts in order for re-installing in their original positions.
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



# CYLINDER HEAD ASSEMBLY

MECHANICAL

## D: ASSEMBLY



ME-00795

- |                       |                           |                             |
|-----------------------|---------------------------|-----------------------------|
| (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    |

# CYLINDER HEAD ASSEMBLY

## MECHANICAL

- 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:

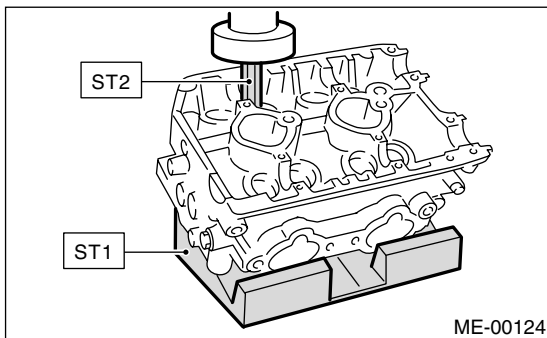
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

- (2) Set the cylinder head on ST1.
- (3) Install the valve spring and retainer using ST2.

ST1 4982676 00 CYLINDER HEAD TABLE  
ST2 499718 000 VALVE SPRING REMOVER

### NOTE:

Be sure to install the valve springs with their close-coiled end facing the seat on cylinder head.



- (4) Compress the valve spring, and then fit the valve spring retainer key.
  - (5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.
- 2) Apply oil to the surface of the valve lifter.
  - 3) Install the valve lifter.

## E: INSPECTION

### 1. CYLINDER HEAD

- 1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
- 2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B). If the warping exceeds 0.05 mm (0.0020 in), re-grind the surface with a surface grinder.

#### **Warping limit:**

**0.05 mm (0.0020 in)**

#### **Grinding limit:**

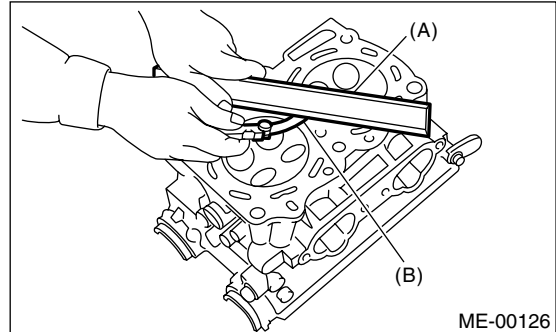
**0.3 mm (0.012 in)**

#### **Standard height of cylinder head:**

**127.5 mm (5.02 in)**

### NOTE:

Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



### 2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

#### **Valve seat width: W**

##### **Intake**

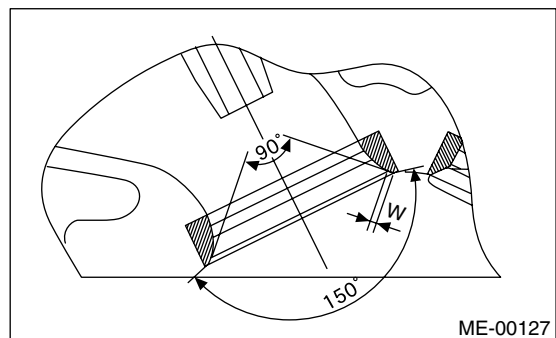
**Standard 1.0 mm (0.039 in)**

**Limit 1.7 mm (0.067 in)**

##### **Exhaust**

**Standard 1.5 mm (0.059 in)**

**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 the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

**Clearance between the valve guide and valve stem:**

**Standard**

**Intake**

**0.030 — 0.057 mm (0.0012 — 0.0022 in)**

**Exhaust**

**0.040 — 0.067 mm (0.0016 — 0.0026 in)**

**Limit**

**0.15 mm (0.0059 in)**

2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

**Valve guide inner diameter:**

**6.000 — 6.012 mm (0.2362 — 0.2367 in)**

**Valve stem outer diameters:**

**Intake**

**5.955 — 5.970 mm (0.2344 — 0.2350 in)**

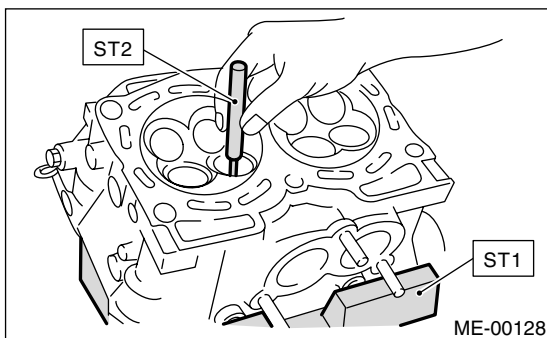
**Exhaust**

**5.945 — 5.960 mm (0.2341 — 0.2346 in)**

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

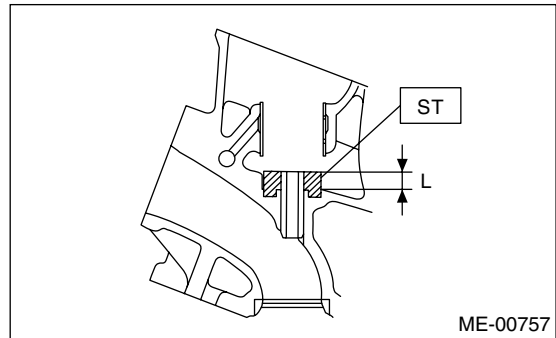
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE  
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place ST as shown in the figure.

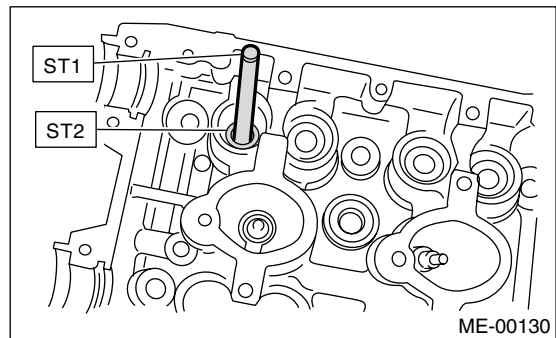
ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER  
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

**Valve guide protrusion: L**

**15.8 — 16.2 mm (0.622 — 0.638 in)**

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

**NOTE:**

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

# CYLINDER HEAD ASSEMBLY

## MECHANICAL

(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

### 4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

**H:**

**Intake (A)**

**Standard 1.2 mm (0.047 in)**

**Limit 0.8 mm (0.031 in)**

**Exhaust (B)**

**Standard 1.5 mm (0.059 in)**

**Limit 0.8 mm (0.031 in)**

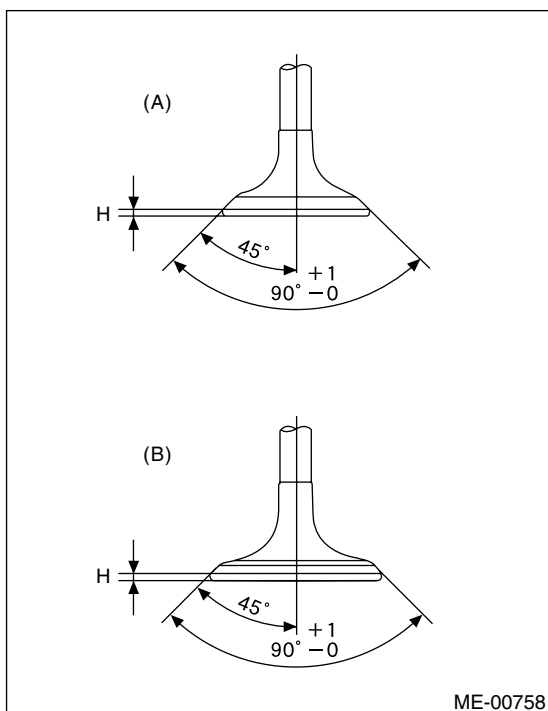
**Valve overall length:**

**Intake (A)**

**104.4 mm (4.110 in)**

**Exhaust (B)**

**104.65 mm (4.120 in)**



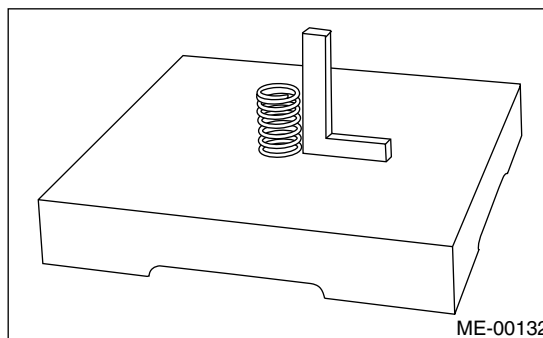
2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

### 5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.

2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

| Valve spring          |                                                                                |
|-----------------------|--------------------------------------------------------------------------------|
| Free length           | 47.32 mm (1.863 in)                                                            |
| Tension/spring height | Set<br>205 — 235 N<br>(20.9 — 24.0 kgf, 46.1 — 52.8 lb)<br>/36.0 mm (1.417 in) |
|                       | Lift<br>426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb) /26.45 mm (1.041 in)      |
| Squareness            | 2.5°, 2.1 mm (0.083 in)                                                        |



### 6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.

1) Place the cylinder head on ST1.

2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.

ST1 498267600 CYLINDER HEAD TABLE

ST2 498857100 VALVE OIL SEAL GUIDE

**NOTE:**

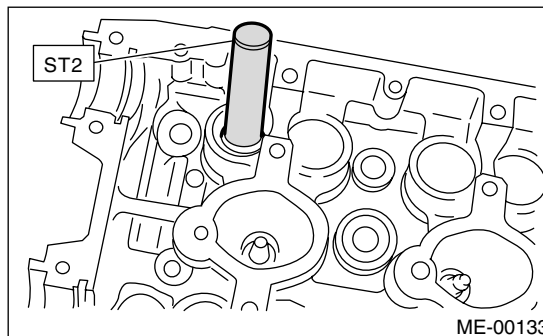
- Apply engine oil to oil seal before press-fit.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

**Color of rubber part:**

**Intake [Black] Exhaust [Brown]**

**Color of spring part:**

**Intake [White] Exhaust [White]**

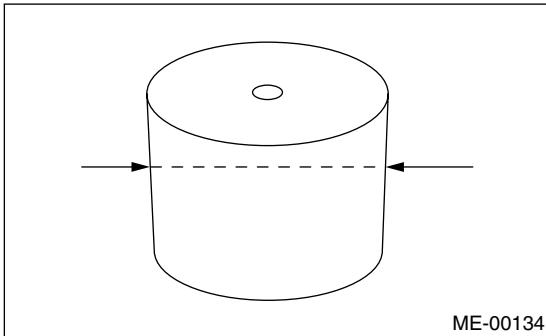


## 7. VALVE LIFTER

- 1) Visually check the valve lifter.
- 2) Measure the outer diameter of valve lifter.

### Outer diameter:

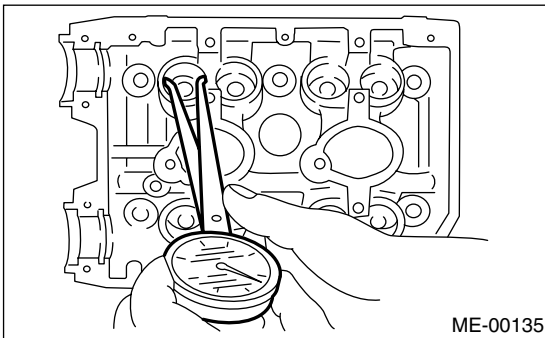
**34.959 — 34.975 mm (1.3763 — 1.3770 in)**



- 3) Measure the inner diameter of valve lifter mating part on cylinder head.

### Inner diameter:

**34.994 — 35.016 mm (1.3777 — 1.3786 in)**



### NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

### Standard:

**0.019 — 0.057 mm (0.0007 — 0.0022 in)**

### Limit:

**0.100 mm (0.0039 in)**

## F: DISPOSAL

### CAUTION:

- Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
- Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

- 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.

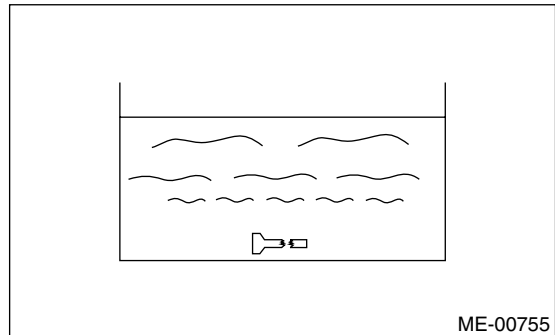
### CAUTION:

**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:

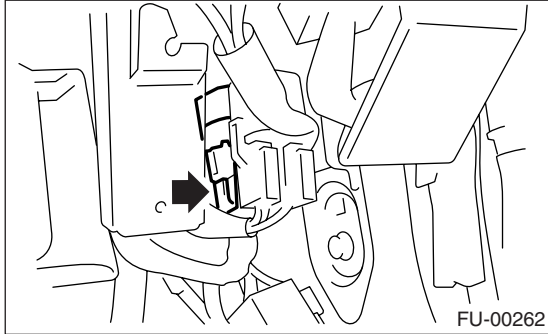
**Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.**



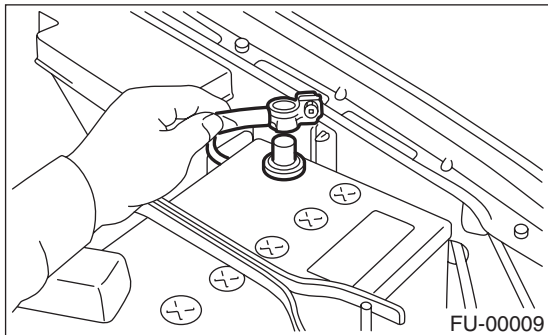
## 9. Engine Assembly

### A: REMOVAL

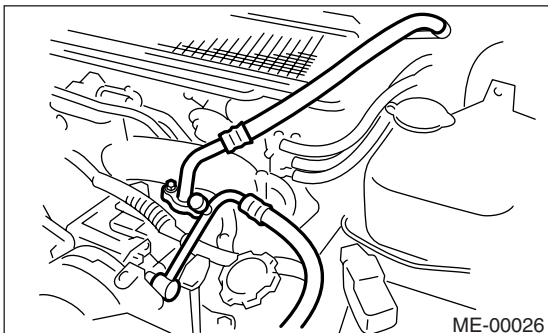
- 1) Set the vehicle on lift arms.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Collect the refrigerant from A/C system.
- 4) Release the fuel pressure.
  - (1) Disconnect the fuel pump relay connector.



- (2) Start the engine, and run until stalls.
  - (3) After the engine stalls, crank it for 5 seconds more.
  - (4) Turn the ignition switch to OFF.
- 5) Remove the filler cap.
- 6) Disconnect the ground cable from battery.

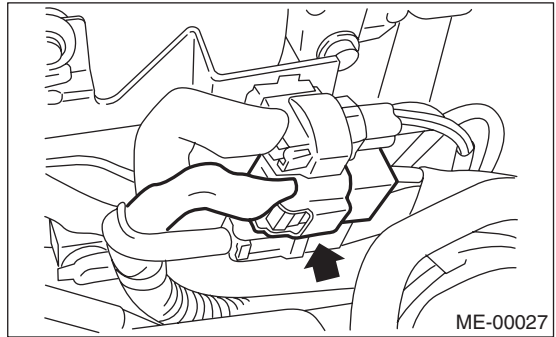


- 7) Remove the radiator from vehicle. <Ref. to CO(H4SO)-26, REMOVAL, Radiator.>
- 8) Remove the coolant filler tank. <Ref. to CO(H4SO)-41, REMOVAL, Coolant Filler Tank.>
- 9) Disconnect the A/C pressure hoses from A/C compressor.

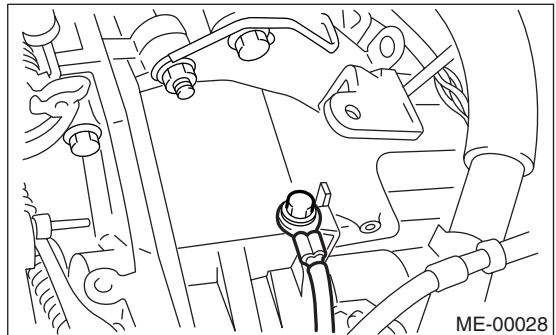


- 10) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

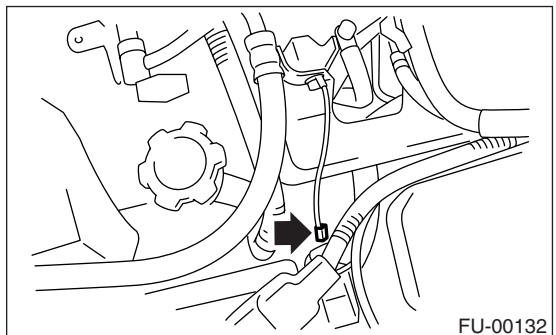
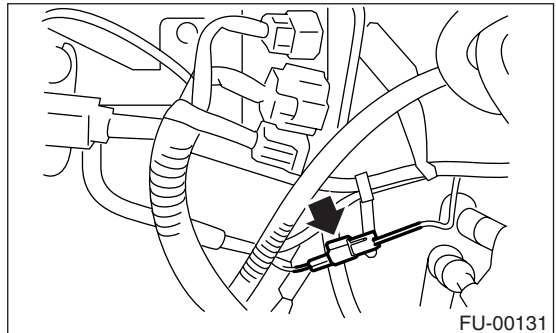
- 11) Disconnect the following connectors and cable.
  - (1) Engine harness connector



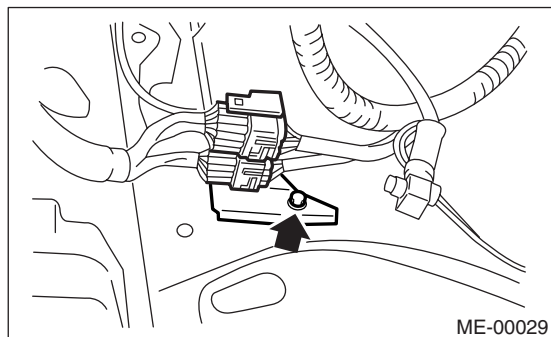
- (2) Engine ground terminal



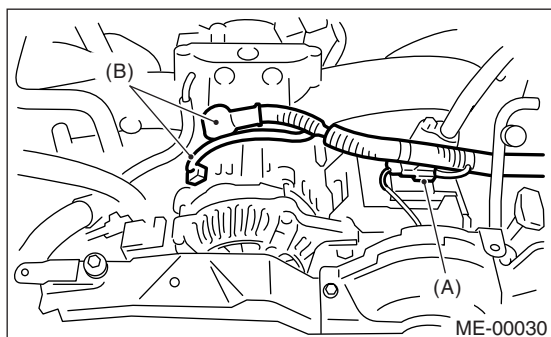
- (3) Disconnect the right and left side engine ground cables.



(4) Engine harness connector

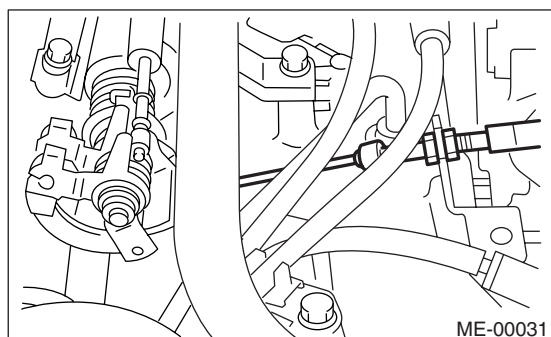


(5) Generator connector, terminal and A/C compressor connectors

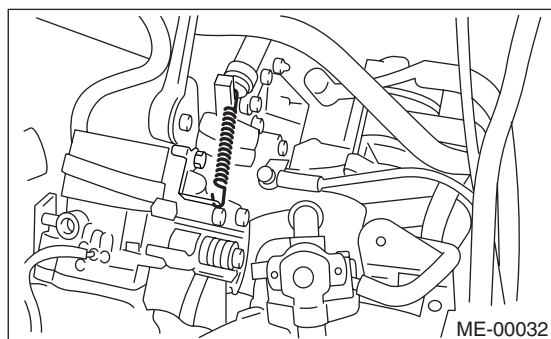


- (A) A/C compressor connector
- (B) Generator connector and terminal

(6) Accelerator cable (MT model)

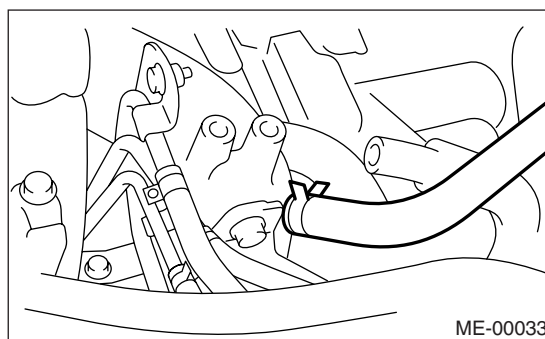


(7) Clutch release spring (MT model)

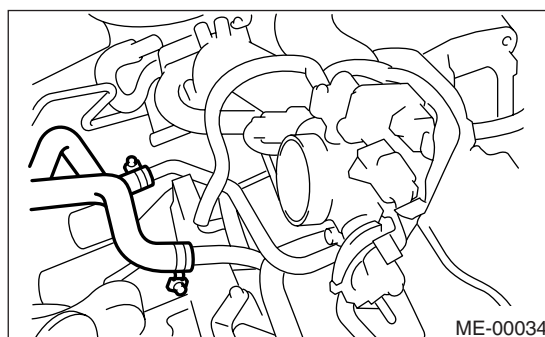


12) Disconnect the following hoses.

(1) Brake booster vacuum hose



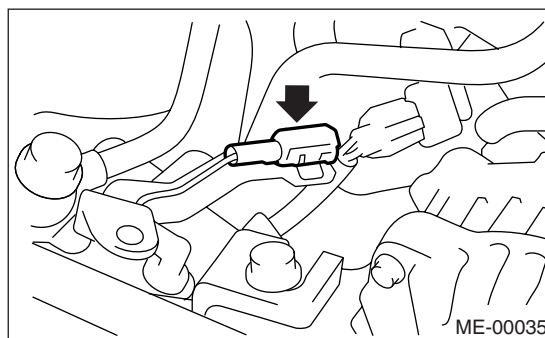
(2) Heater inlet outlet hose



13) Remove the power steering pump from bracket.

(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(H4DOTC)-45, FRONT SIDE BELT, REMOVAL, V-belt.>

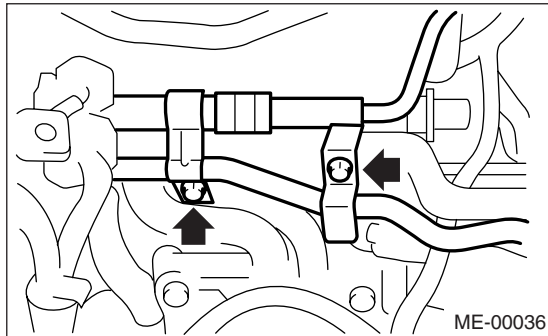
(2) Disconnect the power steering switch connector.



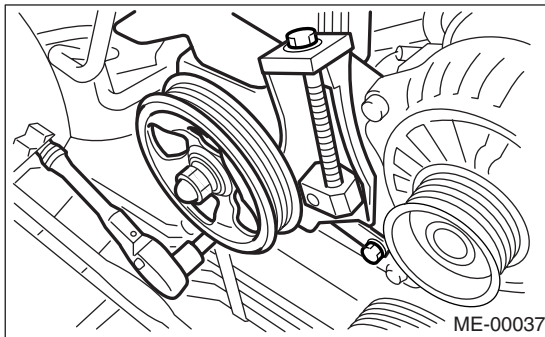
# ENGINE ASSEMBLY

## MECHANICAL

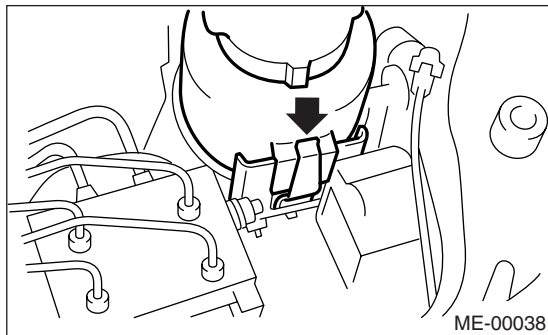
- (3) Remove the pipe with bracket from intake manifold.



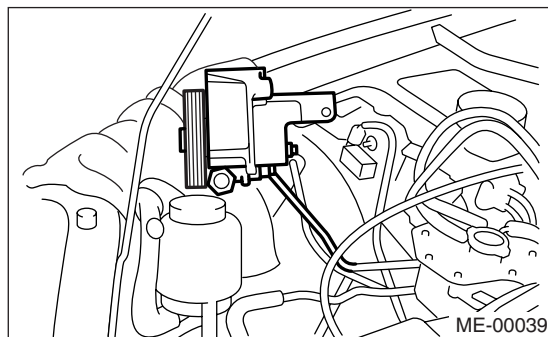
- (4) Remove the power steering pump from engine.



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

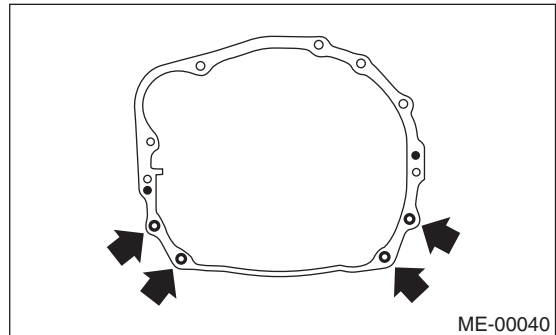


- (6) Place the power steering pump on right side wheel apron.

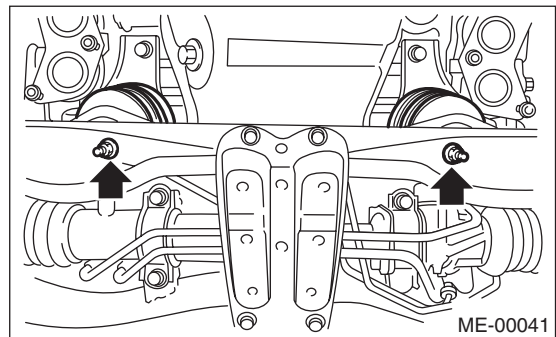


- 16) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

- 17) Remove the nuts which hold lower side of transmission to engine.



- 18) Remove the nuts which install front cushion rubber onto front crossmember.

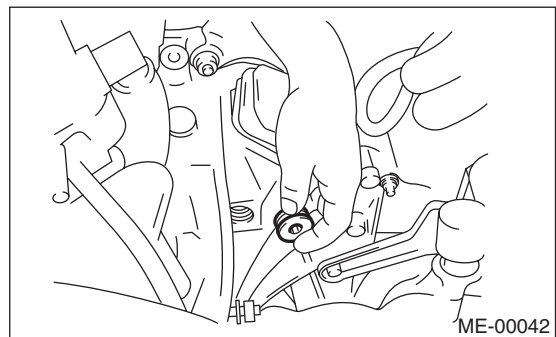


- 19) Lower the vehicle.

- 20) Separate the clutch release fork from release bearing. (MT model)

- (1) Remove the clutch operating cylinder from transmission.

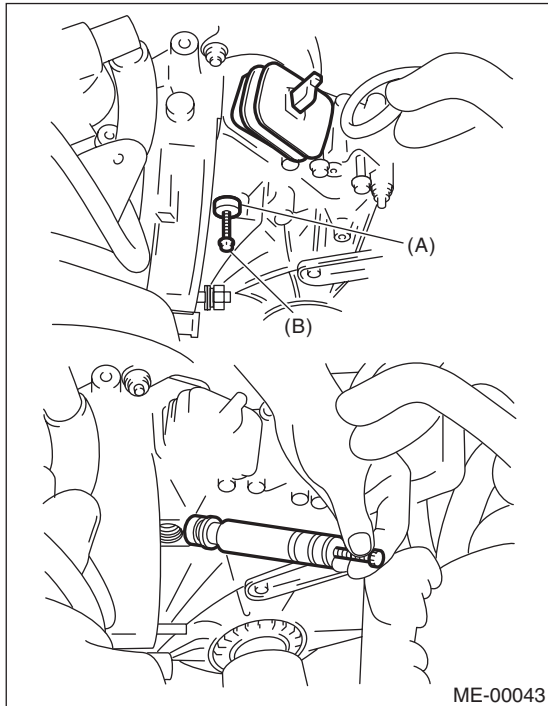
- (2) Remove the plug using a 10 mm hexagon wrench.



- 14) Lift-up the vehicle.

- 15) Remove the ATF cooler pipe from frame. (AT model)

- (3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.



(A) Shaft  
(B) Bolt

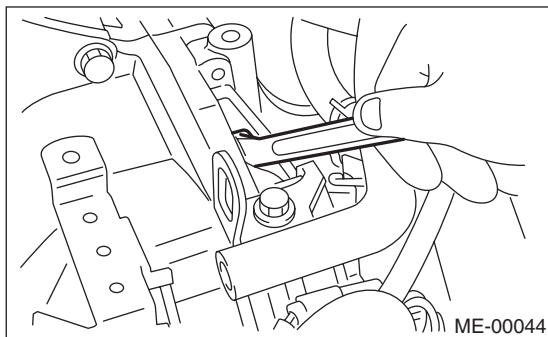
- (4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

**NOTE:**

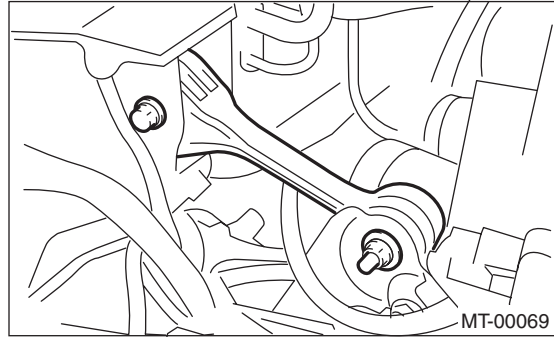
Step (4) is required to prevent interference with engine when removing the engine from transmission.

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 the other bolts while rotating the engine using socket wrench.



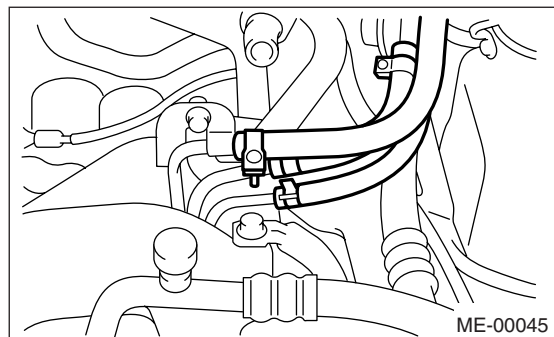
- 22) Remove the pitching stopper.



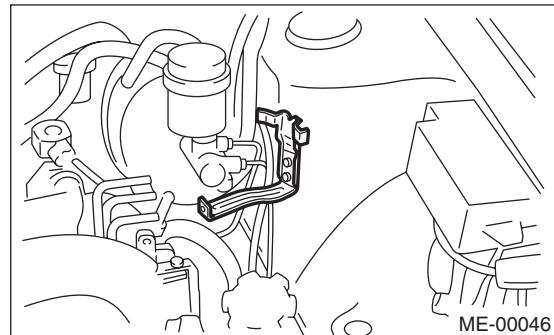
- 23) Disconnect the fuel delivery hose, return hose and evaporation hose.

**CAUTION:**

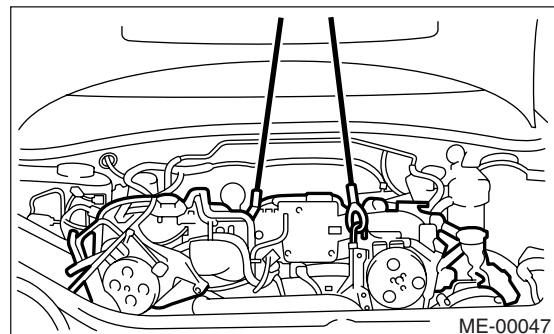
- Catch fuel from the hose into container.
- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



- 24) Remove the fuel filter and bracket.



- 25) Support the engine with a lifting device and wire ropes.



# ENGINE ASSEMBLY

## MECHANICAL

26) Support the transmission with a garage jack.

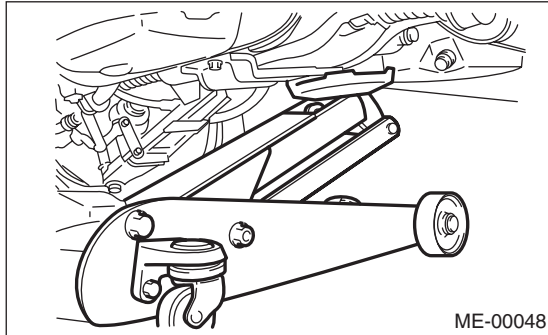
### CAUTION:

**Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.**

### NOTE:

Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

29) Remove the front cushion rubbers.

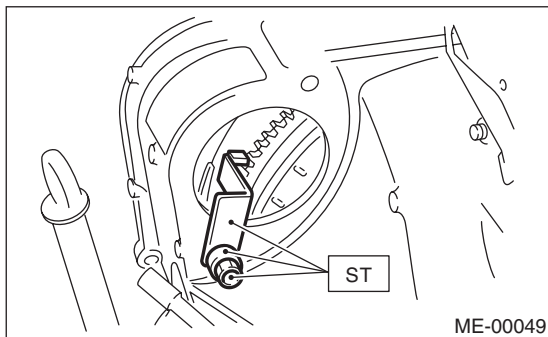


27) Separation of the engine and transmission.

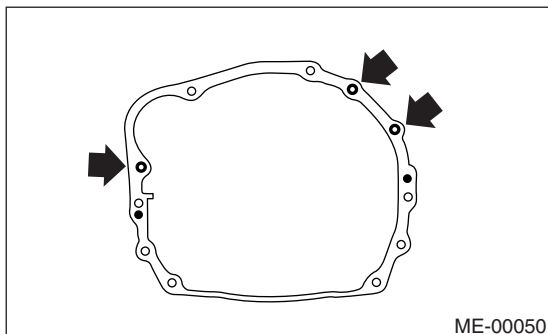
(1) Remove the starter. <Ref. to SC(H4SO)-6, REMOVAL, Starter.>

(2) Install the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold right upper side of transmission to engine.



28) Remove the engine from vehicle.

(1) Slightly raise the engine.

(2) Raise the transmission with garage jack.

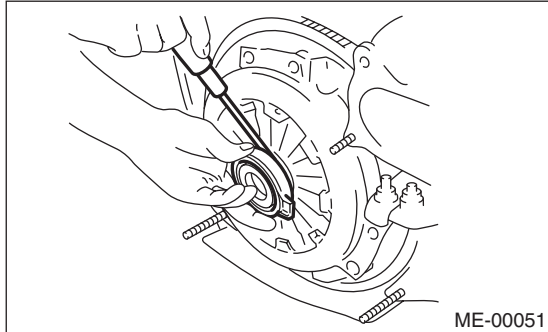
(3) Move the engine horizontally until the main-shaft is withdrawn from clutch cover.

(4) Slowly move the engine away from engine compartment.

## B: INSTALLATION

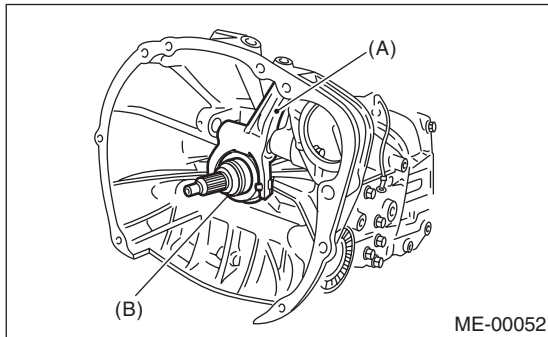
1) Install the clutch release fork and bearing onto transmission. (MT model)

(1) Remove the release bearing from clutch cover with flat type screw driver.



(2) Install the release bearing on transmission.

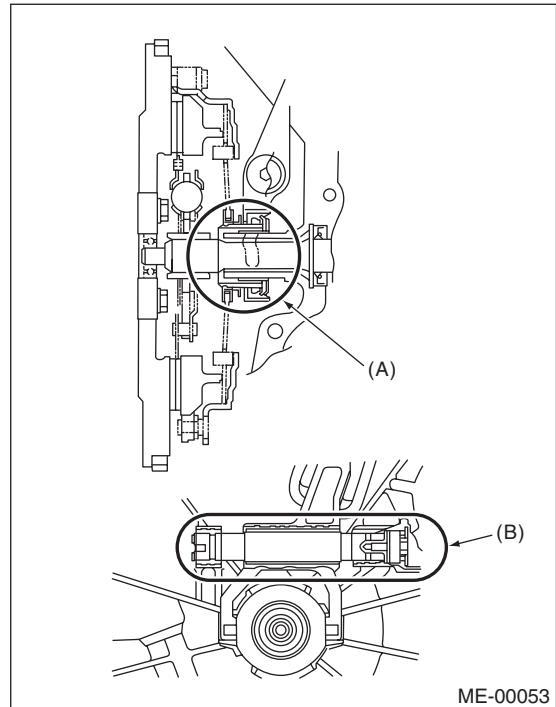
(3) Install the release fork into release bearing tab.



- (A) Release fork
- (B) Release bearing

(4) Apply grease to the specified points.

- Spline FX2200
- Shaft SUNLIGHT 2

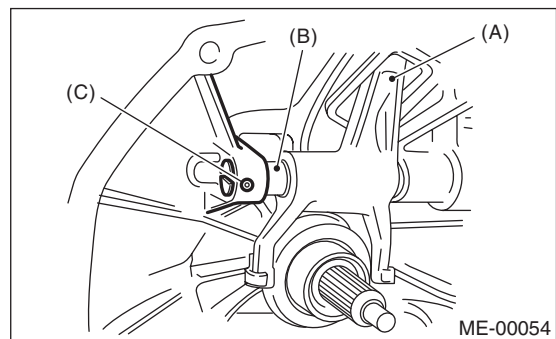


- (A) Spline (FX2200)
- (B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

### CAUTION:

**Make sure the cutout portion of release fork shaft contacts spring pin.**



- (A) Release fork
- (B) Release shaft
- (C) Spring pin

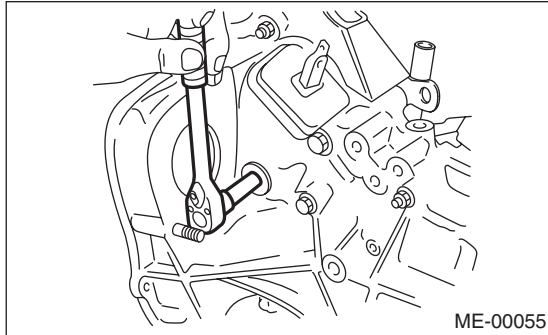
# ENGINE ASSEMBLY

## MECHANICAL

- (6) Tighten the plug.

### **Tightening torque:**

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**



- 2) Install the front cushion rubbers to engine.

### **Tightening torque:**

**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

- 3) Install the engine onto transmission.

- (1) Position the engine in engine compartment, and then align it with the transmission.

### **NOTE:**

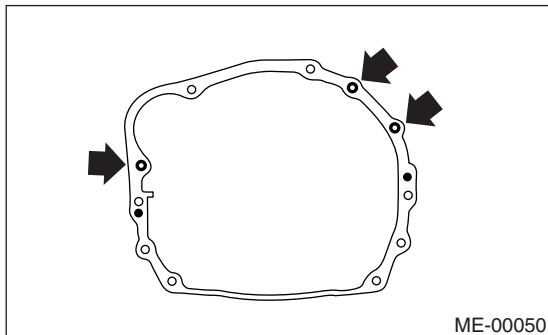
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

- (2) Apply a small amount of grease to the splines of mainshaft. (MT model)

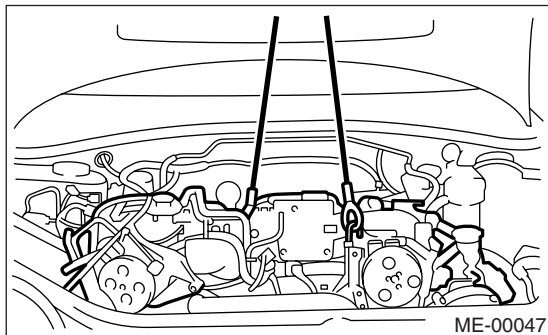
- 4) Tighten the bolts which hold right upper side of transmission to engine.

### **Tightening torque:**

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**



- 5) Remove the lifting device and wire ropes.



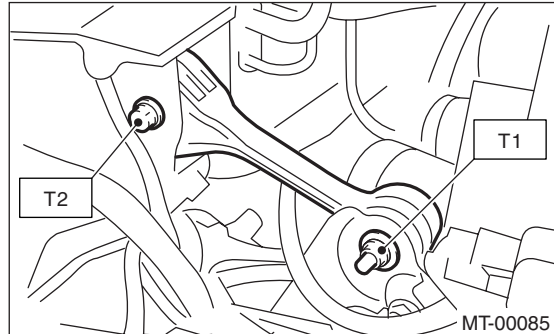
- 6) Remove the garage jack.

- 7) Install the pitching stopper.

### **Tightening torque:**

**T1: 50 N·m (5.1 kgf-m, 37 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 43 ft-lb)**



- 8) Remove the ST from torque converter clutch case. (AT model)

### **CAUTION:**

**Be careful not to drop the ST into torque converter clutch case when removing ST.**

ST 498277200 STOPPER SET

- 9) Install the starter. <Ref. to SC(H4SO)-6, INSTALLATION, Starter.>

- 10) Install the torque converter clutch onto drive plate. (AT model)

- (1) Tighten the bolts which hold torque converter clutch to drive plate.

- (2) Tighten other bolts while rotating the engine by using ST.

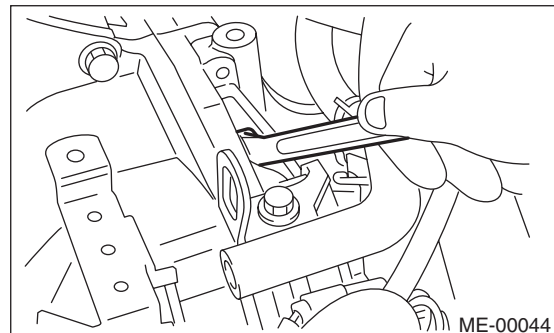
### **CAUTION:**

**Be careful not to drop bolts into the torque converter clutch housing.**

ST 499977100 CRANK PULLEY WRENCH

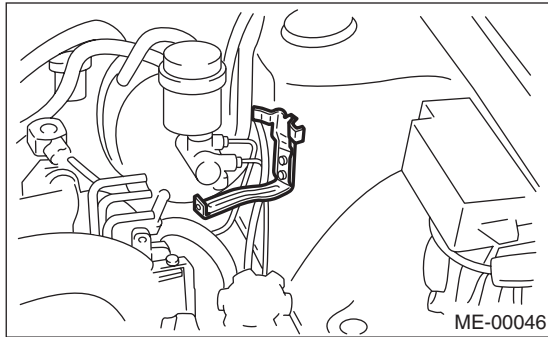
### **Tightening torque:**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

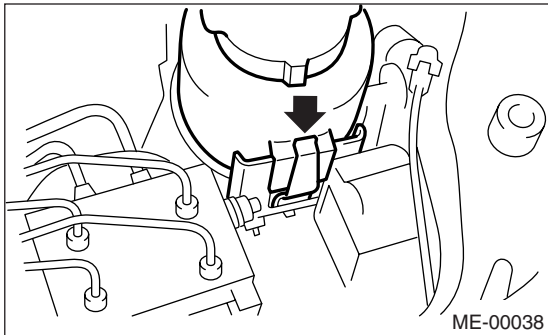


- (3) Plug the service hole with plug.

- 11) Install the fuel filter and bracket.

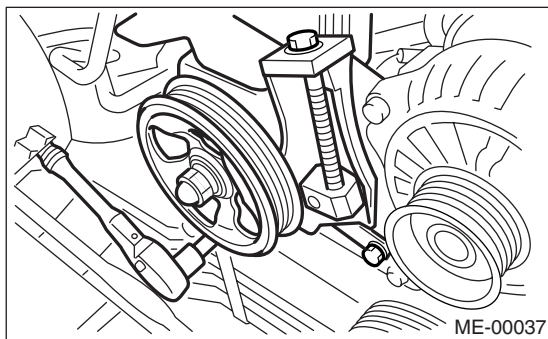


- 12) Install the power steering pump on bracket.  
(1) Install the power steering tank on bracket.

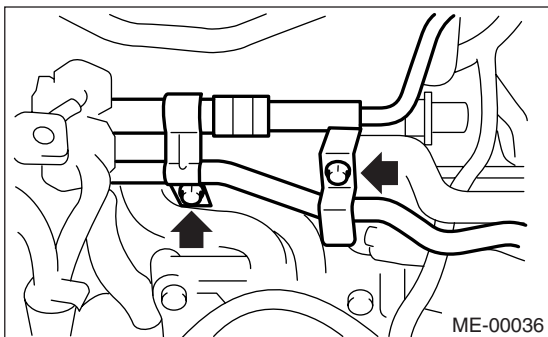


- (2) Install the power steering pump.

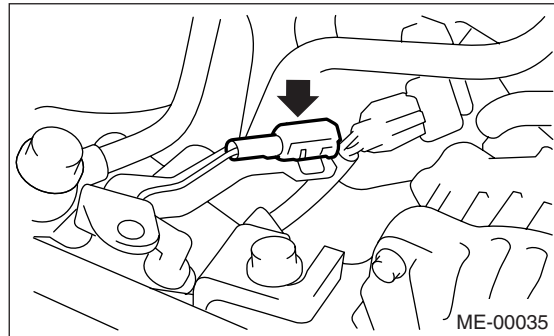
**Tightening torque:**  
**20.1 N·m (2.05 kgf-m, 14.8 ft-lb)**



- (3) Install the power steering pipe bracket on right side intake manifold.



- (4) Connect the power steering switch connector.

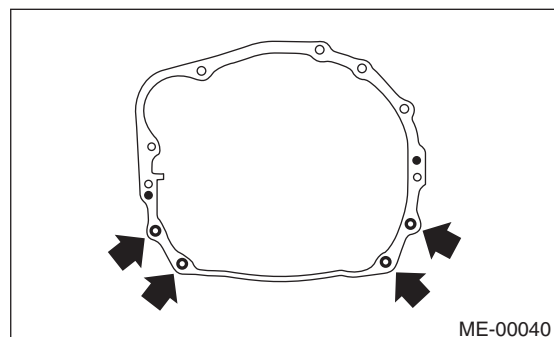


- (5) Install the front side V-belt, and adjust it.  
<Ref. to ME(H4DOTC)-45, FRONT SIDE BELT, INSTALLATION, V-belt.>

- 13) Lift-up the vehicle.

- 14) Tighten the nuts which hold lower side of transmission to engine.

**Tightening torque:**  
**50 N·m (5.1 kgf-m, 36.9 ft-lb)**

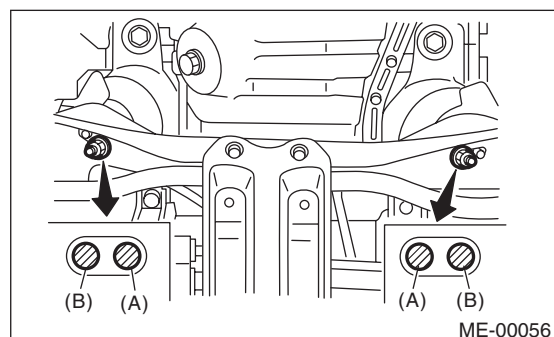


- 15) Tighten the nuts which install front cushion rubber onto crossmember.

**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.



- 16) Install the ATF cooler pipe to frame. (AT model)

# ENGINE ASSEMBLY

## MECHANICAL

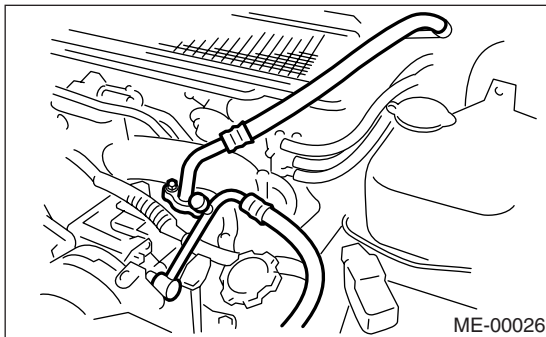
- 17) Install the center exhaust pipe.  
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
- 18) Lower the vehicle.
- 19) Connect the following hoses:
  - (1) Fuel delivery hose, return hose and evaporation hose
  - (2) Heater inlet and outlet hoses
  - (3) Brake booster vacuum hose
- 20) Connect the following connectors and terminals:
  - (1) Engine ground terminal
  - (2) Engine harness connectors
  - (3) Generator connector and terminal
  - (4) A/C compressor connectors
- 21) Connect the following cables:
  - (1) Accelerator cable
  - (2) Clutch release spring
- 22) After connecting each cable, adjust them.
- 23) Install the air intake system.
  - (1) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
  - (2) Install the air cleaner element and air cleaner upper cover.
  - (3) Install the engine harness connector bracket.
  - (4) Install the filler hose to air cleaner case.
- 24) Install the A/C pressure hoses.

### NOTE:

Use new O-rings.

### **Tightening torque:**

**15 N·m (1.5 kgf-m, 10.8 ft-lb)**



- 25) Install the radiator. <Ref. to CO(H4SO)-28, INSTALLATION, Radiator.>
- 26) Install the coolant filler tank. <Ref. to CO(H4SO)-41, INSTALLATION, Coolant Filler Tank.>
- 27) Install the window washer tank.
- 28) Install the battery in the vehicle, and connect cables.

- 29) Fill coolant.  
<Ref. to CO(H4SO)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 30) Charge the A/C system with refrigerant.  
<Ref. to AC-21, OPERATION, Refrigerant Charging Procedure.>
- 31) Remove the front hood stay, and close the front hood.
- 32) Take off the vehicle from lift arms.

## 10.Engine Mounting

### A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME(H4DOTC)-34, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

##### *Engine mounting;*

**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

### C: INSPECTION

Make sure there are no cracks or other damage.

## 26.Engine Noise

### A: INSPECTION

| Type of sound                                                                 | Condition                                                                                | Possible cause                                                                                                                                                                                    |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Regular clicking sound                                                        | Sound increases as engine speed increases.                                               | <ul style="list-style-type: none"> <li>Valve mechanism is defective.</li> <li>Incorrect valve clearance</li> <li>Worn valve rocker</li> <li>Worn camshaft</li> <li>Broken valve spring</li> </ul> |
| Heavy and dull clank                                                          | Oil pressure is low.                                                                     | <ul style="list-style-type: none"> <li>Worn crankshaft main bearing</li> <li>Worn connecting rod bearing (big end)</li> </ul>                                                                     |
|                                                                               | Oil pressure is normal.                                                                  | <ul style="list-style-type: none"> <li>Loose flywheel mounting bolts</li> <li>Damaged engine mounting</li> </ul>                                                                                  |
| High-pitched clank (Spark knock)                                              | Sound is noticeable when accelerating with an overload.                                  | <ul style="list-style-type: none"> <li>Ignition timing advanced</li> <li>Accumulation of carbon inside combustion chamber</li> <li>Wrong spark plug</li> <li>Improper gasoline</li> </ul>         |
| Clank when engine speed is medium (1,000 to 2,000 rpm).                       | Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*) | <ul style="list-style-type: none"> <li>Worn crankshaft main bearing</li> <li>Worn bearing at crankshaft end of connecting rod</li> </ul>                                                          |
| Knocking sound when engine is operating under idling speed and engine is warm | Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*) | <ul style="list-style-type: none"> <li>Worn cylinder liner and piston ring</li> <li>Broken or stuck piston ring</li> <li>Worn piston pin and hole at piston end of connecting rod</li> </ul>      |
|                                                                               | Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)    | <ul style="list-style-type: none"> <li>Unusually worn valve lifter</li> <li>Worn cam gear</li> <li>Worn camshaft journal bore in crankcase</li> </ul>                                             |
| Squeaky sound                                                                 | —                                                                                        | <ul style="list-style-type: none"> <li>Insufficient generator lubrication</li> </ul>                                                                                                              |
| Rubbing sound                                                                 | —                                                                                        | <ul style="list-style-type: none"> <li>Defective generator brush and rotor contact</li> </ul>                                                                                                     |
| Gear scream when starting engine                                              | —                                                                                        | <ul style="list-style-type: none"> <li>Defective ignition starter switch</li> <li>Worn gear and starter pinion</li> </ul>                                                                         |
| Sound like polishing glass with a dry cloth                                   | —                                                                                        | <ul style="list-style-type: none"> <li>Loose drive belt</li> <li>Defective water pump shaft</li> </ul>                                                                                            |
| Hissing sound                                                                 | —                                                                                        | <ul style="list-style-type: none"> <li>Loss of compression</li> <li>Air leakage in air intake system, hoses, connections or manifolds</li> </ul>                                                  |
| Timing belt noise                                                             | —                                                                                        | <ul style="list-style-type: none"> <li>Loose timing belt</li> <li>Belt contacting case/adjacent part</li> </ul>                                                                                   |
| Valve tappet noise                                                            | —                                                                                        | <ul style="list-style-type: none"> <li>Incorrect valve clearance</li> </ul>                                                                                                                       |

**NOTE\*:**

When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory.

Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H4DOTC)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)-36, OPERATION, Inspection Mode.> after connecting the fuel injector connector.

# ENGINE NOISE

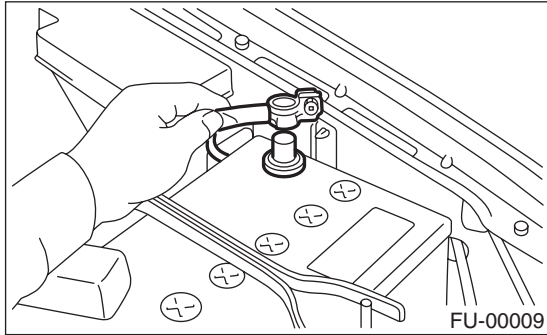
MECHANICAL

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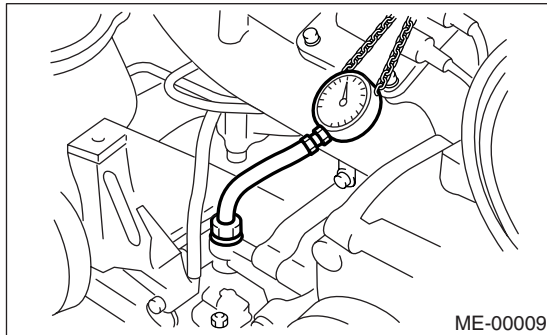
## 6. Engine Oil Pressure

### A: INSPECTION

- 1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(H4SO)-22, REMOVAL, Oil Pressure Switch.>
- 2) Connect the oil pressure gauge hose to cylinder block.
- 3) Connect the battery ground cable to battery.



- 4) Start the engine, and then measure the oil pressure.



#### **Oil pressure:**

**98 kPa (1.0 kgf/cm<sup>2</sup>, 14 psi) or more at 800 rpm**

**294 kPa (3.0 kgf/cm<sup>2</sup>, 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)-26, 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)-26, INSPECTION, Engine Lubrication System Trouble in General.>

#### **NOTE:**

The specified data is based on an engine oil temperature of 80°C (176°F).

- 5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4SO)-22, INSTALLATION, Oil Pressure Switch.>

#### **Tightening torque:**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

# ENGINE TROUBLE IN GENERAL

MECHANICAL

## 25.Engine Trouble in General

### A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

| TROUBLE                               | PROBLEM PARTS, ETC.                                                       | POSSIBLE CAUSE                                   | RANK |
|---------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------|------|
| 1. Engine will not start.             |                                                                           |                                                  |      |
| 1) Starter does not turn.             | Starter                                                                   | Defective battery-to-starter harness             | B    |
|                                       |                                                                           | Defective starter switch                         | C    |
|                                       |                                                                           | Defective inhibitor switch or neutral switch     | C    |
|                                       |                                                                           | Defective starter                                | B    |
|                                       | Battery                                                                   | Poor terminal connection                         | A    |
|                                       |                                                                           | Run-down battery                                 | A    |
|                                       |                                                                           | Defective charging system                        | B    |
|                                       | 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)-2, Basic Diagnostic Procedure.> |                                                  | A    |
|                                       | Fuel line                                                                 | Defective fuel pump and relay                    | A    |
|                                       |                                                                           | Lack of or insufficient fuel                     | B    |
|                                       | Timing belt                                                               | Defective (deterioration, etc.)                  | B    |
|                                       |                                                                           | Defective timing                                 | B    |
|                                       | Compression                                                               | Incorrect valve clearance                        | C    |
|                                       |                                                                           | Loosened spark plugs or defective gasket         | C    |
|                                       |                                                                           | Loosened cylinder head bolts or defective gasket | C    |
|                                       |                                                                           | Improper valve seating                           | 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)-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                                                               | Defective (deterioration, etc.)                  | B    |
|                                       |                                                                           | Defective timing                                 | B    |
|                                       | Compression                                                               | Incorrect valve clearance                        | C    |
|                                       |                                                                           | Loosened spark plugs or defective gasket         | C    |
|                                       |                                                                           | Loosened cylinder head bolts or defective gasket | C    |
|                                       |                                                                           | Improper valve seating                           | C    |
|                                       |                                                                           | Defective valve stem                             | C    |
|                                       |                                                                           | Worn or broken valve spring                      | B    |
|                                       |                                                                           | Worn or stuck piston rings, cylinder and piston  | C    |
|                                       |                                                                           | Incorrect valve timing                           | B    |
|                                       |                                                                           | Improper engine oil (low viscosity)              | B    |

# ENGINE TROUBLE IN GENERAL

MECHANICAL

| TROUBLE                                    | PROBLEM PARTS, ETC.                                                       | POSSIBLE CAUSE                                     | RANK |
|--------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------|------|
| 4) Engine stalls after initial combustion. | Engine control system <Ref. to EN(H4DOTC)-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                                                               | Defective (deterioration, etc.)                    | B    |
|                                            |                                                                           | Defective timing                                   | B    |
|                                            | Compression                                                               | Incorrect valve clearance                          | C    |
|                                            |                                                                           | Loosened spark plugs or defective gasket           | C    |
|                                            |                                                                           | Loosened cylinder head bolts or defective gasket   | C    |
|                                            |                                                                           | Improper valve seating                             | 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)-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 plugs or defective gasket           | B    |
|                                            |                                                                           | Loosened cylinder head bolts or defective gasket   | B    |
|                                            |                                                                           | Improper valve seating                             | B    |
|                                            |                                                                           | Defective valve stem                               | C    |
|                                            |                                                                           | Worn or broken valve spring                        | B    |
|                                            |                                                                           | Worn or stuck piston rings, cylinder and piston    | B    |
|                                            |                                                                           | Incorrect valve timing                             | A    |
|                                            |                                                                           | Improper engine oil (low viscosity)                | B    |
|                                            | Lubrication system                                                        | Incorrect oil pressure                             | B    |
|                                            |                                                                           | Defective rocker cover gasket                      | C    |
|                                            | Cooling system                                                            | Overheating                                        | C    |
|                                            | Others                                                                    | Malfunction of evaporative emission control system | A    |
|                                            |                                                                           | Stuck or damaged throttle valve                    | B    |
|                                            |                                                                           | Accelerator cable out of adjustment                | C    |

# ENGINE TROUBLE IN GENERAL

## MECHANICAL

| TROUBLE                                         | PROBLEM PARTS, ETC.                                                       | POSSIBLE CAUSE                                     | RANK |
|-------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------|------|
| 3. Low output, hesitation and poor acceleration | Engine control system <Ref. to EN(H4DOTC)-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 plugs or defective gasket           | B    |
|                                                 |                                                                           | Loosened cylinder head bolts or defective gasket   | B    |
|                                                 |                                                                           | Improper valve seating                             | B    |
|                                                 |                                                                           | Defective valve stem                               | C    |
|                                                 |                                                                           | Worn or broken valve spring                        | B    |
|                                                 |                                                                           | Worn or stuck piston rings, cylinder and piston    | C    |
|                                                 |                                                                           | Incorrect valve timing                             | A    |
|                                                 |                                                                           | Improper engine oil (low viscosity)                | B    |
|                                                 | Lubrication system                                                        | Incorrect oil pressure                             | B    |
|                                                 | Cooling system                                                            | Overheating                                        | C    |
|                                                 |                                                                           | Over cooling                                       | C    |
|                                                 | Others                                                                    | Malfunction of evaporative emission control system | A    |
| 4. Surging                                      | Engine control system <Ref. to EN(H4DOTC)-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 plugs or defective gasket           | C    |
|                                                 |                                                                           | Loosened cylinder head bolts or defective gasket   | C    |
|                                                 |                                                                           | Improper valve seating                             | C    |
|                                                 |                                                                           | Defective valve stem                               | C    |
|                                                 |                                                                           | Worn or broken valve spring                        | C    |
|                                                 |                                                                           | Worn or stuck piston rings, cylinder and piston    | C    |
|                                                 |                                                                           | Incorrect valve timing                             | A    |
|                                                 |                                                                           | Improper engine oil (low viscosity)                | B    |
|                                                 | Cooling system                                                            | Overheating                                        | B    |
|                                                 | Others                                                                    | Malfunction of evaporative emission control system | C    |

# ENGINE TROUBLE IN GENERAL

MECHANICAL

| TROUBLE                             | PROBLEM PARTS, ETC.                                                       | POSSIBLE CAUSE                                         | RANK |
|-------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------|------|
| 5. Engine does not return to idle.  | Engine control system <Ref. to EN(H4DOTC)-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)-2, Basic Diagnostic Procedure.> |                                                        | A    |
|                                     | Cooling system                                                            | Overheating                                            | B    |
|                                     | Others                                                                    | Malfunction of evaporative emission control system     | B    |
| 7. Afterburning in exhaust system   | Engine control system <Ref. to EN(H4DOTC)-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 plugs or defective gasket               | C    |
|                                     |                                                                           | Loosened cylinder head bolts or defective gasket       | C    |
|                                     |                                                                           | Improper valve seating                                 | B    |
|                                     |                                                                           | Defective valve stem                                   | C    |
|                                     |                                                                           | Worn or broken valve spring                            | C    |
|                                     |                                                                           | Worn or stuck piston rings, cylinder and piston        | C    |
|                                     |                                                                           | Incorrect valve timing                                 | A    |
|                                     | Lubrication system                                                        | Incorrect oil pressure                                 | C    |
|                                     | Cooling system                                                            | Over cooling                                           | C    |
|                                     | Others                                                                    | Malfunction of evaporative emission control system     | C    |
| 8. Knocking                         | Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.> |                                                        | A    |
|                                     | Intake system                                                             | Loosened oil filler cap                                | B    |
|                                     | Timing belt                                                               | Defective timing                                       | B    |
|                                     | Compression                                                               | Incorrect valve clearance                              | C    |
|                                     |                                                                           | Incorrect valve timing                                 | B    |
|                                     | Cooling system                                                            | Overheating                                            | A    |
| 9. Excessive engine oil consumption | Intake system                                                             | Loosened or cracked PCV hose                           | A    |
|                                     |                                                                           | Defective PCV valve                                    | B    |
|                                     |                                                                           | Loosened oil filler cap                                | C    |
|                                     | Compression                                                               | Defective valve stem                                   | A    |
|                                     |                                                                           | Worn or stuck piston rings, cylinder and piston        | A    |
|                                     | Lubrication system                                                        | Loosened oil pump attaching bolts and defective gasket | B    |
|                                     |                                                                           | Defective oil filter o-ring                            | B    |
|                                     |                                                                           | Defective crankshaft oil seal                          | B    |
|                                     |                                                                           | Defective rocker cover gasket                          | B    |
|                                     |                                                                           | Loosened oil drain plug or defective gasket            | B    |
|                                     |                                                                           | Loosened oil pan fitting bolts or defective oil pan    | B    |

# ENGINE TROUBLE IN GENERAL

## MECHANICAL

| TROUBLE                        | PROBLEM PARTS, ETC.                                                       | POSSIBLE CAUSE                                   | RANK |
|--------------------------------|---------------------------------------------------------------------------|--------------------------------------------------|------|
| 10. Excessive fuel consumption | Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.> |                                                  | A    |
|                                | Intake system                                                             | Dirty air cleaner element                        | A    |
|                                | Timing belt                                                               | Defective timing                                 | B    |
|                                | Compression                                                               | Incorrect valve clearance                        | B    |
|                                |                                                                           | Loosened spark plugs or defective gasket         | C    |
|                                |                                                                           | Loosened cylinder head bolts or defective gasket | C    |
|                                |                                                                           | Improper valve seating                           | B    |
|                                |                                                                           | Defective valve stem                             | C    |
|                                |                                                                           | Worn or broken valve spring                      | C    |
|                                |                                                                           | Worn or stuck piston rings, cylinder and piston  | B    |
|                                |                                                                           | Incorrect valve timing                           | B    |
|                                | Lubrication system                                                        | Incorrect oil pressure                           | C    |
|                                | Cooling system                                                            | Over cooling                                     | C    |
|                                | Others                                                                    | Accelerator cable out of adjustment              | B    |

## 7. Fuel Pressure

### A: INSPECTION

#### CAUTION:

Before removing the fuel pressure gauge, release the fuel pressure.

#### NOTE:

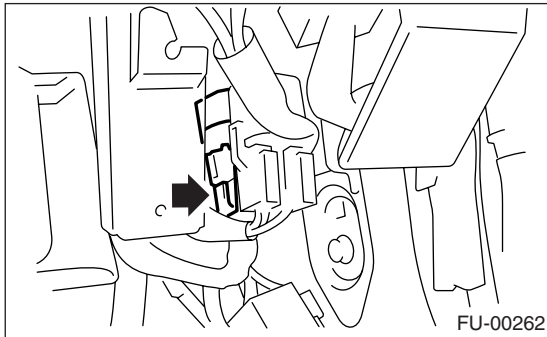
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-46, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Open the fuel filler flap lid, and then remove the fuel filler cap.

3) Disconnect the fuel delivery hoses, and then connect the fuel pressure gauge.

4) Connect the connector of fuel pump relay.

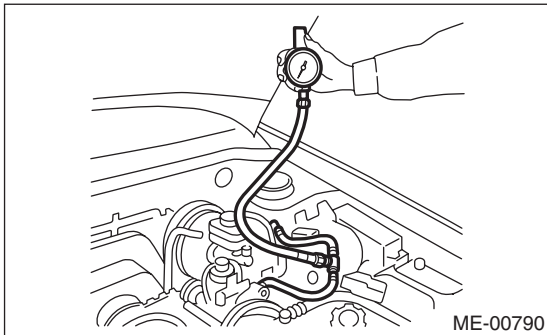


5) Start the engine.

6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

#### Fuel pressure:

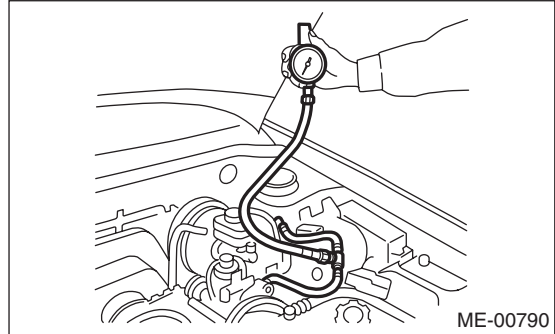
**Standard; 284 — 314 kPa (2.9 — 3.2 kgf/cm<sup>2</sup>, 41 — 46 psi)**



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

#### Fuel pressure:

**Standard; 230 — 260 kPa (2.35 — 2.65 kgf/cm<sup>2</sup>, 33 — 38 psi)**



#### NOTE:

The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm<sup>2</sup>, 1 to 3 psi) higher than standard values during high-altitude operations.

## GENERAL DESCRIPTION

MECHANICAL

### 1. General Description

#### A: SPECIFICATIONS

|        |                                                                            |         |                                                                           |                                                                                        |
|--------|----------------------------------------------------------------------------|---------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Engine | Type                                                                       |         | Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine |                                                                                        |
|        | Valve arrangement                                                          |         | Belt driven, double overhead camshaft, 4-valve/cylinder                   |                                                                                        |
|        | Bore × Stroke                                                              |         | mm (in)                                                                   |                                                                                        |
|        |                                                                            |         | 99.5 × 79.0 (3.917 × 3.110)                                               |                                                                                        |
|        | Piston displacement                                                        |         | cm <sup>3</sup> (cu in)                                                   |                                                                                        |
|        |                                                                            |         | 2,457 (150)                                                               |                                                                                        |
|        | Compression ratio                                                          |         | 8.2                                                                       |                                                                                        |
|        | Compression pressure (at 200 — 300 rpm)                                    |         | kPa (kgf/cm <sup>2</sup> , psi)                                           |                                                                                        |
|        |                                                                            |         | 981 — 1,177 (10 — 12, 142 — 171)                                          |                                                                                        |
|        | Number of piston rings                                                     |         | Pressure ring: 2, Oil ring: 1                                             |                                                                                        |
|        | Intake valve timing                                                        | Opening | Max. retard                                                               | ATDC 5°                                                                                |
|        |                                                                            |         | Min. advance                                                              | BTDC 15°                                                                               |
|        |                                                                            | Closing | Max. retard                                                               | ABDC 65°                                                                               |
|        |                                                                            |         | Min. advance                                                              | ABDC 45°                                                                               |
|        | Exhaust valve timing                                                       | Opening |                                                                           | BBDC 55°                                                                               |
|        |                                                                            | Closing |                                                                           | ATDC 5°                                                                                |
|        | Valve clearance                                                            | Intake  | mm (in)                                                                   | 0.20 <sup>+0.04</sup> <sub>-0.06</sub> (0.0079 <sup>+0.0016</sup> <sub>-0.0024</sub> ) |
|        |                                                                            | Exhaust | mm (in)                                                                   | 0.35±0.05 (0.0138±0.0020)                                                              |
|        | Idling speed [At neutral position on MT, “P” or “N” position on AT]<br>rpm |         | No load                                                                   | M/T: 700±100<br>A/T: 700±100                                                           |
|        |                                                                            |         | A/C ON                                                                    | A/C refrigerant pressure low<br>M/T: 725±100<br>A/T: 750±100                           |
|        |                                                                            |         |                                                                           | A/C refrigerant pressure high<br>M/T: 800±100<br>A/T: 825±100                          |
|        | Firing order                                                               |         | 1 → 3 → 2 → 4                                                             |                                                                                        |
|        | Ignition timing                                                            |         | BTDC/rpm                                                                  |                                                                                        |
|        |                                                                            |         | MT:13°±10°<br>AT:17°±10°                                                  |                                                                                        |

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

# GENERAL DESCRIPTION

MECHANICAL

|                       |                                   |         |                      |                                                                      |  |
|-----------------------|-----------------------------------|---------|----------------------|----------------------------------------------------------------------|--|
| Belt tension adjuster | Protrusion of adjuster rod        |         |                      | 5.2 — 6.2 mm (0.205 — 0.244 in)                                      |  |
| Belt tensioner        | Spacer O.D.                       |         |                      | 17.955 — 17.975 mm (0.7069 — 0.7077 in)                              |  |
|                       | Tensioner bush I.D.               |         |                      | 18.0 — 18.08 mm (0.7087 — 0.7118 in)                                 |  |
|                       | Clearance between spacer and bush |         | STD                  | 0.025 — 0.125 mm (0.0010 — 0.0049 in)                                |  |
|                       |                                   |         | Limit                | 0.175 mm (0.0069 in)                                                 |  |
|                       | Side clearance of spacer          |         | STD                  | 0.2 — 0.55 mm (0.0079 — 0.0217 in)                                   |  |
|                       |                                   |         | Limit                | 0.81 mm (0.0319 in)                                                  |  |
| Camshaft              | Bend limit                        |         |                      | 0.020 mm (0.0079 in)                                                 |  |
|                       | Thrust clearance                  |         | STD                  | 0.068 — 0.116 mm (0.0027 — 0.0046 in)                                |  |
|                       |                                   |         | Limit                | 0.14 mm (0.0055 in)                                                  |  |
|                       | Cam lobe height                   | Intake  | STD                  | 46.55 — 46.65 mm (1.833 — 1.837 in)                                  |  |
|                       |                                   |         | Limit                | 46.45 mm (1.829 in)                                                  |  |
|                       |                                   | Exhaust | STD                  | 46.75 — 46.85 mm (1.841 — 1.844 in)                                  |  |
|                       |                                   |         | Limit                | 46.65 mm (1.837 in)                                                  |  |
|                       | Journal O.D.                      | STD     | 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                     |         | STD                  | 0.037 — 0.072 mm (0.0015 — 0.0028 in)                                |  |
|                       |                                   |         | Limit                | 0.10 mm (0.0039 in)                                                  |  |
| Cylinder head         | Surface warpage limit             |         |                      | 0.05 mm (0.0020 in)                                                  |  |
|                       | Surface grinding limit            |         |                      | 0.3 mm (0.012 in)                                                    |  |
|                       | Standard height                   |         |                      | 127.5 mm (5.02 in)                                                   |  |
| Valve seat            | Refacing angle                    |         |                      | 90°                                                                  |  |
|                       | Contacting width                  | Intake  | STD                  | 1.0 mm (0.039 in)                                                    |  |
|                       |                                   |         | Limit                | 1.7 mm (0.067 in)                                                    |  |
|                       |                                   | Exhaust | STD                  | 1.5 mm (0.059 in)                                                    |  |
|                       |                                   |         | Limit                | 2.2 mm (0.087 in)                                                    |  |
| Valve guide           | Inner 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  | STD                  | 1.2 mm (0.047 in)                                                    |  |
|                       |                                   |         | Limit                | 0.8 mm (0.031 in)                                                    |  |
|                       |                                   | Exhaust | STD                  | 1.5 mm (0.059 in)                                                    |  |
|                       |                                   |         | Limit                | 0.8 mm (0.031 in)                                                    |  |
|                       | Stem diameter                     |         | Intake               | 5.955 — 5.970 mm (0.2344 — 0.2350 in)                                |  |
|                       |                                   |         | Exhaust              | 5.945 — 5.960 mm (0.2341 — 0.2346 in)                                |  |
|                       | Stem oil clearance                | STD     | 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)                                              |  |
|                       | Tension/spring height             |         | Set                  | 205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/<br>36.0 mm (1.417 in) |  |
|                       |                                   |         | Lift                 | 426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/<br>26.50 mm (1.043 in) |  |

## GENERAL DESCRIPTION

### MECHANICAL

|                          |                                                          |                        |                                       |                                                                    |
|--------------------------|----------------------------------------------------------|------------------------|---------------------------------------|--------------------------------------------------------------------|
| Cylinder block           | Surface warpage limit (mating with cylinder head)        |                        |                                       | 0.05 mm (0.0020 in)                                                |
|                          | Surface grinding limit                                   |                        |                                       | 0.1 mm (0.004 in)                                                  |
|                          | Standard height                                          |                        |                                       | 201.0 mm (7.91 in)                                                 |
|                          | Cylinder bore                                            | STD                    | A                                     | 99.505 — 99.515 mm (3.9175 — 3.9179 in)                            |
|                          |                                                          |                        | B                                     | 99.495 — 99.505 mm (3.9171 — 3.9175 in)                            |
|                          | Taper                                                    |                        | STD                                   | 0.015 mm (0.0006 in)                                               |
|                          |                                                          |                        | Limit                                 | 0.050 mm (0.0020 in)                                               |
|                          | Out-of-roundness                                         |                        | STD                                   | 0.010 mm (0.0004 in)                                               |
|                          |                                                          |                        | Limit                                 | 0.050 mm (0.0020 in)                                               |
|                          | Piston clearance                                         |                        | STD                                   | −0.010 — 0.010 mm (−0.0004 — 0.0004 in)                            |
| Limit                    |                                                          |                        | 0.030 mm (0.0012 in)                  |                                                                    |
| Enlarging (boring) limit |                                                          |                        | 0.5 mm (0.020 in)                     |                                                                    |
| Piston                   | Outer diameter                                           | STD                    | 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 pin and hole in piston |                        | STD                                   | 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              | Piston ring gap                                          | Top ring               | STD                                   | 0.20 — 0.25 mm (0.0079 — 0.0098 in)                                |
|                          |                                                          |                        | Limit                                 | 1.0 mm (0.039 in)                                                  |
|                          |                                                          | Second ring            | STD                                   | 0.37 — 0.52 mm (0.015 — 0.020 in)                                  |
|                          |                                                          |                        | Limit                                 | 1.0 mm (0.039 in)                                                  |
|                          |                                                          | Oil ring               | STD                                   | 0.20 — 0.50 mm (0.0079 — 0.020 in)                                 |
|                          |                                                          |                        | Limit                                 | 1.5 mm (0.059 in)                                                  |
|                          | Clearance between piston ring and piston ring groove     | Top ring               | STD                                   | 0.040 — 0.080 mm (0.0016 — 0.0031 in)                              |
|                          |                                                          |                        | Limit                                 | 0.15 mm (0.0059 in)                                                |
| Second ring              |                                                          | STD                    | 0.030 — 0.070 mm (0.0012 — 0.0028 in) |                                                                    |
|                          |                                                          | Limit                  | 0.15 mm (0.0059 in)                   |                                                                    |
| Connecting rod           | Bend twist per 100 mm (3.94 in) in length                |                        | Limit                                 | 0.10 mm (0.0039 in)                                                |
|                          | Side clearance                                           |                        | STD                                   | 0.070 — 0.330 mm (0.0028 — 0.0130 in)                              |
|                          |                                                          |                        | Limit                                 | 0.4 mm (0.016 in)                                                  |
| Connecting rod bearing   | Oil clearance                                            |                        | STD                                   | 0.017 — 0.045 mm (0.0007 — 0.0018 in)                              |
|                          |                                                          |                        | Limit                                 | 0.05 mm (0.0020 in)                                                |
|                          | Thickness at center portion                              |                        | STD                                   | 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)                              |
| Connecting rod bushing   | Clearance between piston pin and bushing                 |                        | STD                                   | 0 — 0.022 mm (0 — 0.0009 in)                                       |
|                          |                                                          |                        | Limit                                 | 0.030 mm (0.0012 in)                                               |

# GENERAL DESCRIPTION

MECHANICAL

|            |                              |                  |                                       |                                         |                                        |
|------------|------------------------------|------------------|---------------------------------------|-----------------------------------------|----------------------------------------|
| Crankshaft | Bend limit                   |                  |                                       | 0.035 mm (0.0014 in)                    |                                        |
|            | Crank pin and crank journal  | Out-of-roundness |                                       | 0.005 mm (0.0002 in) or less            |                                        |
|            |                              | Grinding limit   |                                       | 0.25 mm (0.0098 in)                     |                                        |
|            | Crank pin outer diameter     |                  | STD                                   | 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 | #1, #3, #5       | STD                                   | 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) |                                        |
|            |                              | #2, #4           | STD                                   | 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             |                  | STD                                   | 0.030 — 0.115 mm (0.0012 — 0.0045 in)   |                                        |
|            |                              |                  | Limit                                 | 0.25 mm (0.0098 in)                     |                                        |
|            | Oil clearance                |                  | #1                                    | STD                                     | 0.003 — 0.030 mm (0.00012 — 0.0012 in) |
|            |                              |                  |                                       | Limit                                   | 0.040 mm (0.0016 in)                   |
|            |                              |                  | #2                                    | STD                                     | 0.012 — 0.033 mm (0.0004 — 0.0012 in)  |
|            |                              |                  |                                       | Limit                                   | 0.045 mm (0.0018 in)                   |
|            |                              |                  | #3                                    | STD                                     | 0.003 — 0.030 mm (0.00012 — 0.0012 in) |
|            |                              |                  |                                       | Limit                                   | 0.040 mm (0.0016 in)                   |
|            |                              |                  | #4                                    | STD                                     | 0.012 — 0.033 mm (0.0004 — 0.0012 in)  |
|            |                              |                  |                                       | Limit                                   | 0.045 mm (0.0018 in)                   |
|            | #5                           | STD              | 0.010 — 0.031 mm (0.0004 — 0.0012 in) |                                         |                                        |
|            |                              | Limit            | 0.040 mm (0.0016 in)                  |                                         |                                        |

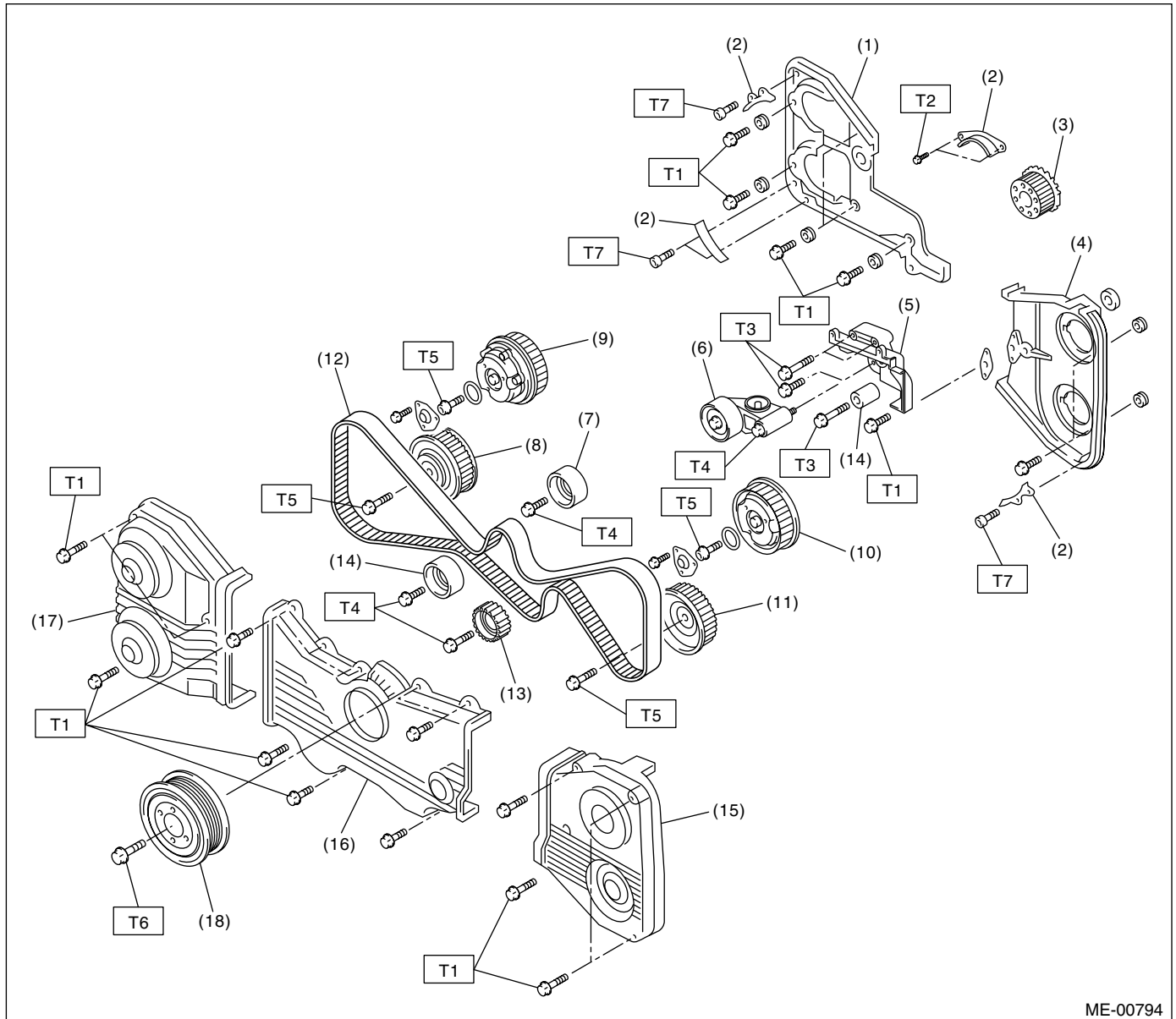
## GENERAL DESCRIPTION

### MECHANICAL

|                            |                                      |            |                              |                                       |
|----------------------------|--------------------------------------|------------|------------------------------|---------------------------------------|
| Crankshaft<br>main bearing | Crankshaft main bearing<br>thickness | #1, #3     | STD                          | 1.998 — 2.011 mm (0.0787 — 0.0792 in) |
|                            |                                      |            | 0.03 mm<br>(0.0012<br>in) US | 2.017 — 2.020 mm (0.0794 — 0.0795 in) |
|                            |                                      |            | 0.05 mm<br>(0.0020<br>in) US | 2.027 — 2.030 mm (0.0798 — 0.0799 in) |
|                            |                                      |            | 0.25 mm<br>(0.0098<br>in) US | 2.127 — 2.130 mm (0.0837 — 0.0839 in) |
|                            |                                      | #2, #4, #5 | STD                          | 2.000 — 2.013 mm (0.0787 — 0.0793 in) |
|                            |                                      |            | 0.03 mm<br>(0.0012<br>in) US | 2.019 — 2.022 mm (0.0795 — 0.0796 in) |
|                            |                                      |            | 0.05 mm<br>(0.0020<br>in) US | 2.029 — 2.032 mm (0.0799 — 0.0800 in) |
|                            |                                      |            | 0.25 mm<br>(0.0098<br>in) US | 2.129 — 2.132 mm (0.0838 — 0.0839 in) |

## B: COMPONENT

### 1. TIMING BELT



ME-00794

- |                                          |                                     |
|------------------------------------------|-------------------------------------|
| (1) Timing belt cover No. 2 (RH)         | (11) Exhaust camshaft sprocket (LH) |
| (2) Timing belt guide (MT model)         | (12) Timing belt                    |
| (3) Crankshaft sprocket                  | (13) Belt idler No. 2               |
| (4) Timing belt cover No. 2 (LH)         | (14) Belt idler                     |
| (5) Tensioner bracket                    | (15) Timing belt cover (LH)         |
| (6) Automatic belt tension adjuster ASSY | (16) Front belt cover               |
| (7) Belt idler                           | (17) Timing belt cover (RH)         |
| (8) Exhaust camshaft sprocket (RH)       | (18) Crankshaft pulley              |
| (9) Intake camshaft sprocket (RH)        |                                     |
| (10) Intake camshaft sprocket (LH)       |                                     |

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

**T1: 5 (0.5, 3.6)**

**T2: 10 (1.0, 7)**

**T3: 25 (2.5, 18.1)**

**T4: 39 (4.0, 28.9)**

**T5: <Ref. to ME(H4DOTC)-58, INSTALLATION, CRANKSHAFT SPROCKET.>**

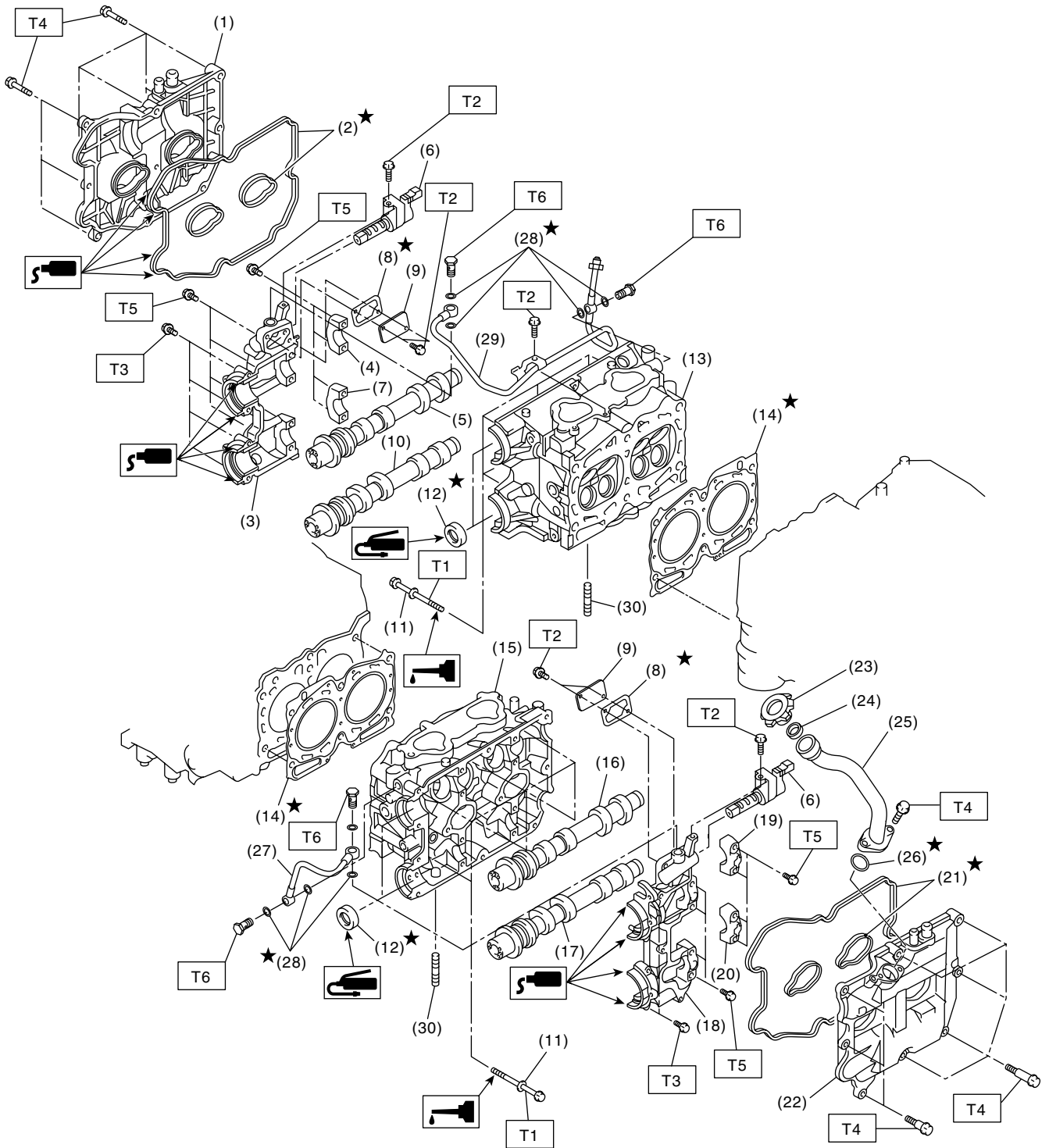
**T6: <Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>**

**T7: 6.4 (0.65, 4.7)**

# GENERAL DESCRIPTION

MECHANICAL

## 2. CYLINDER HEAD AND CAMSHAFT



ME-00765

ME(H4DOTC)-8

## GENERAL DESCRIPTION

MECHANICAL

- |                                          |                                     |
|------------------------------------------|-------------------------------------|
| (1) Rocker cover (RH)                    | (13) Cylinder head (RH)             |
| (2) Rocker cover gasket (RH)             | (14) Cylinder head gasket           |
| (3) Camshaft cap (Front RH)              | (15) Cylinder head (LH)             |
| (4) Intake camshaft cap (RH)             | (16) Intake camshaft (LH)           |
| (5) Intake camshaft (RH)                 | (17) Exhaust camshaft (LH)          |
| (6) Variable valve timing solenoid valve | (18) Camshaft cap (Front LH)        |
| (7) Exhaust camshaft cap (Center RH)     | (19) Intake camshaft cap (Rear LH)  |
| (8) Gasket                               | (20) Exhaust camshaft cap (Rear LH) |
| (9) Oil return cover                     | (21) Rocker cover gasket (LH)       |
| (10) Exhaust camshaft (RH)               | (22) Rocker cover (LH)              |
| (11) Cylinder head bolt                  | (23) Oil filler cap                 |
| (12) Oil seal                            | (24) Gasket                         |
|                                          | (25) Oil filler duct                |
|                                          | (26) O-ring                         |

- |                    |
|--------------------|
| (27) Oil pipe (LH) |
| (28) Gasket        |
| (29) Oil pipe (RH) |
| (30) Stud bolt     |

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

**T1: <Ref. to ME(H4DOTC)-65,  
INSTALLATION, CYLINDER  
HEAD ASSEMBLY.>**

**T2: 8 (0.8, 5.9)**

**T3: 10 (1.0, 7)**

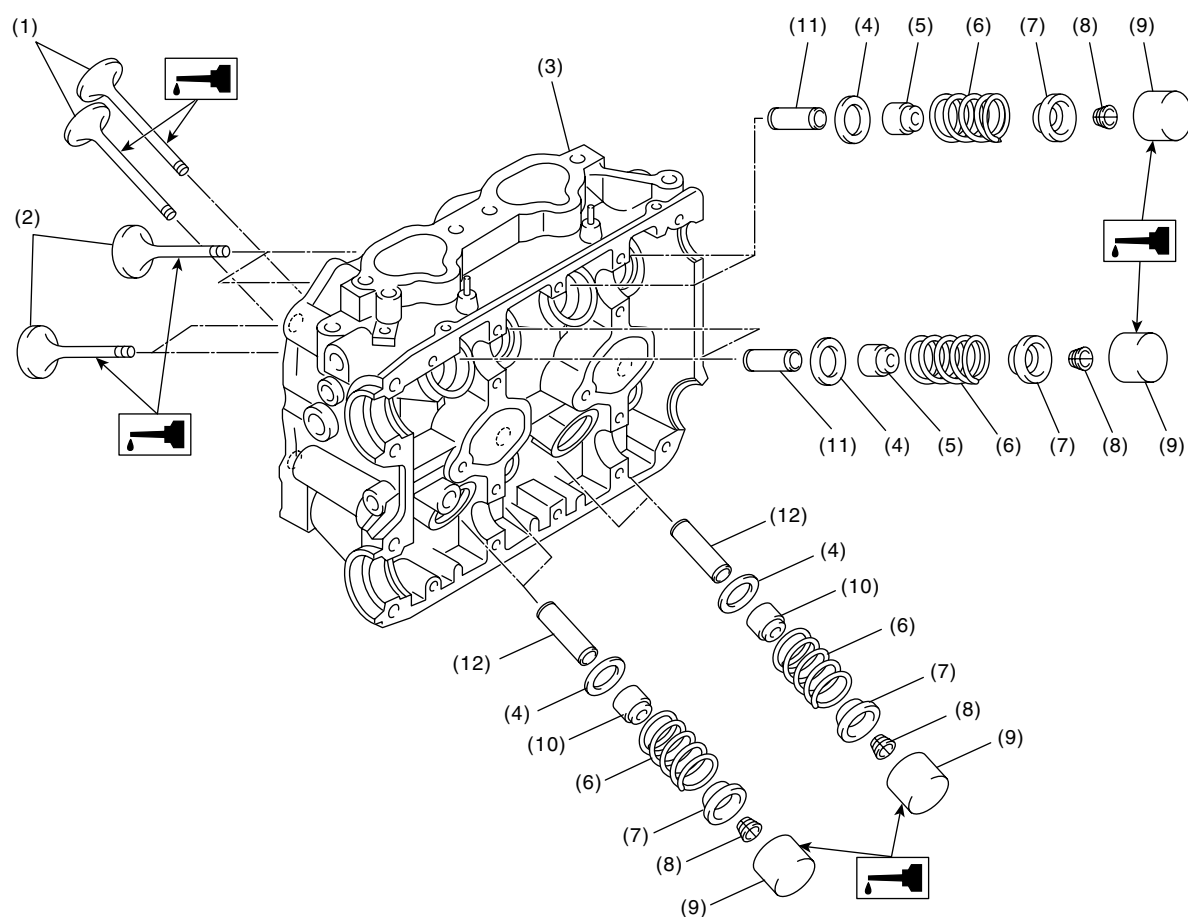
**T4: 6.4 (0.65, 4.7)**

**T5: 20 (2.0, 14.5)**

**T6: 29 (3.0, 21.4)**

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### 3. CYLINDER HEAD AND VALVE ASSEMBLY



ME-00795

- |                       |                           |                             |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve     | (5) Intake valve oil seal | (9) Valve lifter            |
| (2) Intake valve      | (6) Valve spring          | (10) Exhaust valve oil seal |
| (3) Cylinder head     | (7) Retainer              | (11) Intake valve guide     |
| (4) Valve spring seat | (8) Retainer key          | (12) Exhaust valve guide    |

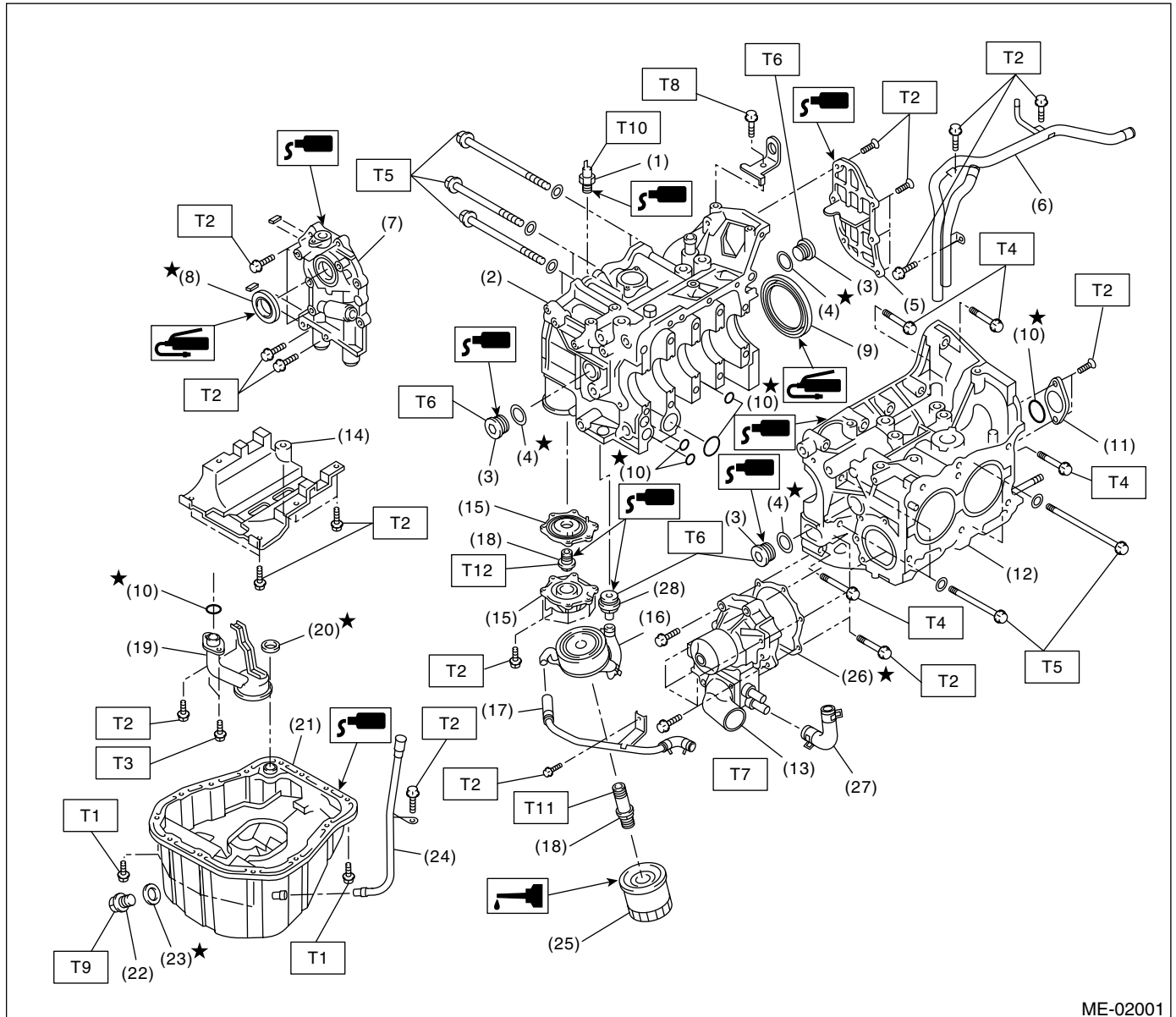
## GENERAL DESCRIPTION

MECHANICAL

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MEMO:

#### 4. CYLINDER BLOCK



## GENERAL DESCRIPTION

MECHANICAL

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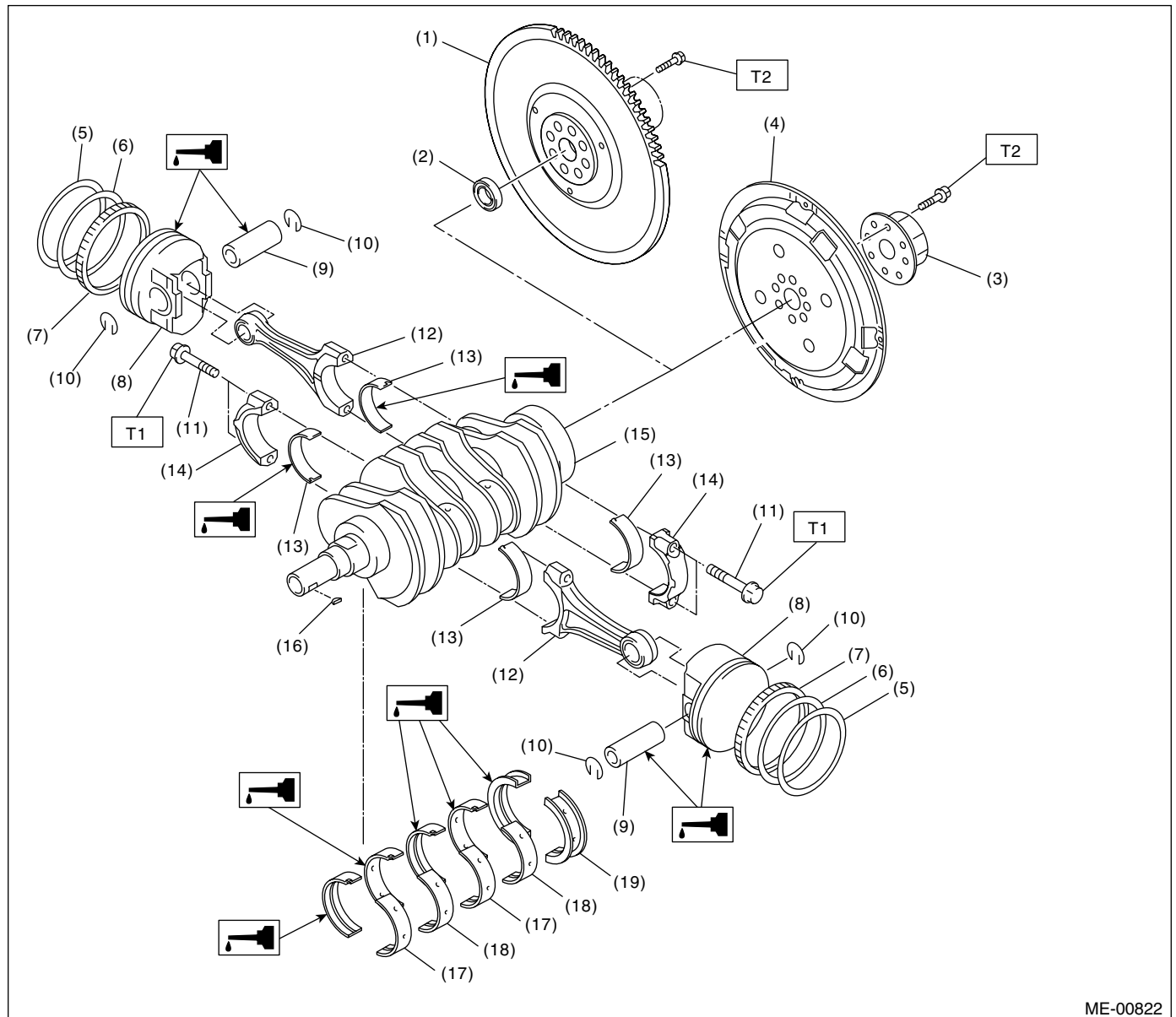
|                          |                            |                                                                                        |
|--------------------------|----------------------------|----------------------------------------------------------------------------------------|
| (1) Oil pressure switch  | (16) Oil cooler            | <b><i>Tightening torque: N·m (kgf-m, ft-lb)</i></b>                                    |
| (2) Cylinder block (RH)  | (17) Water by-pass pipe    | <b><i>T1: 5 (0.5, 3.6)</i></b>                                                         |
| (3) Service hole plug    | (18) Connector             | <b><i>T2: 6.4 (0.65, 4.7)</i></b>                                                      |
| (4) Gasket               | (19) Oil strainer          | <b><i>T3: 10 (1.0, 7.2)</i></b>                                                        |
| (5) Oil separator cover  | (20) Gasket                | <b><i>T4: 25 (2.5, 18.1)</i></b>                                                       |
| (6) Water by-pass pipe   | (21) Oil pan               | <b><i>T5: &lt;Ref. to ME(H4DOTC)-76,<br/>INSTALLATION, CYLINDER<br/>BLOCK.&gt;</i></b> |
| (7) Oil pump             | (22) Drain plug            |                                                                                        |
| (8) Front oil seal       | (23) Metal gasket          | <b><i>T6: 70 (7.1, 50.6)</i></b>                                                       |
| (9) Rear oil seal        | (24) Oil level gauge guide | <b><i>T7: First 12 (1.2, 8.7)<br/>Second 12 (1.2, 8.7)</i></b>                         |
| (10) O-ring              | (25) Oil filter            |                                                                                        |
| (11) Service hole cover  | (26) Gasket                | <b><i>T8: 16 (1.6, 11.6)</i></b>                                                       |
| (12) Cylinder block (LH) | (27) Water pump hose       | <b><i>T9: 44 (4.5, 33)</i></b>                                                         |
| (13) Water pump          | (28) Plug                  | <b><i>T10: 25 (2.5, 18.1)</i></b>                                                      |
| (14) Baffle plate        |                            | <b><i>T11: 54 (5.5, 40)</i></b>                                                        |
| (15) Adapter             |                            | <b><i>T12: 45 (4.6, 33)</i></b>                                                        |

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# GENERAL DESCRIPTION

## MECHANICAL

### 5. CRANKSHAFT AND PISTON



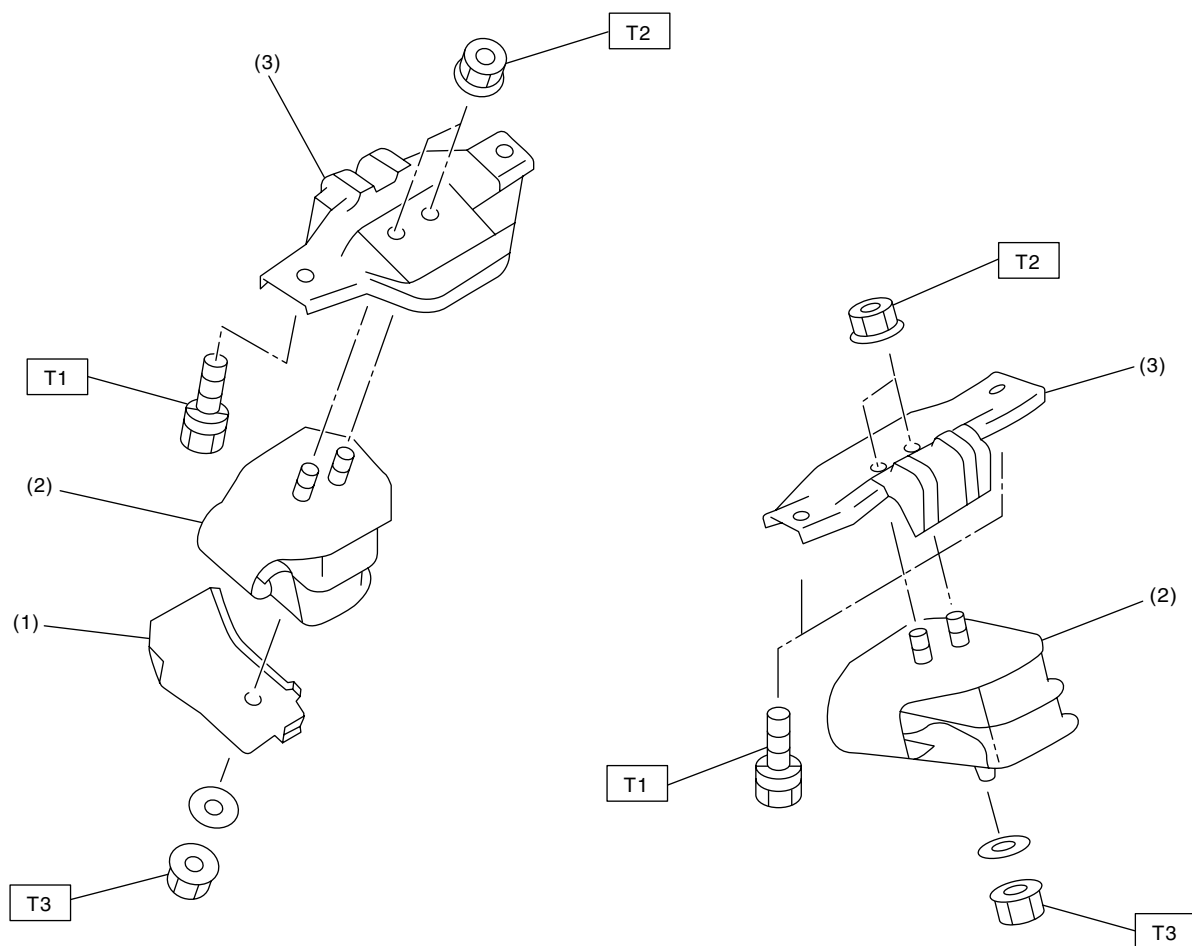
- |                              |                             |                                |
|------------------------------|-----------------------------|--------------------------------|
| (1) Flywheel (MT model)      | (9) Piston pin              | (17) Crankshaft bearing #1, #3 |
| (2) Ball bearing (MT model)  | (10) Circlip                | (18) Crankshaft bearing #2, #4 |
| (3) Reinforcement (AT model) | (11) Connecting rod bolt    | (19) Crankshaft bearing #5     |
| (4) Drive plate (AT model)   | (12) Connecting rod         |                                |
| (5) Top ring                 | (13) Connecting rod bearing |                                |
| (6) Second ring              | (14) Connecting rod cap     |                                |
| (7) Oil ring                 | (15) Crankshaft             |                                |
| (8) Piston                   | (16) Woodruff key           |                                |

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

**T1: 52 (5.3, 38.4)**

**T2: 72 (7.3, 52.8)**

## 6. ENGINE MOUNTING



ME-00706

- (1) Heat shield cover
- (2) Front cushion rubber

- (3) Front engine mounting bracket

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

**T1: 35 (3.6, 25.8)**

**T2: 42 (4.3, 30.9)**

**T3: 85 (8.7, 62.7)**

## GENERAL DESCRIPTION

### MECHANICAL

---

#### **C: CAUTION**

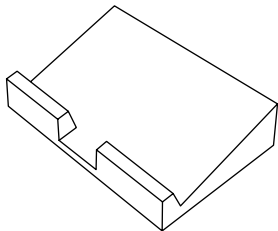
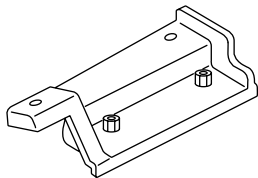
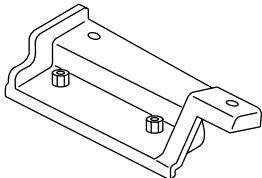
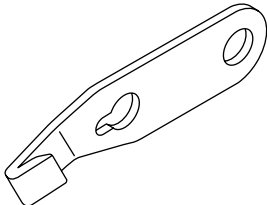
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following: Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

# GENERAL DESCRIPTION

MECHANICAL

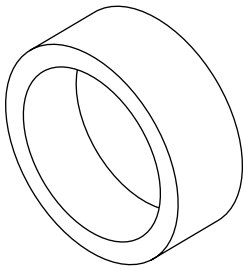
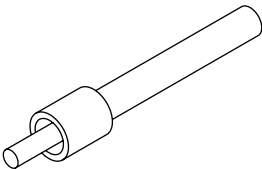
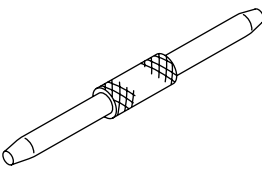
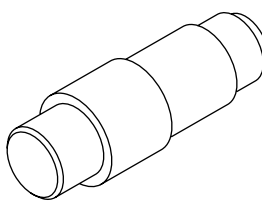
## D: PREPARATION TOOL

### 1. SPECIAL TOOLS

| ILLUSTRATION                                                                                            | TOOL NUMBER | DESCRIPTION             | REMARKS                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>ST-498267600</p>   | 498267600   | CYLINDER HEAD TABLE     | <ul style="list-style-type: none"> <li>Used for replacing valve guides.</li> <li>Used for removing and installing valve springs.</li> </ul> |
|  <p>ST-498457000</p>  | 498457000   | ENGINE STAND ADAPTER RH | Used with ENGINE STAND (499817000).                                                                                                         |
|  <p>ST-498457100</p> | 498457100   | ENGINE STAND ADAPTER LH | Used with ENGINE STAND (499817000).                                                                                                         |
|  <p>ST-498497100</p> | 498497100   | CRANKSHAFT STOPPER      | Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.                                           |

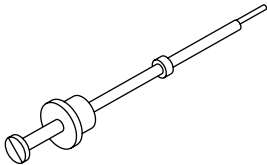
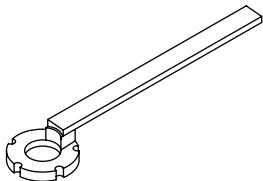
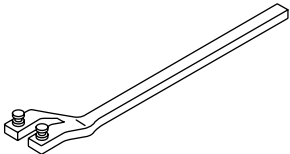
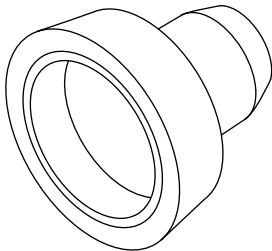
## GENERAL DESCRIPTION

### MECHANICAL

| ILLUSTRATION                                                                                                                        | TOOL NUMBER | DESCRIPTION                                | REMARKS                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------|---------------------------------------------------------------------|
|  <p style="text-align: center;">ST-498747300</p>   | 498747300   | PISTON GUIDE                               | Used for installing piston in cylinder for 2.5 L engine.            |
|  <p style="text-align: center;">ST-498857100</p>   | 498857100   | VALVE OIL SEAL GUIDE                       | Used for press-fitting of intake and exhaust valve guide oil seals. |
|  <p style="text-align: center;">ST-499017100</p> | 499017100   | PISTON PIN GUIDE                           | Used for installing piston pin, piston and connecting rod.          |
|  <p style="text-align: center;">ST-499037100</p> | 499037100   | CONNECTING ROD BUSHING REMOVER & INSTALLER | Used for removing and installing connecting rod bushing.            |

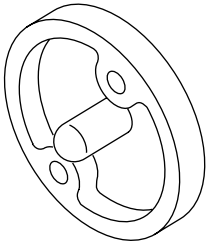
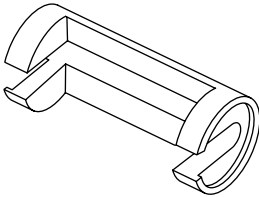
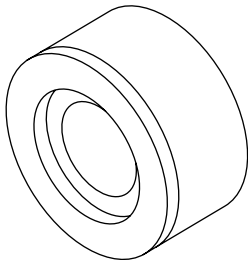
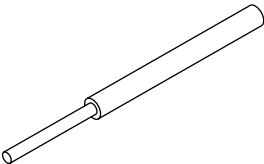
# GENERAL DESCRIPTION

MECHANICAL

| ILLUSTRATION                                                                                            | TOOL NUMBER | DESCRIPTION                         | REMARKS                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------|-------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>ST-499097700</p>   | 499097700   | PISTON PIN<br>REMOVER<br>ASSY       | Used for removing piston pin.                                                                                                                            |
|  <p>ST-499207400</p>   | 499207400   | CAMSHAFT<br>SPROCKET<br>WRENCH      | Used for removing and installing exhaust camshaft sprocket.                                                                                              |
|  <p>ST-499977500</p> | 499977500   | CAMSHAFT<br>SPROCKET<br>WRENCH      | Used for removing and installing intake camshaft sprocket.                                                                                               |
|  <p>ST-499587200</p> | 499587200   | CRANKSHAFT<br>OIL SEAL<br>INSTALLER | <ul style="list-style-type: none"> <li>• Used for installing crankshaft oil seal.</li> <li>• Used with CRANKSHAFT OIL SEAL GUIDE (499597100).</li> </ul> |

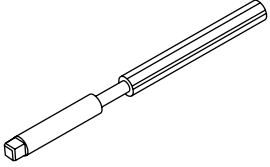
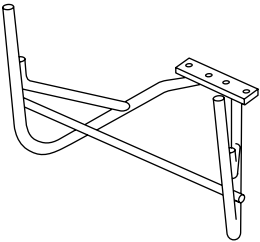
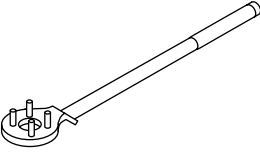
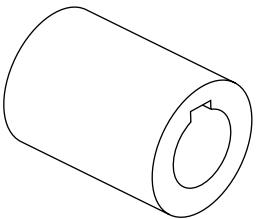
## GENERAL DESCRIPTION

### MECHANICAL

| ILLUSTRATION                                                                                                                        | TOOL NUMBER | DESCRIPTION               | REMARKS                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p style="text-align: center;">ST-499597100</p>   | 499597100   | CRANKSHAFT OIL SEAL GUIDE | <ul style="list-style-type: none"> <li>Used for installing crankshaft oil seal.</li> <li>Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).</li> </ul> |
|  <p style="text-align: center;">ST-499718000</p>   | 499718000   | VALVE SPRING REMOVER      | Used for removing and installing valve spring.                                                                                                           |
|  <p style="text-align: center;">ST18251AA020</p> | 18251AA020  | VALVE GUIDE ADJUSTER      | Used for installing intake and exhaust valve guides.                                                                                                     |
|  <p style="text-align: center;">ST-499767200</p> | 499767200   | VALVE GUIDE REMOVER       | Used for removing valve guides.                                                                                                                          |

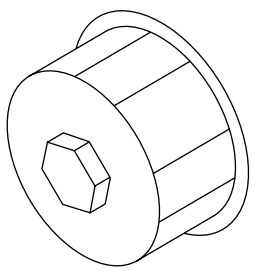
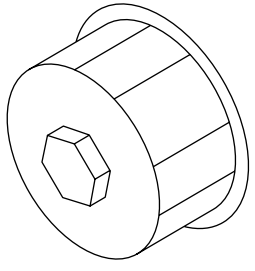
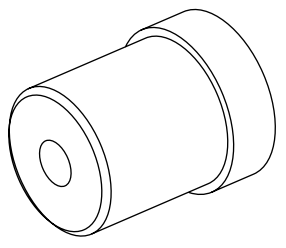
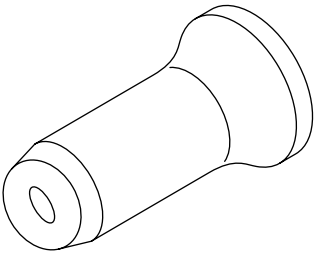
# GENERAL DESCRIPTION

MECHANICAL

| ILLUSTRATION                                                                                            | TOOL NUMBER | DESCRIPTION              | REMARKS                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------|-------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>ST-499767400</p>   | 499767400   | VALVE GUIDE REAMER       | Used for reaming valve guides.                                                                                                                                                 |
|  <p>ST-499817000</p>   | 499817000   | ENGINE STAND             | <ul style="list-style-type: none"> <li>Stand used for engine disassembly and assembly.</li> <li>Used with ENGINE STAND ADAPTER RH (498457000) &amp; LH (498457100).</li> </ul> |
|  <p>ST-499977100</p> | 499977100   | CRANKSHAFT PULLEY WRENCH | Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.                                                                         |
|  <p>ST-499987500</p> | 499987500   | CRANKSHAFT SOCKET        | Used for rotating crankshaft.                                                                                                                                                  |

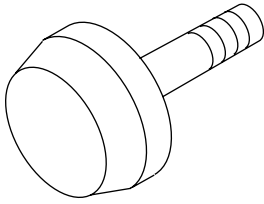
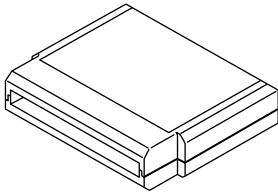
## GENERAL DESCRIPTION

### MECHANICAL

| ILLUSTRATION                                                                                            | TOOL NUMBER | DESCRIPTION           | REMARKS                                                                                |
|---------------------------------------------------------------------------------------------------------|-------------|-----------------------|----------------------------------------------------------------------------------------|
|  <p>ST18332AA000</p>   | 18332AA000  | OIL FILTER<br>WRENCH  | Used for removing and installing the oil filter.<br>(Outer diameter : 68 mm (2.68 in)) |
|  <p>ST18332AA010</p>   | 18332AA010  | OIL FILTER<br>WRENCH  | Used for removing and installing the oil filter.<br>(Outer diameter : 65 mm (2.56 in)) |
|  <p>ST-499587100</p> | 499587100   | OIL SEAL<br>INSTALLER | Used for installing oil pump oil seal.                                                 |
|  <p>ST-499587600</p> | 499587600   | OIL SEAL<br>INSTALLER | Used for installing camshaft oil seal for DOHC engine.                                 |

## GENERAL DESCRIPTION

MECHANICAL

| ILLUSTRATION                                                                                                                        | TOOL NUMBER                        | DESCRIPTION               | REMARKS                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p style="text-align: center;">ST-499597200</p>   | 499597200                          | OIL SEAL GUIDE            | <ul style="list-style-type: none"> <li>Used for installing camshaft oil seal for DOHC engine.</li> <li>Used with OIL SEAL GUIDE (499587600).</li> </ul> |
|  <p style="text-align: center;">ST24082AA230</p>   | 24082AA230<br>(Newly adopted tool) | CARTRIDGE                 | Troubleshooting for electrical systems.                                                                                                                 |
|  <p style="text-align: center;">ST22771AA030</p> | 22771AA030                         | SUBARU SELECT MONITOR KIT | Troubleshooting for electrical systems.                                                                                                                 |

## 2. GENERAL PURPOSE TOOLS

| TOOL NAME         | REMARKS                         |
|-------------------|---------------------------------|
| Compression Gauge | Used for measuring compression. |

## E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

### 3. Idle Speed

#### A: INSPECTION

##### 1. USING SUBARU SELECT MONITOR

1) Before checking the idle speed, check the following:

(1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.

(2) Ensure the malfunction indicator light does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and then turn the ignition switch to OFF.

4) Insert the cartridge to SUBARU Select Monitor.

5) Connect the SUBARU Select Monitor to data link connector.

6) Turn the ignition switch to ON, and SUBARU Select Monitor switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1.12 Data Display} in Data Display Menu.

11) Start the engine, and then read the engine idle speed.

12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

***Idle speed [No load and gears in neutral]:***

***700±100 rpm***

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

***Idle speed [A/C “ON”, no load and gears in neutral]:***

• ***A/C Refrigerant pressure (LOW)***

***MT: 725±100 rpm***

***AT: 750±100 rpm***

• ***A/C Refrigerant pressure (HIGH)***

***MT: 800±100 rpm***

***AT: 825±100 rpm***

NOTE:

As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>

## 4. Ignition Timing

### A: INSPECTION

#### 1. USING SUBARU SELECT MONITOR

1) Before checking the ignition timing speed, check the following:

- (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
- (2) Ensure the malfunction indicator light does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and then turn the ignition switch to OFF.

4) Insert the cartridge to SUBARU Select Monitor.

5) Connect the SUBARU Select Monitor to data link connector.

6) Turn the ignition switch to ON, and SUBARU Select Monitor switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1.12 Data Display} in Data Display Menu.

11) Start the engine and check the ignition timing at idle speed.

**Ignition timing [BTDC/rpm]:**

**17°±10°/700**

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>

## 21.Intake and Exhaust Valve

### A: REMOVAL AND INSTALLATION

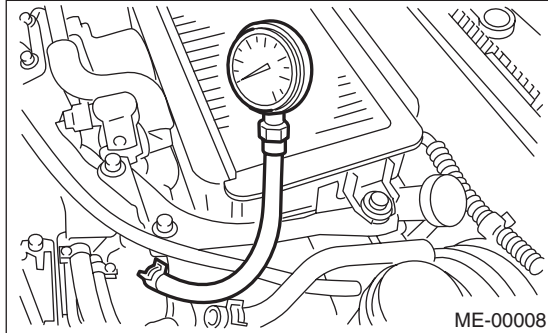
For operations related to intake and exhaust valve, refer to "19. Cylinder Head." <Ref. to ME(H4DOTC)-67, REMOVAL, Cylinder Head Assembly.> <Ref. to ME(H4DOTC)-67, INSTALLATION, Cylinder Head Assembly.>

## 5. Intake Manifold Vacuum

### A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
- 3) Keep the engine at the idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



**Vacuum pressure (at idling, A/C “OFF”):**  
**Less than –60.0 kPa (–450 mmHg, –17.72 inHg)**

| Diagnosis of engine condition by measurement of manifold vacuum                                                                                         |                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Vacuum gauge indication                                                                                                                                 | Possible engine condition                                                     |
| 1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.                                     | Leakage around intake manifold gasket or disconnection or damaged vacuum hose |
| 2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.         | Back pressure too high, or exhaust system clogged                             |
| 3. Needle intermittently drops to position lower than normal position.                                                                                  | Leakage around cylinder                                                       |
| 4. Needle drops suddenly and intermittently from normal position.                                                                                       | Sticky valves                                                                 |
| 5. 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                                                  |
| 6. Needle vibrates above and below normal position in narrow range.                                                                                     | Defective ignition system or throttle chamber idle adjustment                 |

## **22.Piston**

### **A: REMOVAL AND INSTALLATION**

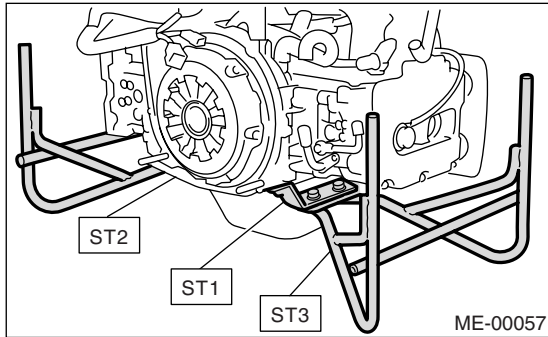
For operations related to piston, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-74, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-78, INSTALLATION, Cylinder Block.>

## 11.Preparation for Overhaul

### A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

|     |           |                            |
|-----|-----------|----------------------------|
| ST1 | 498457000 | ENGINE STAND ADAPTER<br>RH |
| ST2 | 498457100 | ENGINE STAND ADAPTER<br>LH |
| ST3 | 499817000 | ENGINE STAND               |



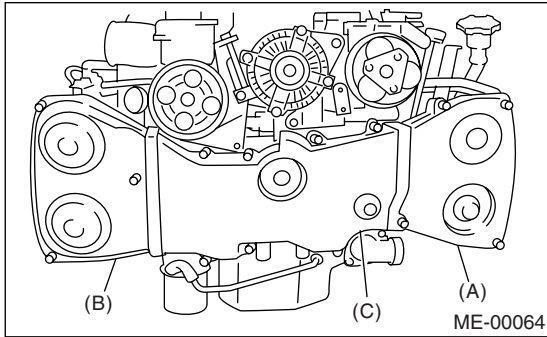
2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

## 14. Timing Belt Cover

### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-48, 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).

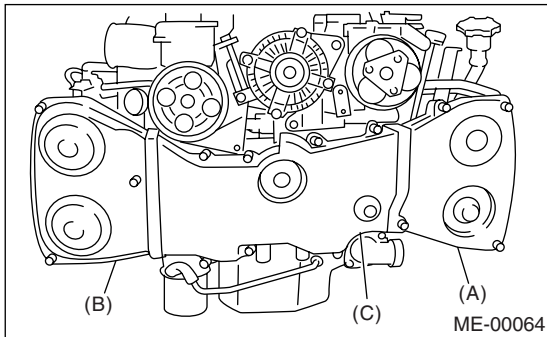
#### **Tightening torque:**

**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)-48, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

### C: INSPECTION

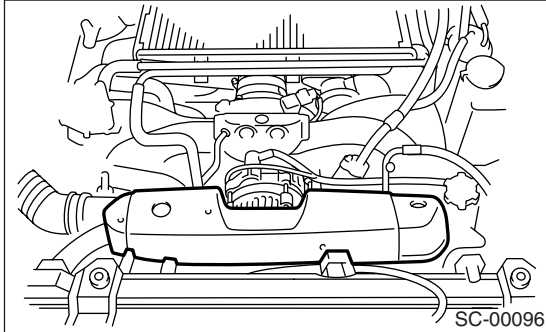
Make sure the cover is not damaged.

## 12.V-belt

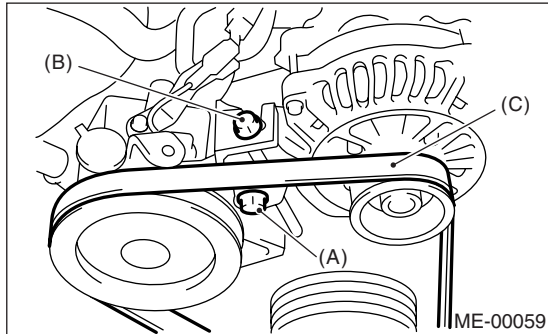
### A: REMOVAL

#### 1. FRONT SIDE BELT

- 1) Remove the V-belt cover.

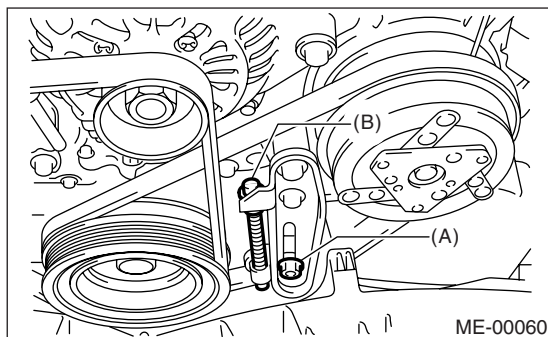


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).



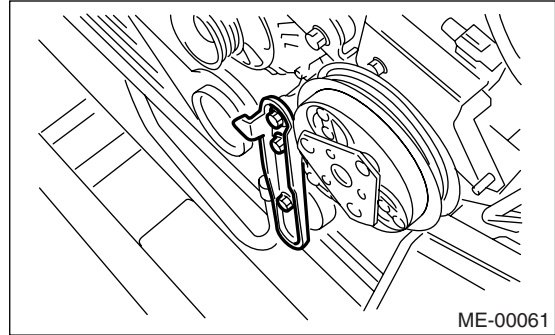
#### 2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the A/C belt.

- 4) Remove the A/C belt tensioner.



### B: INSTALLATION

#### 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 so as to obtain the specified belt tension <Ref. to ME(H4DOTC)-46, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

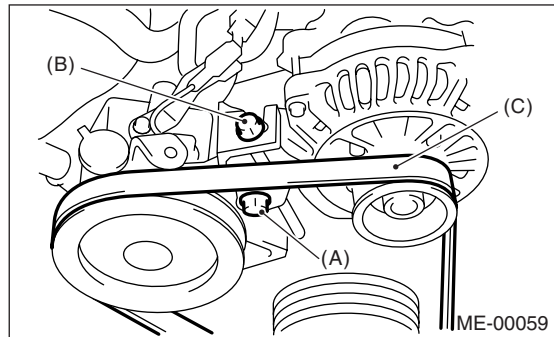
##### Tightening torque:

**Lock bolt through bolt:**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

**Slider bolt:**

**8 N·m (0.8 kgf-m, 5.5 ft-lb)**



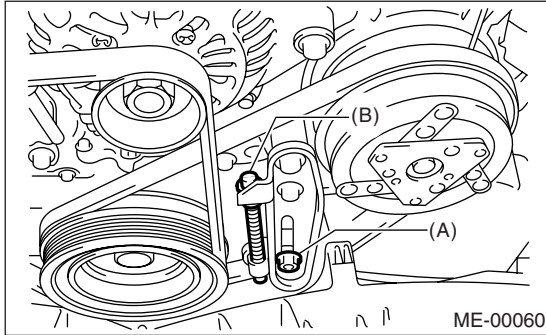
## 2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-46, 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 cracks, 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 using belt tension gauge)

(A)

**replaced: 618 — 755 N (63 — 77 kgf, 139 — 169 lb)**

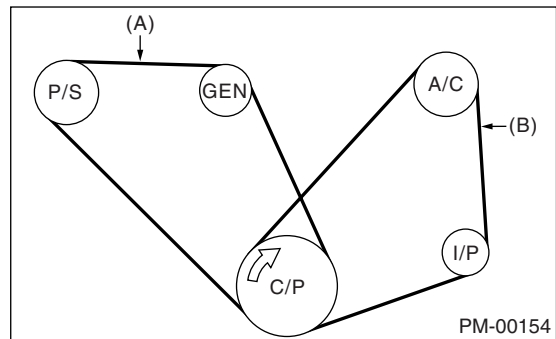
**reused: 490 — 640 N (50 — 65 kgf, 110 — 144 lb)**

(B)\*

**replaced: 740 — 880 N (76 — 89 kgf, 167 — 197 lb)**

**reused: 350 — 450 N (36 — 46 kgf, 78 — 101 lb)**

**\*: with air conditioner**



(A) Front side belt

(B) Rear side belt

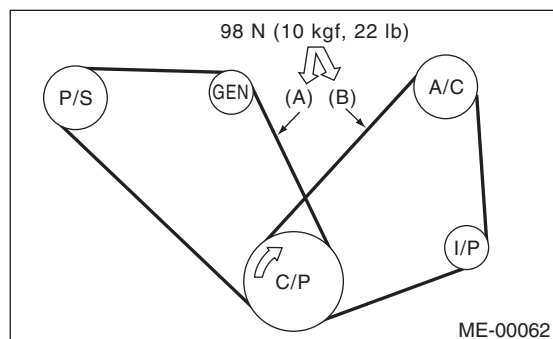
C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

A/C A/C compressor pulley

I/P Idler pulley

**Belt tension (Without using belt tension gauge)****(A)****replaced: 7 — 9 mm (0.276 — 0.354 in)****reused: 9 — 11 mm (0.354 — 0.433 in)****(B)\*****replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)****reused: 9.0 — 10.0 mm (0.354 — 0.394 in)****\*: 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

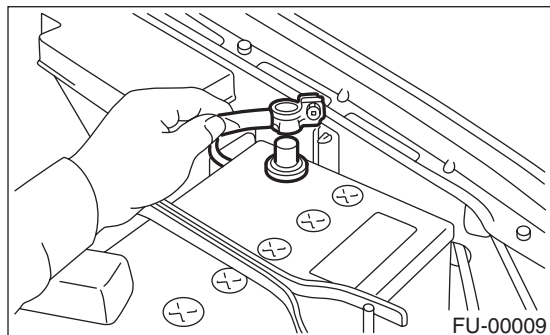
I/P Idler pulley

## 8. Valve Clearance

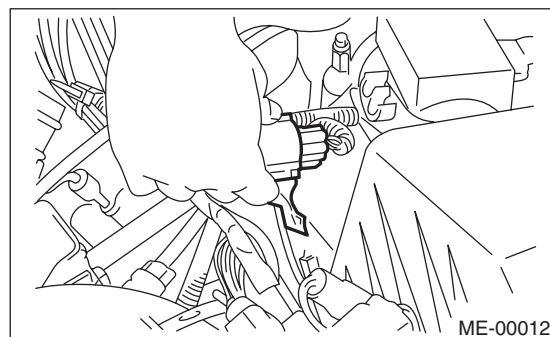
### A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

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

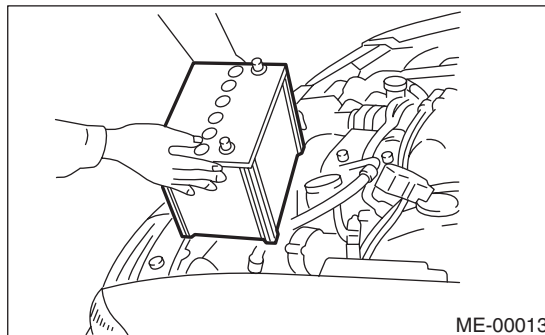


- 3) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
- 4) Remove the bolts which secure the timing belt cover (RH).
- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
- 8) Lower the vehicle.
- 9) When inspecting the #1 and #3 cylinders:
  - (1) Pull out the engine harness connector with bracket from air cleaner upper cover.

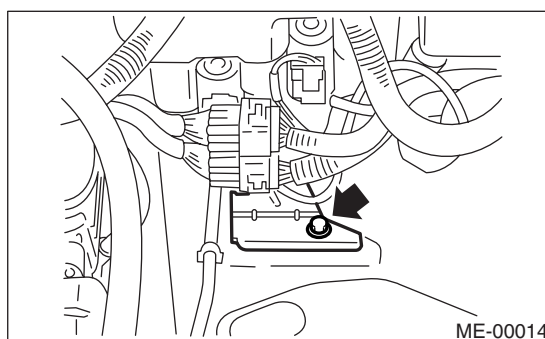


- (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
- (3) Disconnect the ignition coil connector.
- (4) Remove the ignition coil.
- (5) Place a suitable container under the vehicle.
- (6) Disconnect the PCV hose from rocker cover (RH).
- (7) Remove the bolts, and then remove the rocker cover (RH).

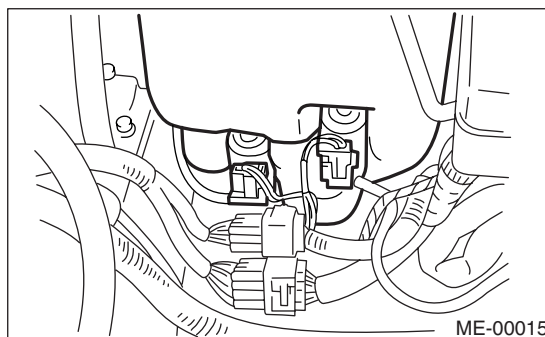
- 10) When inspecting the #2 and #4 cylinders:
  - (1) Disconnect the battery cable, and then remove the battery and battery carrier.



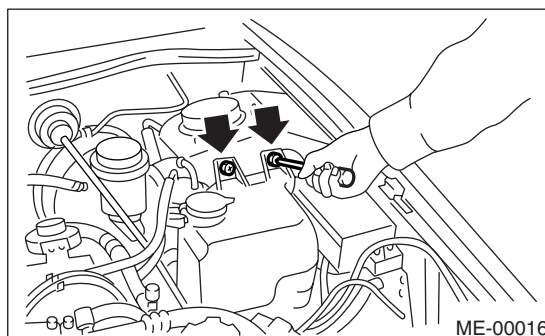
- (2) Remove the bolt which secures the engine harness bracket onto body.



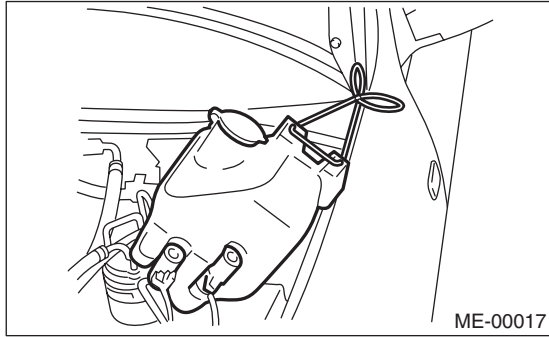
- (3) Disconnect the washer motor connectors.



- (4) Remove the washer tank mounting bolts.



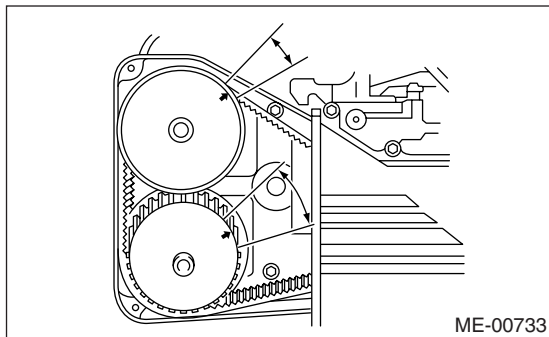
- (5) Move the washer tank upward.



- (6) Disconnect the ignition coil connector.  
 (7) Remove the ignition coil.  
 (8) Place a suitable container under the vehicle.  
 (9) Disconnect the PCV hose from rocker cover (LH).  
 (10) Remove the bolts, and then remove the rocker cover (LH).  
 11) Turn the crank pulley clockwise until arrow mark on the cam sprocket is set to position shown in the figure.

NOTE:

Turn the crankshaft using socket wrench.



- 12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:

- Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
- Measure the exhaust valve clearances while lifting-up the vehicle.

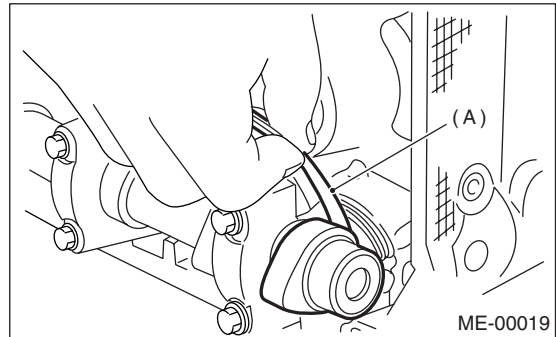
**Valve clearance:**

**Intake:**  $0.20^{+0.04}_{-0.06}$  mm ( $0.0079^{+0.0016}_{-0.0024}$  in)

**Exhaust:**  $0.35 \pm 0.05$  mm ( $0.0138 \pm 0.0020$  in)

NOTE:

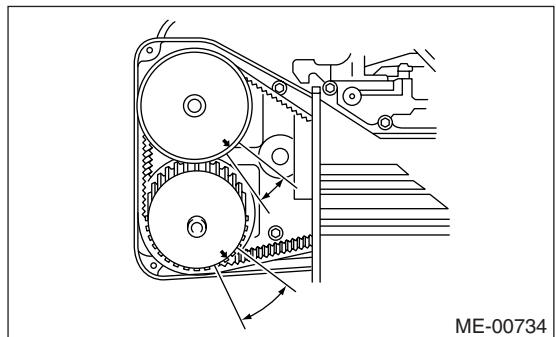
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



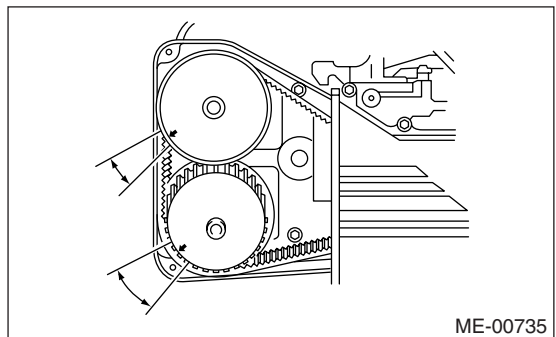
- 13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-32, ADJUSTMENT, Valve Clearance.>

- 14) Further turn the crank pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

- (1) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



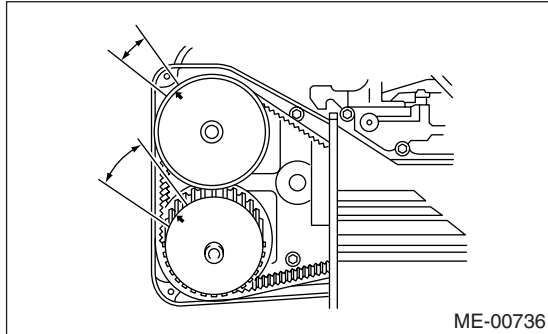
- (2) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



# VALVE CLEARANCE

## MECHANICAL

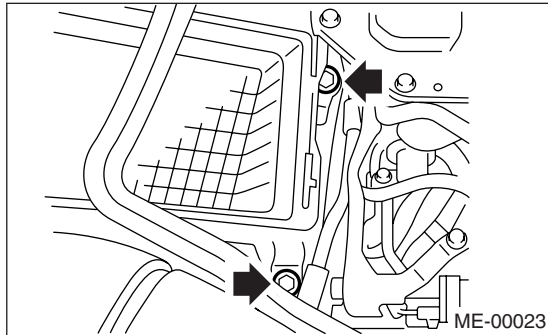
- (3) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



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

### Tightening torque:

**33 N·m (3.4 kgf-m, 25 ft-lb)**



## B: ADJUSTMENT

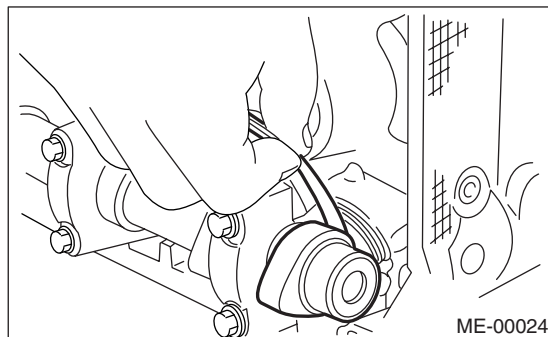
### CAUTION:

**Adjustment of the valve clearance should be performed while engine is cold.**

- 1) Measure all valve clearances. <Ref. to ME(H4DOTC)-30, INSPECTION, Valve Clearance.>

### NOTE:

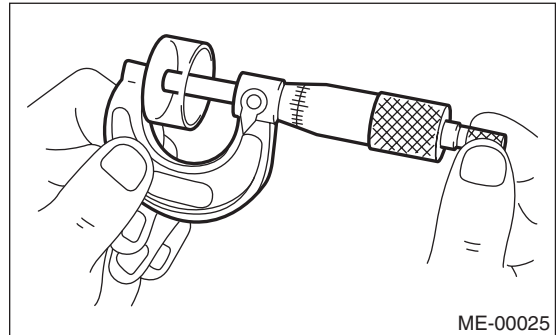
Record each valve clearance after it has been measured.



- 2) Remove the camshaft. <Ref. to ME(H4DOTC)-61, REMOVAL, Camshaft.>

- 3) Remove the valve lifter.

- 4) Measure the thickness of valve lifter with a micrometer.



- 5) Select a valve lifter of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

| 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 AB101 | 4.68 (0.1843)     |
| 13228 AB111 | 4.69 (0.1846)     |
| 13228 AB121 | 4.70 (0.1850)     |
| 13228 AB131 | 4.71 (0.1854)     |
| 13228 AB141 | 4.72 (0.1858)     |
| 13228 AB151 | 4.73 (0.1862)     |
| 13228 AB161 | 4.74 (0.1866)     |
| 13228 AB171 | 4.75 (0.1870)     |
| 13228 AB181 | 4.76 (0.1874)     |
| 13228 AB191 | 4.77 (0.1878)     |
| 13228 AB201 | 4.78 (0.1882)     |
| 13228 AB211 | 4.79 (0.1886)     |
| 13228 AB221 | 4.80 (0.1890)     |
| 13228 AB231 | 4.81 (0.1894)     |
| 13228 AB241 | 4.82 (0.1898)     |
| 13228 AB251 | 4.83 (0.1902)     |
| 13228 AB261 | 4.84 (0.1906)     |
| 13228 AB271 | 4.85 (0.1909)     |
| 13228 AB281 | 4.86 (0.1913)     |
| 13228 AB291 | 4.87 (0.1917)     |
| 13228 AB301 | 4.88 (0.1921)     |
| 13228 AB311 | 4.89 (0.1925)     |
| 13228 AB321 | 4.90 (0.1929)     |
| 13228 AB331 | 4.91 (0.1933)     |
| 13228 AB341 | 4.92 (0.1937)     |
| 13228 AB351 | 4.93 (0.1941)     |
| 13228 AB361 | 4.94 (0.1945)     |
| 13228 AB371 | 4.95 (0.1949)     |

# VALVE CLEARANCE

MECHANICAL

| Part No.    | Thickness mm (in) |
|-------------|-------------------|
| 13228 AB381 | 4.96 (0.1953)     |
| 13228 AB391 | 4.97 (0.1957)     |
| 13228 AB401 | 4.98 (0.1961)     |
| 13228 AB411 | 4.99 (0.1965)     |
| 13228 AB421 | 5.00 (0.1969)     |
| 13228 AB431 | 5.01 (0.1972)     |
| 13228 AB441 | 5.02 (0.1976)     |
| 13228 AB451 | 5.03 (0.1980)     |
| 13228 AB461 | 5.04 (0.1984)     |
| 13228 AB471 | 5.05 (0.1988)     |
| 13228 AB481 | 5.06 (0.1992)     |
| 13228 AB491 | 5.07 (0.1996)     |
| 13228 AB501 | 5.08 (0.2000)     |
| 13228 AB511 | 5.09 (0.2004)     |
| 13228 AB521 | 5.10 (0.2008)     |
| 13228 AB531 | 5.11 (0.2012)     |
| 13228 AB541 | 5.12 (0.2016)     |
| 13228 AB551 | 5.13 (0.2020)     |
| 13228 AB561 | 5.14 (0.2024)     |
| 13228 AB571 | 5.15 (0.2028)     |
| 13228 AB581 | 5.16 (0.2031)     |
| 13228 AB591 | 5.17 (0.2035)     |
| 13228 AB601 | 5.18 (0.2039)     |
| 13228 AB611 | 5.19 (0.2043)     |
| 13228 AB621 | 5.20 (0.2047)     |
| 13228 AB631 | 5.21 (0.2051)     |
| 13228 AB641 | 5.22 (0.2055)     |
| 13228 AB651 | 5.23 (0.2059)     |
| 13228 AB661 | 5.24 (0.2063)     |
| 13228 AB671 | 5.25 (0.2067)     |
| 13228 AB681 | 5.26 (0.2071)     |
| 13228 AB691 | 5.27 (0.2075)     |
| 13228 AB701 | 4.38 (0.1724)     |
| 13228 AB711 | 4.40 (0.1732)     |
| 13228 AB721 | 4.42 (0.1740)     |
| 13228 AB731 | 4.44 (0.1748)     |
| 13228 AB741 | 4.46 (0.1756)     |
| 13228 AB751 | 4.48 (0.1764)     |
| 13228 AB761 | 4.50 (0.1771)     |
| 13228 AB771 | 4.52 (0.1780)     |
| 13228 AB781 | 4.54 (0.1787)     |
| 13228 AB791 | 4.56 (0.1795)     |
| 13228 AB801 | 4.58 (0.1803)     |
| 13228 AB811 | 4.60 (0.1811)     |
| 13228 AB821 | 4.62 (0.1819)     |
| 13228 AB831 | 4.64 (0.1827)     |
| 13228 AB841 | 4.66 (0.1835)     |
| 13228 AB851 | 5.29 (0.2083)     |
| 13228 AB861 | 5.31 (0.2091)     |
| 13228 AB871 | 5.33 (0.2098)     |
| 13228 AB881 | 5.35 (0.2106)     |

| Part No.    | Thickness mm (in) |
|-------------|-------------------|
| 13228 AB891 | 5.37 (0.2114)     |
| 13228 AB901 | 5.39 (0.2122)     |
| 13228 AB911 | 5.41 (0.2123)     |
| 13228 AB921 | 5.43 (0.2138)     |
| 13228 AB931 | 5.45 (0.2146)     |
| 13228 AB941 | 5.47 (0.2154)     |
| 13228 AB951 | 5.49 (0.2161)     |
| 13228 AB961 | 5.51 (0.2169)     |
| 13228 AB971 | 5.53 (0.2177)     |
| 13228 AB981 | 5.55 (0.2185)     |
| 13228 AB991 | 5.57 (0.2193)     |
| 13228 AC001 | 5.59 (0.2201)     |
| 13228 AC011 | 5.61 (0.2209)     |
| 13228 AC021 | 5.63 (0.2217)     |
| 13228 AC031 | 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.

## 1. General Description

### A: SPECIFICATION

Specifications for turbo model is as same as NA model. <Ref. to SC(H4SO)-2, General Description.>