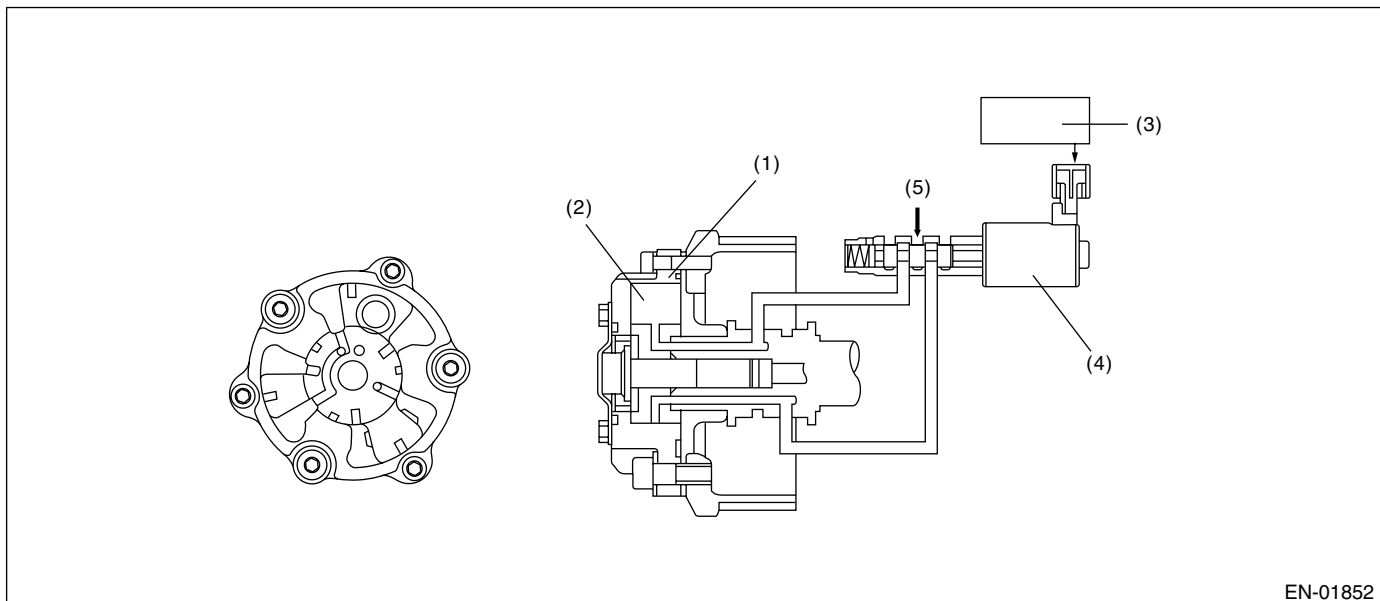# 2. Diagnostic Trouble Code (DTC) Detecting Criteria

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

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.
Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

### 2. COMPONENT DESCRIPTION



EN-01852

(1)  AVCS timing controller

(2)  Vane

(3)  Engine control module (ECM)

(4)  Oil flow control valve

(5)  Oil pressure

### 3. ENABLE CONDITION (For abnormality judgment only)

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | ≥ 10.9 V |
| Engine speed | ≥ 600 rpm |
| Coolant temperature | ≥ 60°C |
| Amount of AVCS target timing advance | = 0°CA |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after idling when the amount of AVCS target timing advance is equal to 0.

**GD(STi)-9**

## 5. DIAGNOSTIC METHOD

Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large, and judge OK when the difference becomes small.

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| AVCS target position − AVCS actual position | $\geq 20°$ |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| AVCS control | During feedback |
| Amount of AVCS target timing advance | 5 — 30°CA |
| AVCS target position − AVCS actual position | $< 10°$ |

## 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)

## 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(STi)-9, DTC P0011 — "A" CAMSHAFT PO-SITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
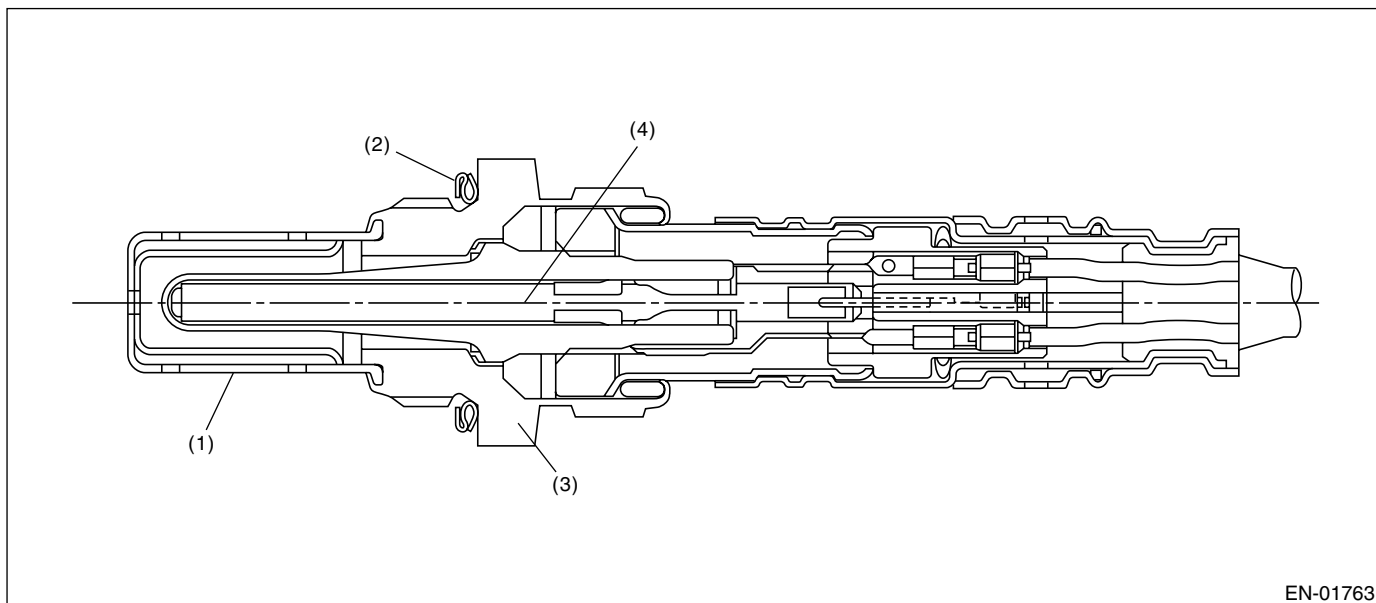
## C: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

### 2. COMPONENT DESCRIPTION



EN-01763

  (1)  Protection tube
  (2)  Gasket
  (3)  Sensor housing
  (4)  Ceramic heater

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Time needed for all secondary parameters to be in enable conditions | 60 seconds or more |
| Battery voltage | > 10.9 V |
| After fuel shut-off | 20 seconds or more |
| Front oxygen (A/F) sensor heater control duty ≥ 70% | Experienced |

### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting 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 continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Impedance of front oxygen (A/F) sensor | > 50 Ω |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

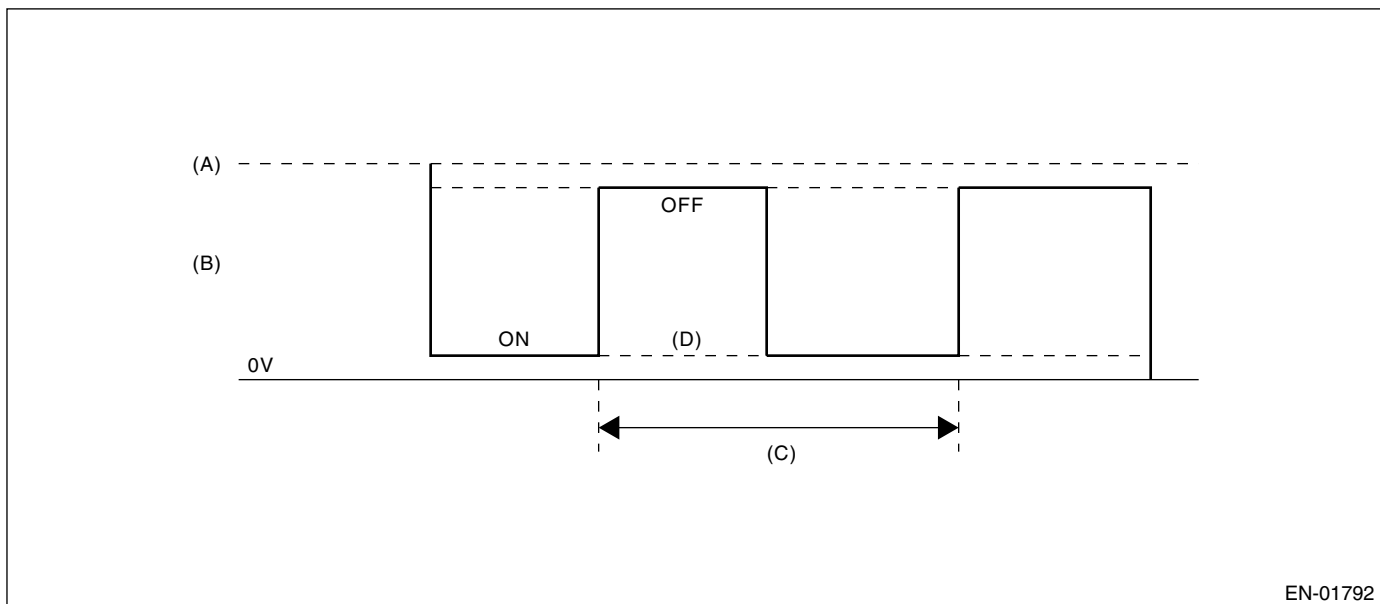## D: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be Low.

### 2. COMPONENT DESCRIPTION



EN-01792

(A)  Battery voltage
(B)  Front oxygen (A/F) sensor heater output voltage
(C)  128 milliseconds
(D)  Low abnormality

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage level | Low |
| Front oxygen (A/F) sensor heater control duty | < 87.5% |

**Time Needed for Diagnosis:** 1 second
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

**• 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)

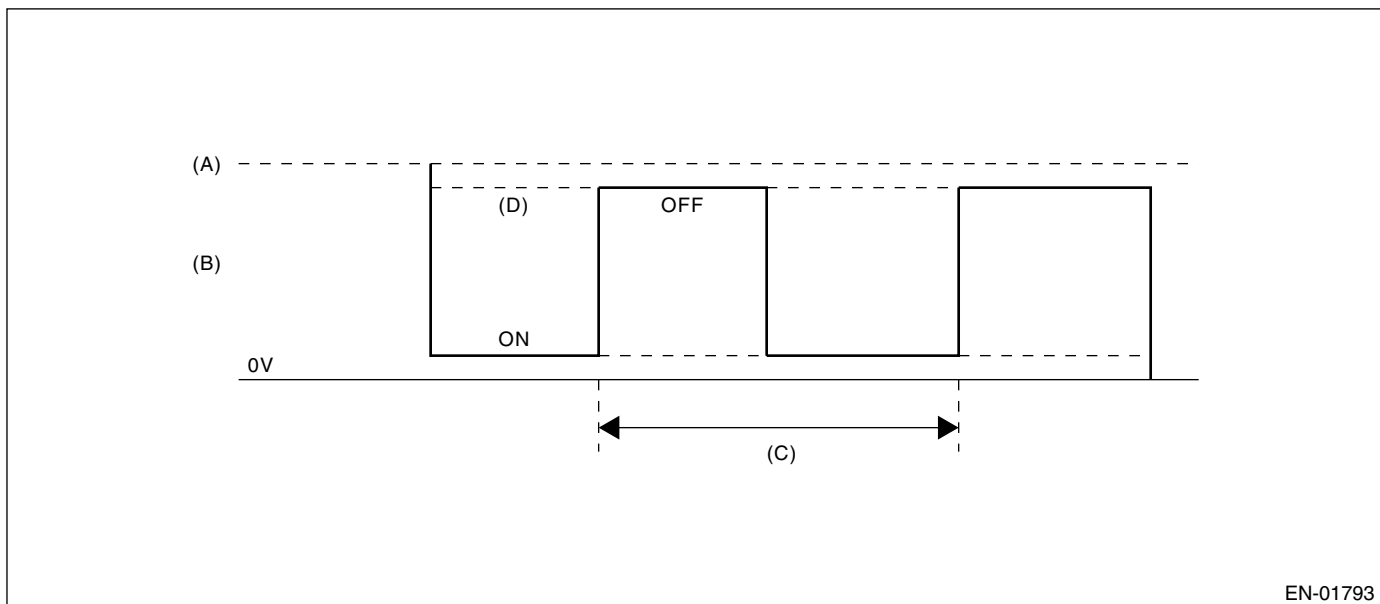## E: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be High.

### 2. COMPONENT DESCRIPTION



EN-01793

(A)  Battery voltage
(B)  Front oxygen (A/F) sensor heater output voltage
(C)  128 milliseconds
(D)  High abnormality

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage level | High |
| Front oxygen (A/F) sensor heater control duty | ≥ 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)

**GD(STi)-17**

## 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



EN-01792
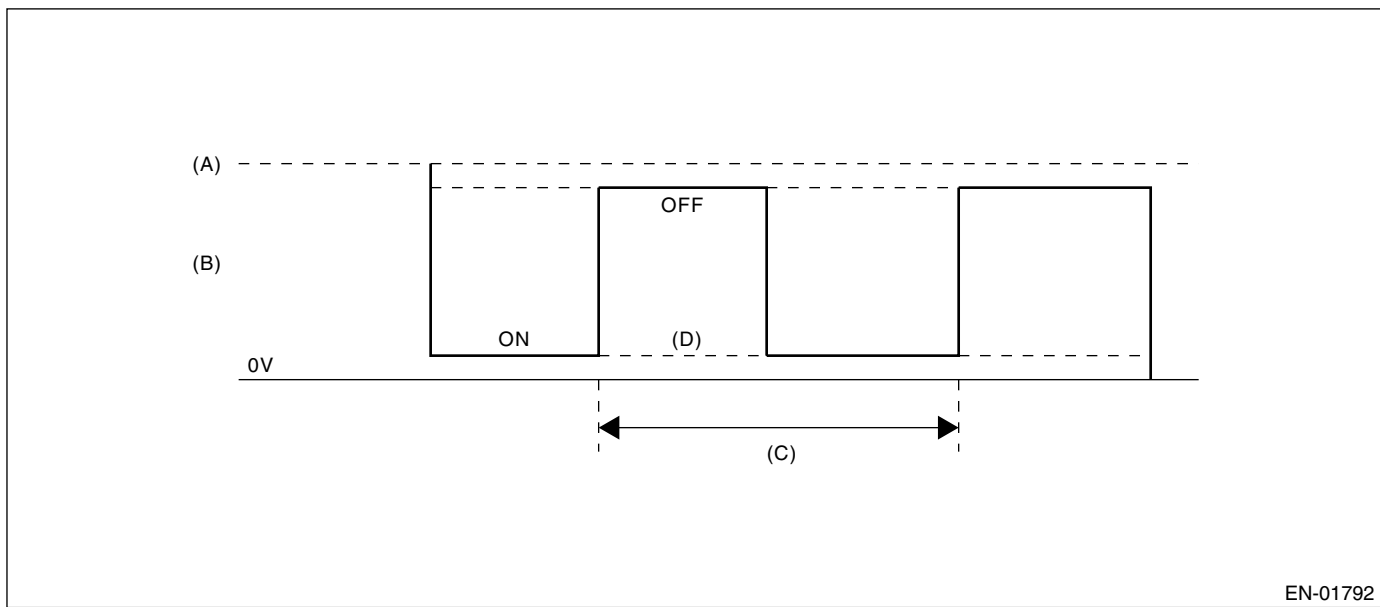
(A)  Battery voltage

(B)  Rear oxygen sensor heater output voltage

(C)  256 milliseconds (cycles)

(D)  Low malfunction

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | > 10.9 V |
| Elapsed time after engine starting | ≥ 1 second |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 1 second after engine starting.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 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)

## 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



EN-01793
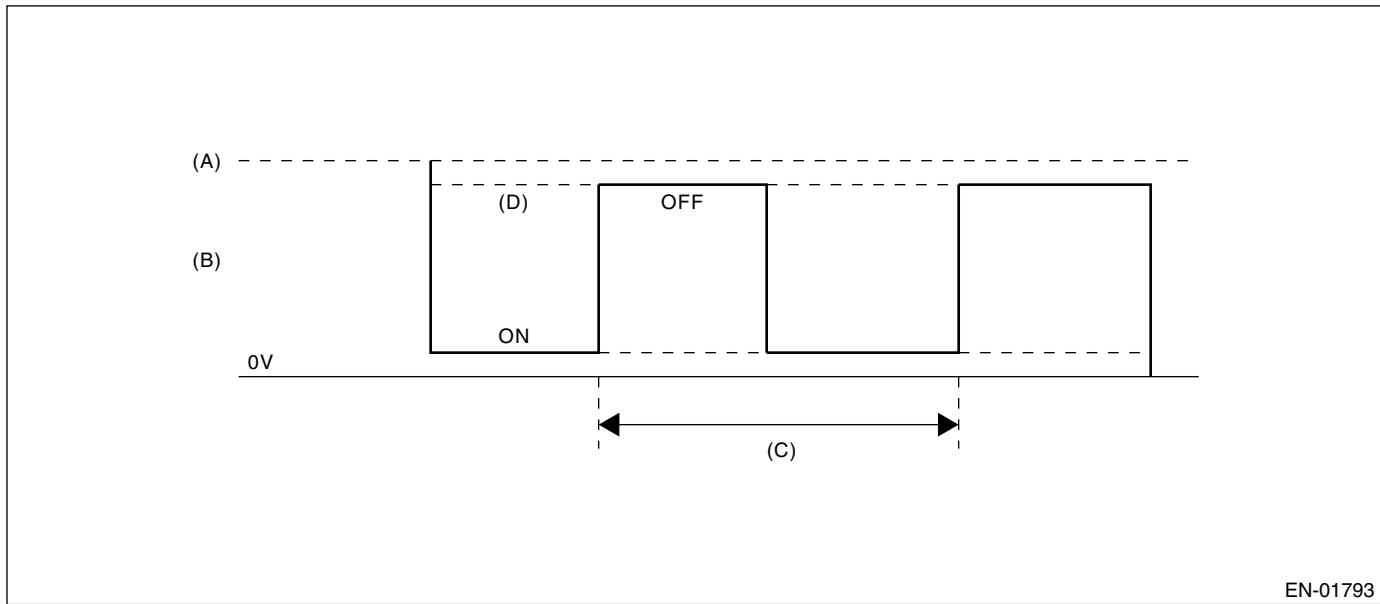
(A) Battery voltage

(B) Rear oxygen sensor heater output voltage

(C) 256 milliseconds (cycle)

(D) High malfunction

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | > 10.9 V |
| Elapsed time after engine starting | ≥ 21 second |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 1 second after engine starting.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 milliseconds (10 cycles).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage level | High |
| Rear oxygen sensor heater control duty | $\geq 25\%$ |

**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

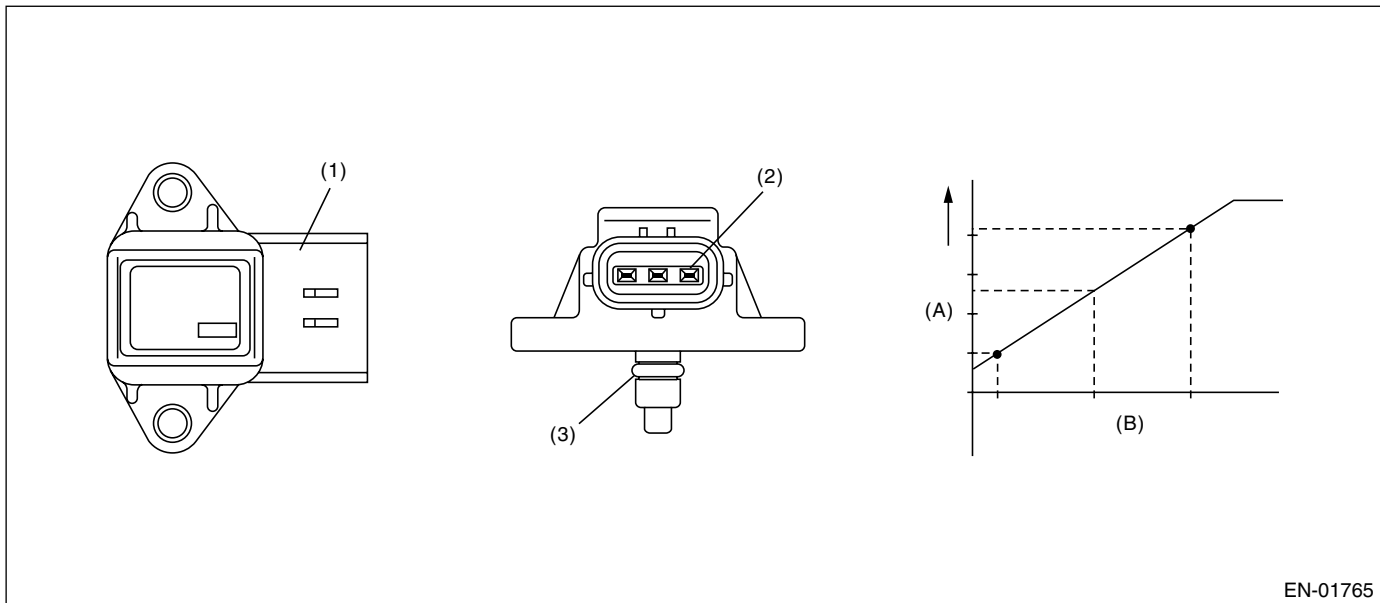Memorize the freeze frame data. (For test mode $02)

## 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 | (A) | Output voltage |
| (2) | Terminal | (B) | Absolute pressure |
| (3) | O-ring | | |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Engine coolant temperature | ≥ 75°C (167°F) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when either Low side or High side becomes NG.
Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Low side | |
| Engine speed | < 2500 rpm |
| Throttle position | $\geq 10°$ |
| Output voltage | < 1.0 V |
| High side | |
| Engine speed | $600 \leftrightarrow 900$ rpm |
| Throttle position | < 1.3° |
| 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 | $\geq 10°$ |
| Output voltage | $\geq 1.0$ V |
| High side | |
| Engine speed | $600 \leftrightarrow 900$ rpm |
| Throttle position | < 1.3° |
| Output voltage | < 2.6 V |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

## 9. ECM OPERATING AT DTC SETTING

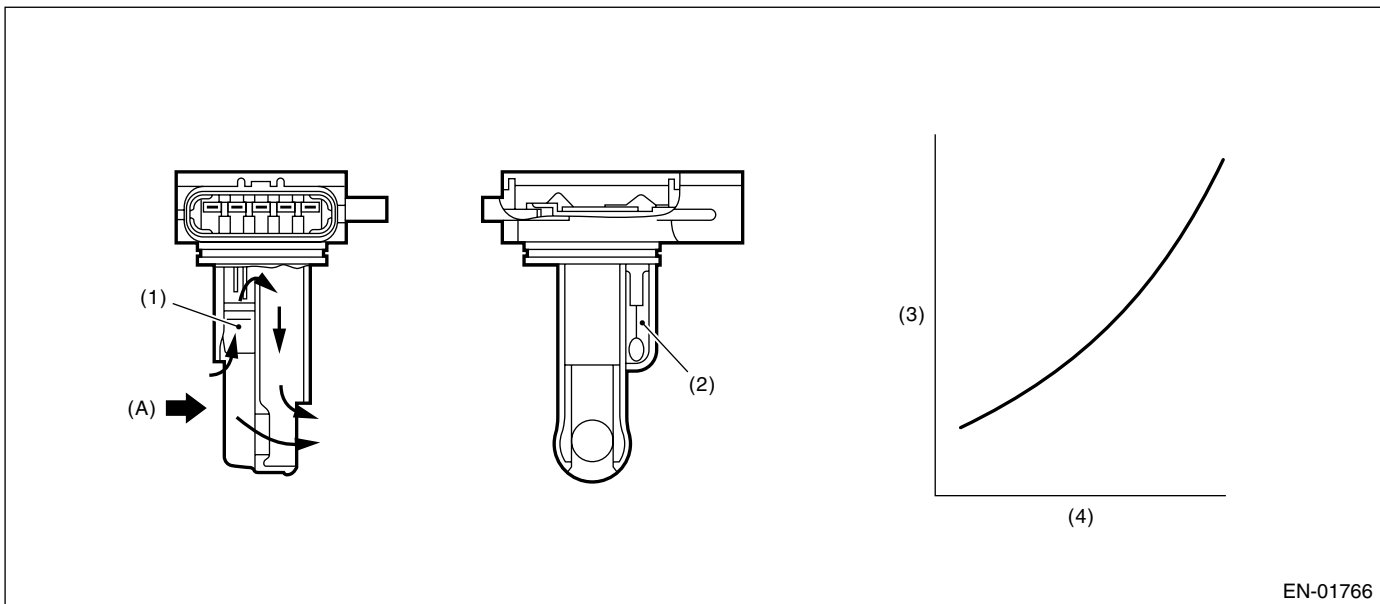Memorize the freeze frame data. (For test mode $02)

## I: DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFOR-MANCE —

### 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/s)

(A) Air

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Engine coolant temperature | ≥ 75°C (167°F) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more then 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

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.

EVAP conc. learning (fuel): Not allowed to learn.

- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.

- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING
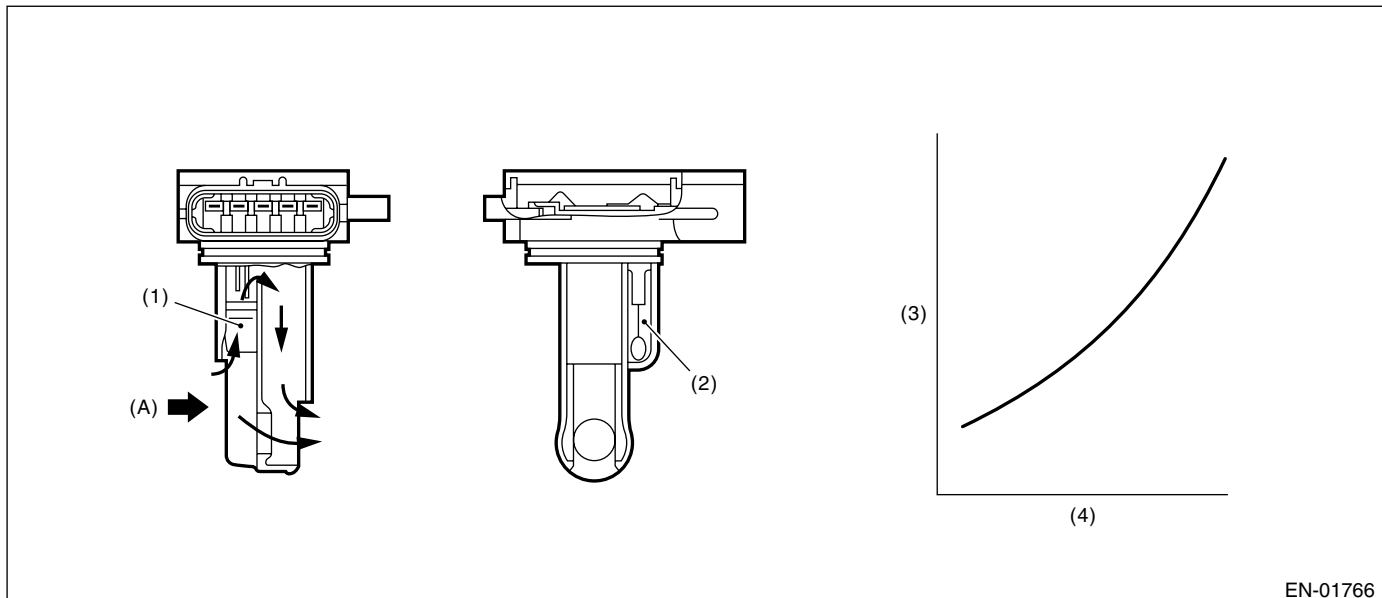
Memorize the freeze frame data. (For test mode $02)

## 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/s)

(A) Air

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the 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 | ≤ 0.2 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

## 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

## 9. ECM OPERATING AT DTC SETTING
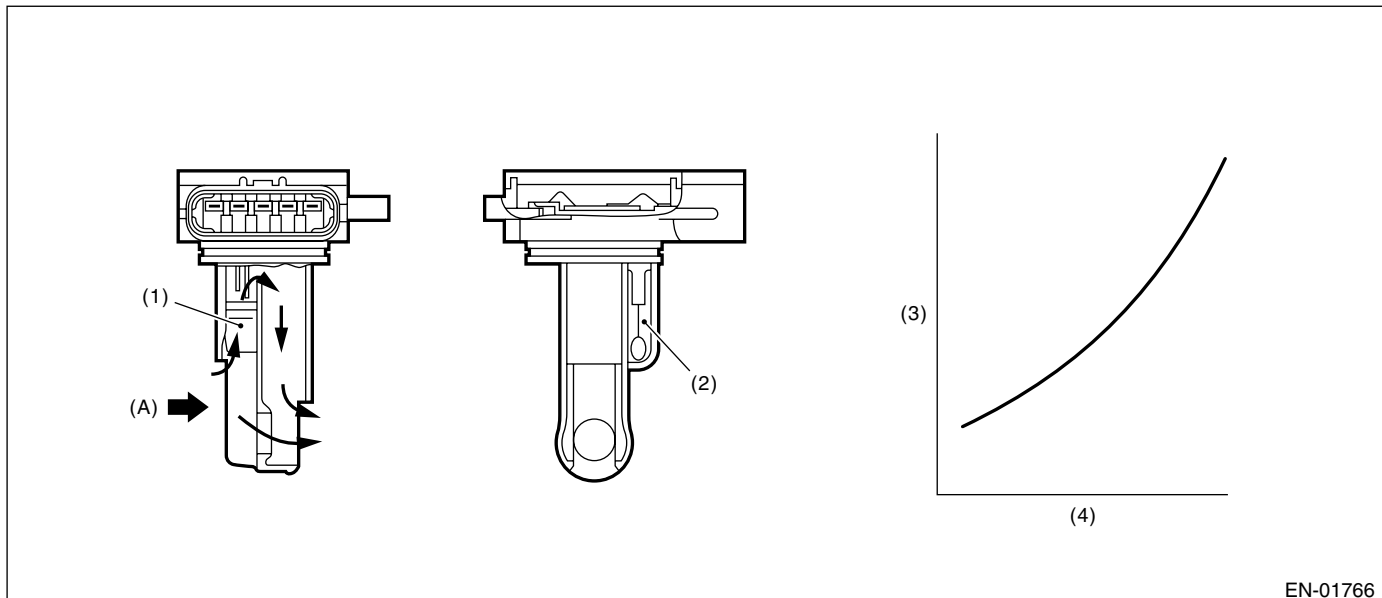
Memorize the freeze frame data. (For test mode $02)

## 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



EN-01766

(1)  Air flow sensor

(2)  Intake air temperature sensor

(3)  Voltage (V)

(4)  Intake air volume (kg/s)

(A)  Air

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage | ≥ 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

### 8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  – At normal: knock compensation = 0°CA is fixed.
  – At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  – Not allowed to update the whole learning compensation factor.
  – Not allowed to calculate the partial learning zone compensation value.
• ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
• Purge control: Not allowed to purge.

### 9. ECM OPERATING AT DTC SETTING
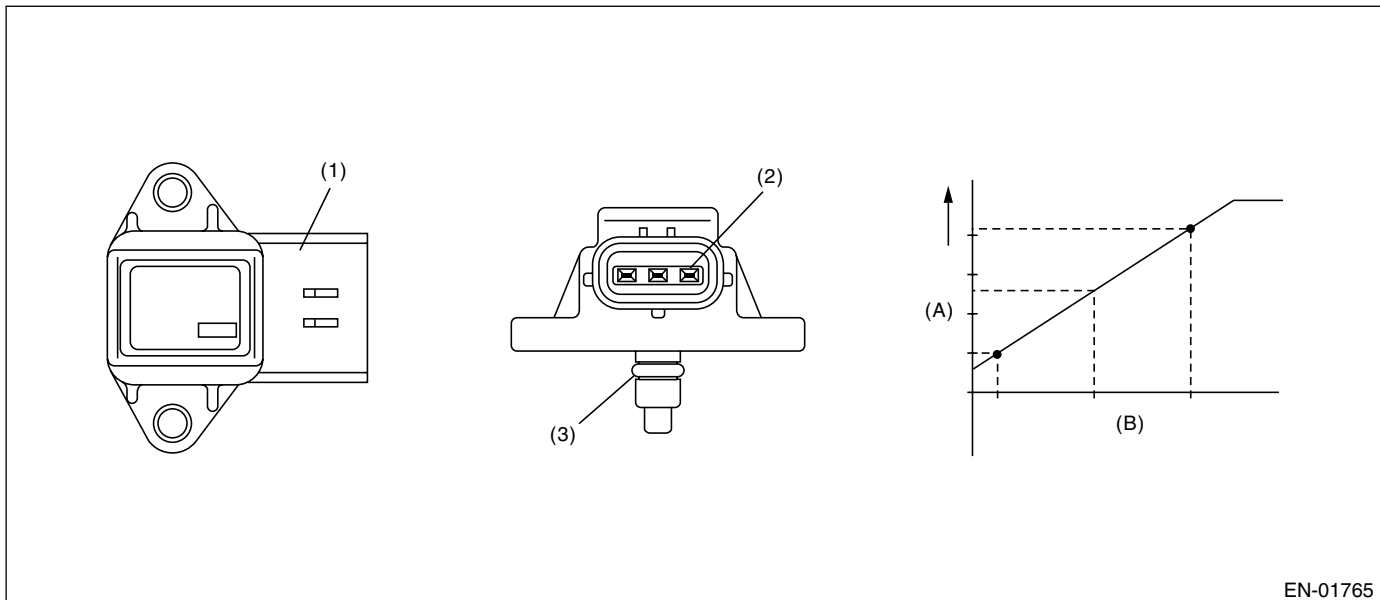
Memorize the freeze frame data. (For test mode $02)

## L: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRES-SURE 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 |
| --- | --- |
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
| --- | --- |
| Output voltage | < 0.568 V |

**Time Needed for Diagnosis:** 0.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 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
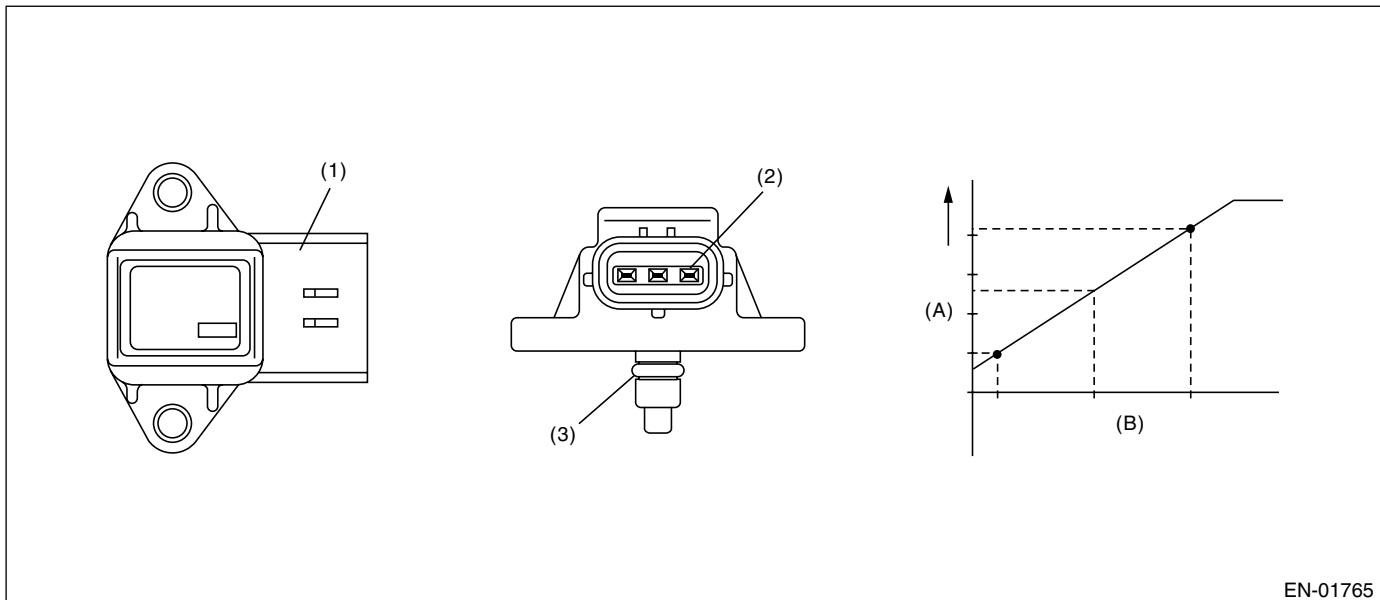
Memorize the freeze frame data. (For test mode $02)

## 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 |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage | ≥ 4.921 V |

**Time Needed for Diagnosis:** 0.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

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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

- 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

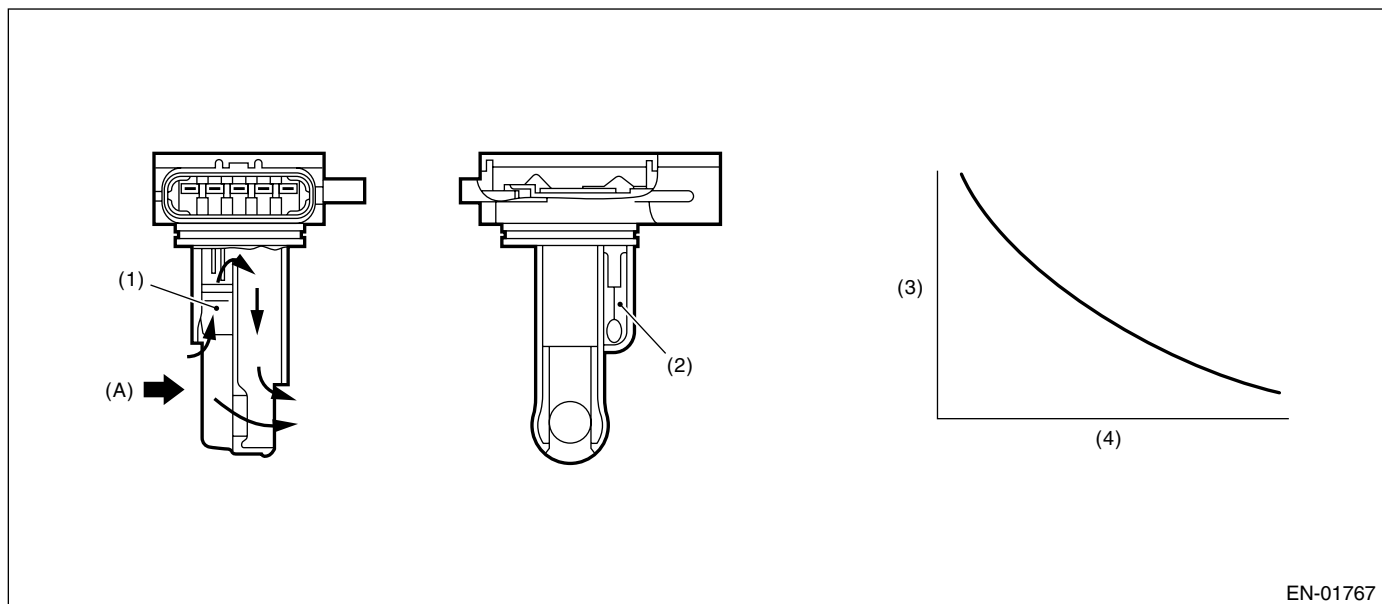Memorize the freeze frame data. (For test mode $02)

## N: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFOR-MANCE —

### 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



EN-01767

(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 |
|---|---|
| Coolant temp. before engine start | < 30°C (86°F) |
| Coolant temperature | > 75°C (167°F) |
| Battery voltage | ≥ 10.9 V |
| Continuous time when the vehicle speed is less than 50 km/h (31 MPH) | 600 seconds or more |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

## 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
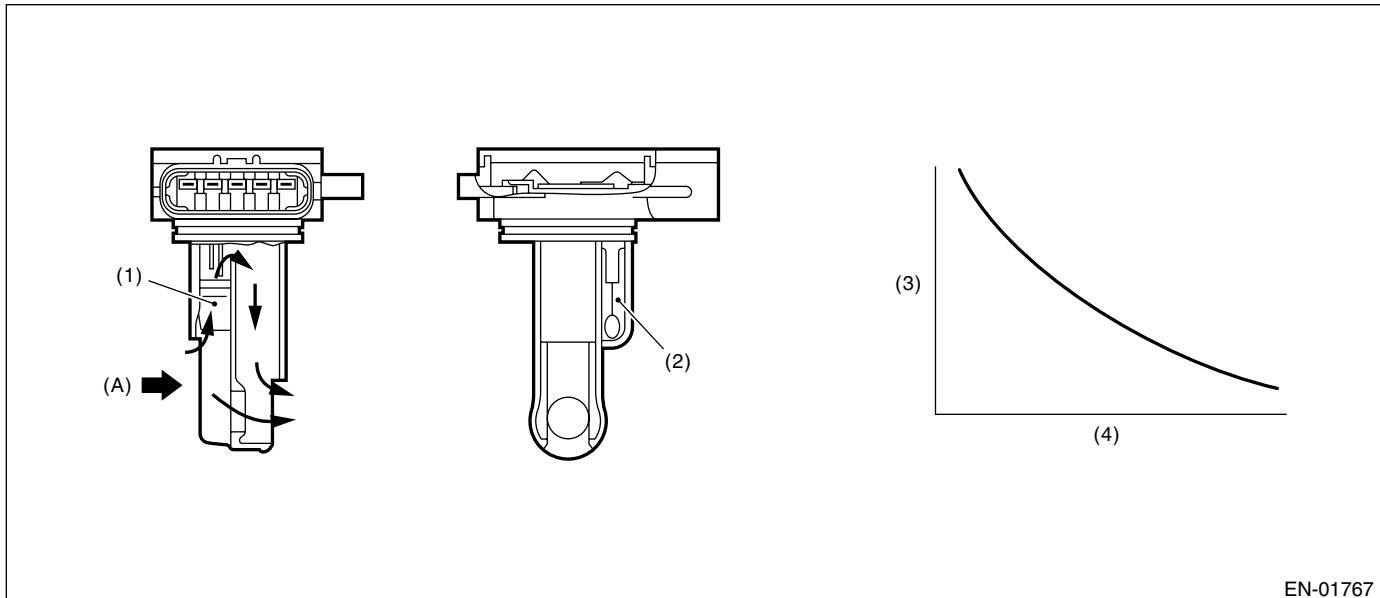
Memorize the freeze frame data. (For test mode $02)

## 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 (Ω)

(4) Intake air temperature °C (°F)

(A) Air

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage | < 0.165 V |
| Ignition switch | ON |

**Time Needed for Diagnosis:** 0.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**GD(STi)-37**

**• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage | ≥ 0.165 V |
| Ignition switch | ON |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATING AT DTC SETTING
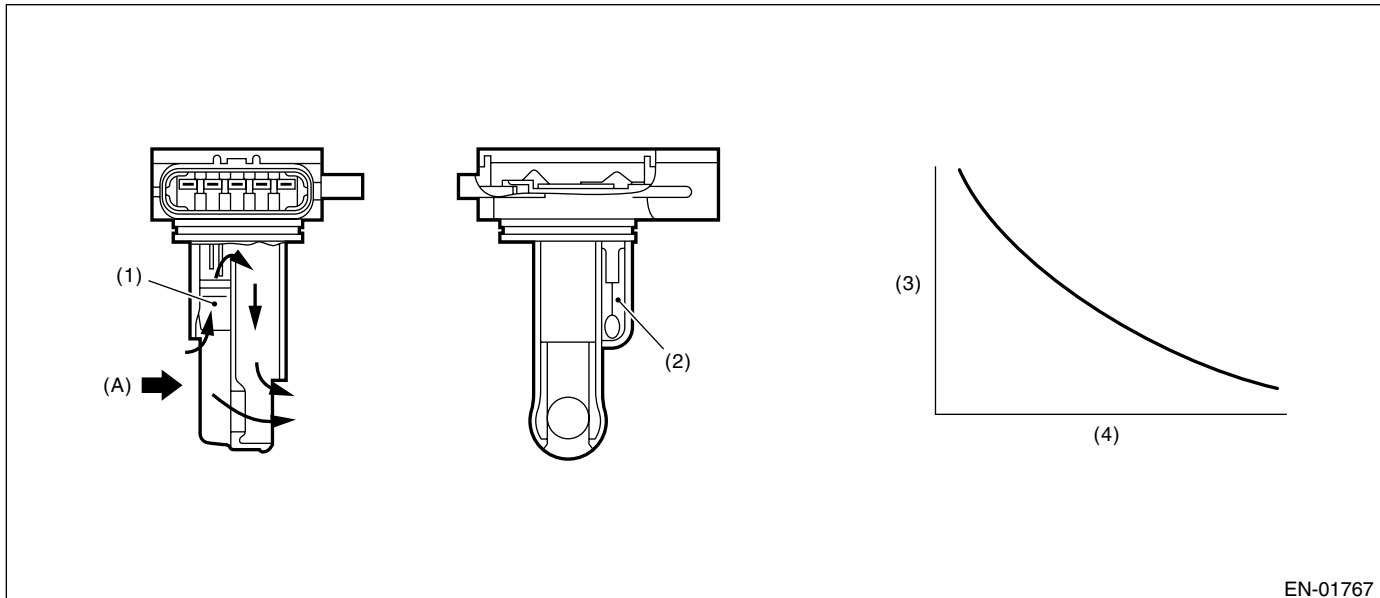
Memorize the freeze frame data. (For test mode $02)

## 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



EN-01767

| | | | |
|---|---|---|---|
| (1) | Air flow sensor | (A) | Air |
| (2) | Intake air temperature sensor | | |
| (3) | Resistance ($\Omega$) | | |
| (4) | Intake air temperature °C (°F) | | |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage | ≥ 4.72 V |
| Ignition switch | ON |

**Time Needed for Diagnosis:** 0.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**GD(STi)-39**

• **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
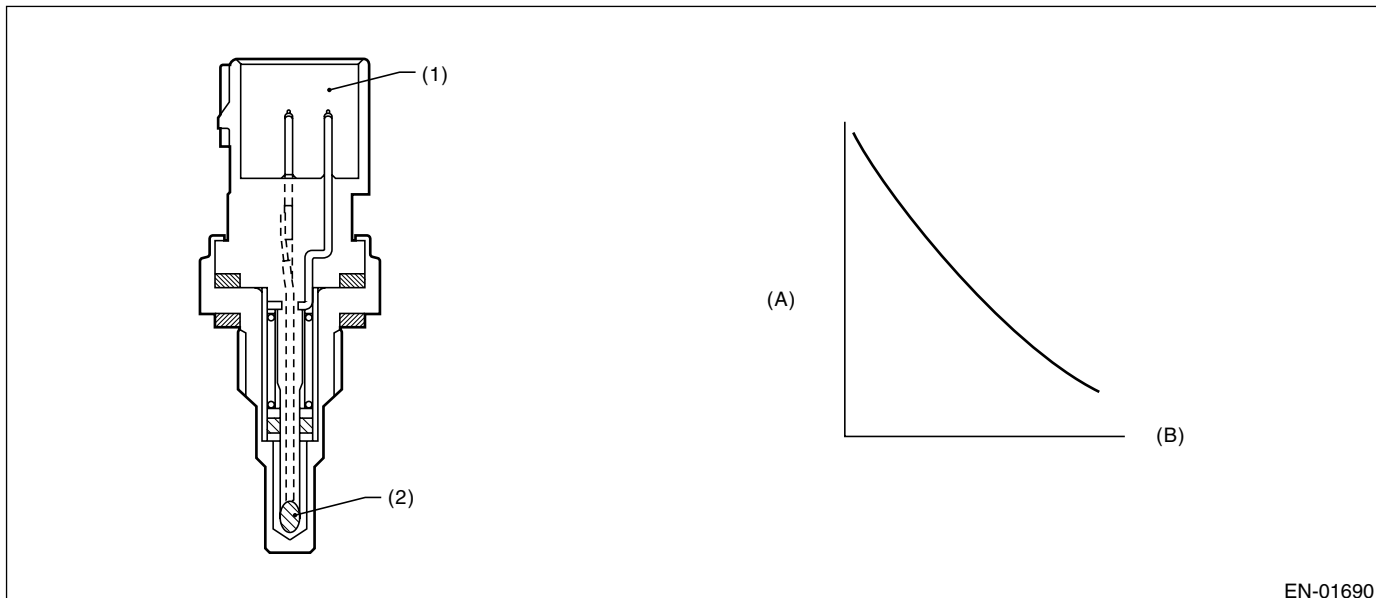
Memorize the freeze frame data. (For test mode $02)

## 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

EN-01690

(1) Connector
(2) Thermistor element

(A) Resistance value (kΩ)
(B) Temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage | < 0.165 V |

**Time Needed for Diagnosis:** 0.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 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
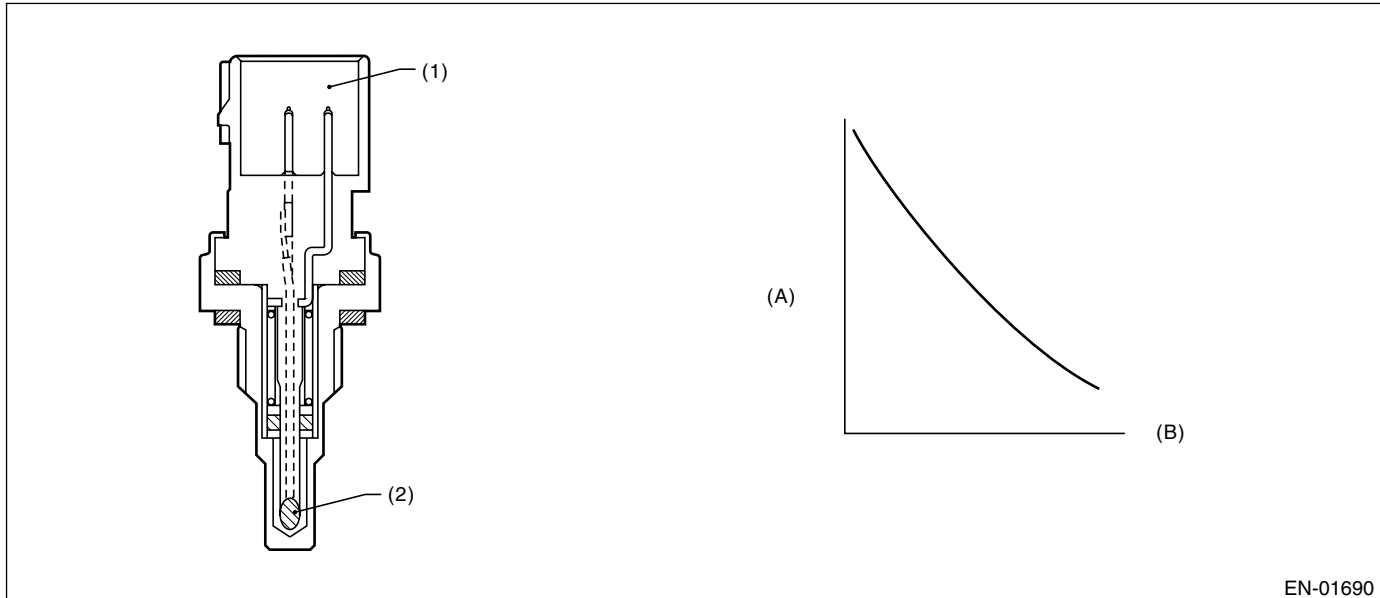
Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor.
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01690

| (1) Connector | (A) Resistance value (kΩ) |
| (2) Thermistor element | (B) Temperature °C (°F) |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
| --- | --- |
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
| --- | --- |
| Output voltage | ≥ 4.716 V |

**Time Needed for Diagnosis:** 0.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 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
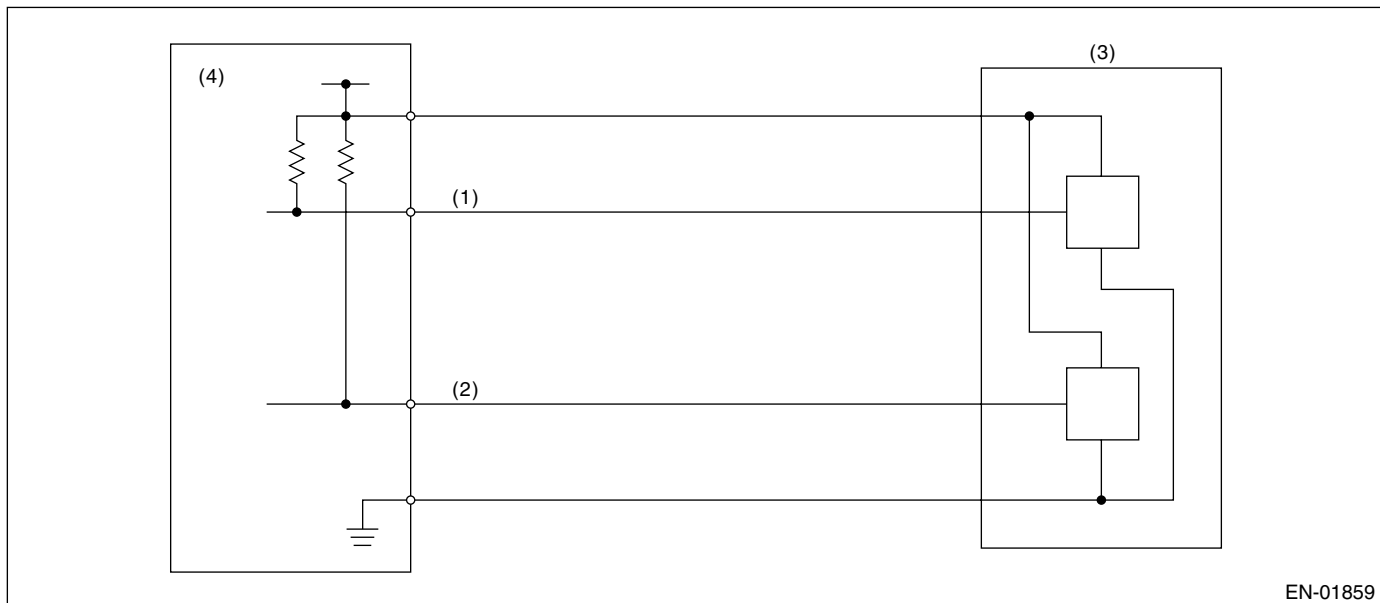
Memorize the freeze frame data. (For test mode $02)

## 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



EN-01859

(1) Throttle position sensor 1 signal

(2) Throttle position sensor 2 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Sensor 1 input voltage | ≤ 0.309 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)

## 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)
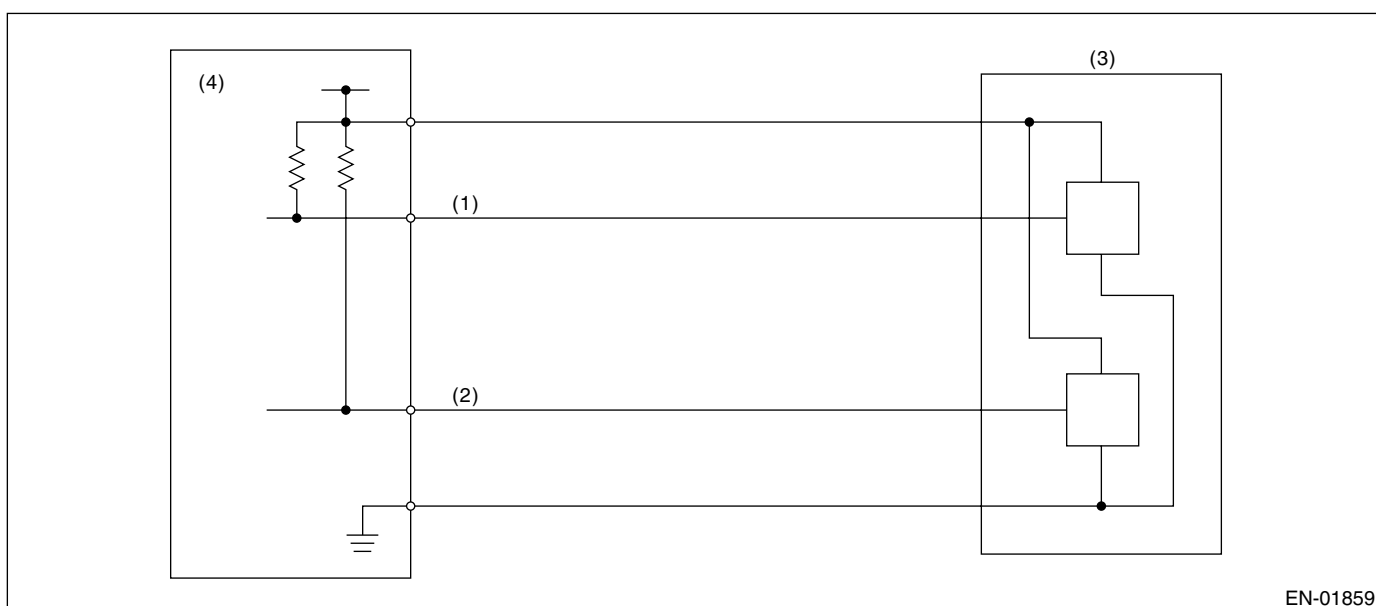- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## 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



EN-01859

(1) Throttle position sensor 1 signal

(2) Throttle position sensor 2 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Sensor 1 input voltage | ≥ 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)

### 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)
• Memorize the diagnostic value and trouble standard value. (For test mode $06)
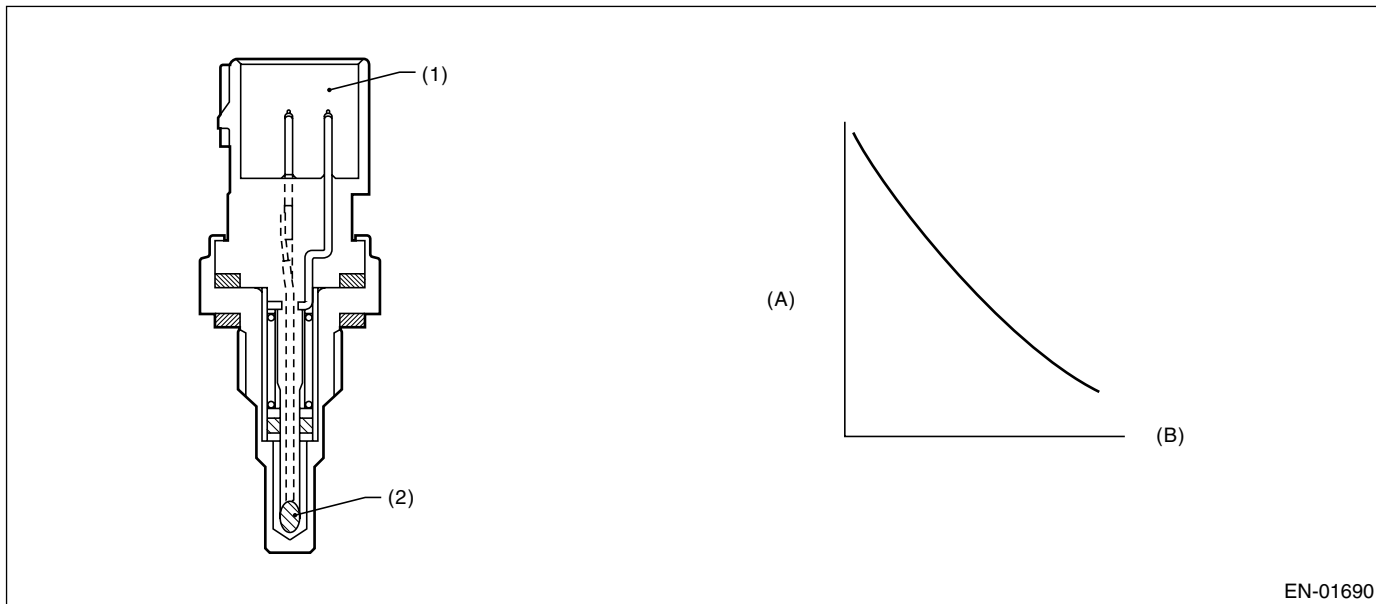
## U: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

### 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



EN-01690

| (1) | Connector | (A) | Resistance value (kΩ) |
| (2) | Thermistor element | (B) | Temperature °C (°F) |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Diagnosis of engine coolant temperature sensor property | Not finished |
| Engine speed | ≥ 500 rpm |
| Battery voltage | > 10.9 V |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Engine coolant temperature | < 20°C (68°F) |
| Timer for diagnosis after engine starting | ≥ Timer judgment value after engine starting |

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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 °C (°F) | Vehicle speed km/h (MPH) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 (0) | 8 (4.97) | 16 (9.94) | 24 (14.9) | 32 (19.9) | 40 (24.9) | 48 (29.8) | 56 (34.8) |
| −20 (−4) | 0 ms | 37.14 ms | 74.27 ms | 111.41 ms | 126.66 ms | 141.91 ms | 163.59 ms | 185.26 ms |
| −10 (14) | 0 ms | 27.39 ms | 54.78 ms | 82.17 ms | 99.65 ms | 117.13 ms | 135.96 ms | 154.80 ms |
| 0 (32) | 0 ms | 17.65 ms | 35.29 ms | 52.94 ms | 72.64 ms | 92.34 ms | 108.34 ms | 124.33 ms |
| 10 (50) | 0 ms | 7.90 ms | 15.80 ms | 23.70 ms | 45.63 ms | 67.56 ms | 80.71 ms | 93.87 ms |
| 20 (68) | 0 ms | 7.90 ms | 15.80 ms | 23.70 ms | 45.63 ms | 67.56 ms | 80.71 ms | 93.87 ms |

Judgment value of timer after engine starting
$t = 451.1 - 25.9 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
**Time Needed for Diagnosis:** To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.
**• Normality Judgment**

Judge 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

## 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

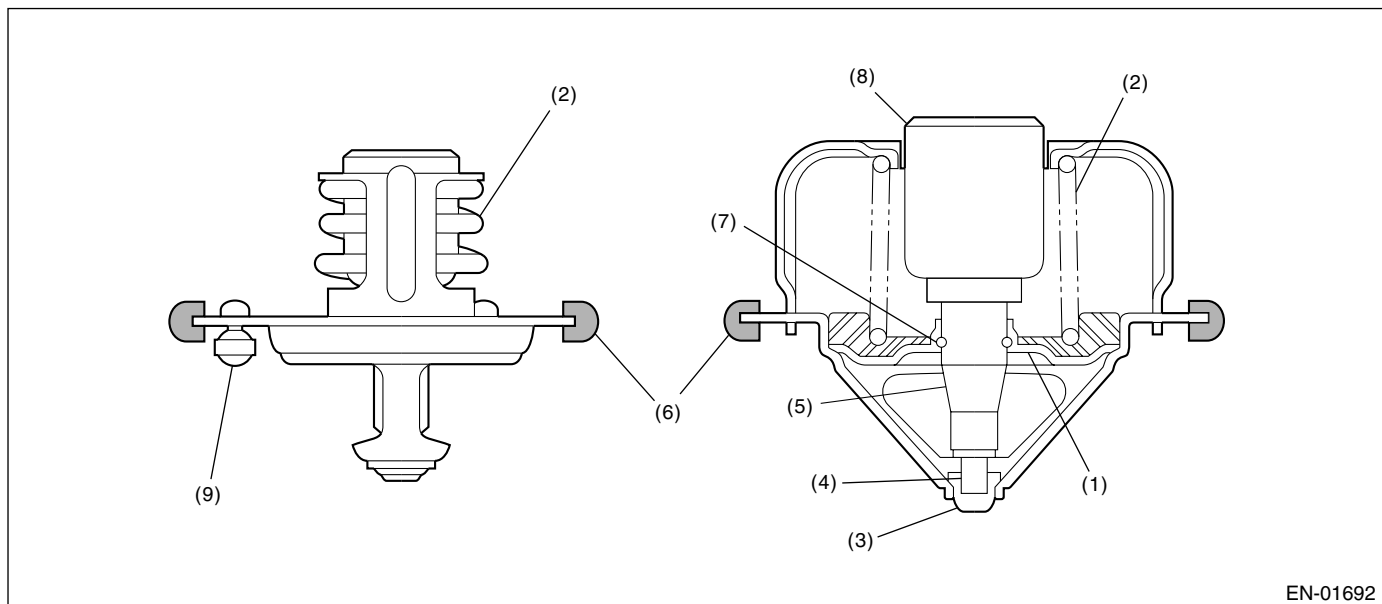Memorize the freeze frame data. (For test mode $02)

## V: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BE-LOW THERMOSTAT REGULATING TEMPERATURE) —

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function.
Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

### 2. COMPONENT DESCRIPTION



EN-01692

(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide

(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 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 V |
| Estimated ambient air temperature | $\geq$ −7°C (19.4°F) |
| Thermostat malfunction diagnosis | Not finished |
| Engine coolant temperature at engine starting | < 55°C (131°F) |
| Estimated coolant temperature | $\geq$ 75°C (167°F) |
| Engine coolant temperature | < 75°C (167°F) |
| (Estimated − measured) coolant temperature | > 20°C (68°F) |

**Time Needed for Diagnosis:** 30 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Battery voltage | $\geq$ 10.9 V |
| Estimated ambient air temperature | $\geq$ −7°C (19.4°F) |
| Thermostat malfunction diagnosis | Not finished |
| Engine coolant temperature at engine starting | < 55°C (131°F) |
| Engine coolant temperature | $\geq$ 75°C (167°F) |
| (Estimated − measured) coolant temperature | $\leq$ 30°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)

**GD(STi)-52**

## 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 at engine starting | < 300 rpm |
| Vehicle speed | < 1 km/h (0.62 MPH) |
| Diagnosis for atmospheric pressure sensor property | Not finished |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once turning the ignition switch to ON.

### 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.33 seconds.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| \|Atmospheric – manifold absolute pressure\| | $\geq$ 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

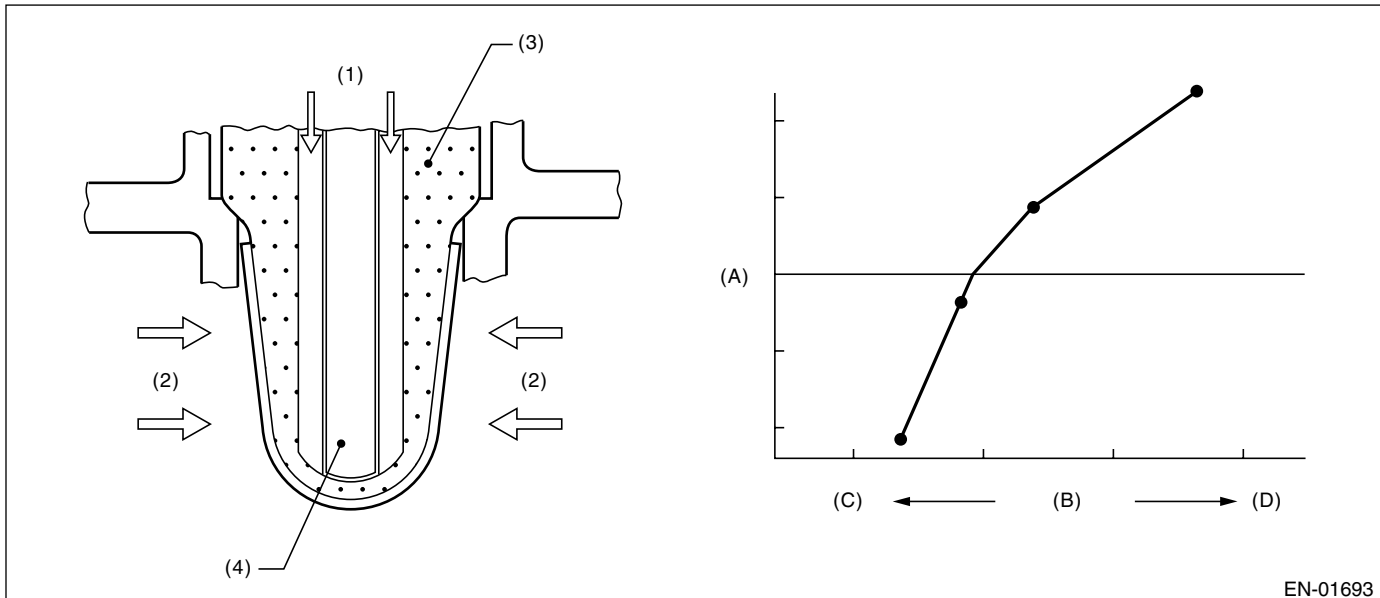Memorize the freeze frame data. (For test mode $02)

## X: DTC P0131 — O$_2$ 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$_2$ | (C) | Lean |
| (4) | Ceramic heater | (D) | Rich |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Input voltage | < 1.8 V |
| Input current | < −0.01 A |

**Time Needed for Diagnosis:** 1 second
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

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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

• 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

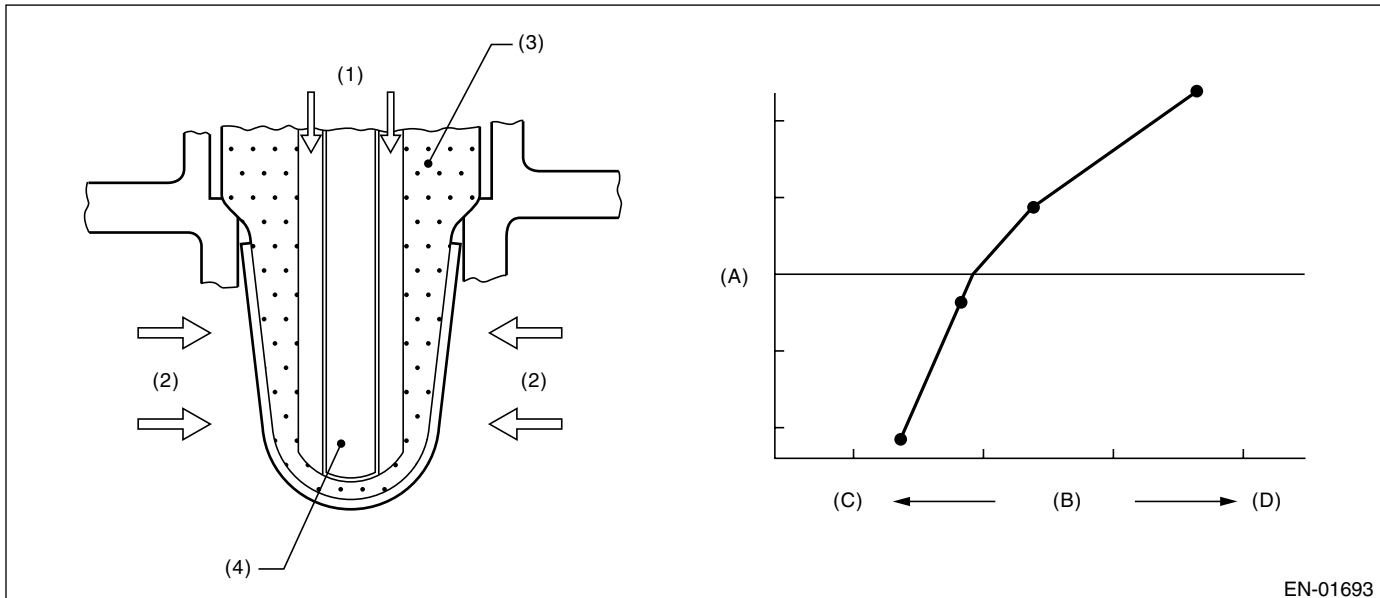Memorize the freeze frame data. (For test mode $02)

## Y: DTC P0132 — O$_2$ 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



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| | |
|---|---|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust | (B) Air fuel ratio |
| (3) ZrO$_2$ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Input voltage | ≥ 3.8 V |
| Input current | ≥ 0.01 A |

**Time Needed for Diagnosis:** 1 second
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 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)

## Z: DTC P0133 — O$_2$ 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.



EN-01694
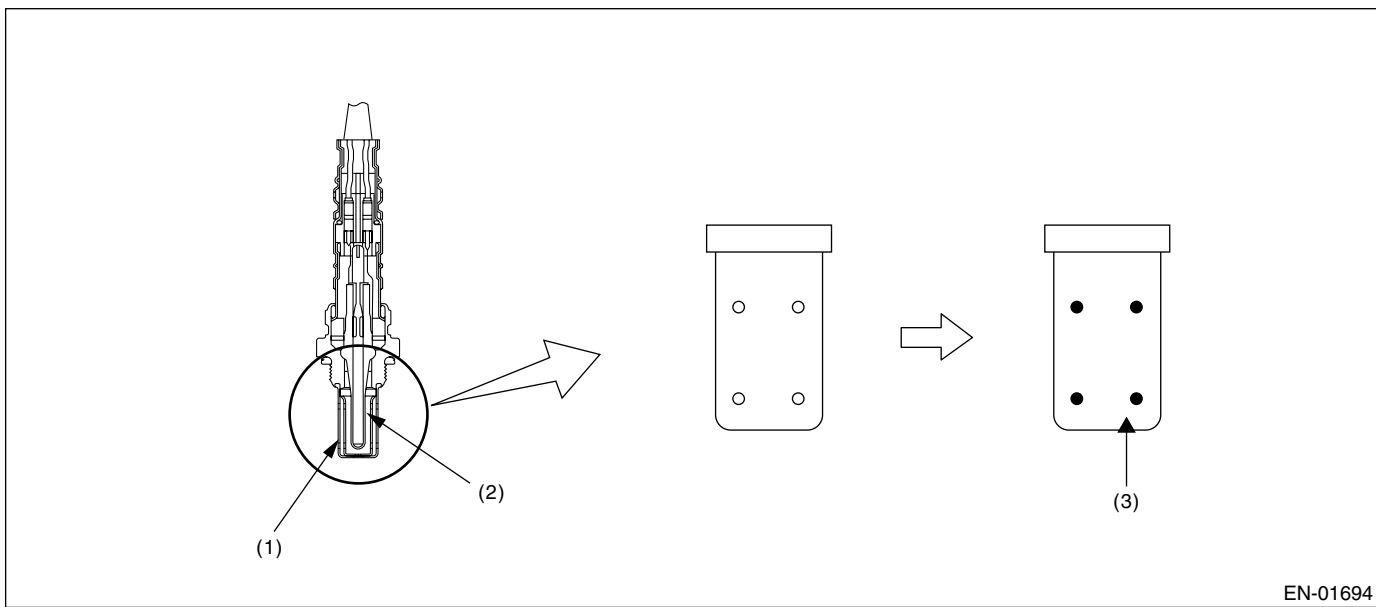
(1) Cover

(2) Zirconia

(3) Clogging

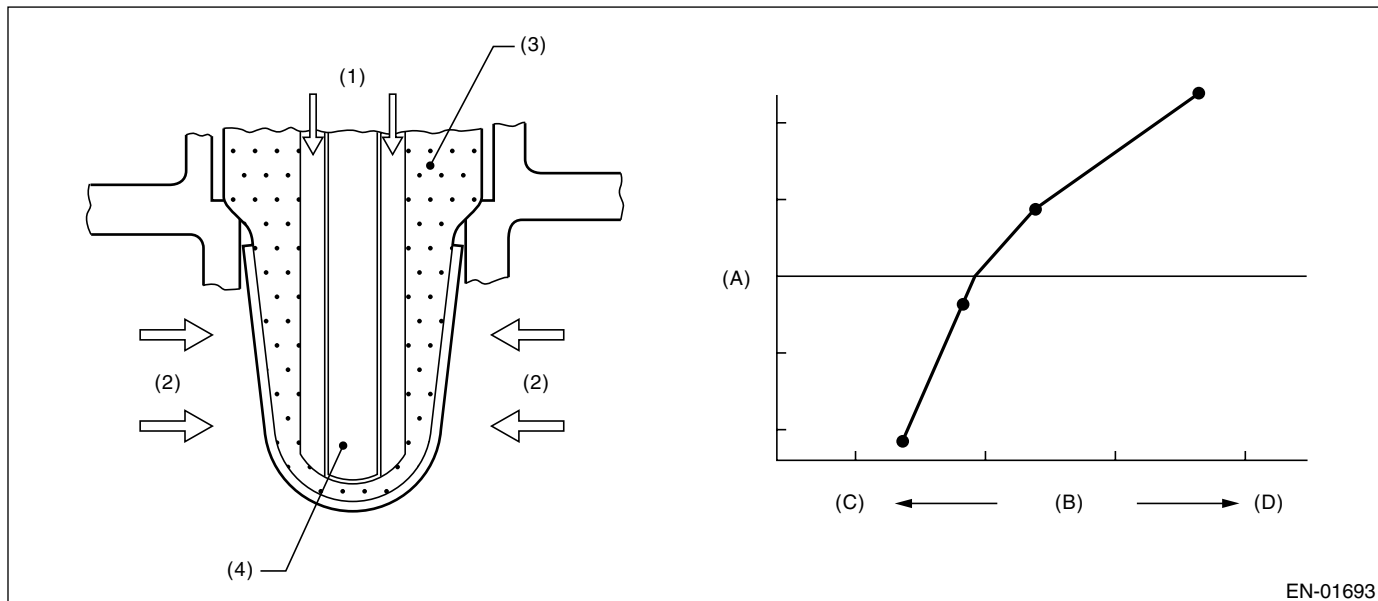## 2. COMPONENT DESCRIPTION



EN-01693

(1) Atmosphere

(2) Exhaust

(3) $ZrO_2$

(4) Ceramic heater

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

## 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| All secondary parameter enable conditions | more than 1 second |
| Diagnosis of A/F response | Not done |
| Battery voltage | > 10.9 V |
| Atmospheric pressure | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Closed loop control with main feedback | operating |
| Impedance of front oxygen (A/F) sensor | 0 ↔ 50 Ω |
| After engine starting | 120 seconds or more |
| Engine coolant temperature | ≥ 75°C (167°F) |
| Engine speed | 1000 ↔ 3200 rpm |
| Vehicle speed | 10 ↔ 120 km/h (6.21 ↔ 74.6 MPH) |
| Amount of intake air | 10 ↔ 31 g/s |
| Engine load change during 0.5 engine rev. | ≤ 0.01 g/rev |
| All conditions for EVAP canister purge | to be in enable |
| Learning value of EVAP conc. during purge | ≤ 0.2 |
| Total time of operating canister purge | 20 seconds or more |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

**GD(STi)-59**

## 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 |
|---|---|
| parafca = td2faf/td2lmd<br>where,<br>td2faf (N) = td2faf (n−1) + \|d2faf (n)\|<br>td2lmd (N) = td2lmd (n−1) + \|d2lmd (n)\|<br> add up for a total of 210 seconds<br>d2faf (n) = (faf (n) − faf (n−1)) − (faf (n−1) − faf (n−2))<br>d2lmd (n) = (lmd (n) − lmd (n−1)) − (lmd (n−1) − lmd (n−2))<br>faf = main feedback compensation coefficient every 128 milliseconds<br> lmd = output lambda every 128 milliseconds | ≥ 0.30 |

**Time Needed for Diagnosis:** 210 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

• Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
• Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
• Purge control: Not allowed to purge.

## 9. ECM OPERATING AT DTC SETTING

• Memorize the freeze frame data. (For test mode $02)
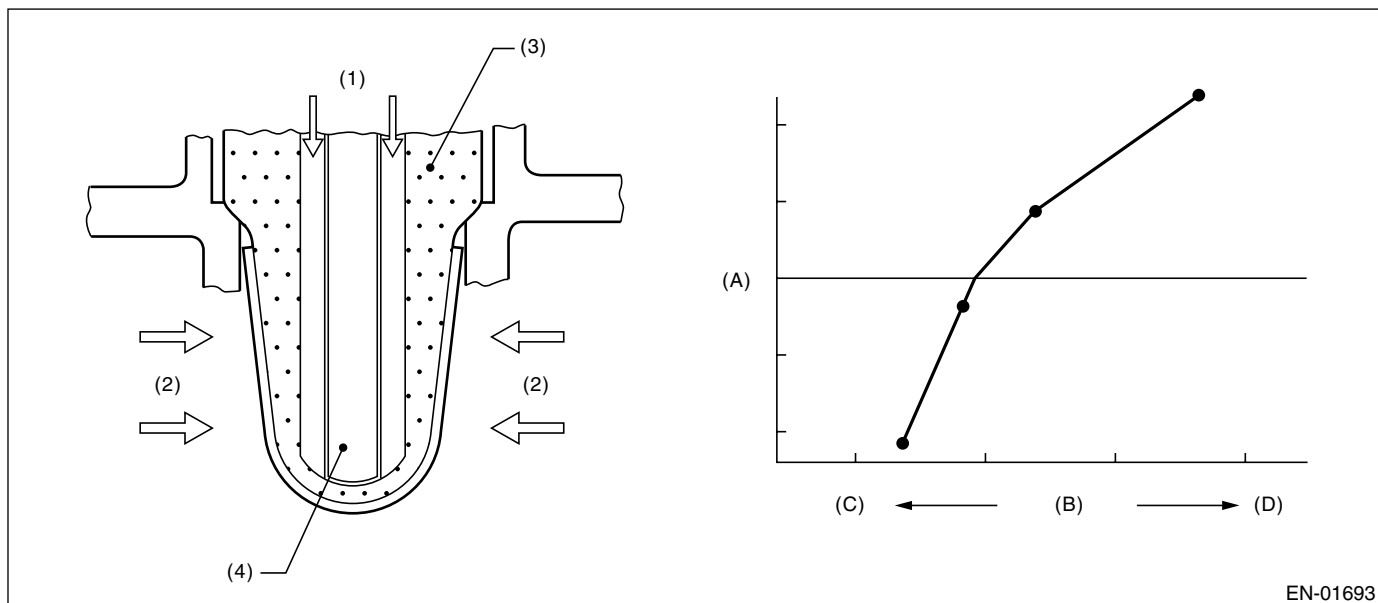• Memorize the diagnostic value and trouble standard value. (For test mode $06)

## AA:DTC P0134 — O$_2$ 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$_2$

(4) Ceramic heater

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Voltage | $\geq 10.9$ V |
| Time after engine starting | $\geq 50$ seconds |
| Variable amount of Front O$_2$ (A/F) sensor heater control duty every 128 milliseconds | $\geq 28000\%$ |
| Front lambda sensor impedance | $\geq 500\ \Omega$ |

**Time Needed for Diagnosis:** 2 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

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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

## 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)

## AB:DTC P0137 — O$_2$ 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
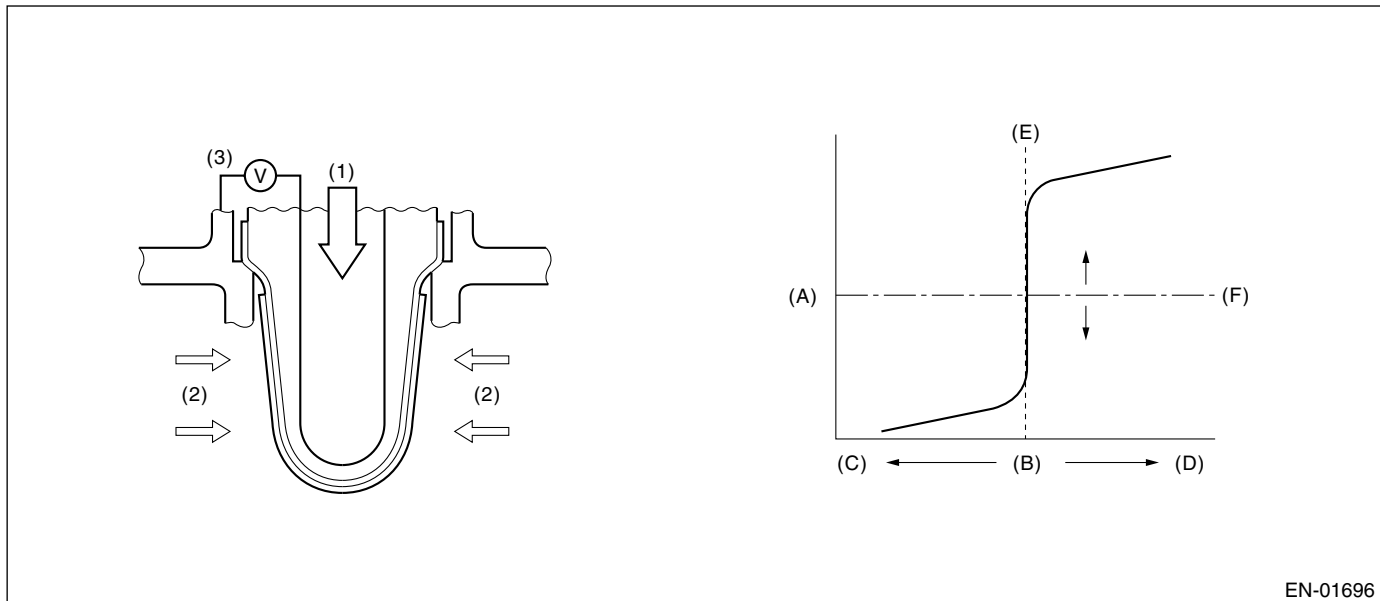
(1) Atmosphere

(2) Exhaust

(3) Electromotive force

(A) Electromotive force

(B) Air fuel ratio

(C) Rich

(D) Lean

(E) Theoretical air fuel ratio

(F) Comparative voltage

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

## 3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

| Secondary Parameters | Enable Conditions |
|---|---|
| Low side diagnosis of rear oxygen sensor voltage with main feedback control | Incomplete |
| Closed loop control with main feedback control | In operation |
| Target output voltage of rear oxygen sensor with main feedback control | ≥ 0.54 V |
| Amount of intake air with main feedback control | ≥ 10 g/s |
| Engine coolant temperature with main feedback control | ≥ 75°C (167°F) |
| Misfire detection during 200 engine revs. | < 5 times |
| Compensation factor for front oxygen (A/F) sensor with main feedback control | Not in limit value |
| Battery voltage with main feedback control | > 10.9 V |
| Cumulative time for completing the conditions with main feedback control | ≥ 200 seconds |
| 5 seconds or more fuel shut-off in decel. | Experienced |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Max. output voltage | < 490 mV |

**Time Needed for Diagnosis:** 200 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Low side diagnosis of rear oxygen sensor voltage | Incomplete |
| Max. output voltage | ≥ 490 mV |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## AC:DTC P0138 — O$_2$ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit.
Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

### 2. COMPONENT DESCRIPTION



EN-01696
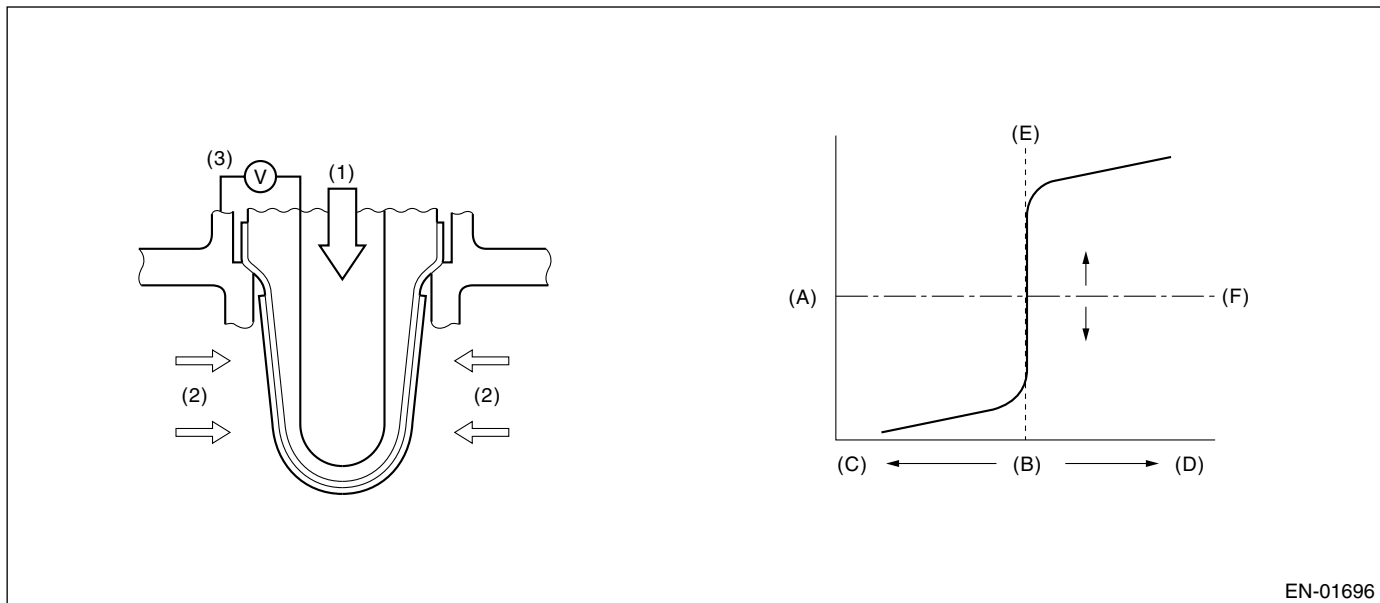
(1)  Atmosphere
(2)  Exhaust
(3)  Electromotive force

(A)  Electromotive force
(B)  Air fuel ratio
(C)  Rich
(D)  Lean
(E)  Theoretical air fuel ratio
(F)  Comparative voltage

### 3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

| Secondary Parameters | Enable Conditions |
|---|---|
| High side diagnosis of rear oxygen sensor voltage with main feedback control | Incomplete |
| Closed loop control with main feedback control | In operation |
| Target output voltage of rear oxygen sensor with main feedback control | ≥ 0.54 V |
| Amount of intake air with main feedback control | ≥ 10 g/s |
| Engine coolant temperature with main feedback control | ≥ 75°C (167°F) |
| Misfire detection during 200 engine revs. | < 5 times |
| Compensation factor for front oxygen (A/F) sensor with main feedback control | Not in limit value |
| Battery voltage with main feedback control | > 10.9 V |
| Cumulative time for completing the conditions with main feedback control | ≥ 200 seconds |
| 5 seconds or more fuel shut-off in decel. | Experienced |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Min. output voltage | > 250 mV |

**Time Needed for Diagnosis:** 200 seconds
**Malfunction Indicator Light Illumination:** Detect when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| High side diagnosis of rear oxygen sensor voltage | Incomplete |
| Min. output voltage | ≤ 250 mV |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

**GD(STi)-67**

## AD:DTC P0139 — O$_2$ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —
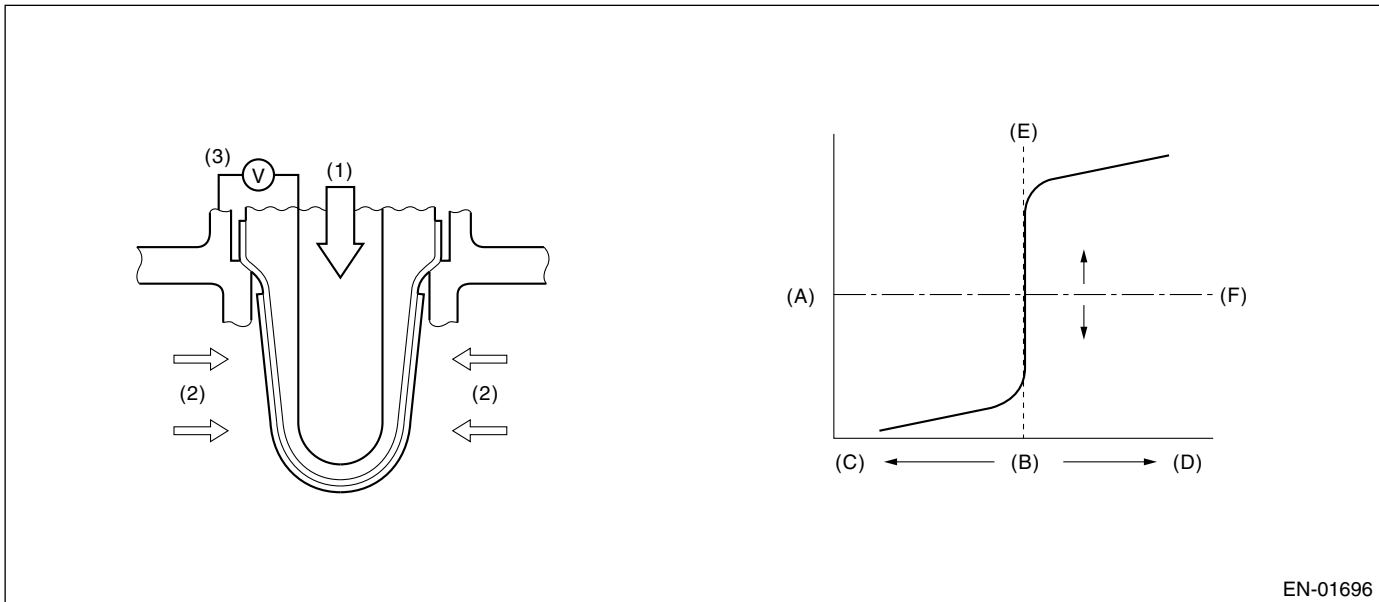
### 1. OUTLINE OF DIAGNOSIS

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 |
| Deterioration diagnosis for rear oxygen sensor response | Not completed |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration in order to calculate the diagnostic value. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

## 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.
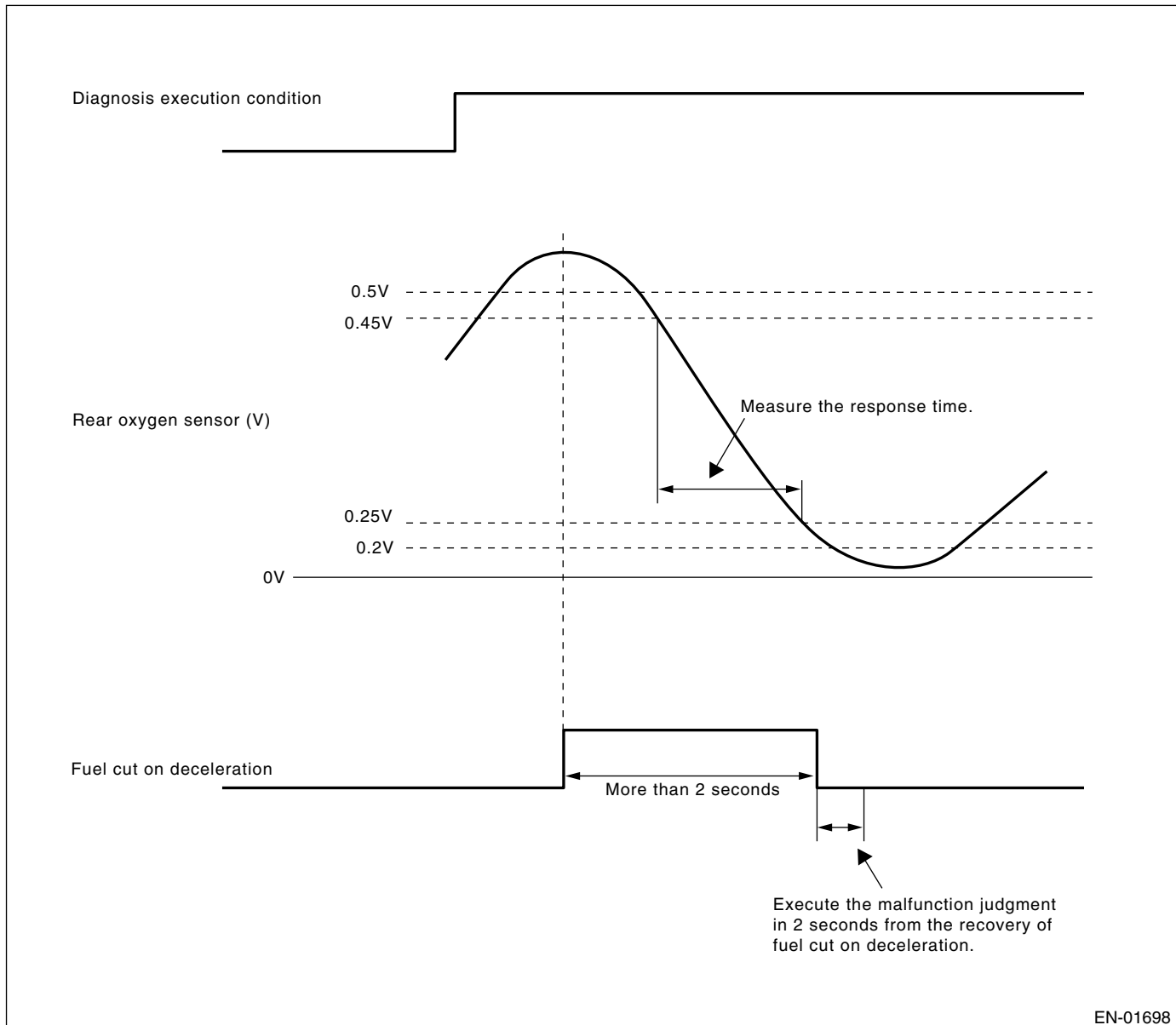
Diagnosis execution condition

0.5V
0.45V

Rear oxygen sensor (V)

Measure the response time.

0.25V
0.2V
0V

Fuel cut on deceleration

More than 2 seconds

Execute the malfunction judgment
in 2 seconds from the recovery of
fuel cut on deceleration.

EN-01698

**• 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.

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 $O_2$ 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)
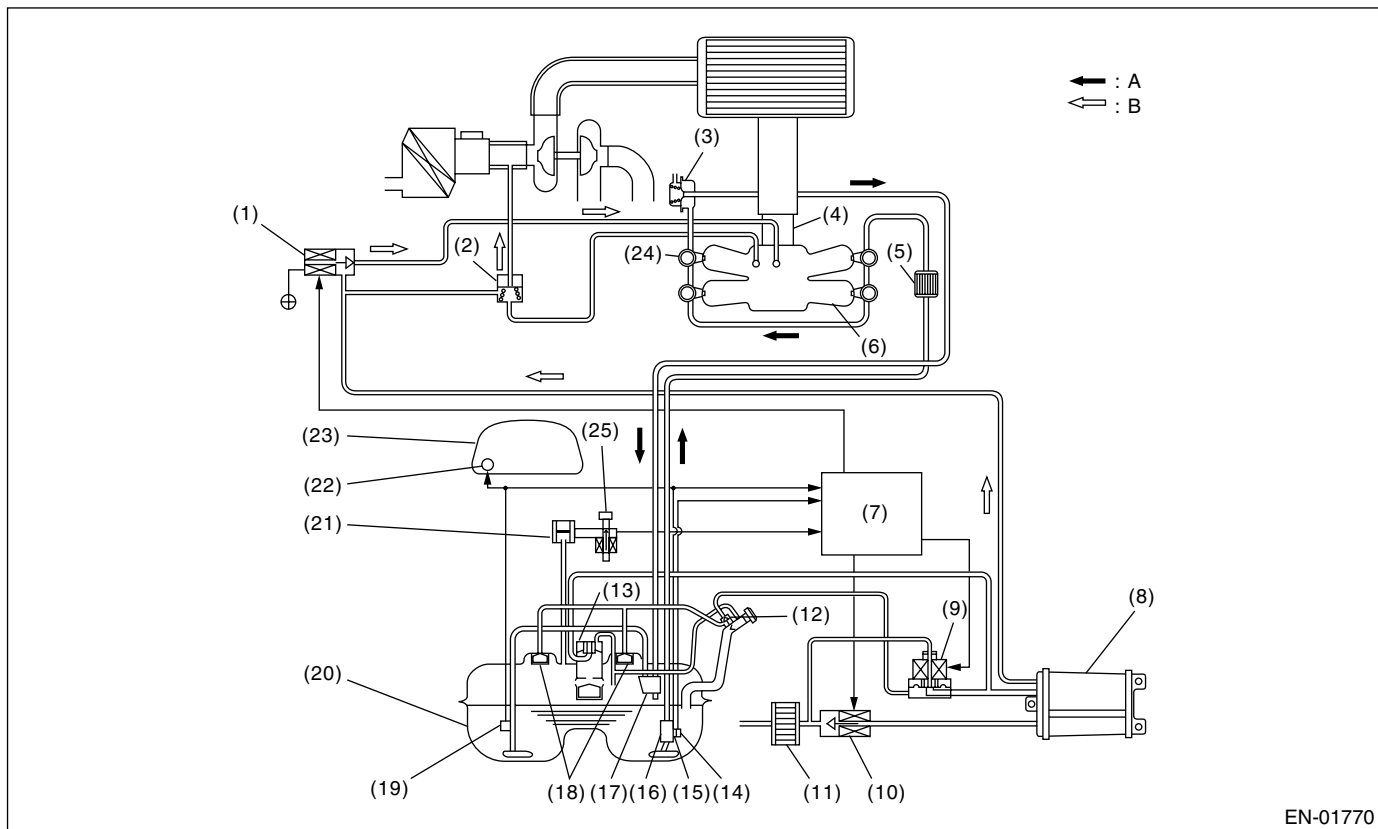- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• **Fuel System Diagnosis**



EN-01770

| | | | |
|---|---|---|---|
| (1) | Purge control solenoid valve | (14) | Fuel temperature sensor |
| (2) | Purge valve | (15) | Fuel level sensor |
| (3) | Pressure regulator | (16) | Fuel pump |
| (4) | Throttle body | (17) | Jet pump |
| (5) | Fuel filter | (18) | Fuel cut valve |
| (6) | Intake manifold | (19) | Fuel sub level sensor |
| (7) | Engine control module (ECM) | (20) | Fuel tank |
| (8) | Canister | (21) | Fuel tank pressure sensor |
| (9) | Pressure control solenoid valve | (22) | Fuel meter |
| (10) | Drain valve | (23) | Combination meter |
| (11) | Drain filter | (24) | Fuel injector |
| (12) | Shut-off valve | (25) | Tank pressure switching solenoid valve |
| (13) | Vent valve | | |

• **Diagnostic Method**

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

## 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| A/F main learning system | In operation |
| Engine coolant temperature | 75 ↔ 119°C (167 ↔ 246°F) |
| Engine load | ≥ Map 5 |
| Intake air change during 0.5 engine rev. | ≤ 0.02 g/rev |
| Learning value of EVAP conc. during purge | ≤ 0.1 |
| Cumulative time of canister purge after engine start | 20 seconds or more |
| Continuous period after canister purge starting | 30 seconds or more |

Map 5

| Engine speed (rpm) | idle | 800 | 1200 | 1600 | 2000 | 2400 | 2800 | 3200 | 3600 | 4000 | 4400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Measured value (g/rev) | NA | 0.237 | 0.224 | 0.221 | 0.238 | 0.255 | 0.267 | 0.242 | 0.243 | 0.258 | 0.263 |

## 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

## 4. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| fsobd = (sglmd − tglmda) + faf + flaf where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient | ≥ fsobdL1 See Map 4 fsobdL1 = lean side threshold value of fsobd |

Map 4    Threshold value for fuel system malfunction criteria

| Amount of air (g/s) | 0 | 2.4 | 4.7 | 7 | 9.4 | 11.7 | |
|---|---|---|---|---|---|---|---|
| fsobdL1 (%) | 40 | 40 | 36.9 | 32.0 | 27.0 | 26.5 | |

**Time Needed for Diagnosis:** 10 seconds × 3 times
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| fsobd = (sglmd − tglmda) + faf + flaf | < 19% |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

**GD(STi)-72**

## 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
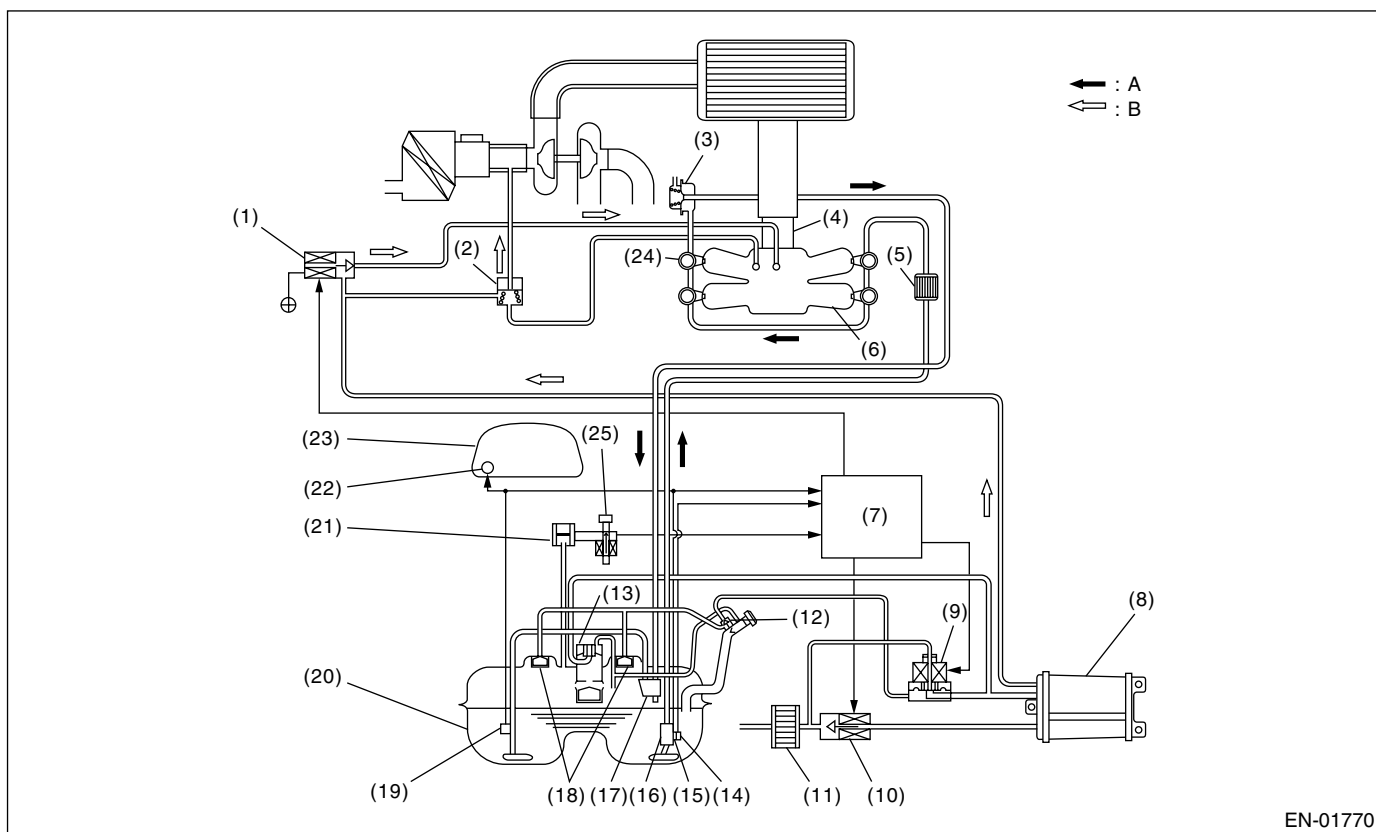
Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• **Fuel System Diagnosis**



EN-01770

| | | | |
|---|---|---|---|
| (1) | Purge control solenoid valve | (14) | Fuel temperature sensor |
| (2) | Purge valve | (15) | Fuel level sensor |
| (3) | Pressure regulator | (16) | Fuel pump |
| (4) | Throttle body | (17) | Jet pump |
| (5) | Fuel filter | (18) | Fuel cut valve |
| (6) | Intake manifold | (19) | Fuel sub level sensor |
| (7) | Engine control module (ECM) | (20) | Fuel tank |
| (8) | Canister | (21) | Fuel tank pressure sensor |
| (9) | Pressure control solenoid valve | (22) | Fuel meter |
| (10) | Drain valve | (23) | Combination meter |
| (11) | Drain filter | (24) | Fuel injector |
| (12) | Shut-off valve | (25) | Tank pressure switching solenoid valve |
| (13) | Vent valve | | |

• **Diagnostic Method**

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

## 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| A/F main learning system | In operation |
| Engine coolant temperature | 75 $\leftrightarrow$ 119°C (167 $\leftrightarrow$ 246°F) |
| Engine load | $\geq$ Map 5 |
| Intake air change during 0.5 engine rev. | $\leq$ 0.02 g/rev |
| Learning value of EVAP conc. during purge | $\leq$ 0.1 |
| Cumulative time of canister purge after engine start | 20 seconds or more |
| Continuous period after canister purge starting | 30 seconds or more |

Map 5

| Engine speed (rpm) | idle | 800 | 1200 | 1600 | 2000 | 2400 | 2800 | 3200 | 3600 | 4000 | 4400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Measured value (g/rev) | NA | 0.237 | 0.224 | 0.221 | 0.238 | 0.255 | 0.267 | 0.242 | 0.243 | 0.258 | 0.263 |

## 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

## 4. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| fsobd = (sglmd – tglmda) + faf + flaf where, sglmd = measured lambda | $\leq$ fsobdR1 See Map 4 fsobdR1 = rich side threshold value of fsobd |
| tglmda = target lambda | |
| faf = main feedback compensation coefficient every 64 milliseconds | |
| flaf = main feedback learning compensation coefficient | |

Map 4    Threshold value for fuel system malfunction criteria for System E

| Amount of air (g/s) | 0 | 2.4 | 4.7 | 7 | 9.4 | 11.7 | |
|---|---|---|---|---|---|---|---|
| fsobdR1 (%) | –40 | –40 | –36.9 | –32.0 | –27.0 | –27.0 | |

**Time Needed for Diagnosis:** 10 seconds $\times$ 3 times
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| fsobd = (sglmd – tglmda) + faf + flaf | $\geq$ –20% |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

**GD(STi)-75**

## 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)

## AG:DTC P0181 — FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PER-FORMANCE —
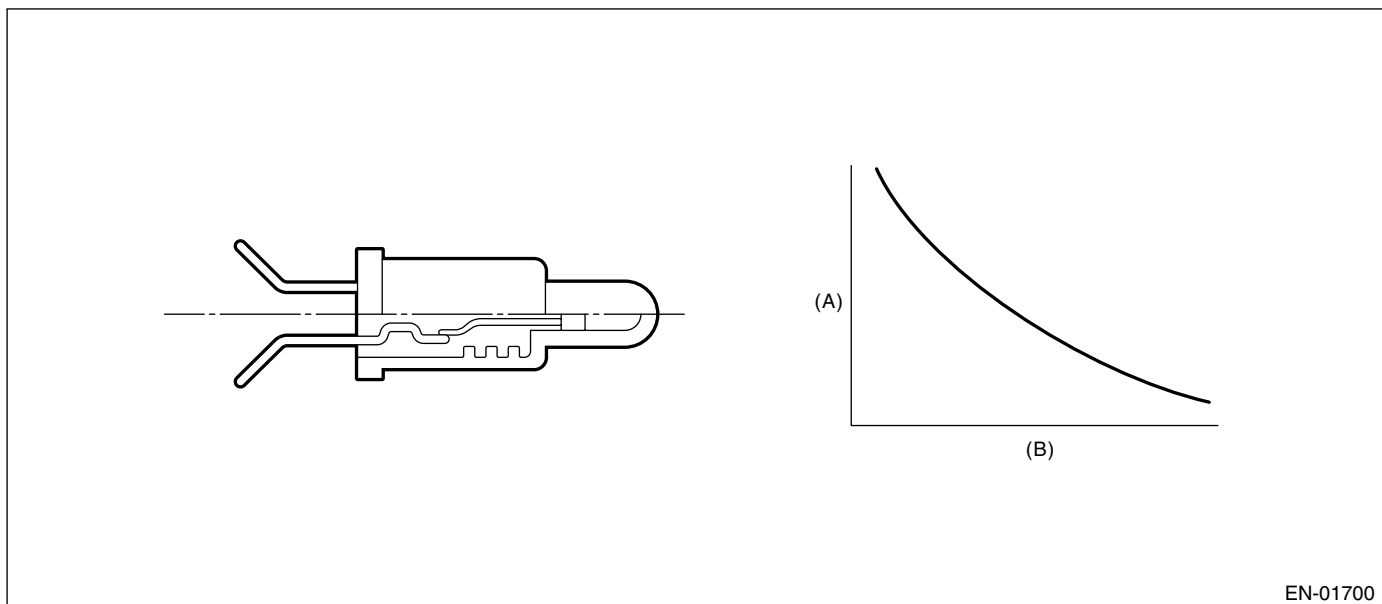
### 1. OUTLINE OF DIAGNOSIS

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 $°C$ ($°F$)

### 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 120 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Fuel level | ≥ 10 ℓ (2.64 US gal, 2.20 Imp gal) |
| After engine starting | 20 seconds or more |
| Engine coolant temperature – engine coolant temperature at engine starting | > 10°C (50°F) |
| Fuel temperature – engine coolant temperature | ≥ 10°C (50°F) |
| Battery voltage | > 10.9 V |

**Time Needed for Diagnosis:** 120 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Fuel level | ≥ 10 ℓ (2.64 US gal, 2.20 Imp gal) |
| After engine starting | 20 seconds or more |
| Engine coolant temperature – engine coolant temperature at engine starting | > 10°C (50°F) |
| Fuel temperature – engine coolant temperature | < 10°C (50°F) |
| Battery voltage | > 10.9 V |

### • Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

## 6. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| After engine starting | 20 seconds or more |
| Battery voltage | > 10.9 V |

## 7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

## 8. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Accumulated amount of intake air | ≥ 550 kg (1212.5 lb) |
| Fuel temperature difference between Max. and Min. | < 3°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 | ≥ 550 kg (1212.5 lb) |
| Fuel temperature difference between Max. and Min. | ≥ 3°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
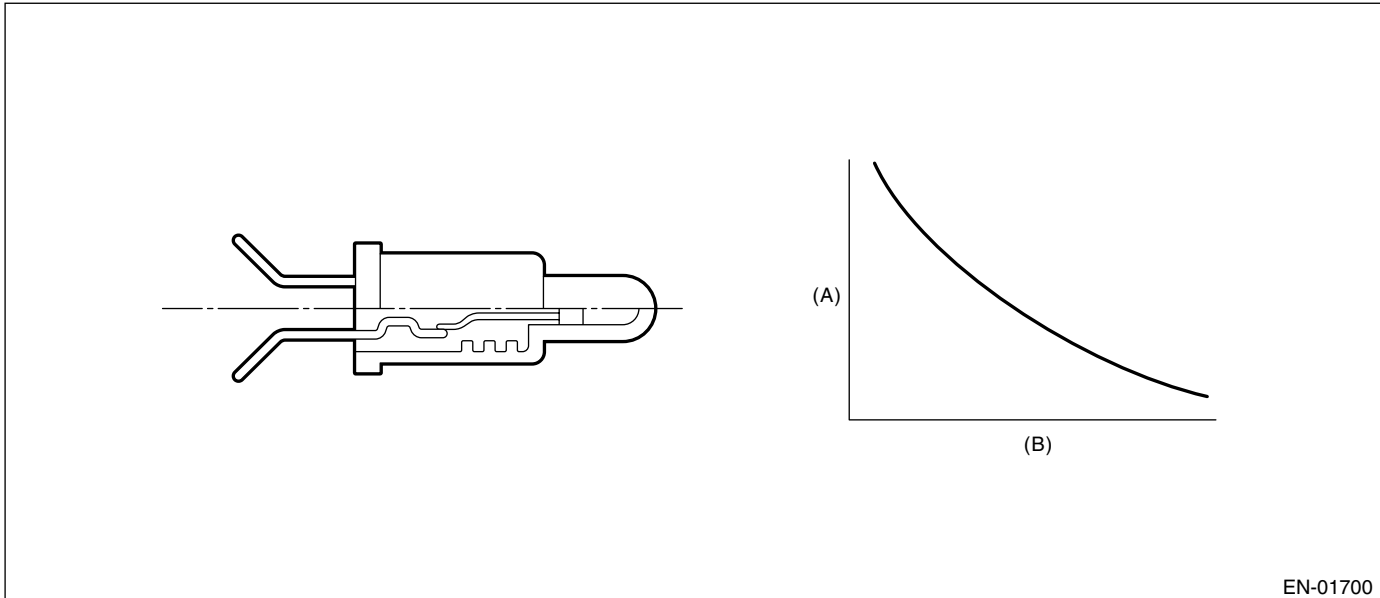
Memorize the freeze frame data. (For test mode $02)

## 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 °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 | < 0.1646 V |
| Battery voltage | ≥ 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 | ≥ 0.1646 V |
| Battery voltage | ≥ 10.9 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
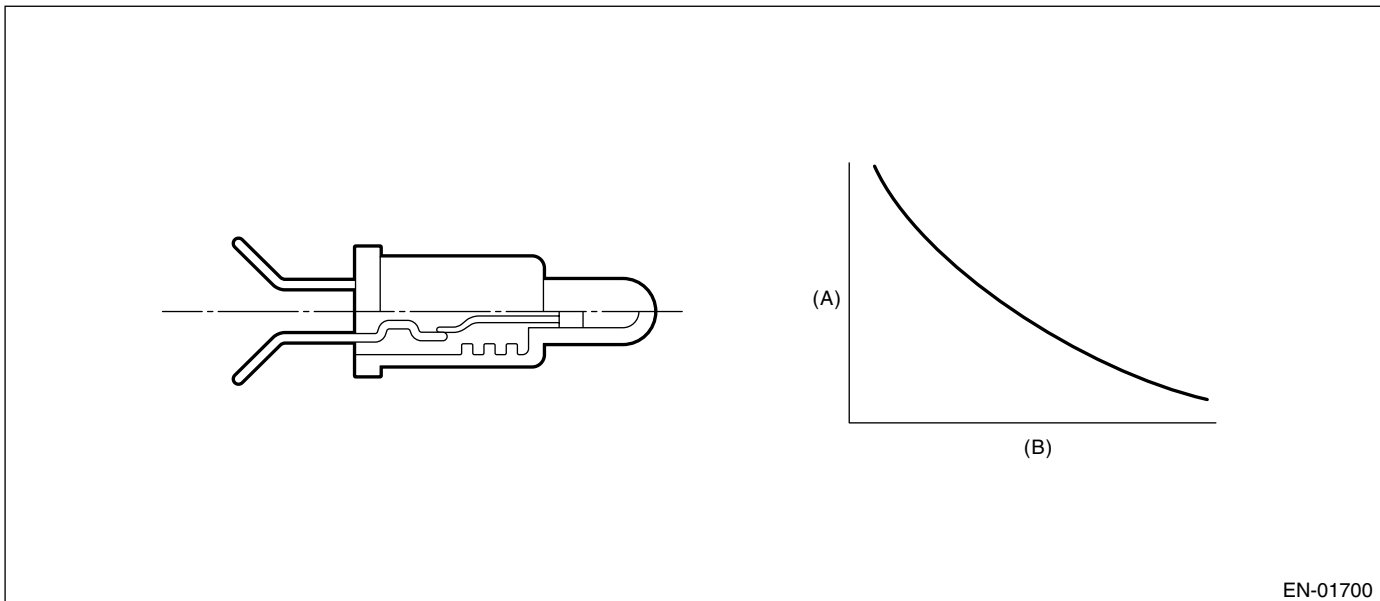
Memorize the freeze frame data. (For test mode $02)

## 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 (Ω)

(B) Fuel temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

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 | ≥ 4.72 V |
| Battery voltage | ≥ 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 | ≥ 10.9 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
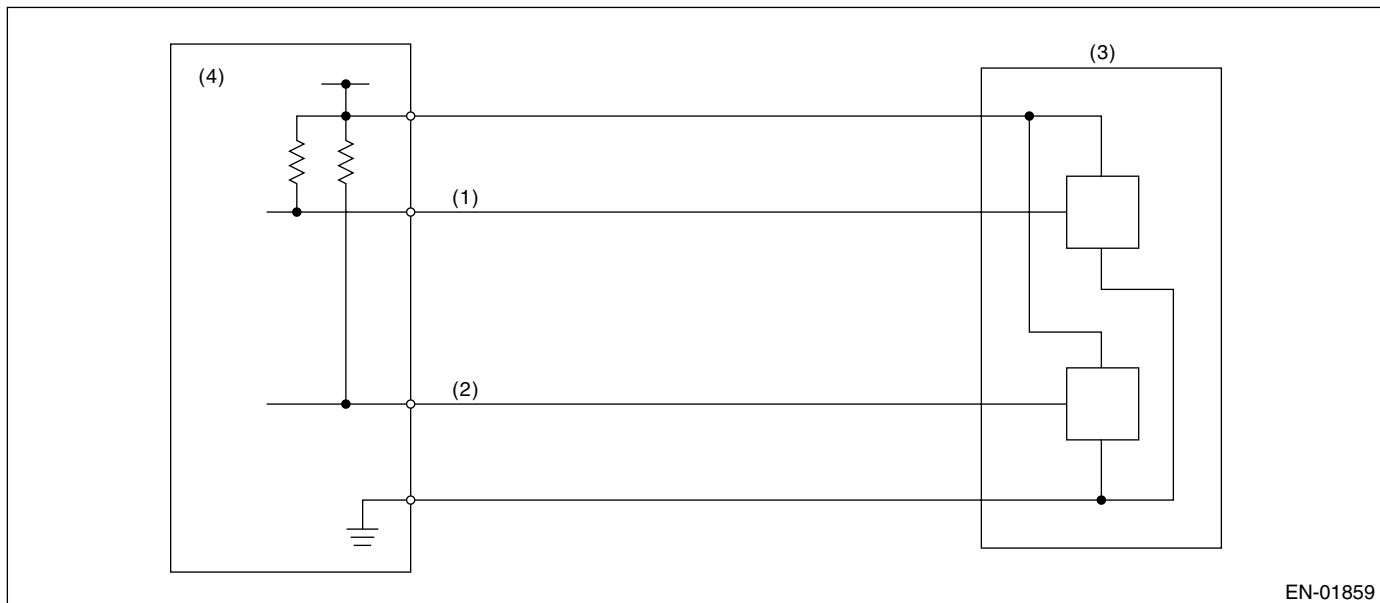
Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01859

(1) Throttle position sensor 1 signal

(2) Throttle position sensor 2 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Sensor 1 input voltage | ≤ 0.749 V |

**Time Needed for Diagnosis:** 24 milliseconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only 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 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)
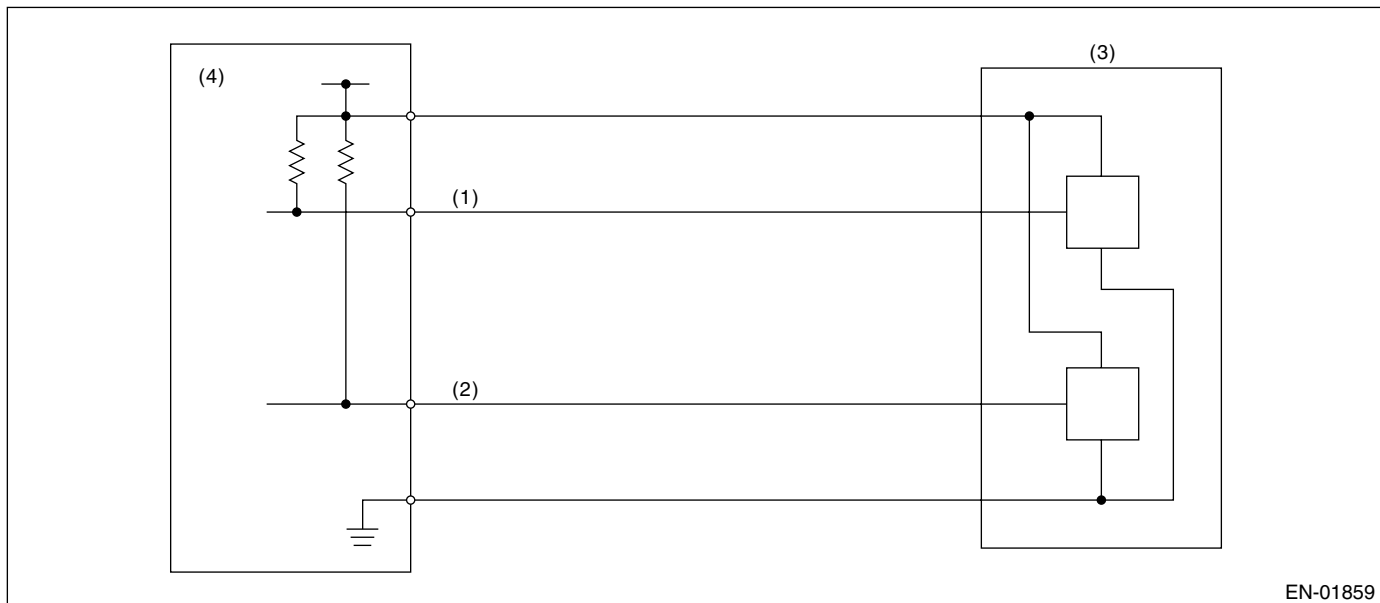• Memorize the diagnostic value and trouble standard value. (For test mode $06)

## AK:DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIR-CUIT 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

(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 | $\geq 4.747$ 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)

### 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)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit.
Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit.
Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

### 2. COMPONENT DESCRIPTION



EN-01771
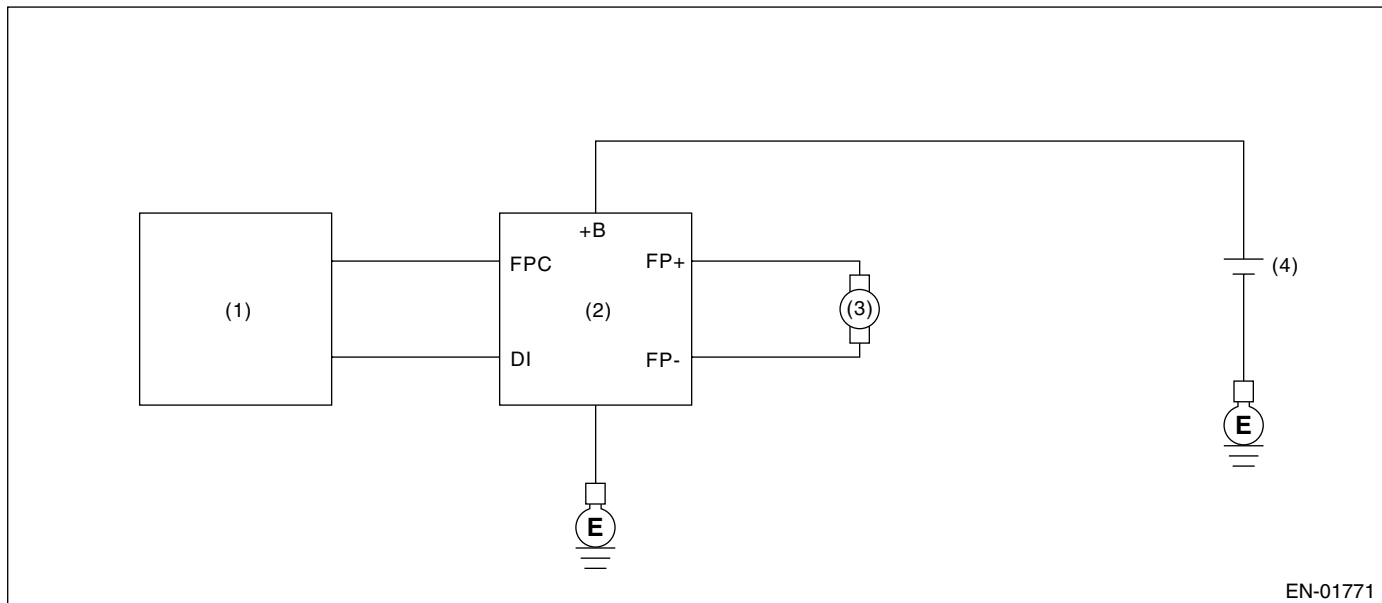
(1)  Engine control module (ECM)
(2)  Fuel pump control unit
(3)  Fuel pump
(4)  Battery

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Battery voltage | ≥ 8 V |
| After engine starting | 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 | ≥ 8 V |
| After engine starting | 30 seconds or more |
| Fuel pump control | ON |
| Fuel pump control unit output diagnosis signal | High |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

## 9. ECM OPERATING AT DTC SETTING
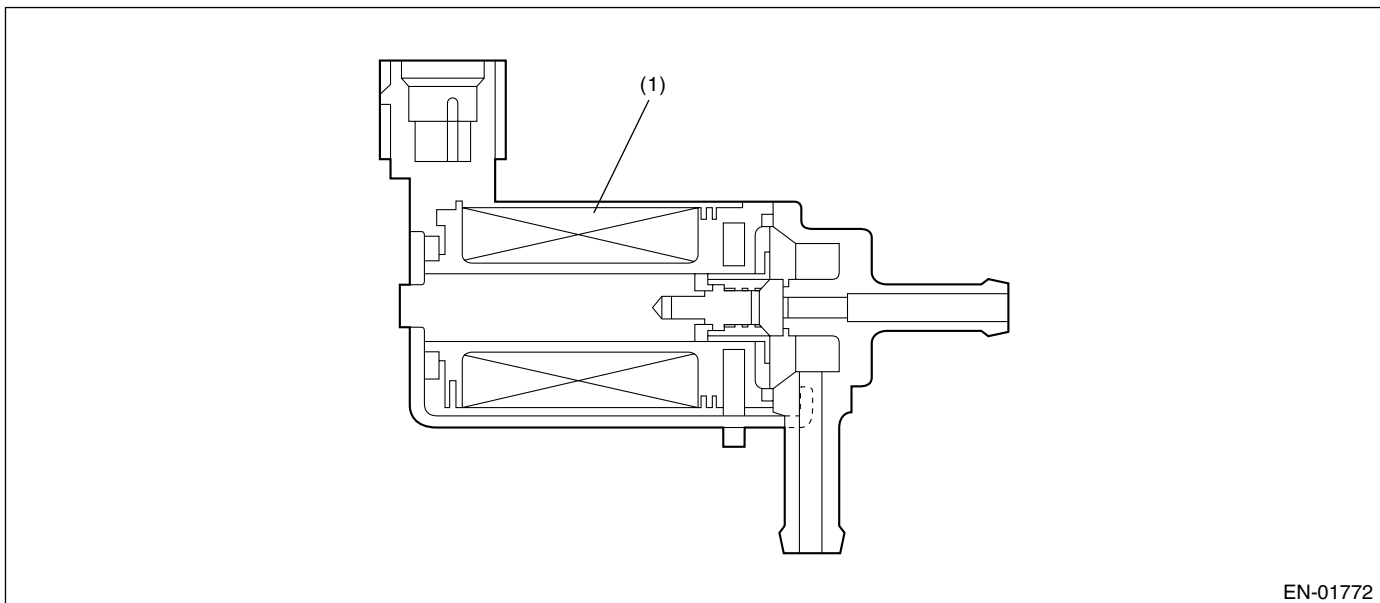
Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function.
Judge NG when becoming high wastegate pressure.

### 2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Intake manifold pressure | ≥ Map 10 |

**Map 10**

| Pa (kPa (mmHg, inHg)) | 56.7 (440,17.3) | 67.2 (504, 19.8) | 75.7 (568, 22.4) | 84.3 (632, 24.9) | 92.8 (696, 27.4) | 101.3 (760, 29.9) |
|---|---|---|---|---|---|---|
| Abnormal threshold (kPa (mmHg, inHg)) | 170.0 (1275, 50.2) | 184.4 (1383, 54.4) | 199.1 (1493, 58.8) | 213.3 (1600, 63.0) | 228.0 (1710, 67.3) | 228.0 (1710, 67.3) |
| Normal threshold (kPa (mmHg, inHg)) | 147.6 (1107, 43.6) | 162.0 (1215, 47.8) | 176.7 (1325, 52.2) | 190.9 (1432, 56.4) | 205.6 (1542, 60.7) | 205.6 (1542, 60.7) |

**GD(STi)-90**

**• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Intake manifold pressure | < Map 10 |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATING AT DTC SETTING

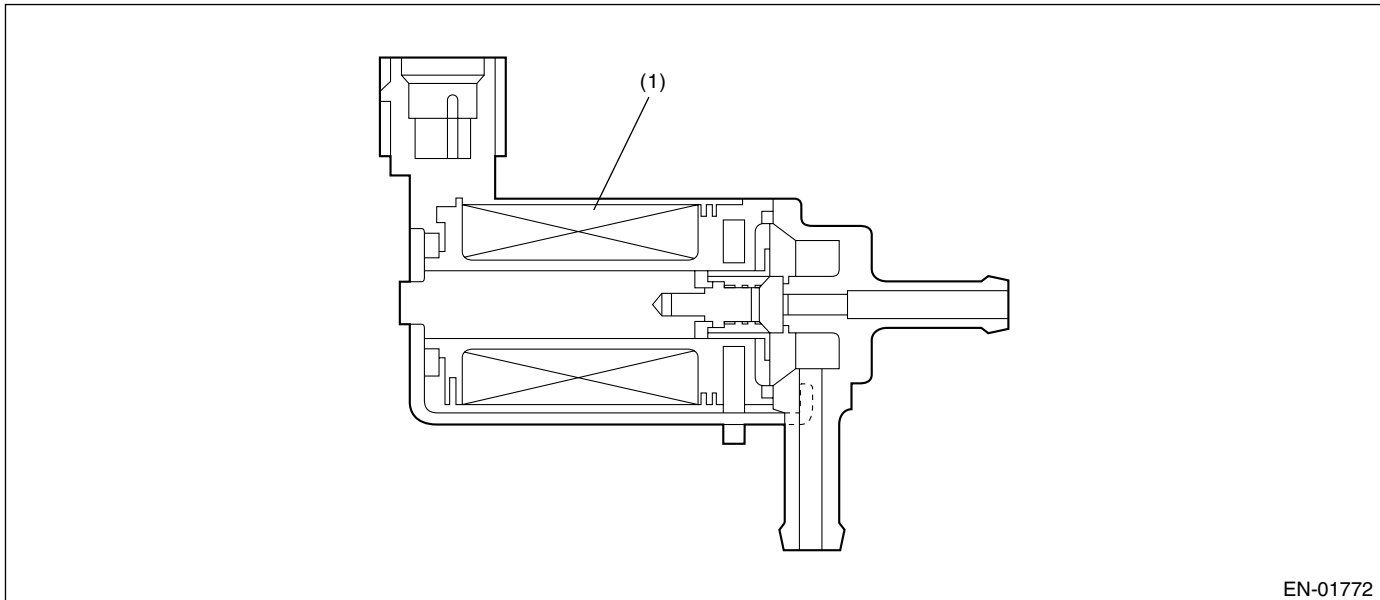Memorize the freeze frame data. (For test mode $02)

## AN:DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve.
Judge NG when the terminal output voltage remains Low during outputting the duty signal.

### 2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | > 10.9 V |
| After engine starting | 1 second or more |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Duty ratio for turbocharged pressure control when terminal output voltage is Low | < 75% |

**Time Needed for Diagnosis:** 655 milliseconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Terminal output voltage | High |

## 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

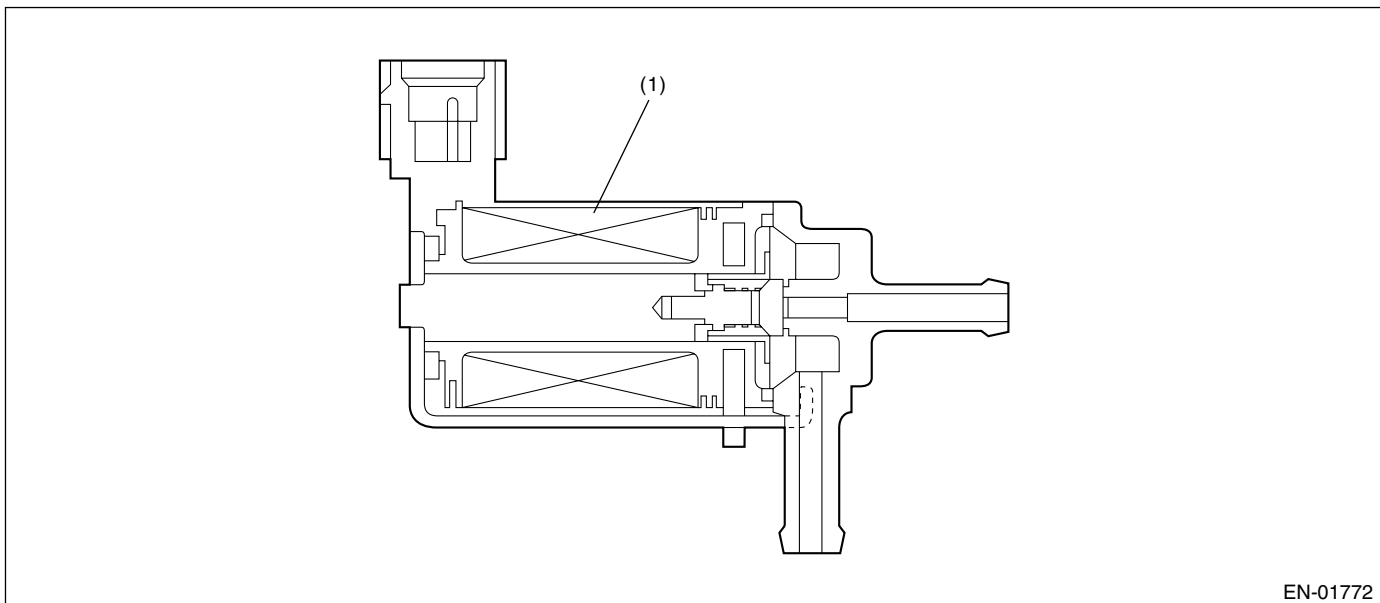Memorize the freeze frame data. (For test mode $02)

## AO:DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve.
Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

### 2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | > 10.9 V |
| After engine starting | 1 second or more |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

### 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Duty ratio for turbocharged pressure control when output terminal voltage is High | > 25% |

**Time Needed for Diagnosis:** 655 milliseconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Terminal output voltage | Low |

## 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)

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

### 1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method)
Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.
• Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
• Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.
1) Intermittent misfire: FTP 1.5 times misfire
• 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
• 360° Interval Difference Method (whole range)
• 720° Interval Difference Method (3,000 rpm or less)
2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire
• 360° Interval Difference Method

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Intake manifold pressure change during 0.5 engine rev. | < 16.0 kPa (120 mmHg, 4.72 inHg) |
| Engine speed change | < 500 rpm/32 milliseconds |
| Throttle position change during 16 milliseconds | < 10° |
| Fuel shut-off function | Not operating |
| Atmospheric pressure | ≥ 75.1 kPa (563 mmHg, 22.2 inHg) |
| Fuel level | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| 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 — 7000 rpm |
| Intake manifold pressure | > Map 3 or more |
| Battery voltage | ≥ 8 V |

**Map3**

**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, | (188, | (186, | (192, | (175, | (197, | (194, | (216.5, | (225, | (237.5, | (248, | (278.5, | (314, | (352.5, | (383, |
| inHg) | 7.40) | 7.32) | 7.56) | 6.89) | 7.76) | 7.64) | 8.52) | 8.86) | 9.35) | 9.76) | 11.0) | 12.4) | 13.9) | 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, | (191, | (188, | (227.7, | (267.4, | (288.9, | (302.9, | (308.6, | (306, | (335.8, | (354.5, | (368.2, | (381.9, | (396, | (396, |
| inHg) | 7.52) | 7.40) | 8.96) | 10.5) | 11.4) | 11.9) | 12.1) | 12.0) | 13.2) | 14.0) | 14.5) | 15.0) | 15.6) | 15.6) |

## 3. GENERAL DRIVING CYCLE

• Detecting misfire is able to be carried out in the condition between idling and high revolution; however, idling condition is better for detecting misfire from the viewpoint of engine load and damage.
• Perform the diagnosis continuously.

## 4. DIAGNOSTIC METHOD



EN-01773
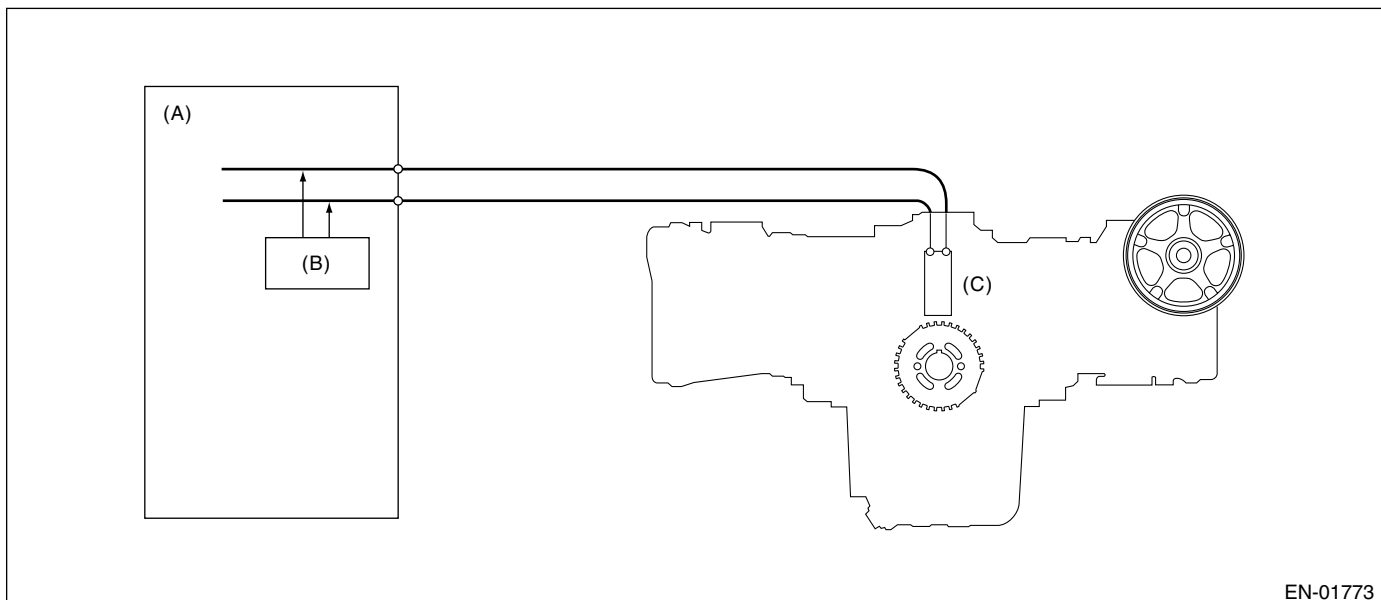
(A)   Engine control module (ECM)

(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)
- 180° Interval Difference Method
- 360° Interval Difference Method
- 720° Interval Difference Method

→ NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
- Catalyst damage misfire NG judgment

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



EN-01774
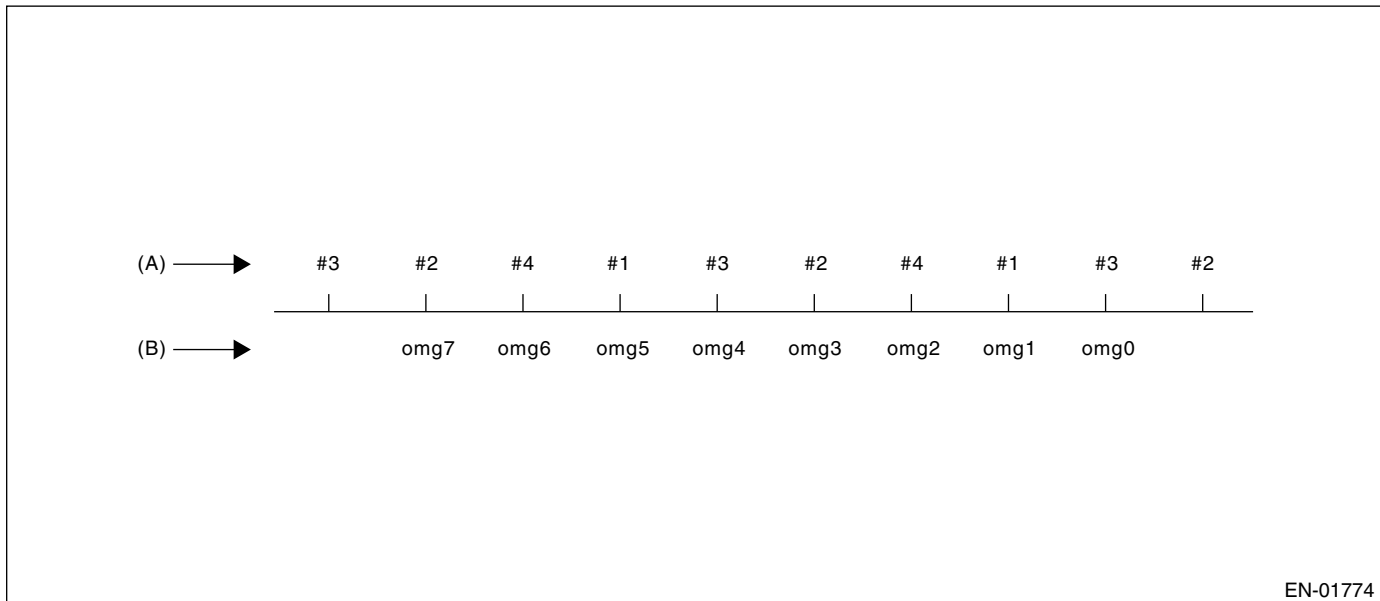
(A)   Ignition order
(B)   Crankshaft position speed
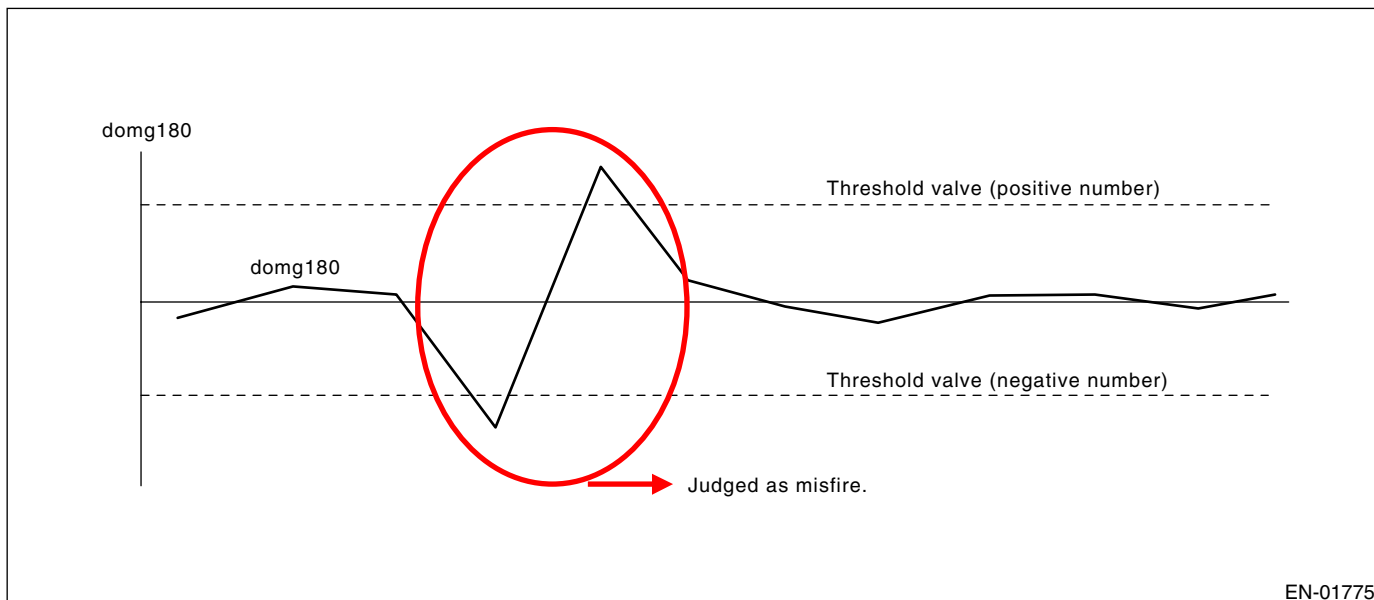
## • 180° Interval Difference Method

Diagnosis value     domg 180 = (omg −1 omg 0) − (omg 7 − omg 1)/6

Judge misfire occurs in the following cases.

• domg 180 > judgment value of positive side
• domg 180 ≤ judgment value of negative side

(judgment value before 180°CA)

domg180

domg180

Threshold valve (positive number)

Threshold valve (negative number)

Judged as misfire.

EN-01775

## • 360° Interval Difference Method

Diagnosis value     domg 360 = (omg 1 − omg 0) − (omg 4 − omg 3)

Misfire judgment     domg 360 > judgment value          →     Misfire occurs

domg360

domg360

Threshold valve

Judged as misfire.

EN-01776
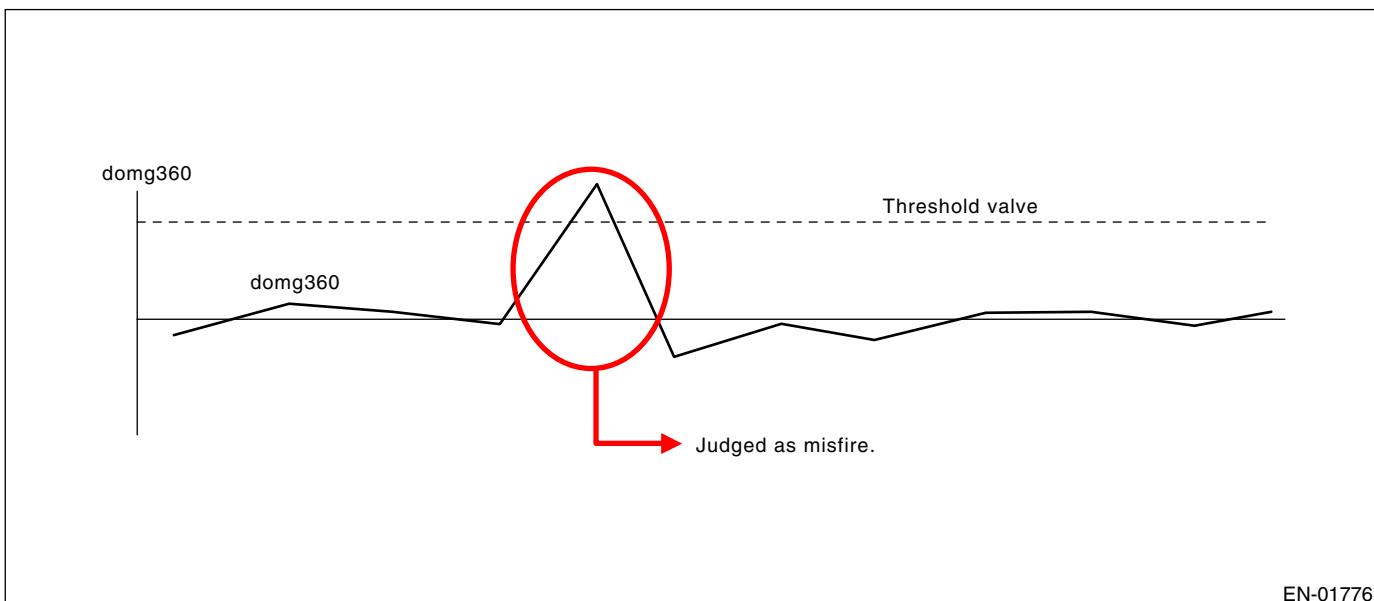
**GD(STi)-99**

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

### • 720° Interval Difference Method

Diagnosis value      domg 720 = (omg 1 − omg 0) − (omg 7 − omg 6)

Misfire judgment      domg 720 > judgment value          →      Misfire occurs
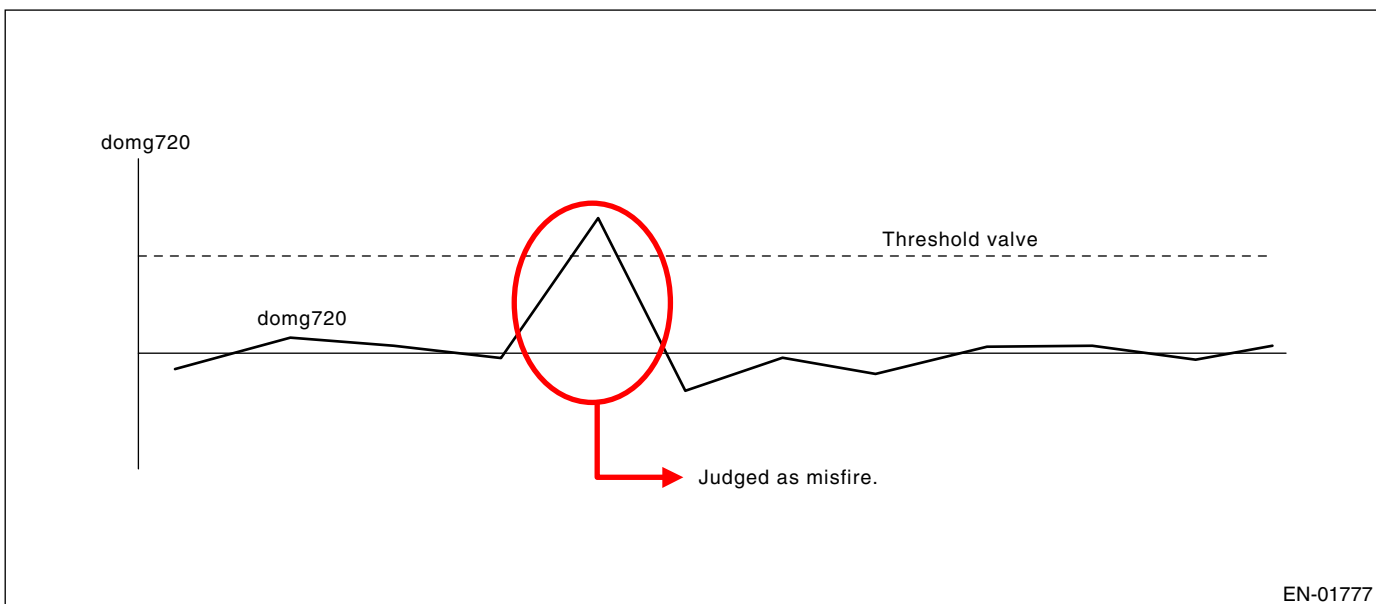


EN-01777

### • 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 |

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

| Percentage | | Intake air (g/gev.) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.2 | 0.3 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.3 | 1.4 | 1.6 | 1.8 | 1.9 | 2.0 | 2.2 | 2.4 |
| Engine speed (rpm) | 700 | 45.80 | 45.80 | 45.80 | 41.70 | 36.15 | 30.60 | 27.80 | 26.40 | 25.00 | | | | | | |
| | 1000 | 45.80 | 45.80 | 45.80 | 37.50 | 33.30 | 25.00 | 23.75 | 25.00 | | | | | | | |
| | 1500 | 43.74 | 41.13 | 38.53 | 31.25 | 27.28 | 21.25 | 20.13 | 20.50 | | | | | | | |
| | 2000 | 41.67 | 36.46 | 31.25 | 25.00 | 21.25 | 17.50 | 16.50 | 16.00 | 15.50 | 14.30 | | | | | |
| | 2500 | 38.55 | 33.02 | 27.50 | 21.25 | 17.78 | 14.31 | 12.43 | 11.49 | 10.55 | 9.65 | | | | | |
| | 3000 | 35.42 | 29.59 | 23.75 | 17.50 | 14.31 | 11.11 | 8.36 | 6.98 | 5.60 | 5.00 | 4.40 | 6.70 | | | |
| | 3500 | | 24.99 | 22.53 | 14.30 | 12.20 | 10.11 | 8.38 | 7.51 | 6.65 | 6.20 | 5.75 | 6.18 | | | |
| | 4000 | | 20.40 | 21.30 | 11.10 | 10.10 | 9.10 | 8.40 | 8.05 | 7.70 | 7.40 | 7.10 | 5.65 | 4.20 | 2.50 | 0.80 |
| | 4500 | | 19.35 | 19.00 | 12.25 | 10.90 | 9.55 | 9.20 | 9.03 | 8.85 | 7.68 | 6.50 | 5.58 | 4.65 | | |
| | 5000 | | 18.30 | 16.70 | 13.40 | 11.70 | 10.00 | 10.00 | 10.00 | 10.00 | 7.95 | 5.90 | 5.50 | 5.10 | | |
| | 5500 | | | 16.10 | 12.00 | 10.58 | 9.15 | 8.75 | 8.55 | 8.35 | 6.30 | 4.25 | | | | |
| | 6000 | | | 15.50 | 10.60 | 9.45 | 8.30 | 7.50 | 7.10 | 6.70 | 4.65 | 2.60 | | | | |
| | 6500 | | | 15.50 | 10.00 | | | | | | | | | | | |

EN-01856

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) $\times$ 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.
**Time Needed for Diagnosis:** 200 engine revs.
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-96, DTC P0301 — CYLINDER 1 MIS-FIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-96, DTC P0301 — CYLINDER 1 MIS-FIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## AS:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-96, DTC P0301 — CYLINDER 1 MIS-FIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
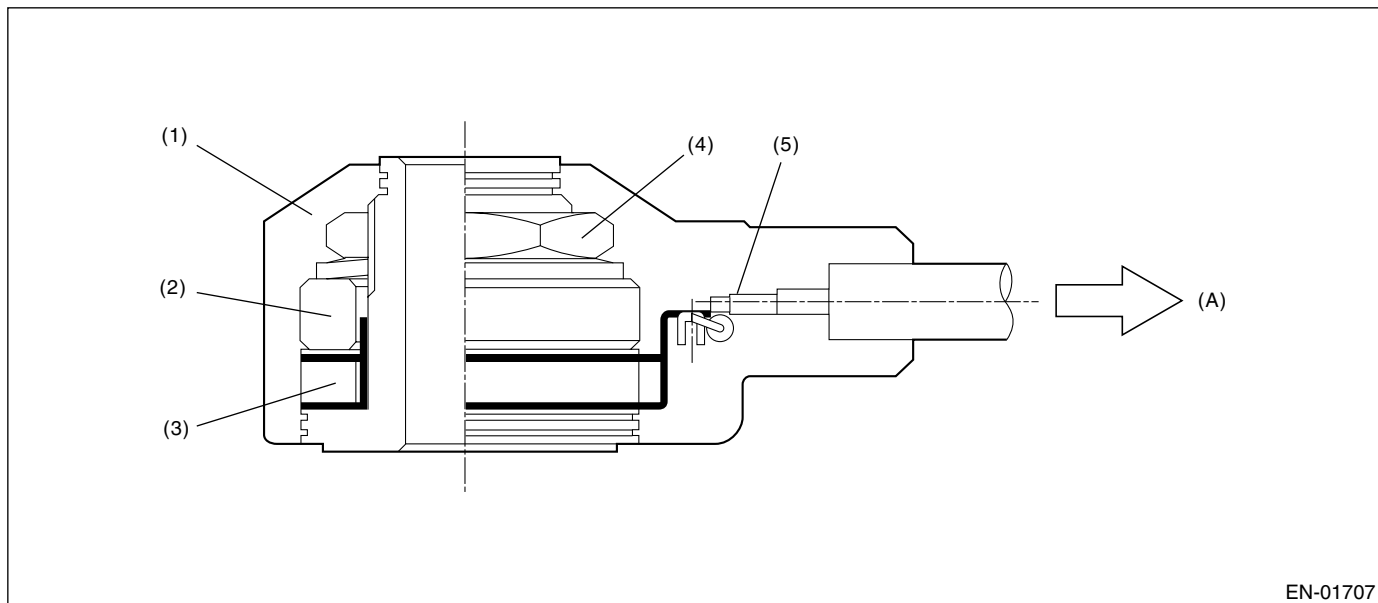
## AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor.
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01707

| | | | |
|---|---|---|---|
| (1) | Case | (A) | To knock sensor harness |
| (2) | Weight | | |
| (3) | Piezoelectric element | | |
| (4) | Nut | | |
| (5) | Resistance | | |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

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 | ≥ 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
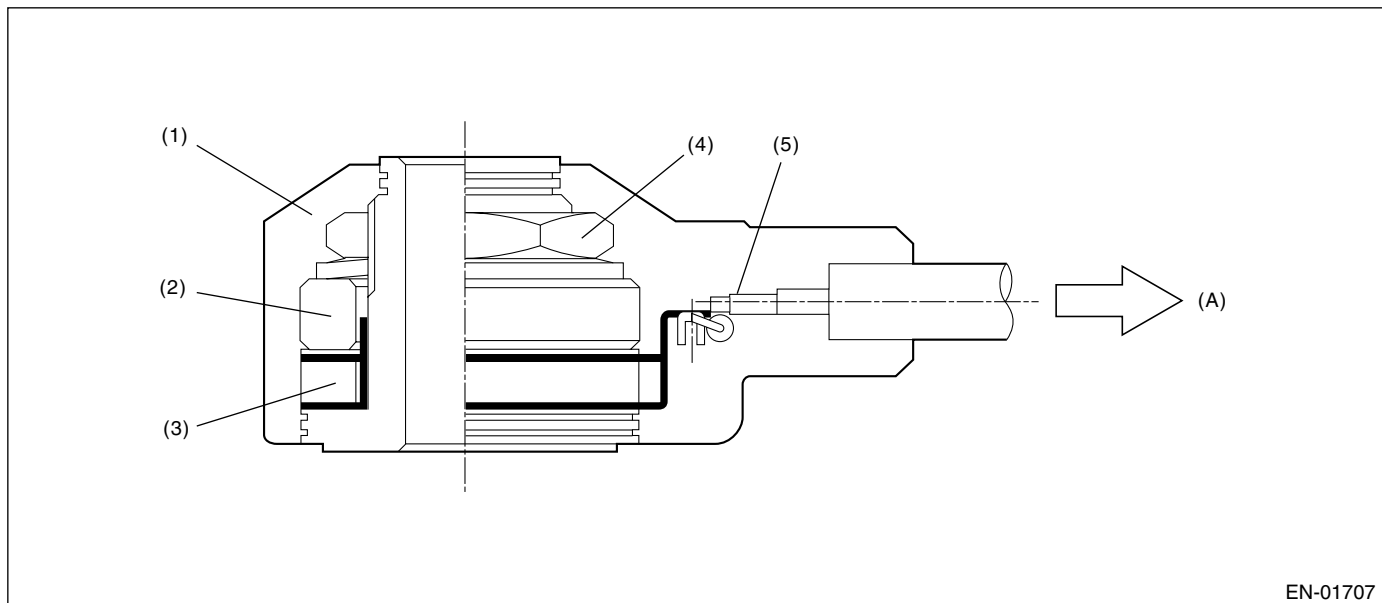
Memorize the freeze frame data. (For test mode $02)

## 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



EN-01707

| | | | |
|---|---|---|---|
| (1) | Case | (A) | To knock sensor harness |
| (2) | Weight | | |
| (3) | Piezoelectric element | | |
| (4) | Nut | | |
| (5) | Resistance | | |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Output voltage | ≥ 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°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

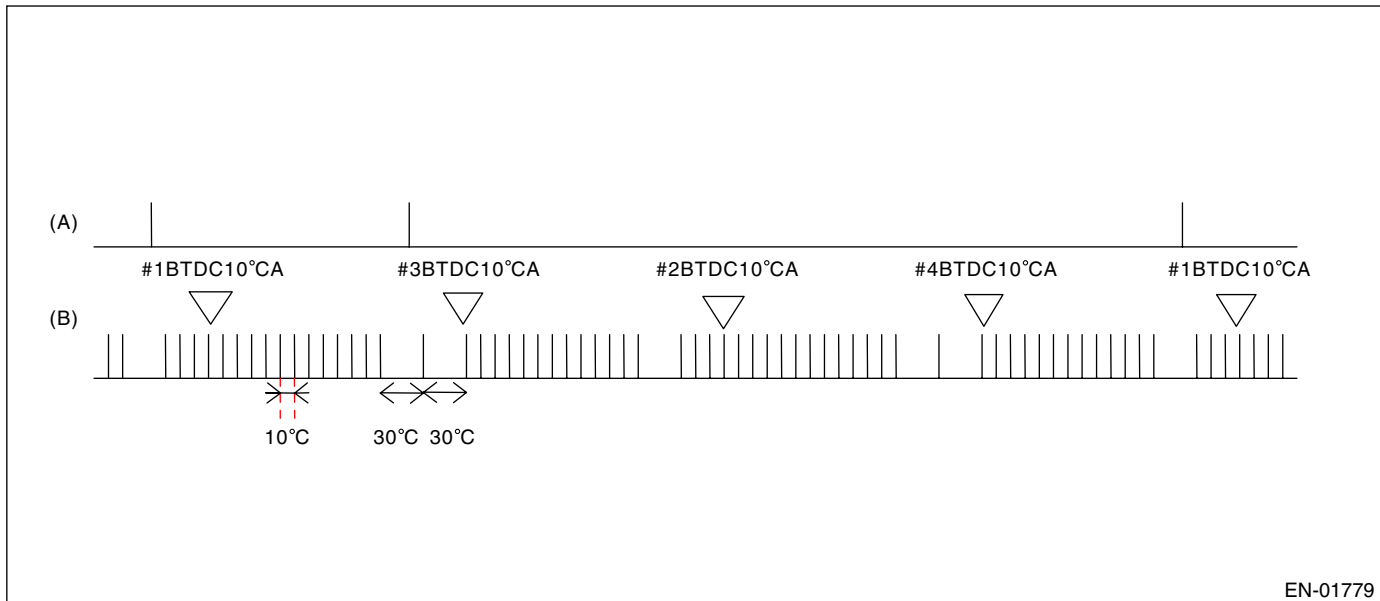Memorize the freeze frame data. (For test mode $02)

## AV:DTC P0335 — CRANKSHAFT POSITION SENSOR "A" CIRCUIT —
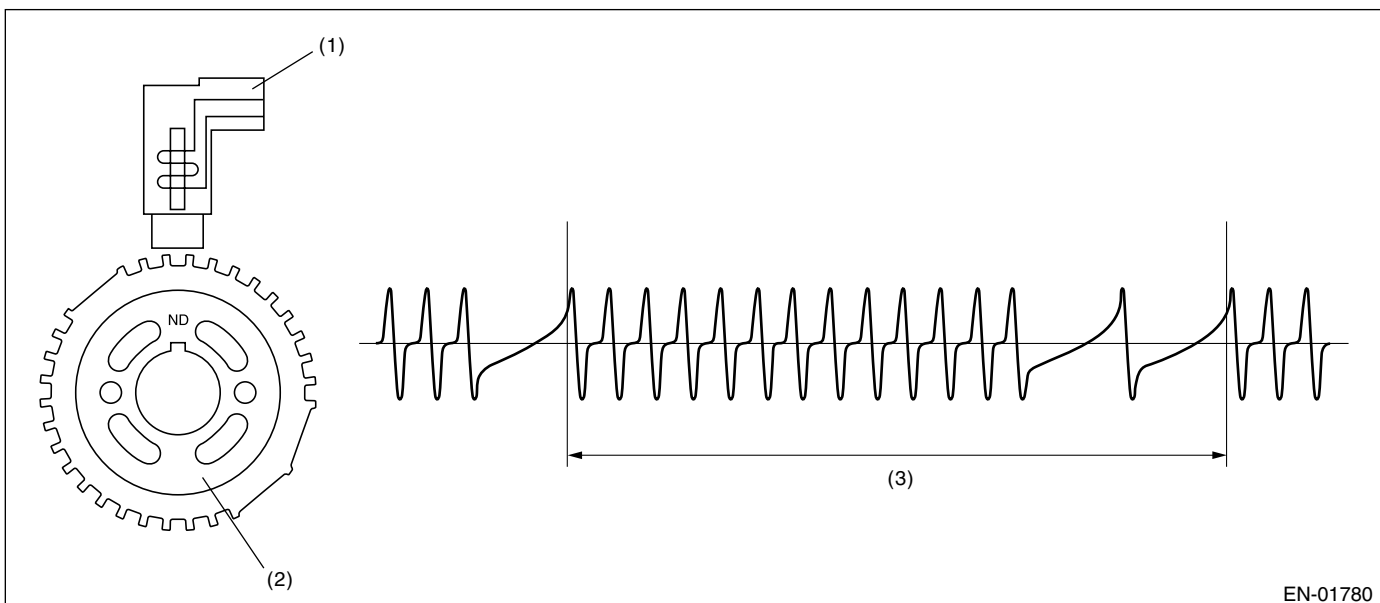
### 1. OUTLINE OF DIAGNOSIS

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



EN-01779

(A) Camshaft signal

(B) Crankshaft signal



EN-01780

(1) Crankshaft position sensor

(2) Crankshaft sprocket

(3) Crankshaft half-turn

## 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

## 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Starter switch | ON |
| Crankshaft position sensor signal | Not detected |
| Battery voltage | ≥ 8 V |

**Time Needed for Diagnosis:** 3 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as 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 | ≥ 8 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
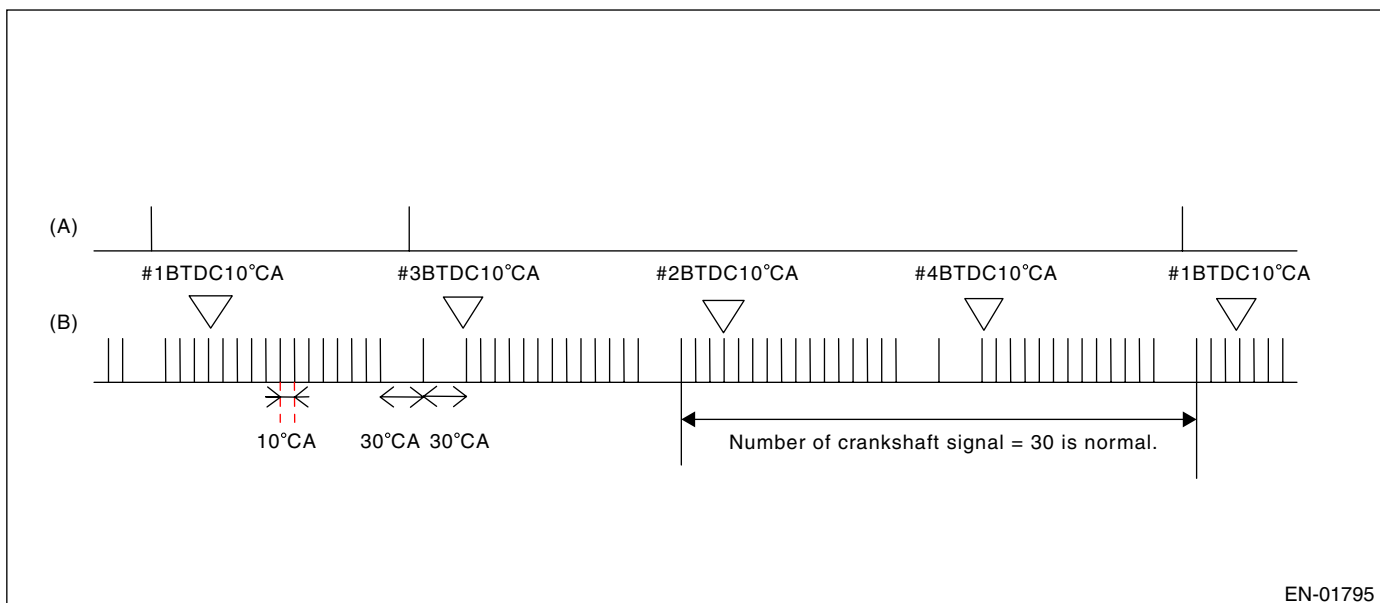
Memorize the freeze frame data. (For test mode $02)

## AW:DTC P0336 — CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/ PERFORMANCE —
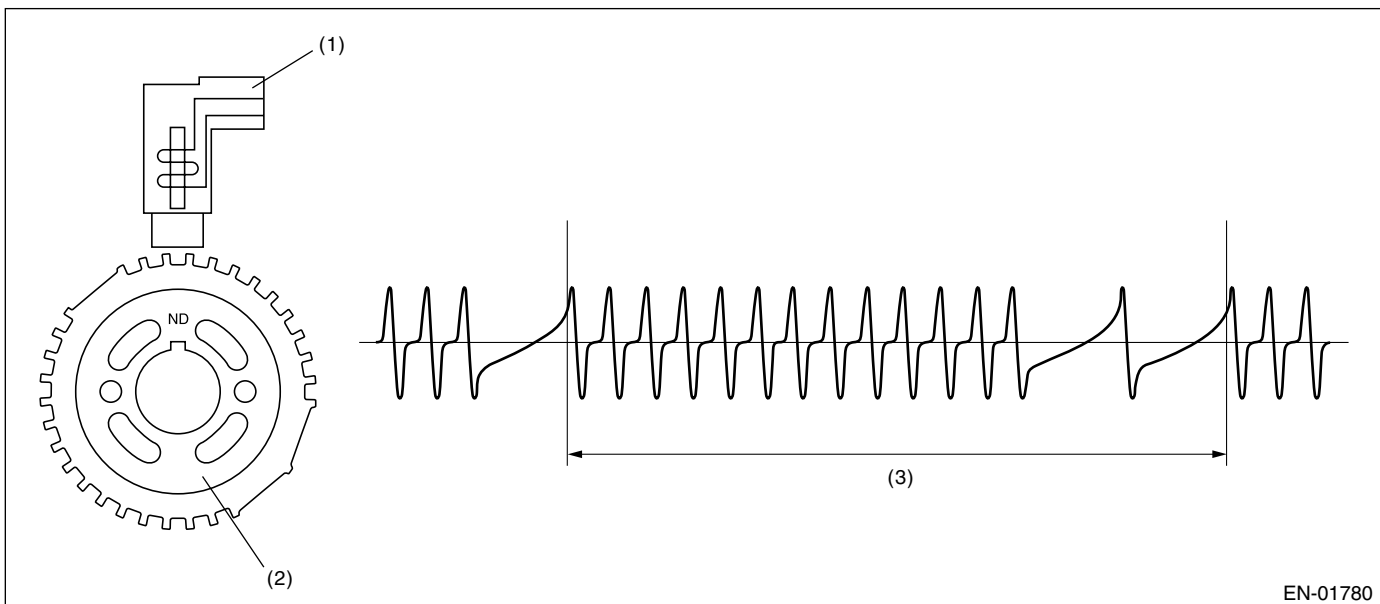
### 1. OUTLINE OF DIAGNOSIS

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



EN-01795

(A)   Camshaft signal

(B)   Crankshaft signal



EN-01780

(1)   Crankshaft position sensor

(2)   Crankshaft sprocket

(3)   Crankshaft half-turn

## 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | ≥ 8 V |
| Engine speed | < 3000 rpm |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge 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)

## 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



Number of camshaft signal = 3 is normal at two engine revolution.

EN-01853
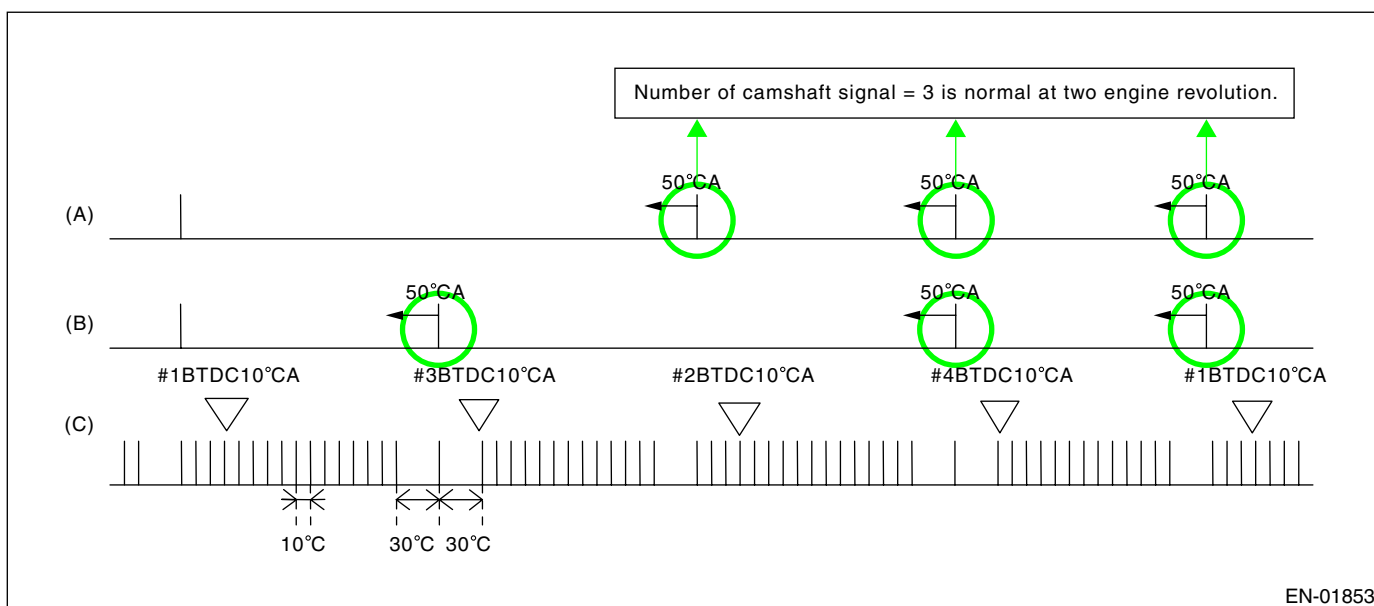
(A)   Camshaft signal RH
(B)   Camshaft signal LH
(C)   Crankshaft signal

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Voltage | ≥ 8 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment 1

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.
Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Number of camshaft sensor signal during 2 rev. | Except 3 |

**Time Needed for Diagnosis:** 100 rev.
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**• Abnormality Judgment 2**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Starter switch | ON |
| Camshaft angle signal | None |

**Time Needed for Diagnosis:** 3 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.
**• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Camshaft angle signal | Exists |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

• Ignition timing whole learning compensation:
– Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
– Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
• Ignition timing partial learning compensation:
– Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
– Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
• AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
• ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

## 9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

NOTE:
For diagnostic procedure, refer to DTC P0340. <Ref. to GD(STi)-111, DTC P0340 — CAMSHAFT POSI-TION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

### 1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

### 2. COMPONENT DESCRIPTION



EN-01713
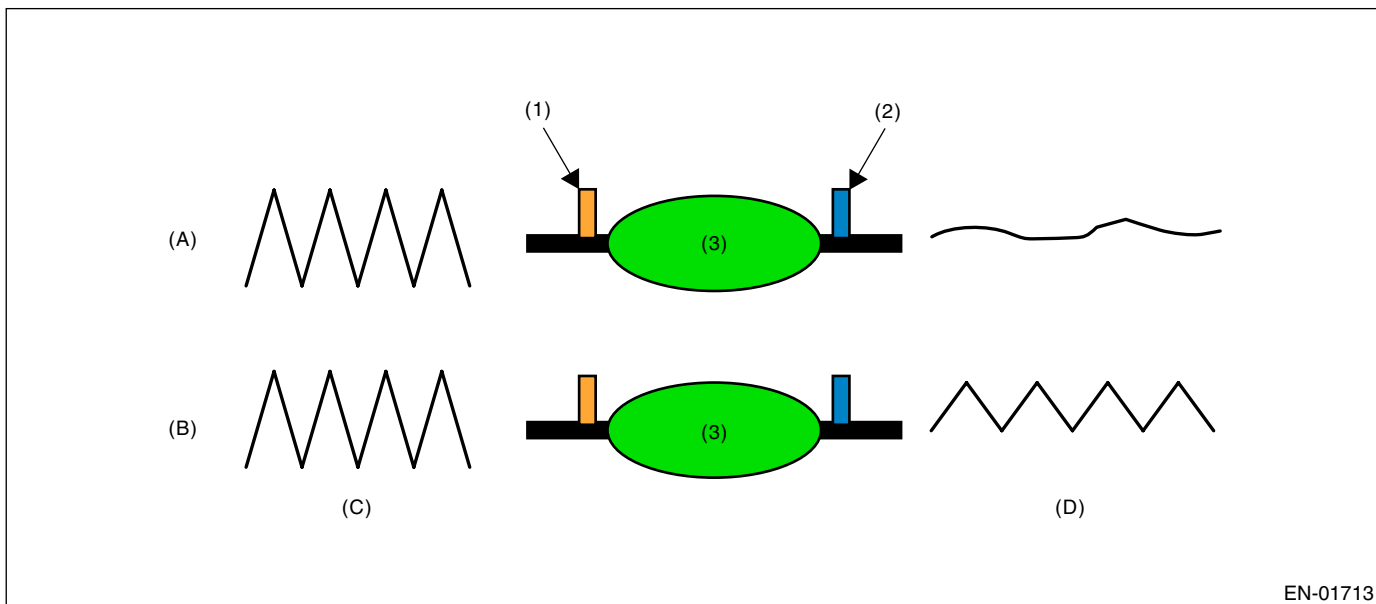
| | |
|---|---|
| (1) Front oxygen (A/F) sensor | (A) Normal |
| (2) Rear oxygen sensor | (B) Deterioration |
| (3) Catalyst | (C) Front oxygen (A/F) sensor waveform |
| | (D) Rear oxygen sensor waveform |

## 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Time for keep completing all secondary parameters | 1.2 seconds or more |
| Catalyst deterioration diagnosis | Not finished |
| Battery voltage | > 10.9 V |
| Atmospheric pressure | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Engine coolant temperature | ≥ 65°C (149°F) |
| Catalyst warm-up counter on Map 2 | ≥ 7600 |
| Misfire detection during 200 engine revs. | < 5 times |
| Learning value of evaporation gas density | < 0.20 |
| Sub feedback | Operating |
| Evaporative system diagnostic | Not in operation |
| Difference between actual and target time lambda < 0.10 | 1000 milliseconds or more |
| Vehicle speed | ≥ 75 km/h (46.6 MPH) |
| Amount of intake air | 10 ↔ 40 g/s |
| Engine load change every 0.5 engine revs. | < 0.03 g/rev |
| Rear $O_2$ output change from below 600 mV to over | Experienced after fuel cut |
| After engine starting | ≥ 150 seconds |

### • Map 2

Add the following value every 512 milliseconds.

**Catalyst warm-up counter ≤ 8000**

| Amount of intake air (g/s) | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Integrated value for warm-up counter | −20 | −8 | 15 | 36 | 57 | 79 | 100 | 121 | 127 | 127 | 127 | 127 |

**Catalyst warm-up counter > 8000**

| Amount of intake air (g/s) | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Integrated value for warm-up counter | −2 | −1 | 5 | 7 | 8 | 9 | 11 | 12 | 13 | 13 | 13 | 13 |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed from 80 to 100 km/h (49.7 to 62.1 MPH).

**GD(STi)-115**

## 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 $\times$ 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds $\times$ 4 | $\geq$ Map 3 |

**Map 3**

| Diagnosis value | 0.1 | 0.162 | 0.214 | 0.266 | 0.318 |
|---|---|---|---|---|---|
| Judgment value | 4.51 | 4.51 | 10.45 | 16.39 | 22.34 |

**Time Needed for Diagnosis:** 55 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

• Memorize the freeze frame data. (For test mode $02)
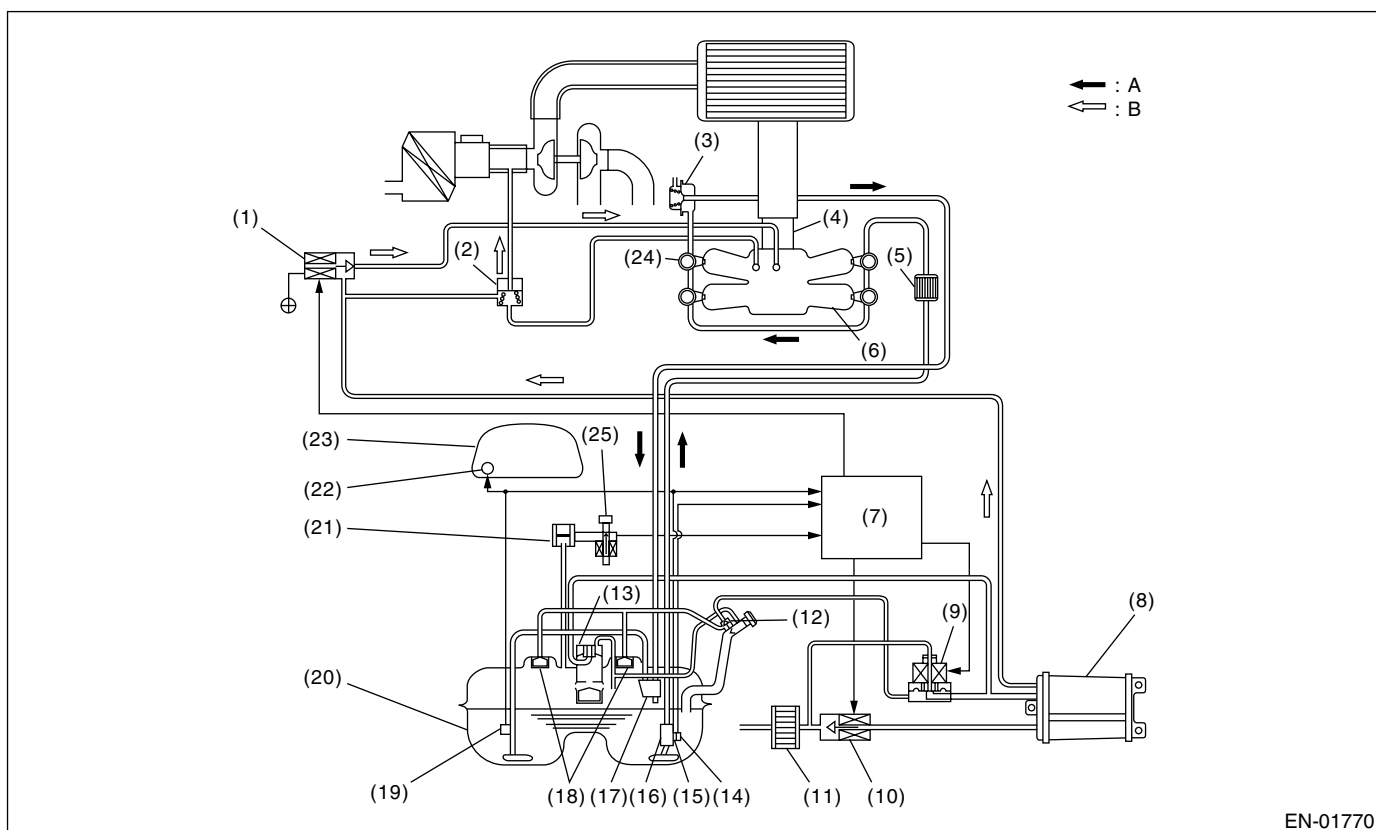• Memorize the diagnostic value and trouble standard value. (For test mode $06)

## BA:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DE-TECTED (SMALL LEAK) —

### 1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



EN-01770

| | | | |
|---|---|---|---|
| (1) | Purge control solenoid valve | (14) | Fuel temperature sensor |
| (2) | Purge valve | (15) | Fuel level sensor |
| (3) | Pressure regulator | (16) | Fuel pump |
| (4) | Throttle body | (17) | Jet pump |
| (5) | Fuel filter | (18) | Fuel cut valve |
| (6) | Intake manifold | (19) | Fuel sub level sensor |
| (7) | Engine control module (ECM) | (20) | Fuel tank |
| (8) | Canister | (21) | Fuel tank pressure sensor |
| (9) | Pressure control solenoid valve | (22) | Fuel meter |
| (10) | Drain valve | (23) | Combination meter |
| (11) | Drain filter | (24) | Fuel injector |
| (12) | Shut-off valve | (25) | Tank pressure switching solenoid valve |
| (13) | Vent valve | | |

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure with each solenoid valve switched to ON/OFF, 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.

• **0.04-inch Diagnosis**
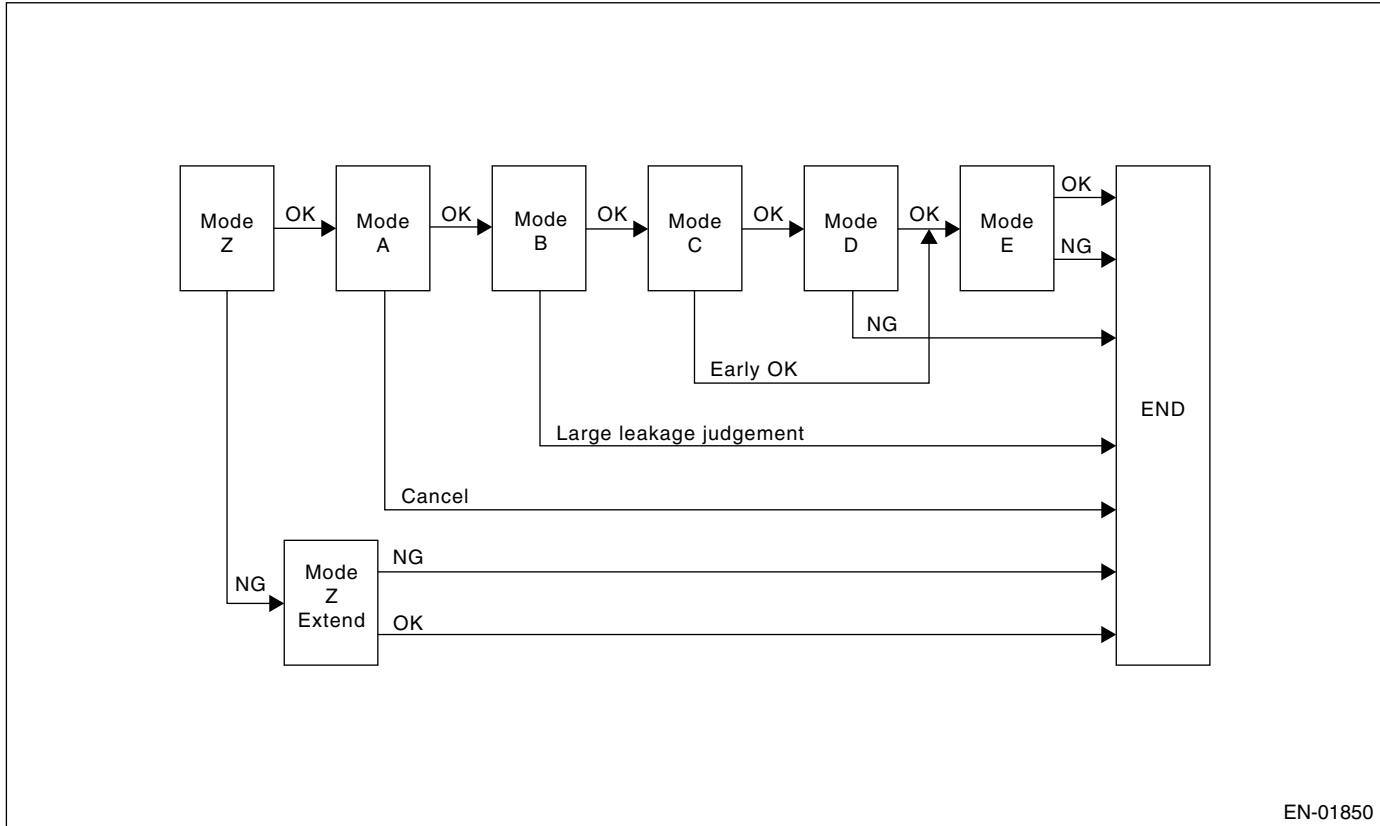


EN-01850

| Mode | Mode Description | Diagnosis Period |
|---|---|---|
| Mode Z<br>(CPC abnormal open diagnosis, CCV abnormal close diagnosis) | Perform with CPC Duty = 0%, Pressure control solenoid valve = ON (open) → CCV = ON (closed), and carry out CPC open trouble and CCV close trouble diagnosis according to tank pressure change amount. | 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 leakage judgment) | Manipulate CPC, 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 OK judgment) | With CPC Duty = 0%, 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 measurement evaporation leakage diagnosis) | Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value. | 12 — 16 seconds |
| Mode E<br>(CCV property abnormal diagnosis) | With CCV = OFF (open), perform the CCV property abnormal diagnosis according to the tank pressure change amount. | 4 seconds |

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• **0.02-inch Diagnosis**
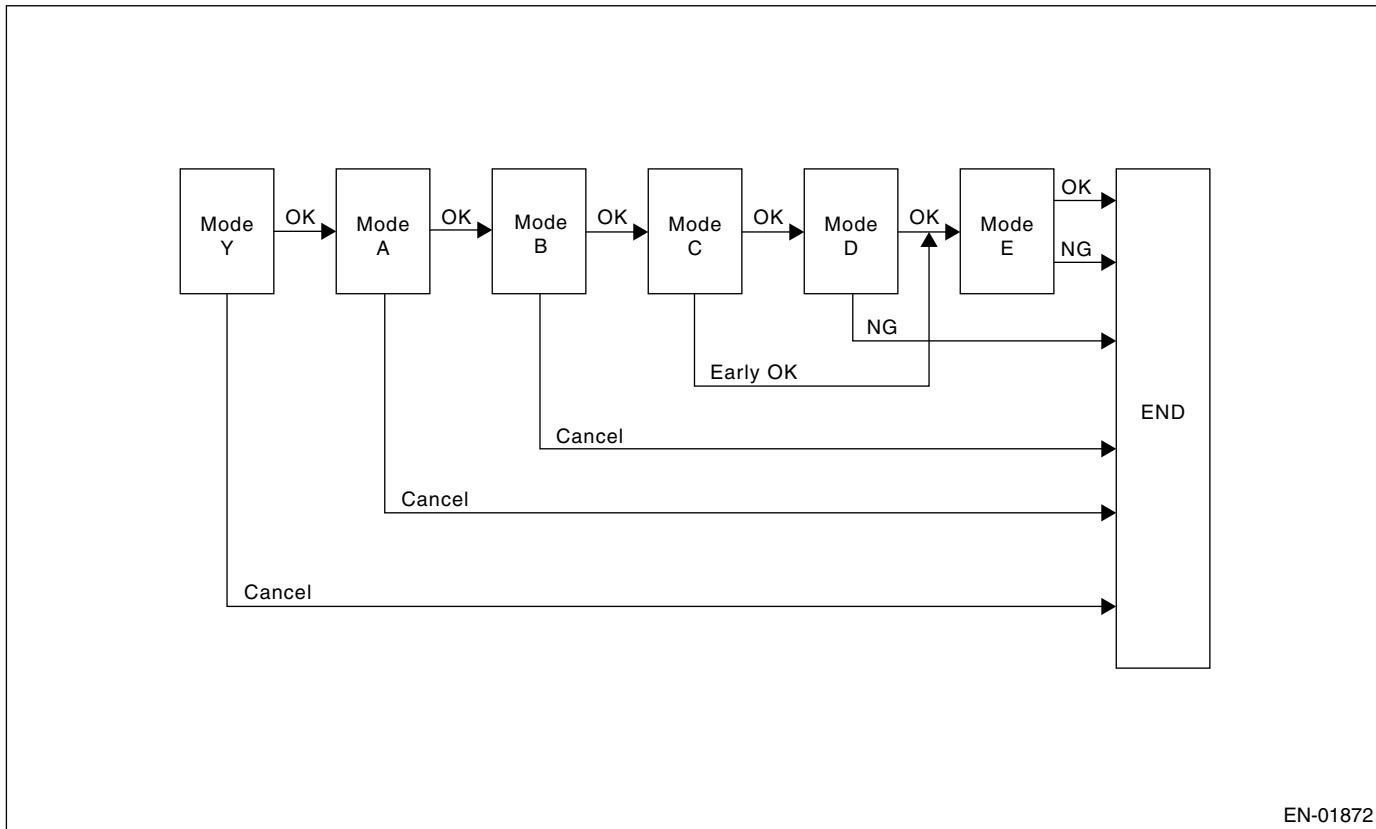


EN-01872

| Mode | Mode Description | Diagnosis Period |
|---|---|---|
| Mode Y<br>(Tank pressure stabilization) | Perform with CPC Duty = 0%, Pressure control solenoid valve = ON (open) and CCV = OFF (close), and return the tank pressure to atmosphere. | 15 seconds |
| Mode A<br>(Estimated evaporation amount) | With CPC Duty = 0%, Pressure control solenoid valve = ON (open) and CCV = ON (close), and calculate the tank pressure change amount (P1). | 29 seconds |
| Mode B<br>(Negative pressure sealed) | Manipulate CPC, introduce the 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) | With CPC Duty = 0%, 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) | With pressure control solenoid valve = OFF (close) perform the CCV property abnormal diagnosis according to the tank pressure change amount. | 4 seconds |

• **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 |
| | | CPC is judged to be stuck open. | P0457 |
| Mode A | Pressure is in proportion to amount of evaporative emission. | | |
| Mode B | Negative pressure is formed due to intake manifold negative pressure | Large leakage | P0457 |
| Mode C | Target pressure is undershot after CPC is closed. | 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 |
| | | P2 measurement of small leak in system. EVAP. system is judged to have small leak [0.5 mm (0.02 in.)]. | P0456 |
| 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 after CPC is closed. | | |
| 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 |

**GD(STi)-120**

## 2. COMPONENT DESCRIPTION

### • Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.
Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



EN-01715
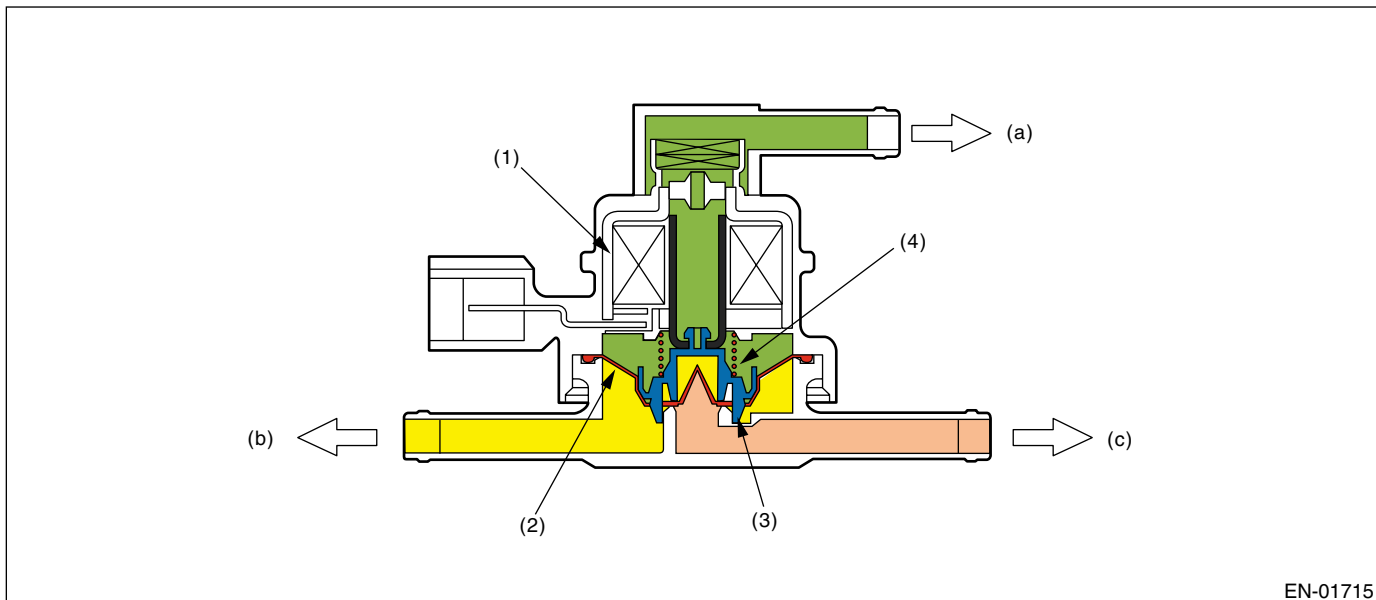
(1)  Solenoid
(2)  Diaphragm
(3)  Valve
(4)  Spring

(a)  Atmospheric pressure
(b)  Fuel tank
(c)  Canister

**• Valve Operation and Air Flow**

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



EN-01716
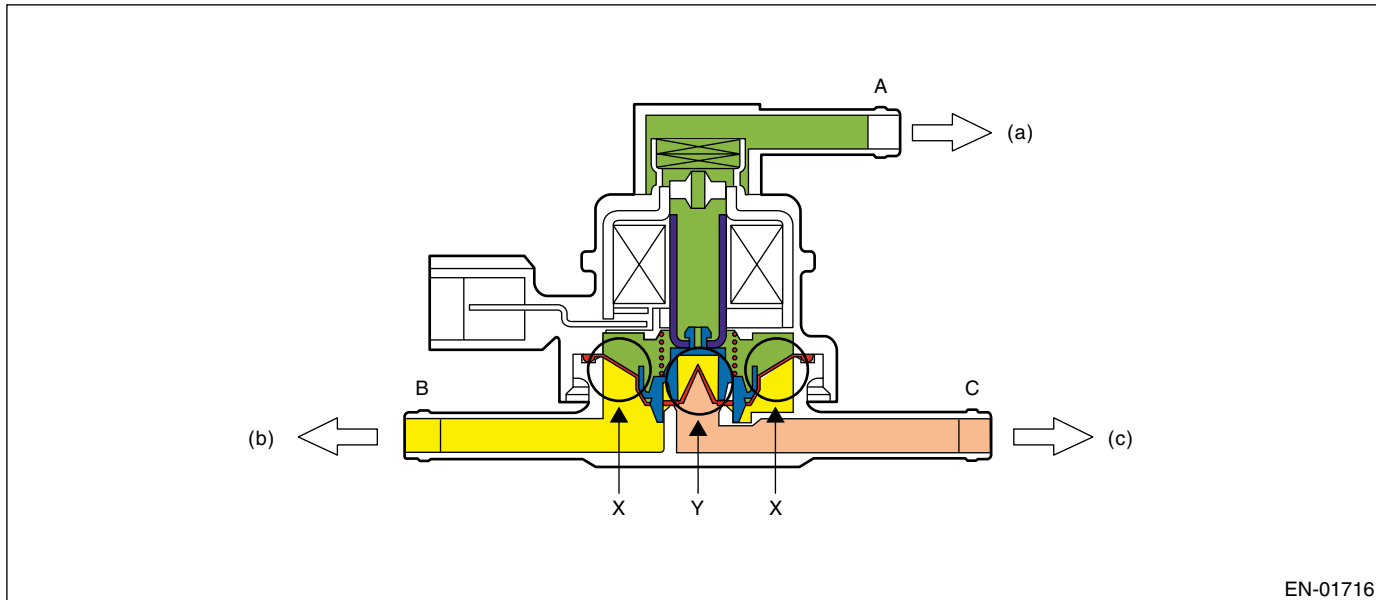
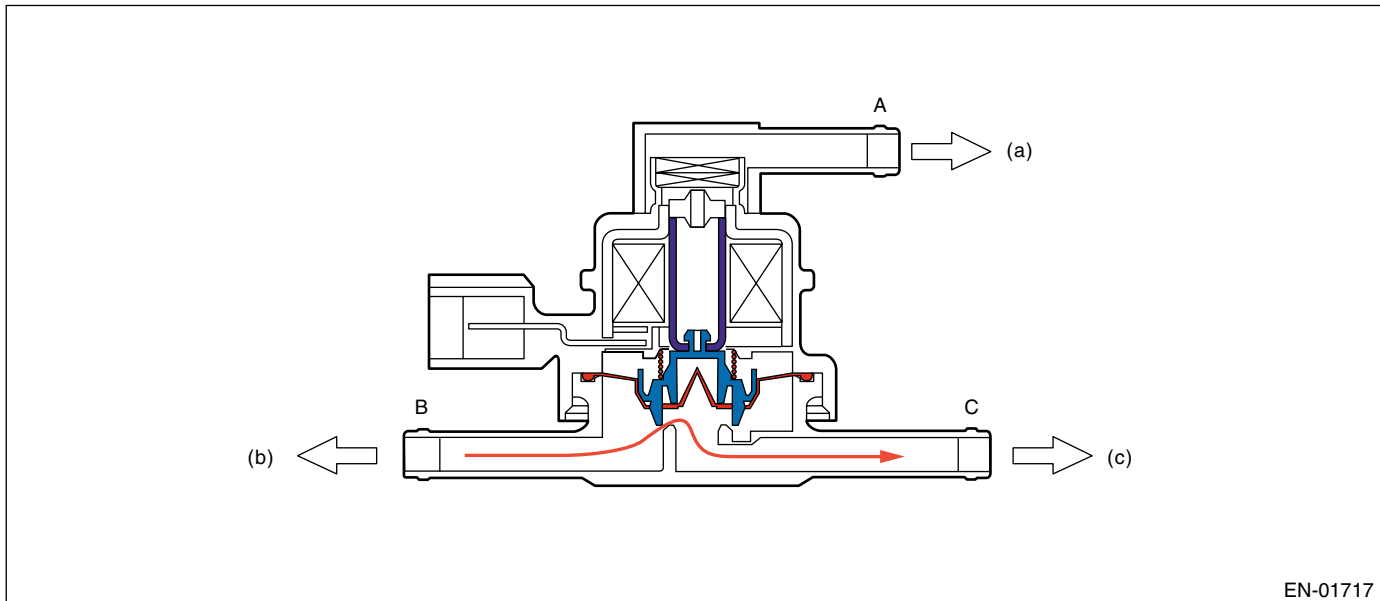(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

| Condition of pressure | Flow |
|---|---|
| A < B (solenoid OFF) | B → C |
| B < C (solenoid OFF) | C → B |
| Solenoid ON | B ↔ C |

**• When A < B (Solenoid OFF)**



EN-01717

(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

**• When B < C (Solenoid OFF)**



EN-01718
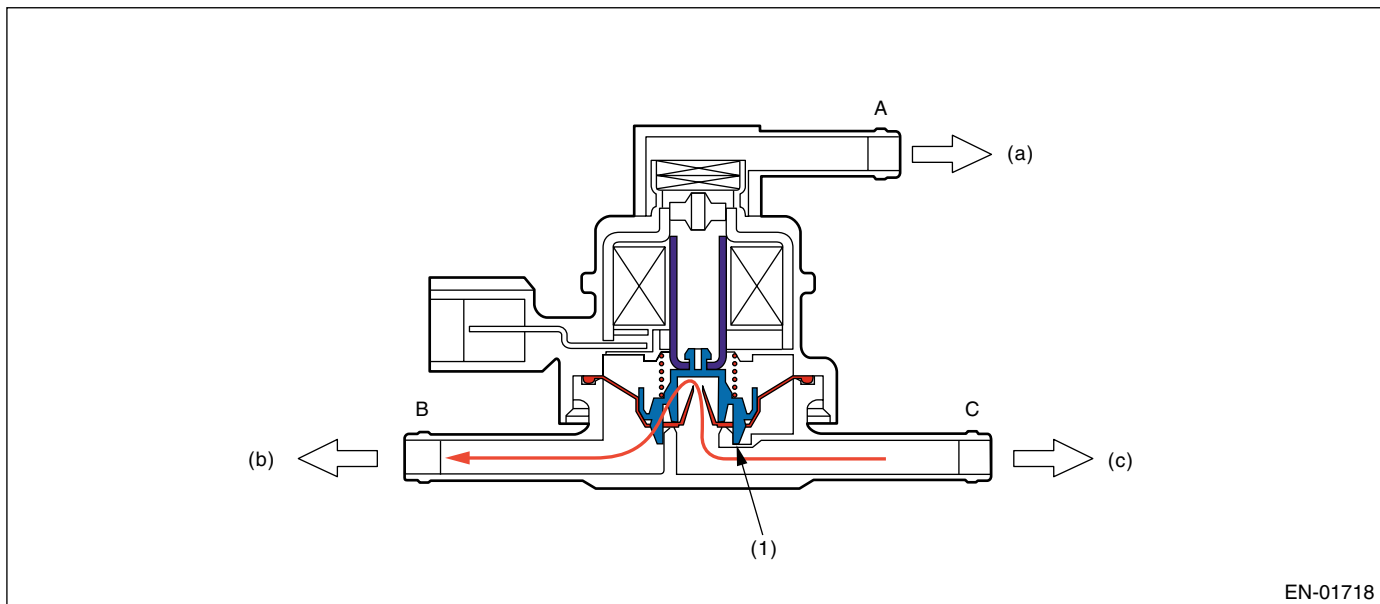
(1) Valve

(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

**GD(STi)-123**

• **When Solenoid is ON**



EN-01719

(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

## • CCV

CCV controls the ambient air to be introduced to the canister. Normally the solenoid is set to OFF and the valve is open. The valve is closed when the solenoid is set to ON only at the time of diagnosis.
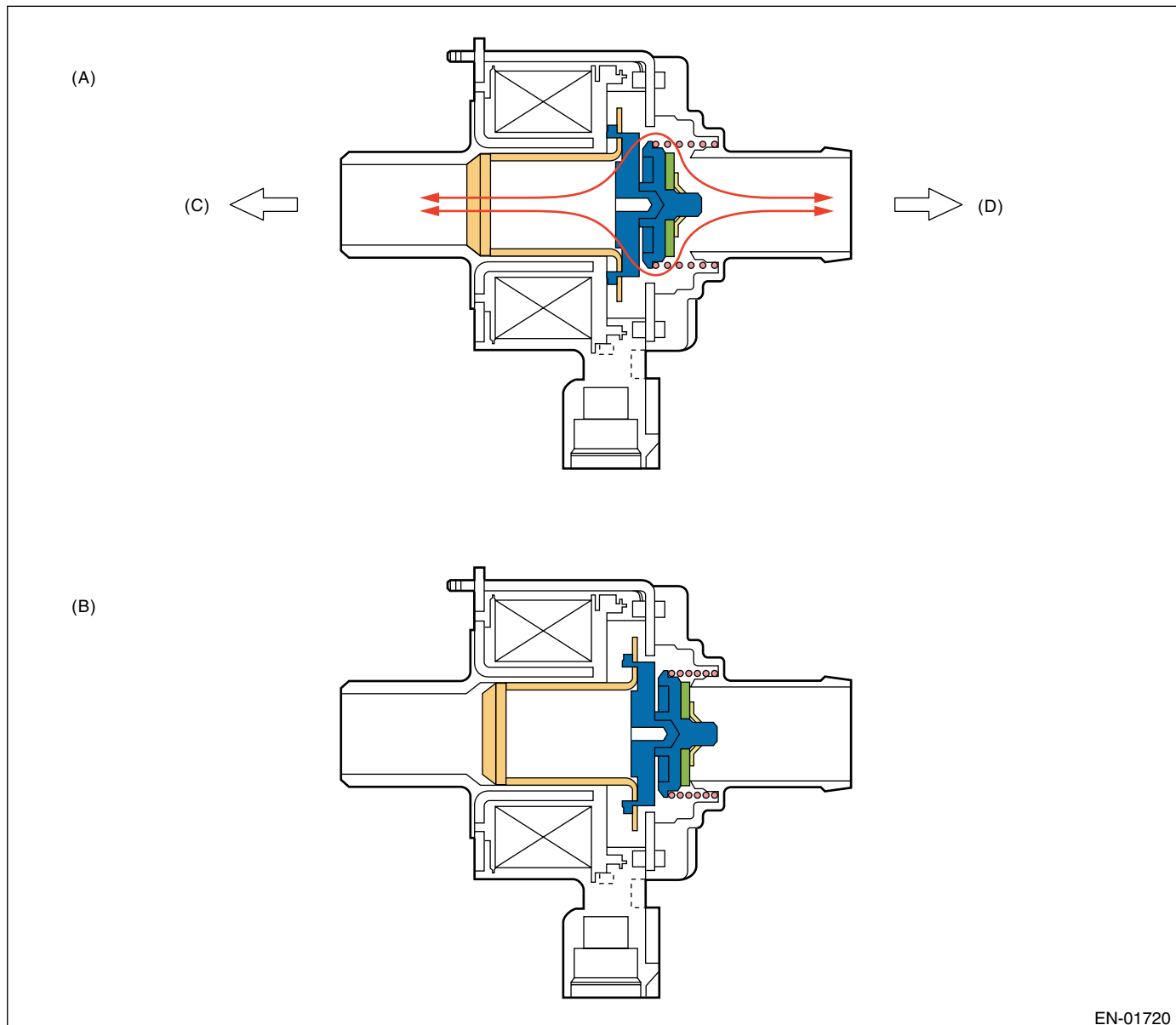


EN-01720

(A)   Open (Solenoid OFF)
(B)   Close (Solenoid ON)
(C)   Filter
(D)   Canister

**• Tank Pressure Switching Solenoid**

One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid is set to ON at diagnosis and the passage open to atmosphere is closed.



EN-01721
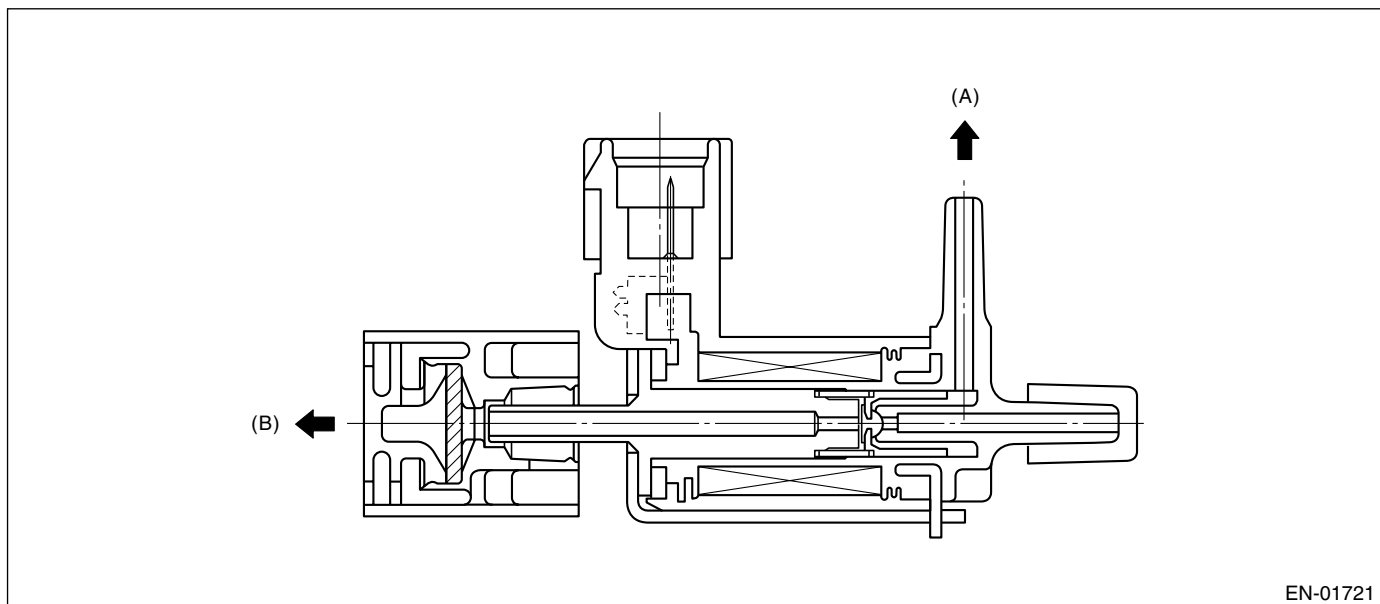
(A)  Fuel tank pressure sensor

(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.
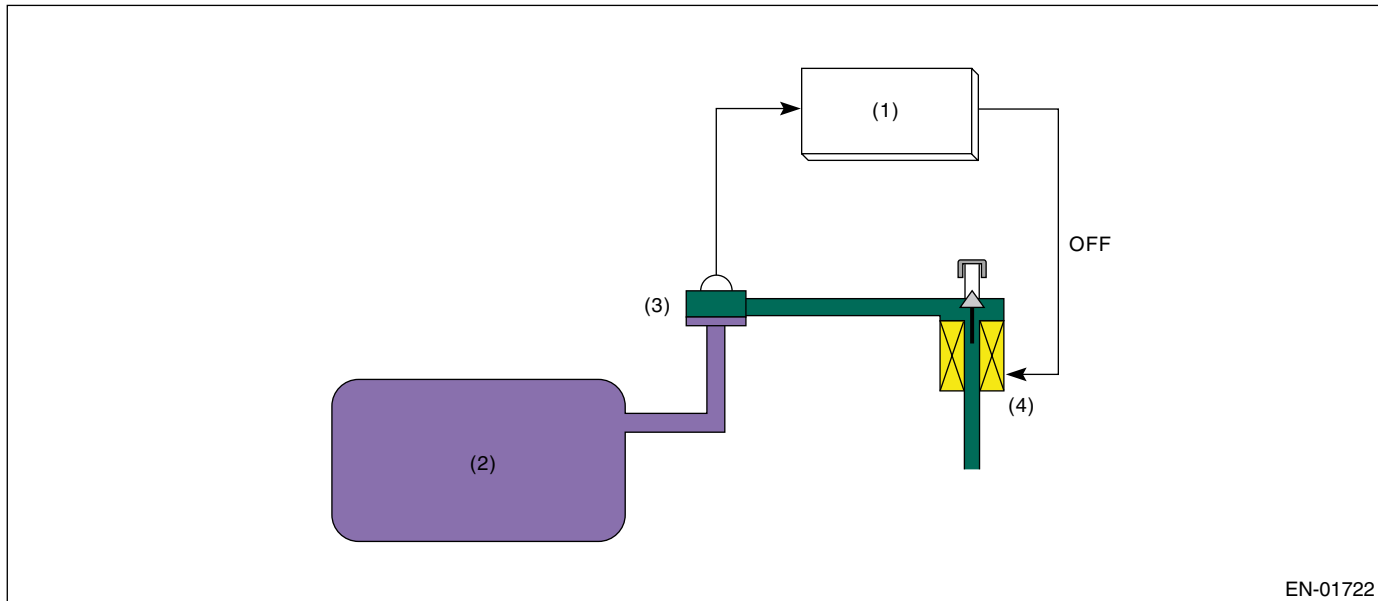


EN-01722

(1)  Engine control module (ECM)

(2)  Fuel tank

(3)  Fuel tank pressure sensor

(4)  Atmospheric pressure switching solenoid

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.
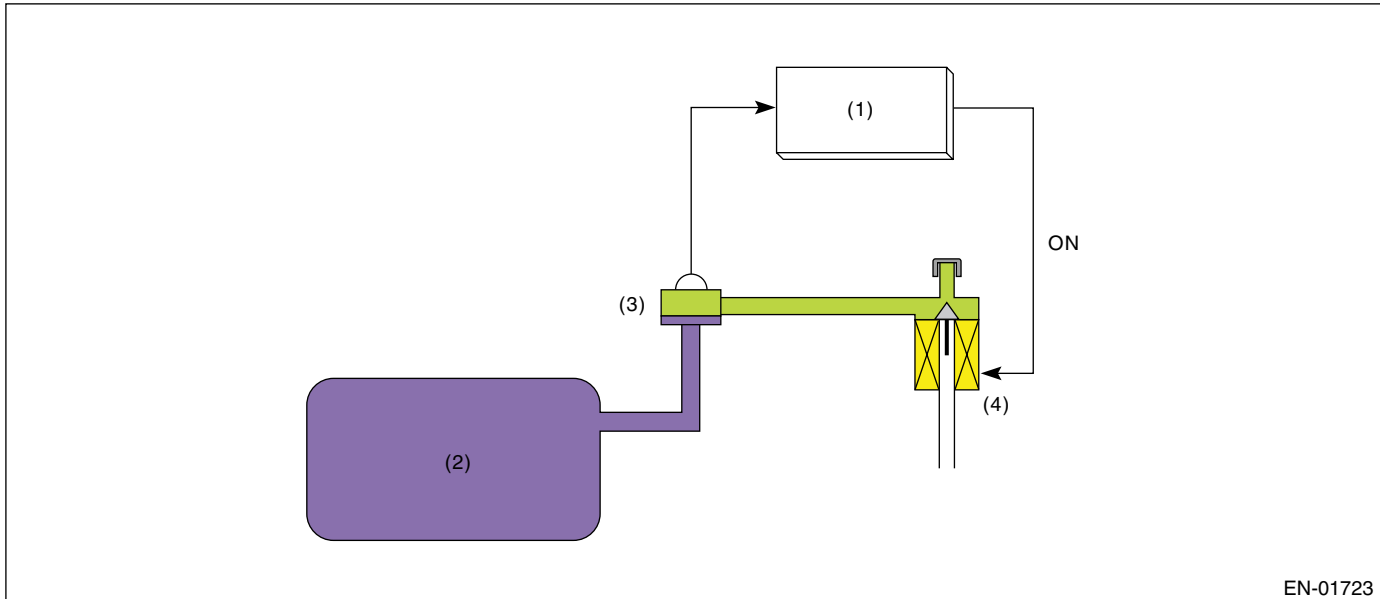


EN-01723

(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.

## 3. ENABLE CONDITION

### 0.04-inch Diagnosis

| Secondary Parameters | Enable Conditions |
|---|---|
| Evaporation diagnosis | Incomplete |
| Battery voltage | ≥ 10.9 V |
| Barometric pressure | ≥ 75.1 kPa (563 mmHg, 22.2 inHg) |
| Total time of canister purge operation | 120 seconds or more |
| After engine starting | 856 seconds or more |
| Learning value of evaporation gas density | ≤ 0.04 |
| Engine speed | 1050 ↔ 6500 rpm |
| Fuel tank pressure | −4.0 — 1.03 kPa (−30 — 7.72 mmHg, −1.2 — 0.30 inHg) |
| Intake manifold vacuum (relative pressure) | < −13.3 kPa (−100 mmHg, −3.92 inHg) |
| Vehicle speed | ≥ 32 km/h (20 MPH) |
| Fuel level | 9 ↔ 51 ℓ (2.38 ↔ 13.5 US gal, 1.98 ↔ 11.2 Imp gal) |
| Closed air/fuel ratio control | In operation |
| Fuel temperature | −10 ↔ 45°C (14 ↔ 113°F) |
| Intake air temperature | ≥ −10°C (14°F) |
| Pressure change per second | < 0.13 kPa (0.95 mmHg, 0.04 inHg) |
| Min. pressure change per second – Max. pressure change per second | < 0.23 kPa (1.75 mmHg, 0.07 inHg) |
| Fuel level change | < 2.5 ℓ (0.66 US gal, 0.55 Imp gal)/131 milliseconds |
| Air fuel ratio | > 0.76 — 1.25 |

**0.02-inch Diagnosis**

| Secondary Parameters | Enable Conditions |
|---|---|
| (At starting a diagnosis) | |
| EVAP. diagnosis | Incomplete |
| Battery voltage | ≥ 10.9 V |
| Atmospheric pressure | ≥ 75.1 kPa (563 mmHg, 22.2 inHg) |
| Since last incomplete diagnosis event of 0.02-inch leakage | ≥ 120 seconds |
| Total time of canister purge operation | 120 second or more |
| After engine starting | 335 second or more |
| Fuel temperature | −10 ↔ 35°C (14 ↔ 95°F) < 2400 seconds |
| Or engine coolant temperature at engine start | < 45°C (113°F) |
| And time after engine start | < 2400 seconds |
| Fuel level | 9 ↔ 51 ℓ (2.38 ↔ 13.5 US gal, 1.98 ↔ 11.2 Imp gal) |
| (Ambient − fuel) temperature | < 1°C (1.8°F) |
| Fuel tank pressure below −3.01 kPa (−22.8 mmHg, −0.88 inHg) (during same driving cycle) | Up to 2 times |
| Intake manifold vacuum (relative pressure) | < −13.3 kPa (−100 mmHg, −3.92 inHg) |
| Fuel tank pressure | −0.13 — 0.91 kPa (−1 — 6.8 mmHg, −0.04 — 0.27 inHg) |
| Vehicle speed | ≥ 68 km/h (42 MPH) |
| Closed air/fuel ratio control | In operation |
| Engine speed | 1500 ↔ 3000 rpm |
| (During diagnosis) | |
| P1 | −0.13 ↔ 0.13 kPa (−1 ↔ 1 mmHg, −0.04 ↔ 0.04 inHg) |
| Pressure change per second | < 0.13 kPa (0.96 mmHg, 0.04 inHg) |
| Fuel level change | 1 ↔ 3 ℓ (0.3 ↔ 0.8 US gal, 0.2 ↔ 0.7 Imp gal) |
| Tank pressure | < 1.03 kPa (7.72 mmHg, 0.30 inHg) |
| Min. tank pressure change per second − Max. tank pressure change per second | < 0.23 kPa (1.75 mmHg, 0.07 inHg) |
| Change of atmospheric pressure during P1 calculation | −0.04 ↔ 0.13 kPa (−0.3 ↔ 1 mmHg, −0.01 ↔ 0.04 inHg) |
| Change of atmospheric pressure during P2 calculation | 0 ↔ 0.12 kPa (0 ↔ 0.9 mmHg, 0 ↔ 0.04 inHg) |

## 4. GENERAL DRIVING CYCLE

### • 0.04-inch Diagnosis

• Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.
• Pay attention to the fuel temperature and fuel level.

### • 0.02-inch Diagnosis

• Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
• If not judged OK or NG, repeat the diagnosis until judged OK or NG.
• Pay attention to the fuel temperature and fuel level.

## 5. DIAGNOSTIC METHOD

### • MODE Z (Purge control solenoid valve open malfunction diagnosis, 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. The occurrence of this status before the diagnosis results in erroneous diagnosis, because 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.
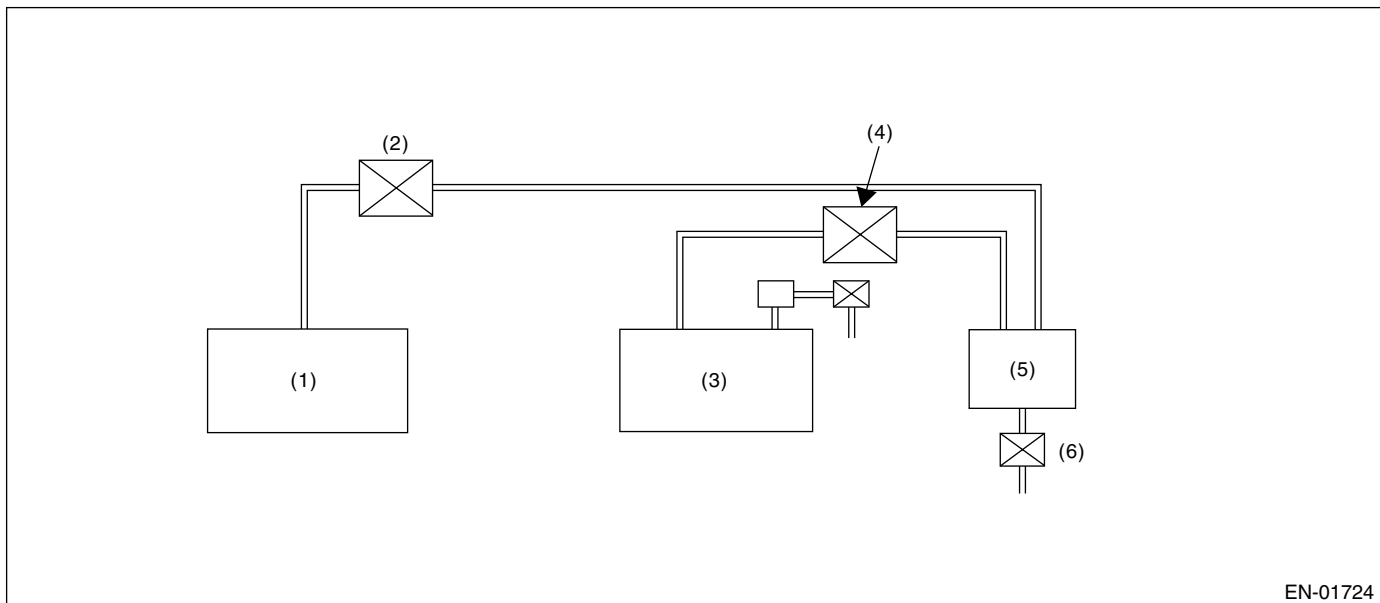


EN-01724

| | | | |
|---|---|---|---|
| (1) | Engine | (4) | Pressure control solenoid valve close |
| (2) | Purge control solenoid valve open | (5) | Canister |
| (3) | Fuel tank | (6) | CCV stuck close |
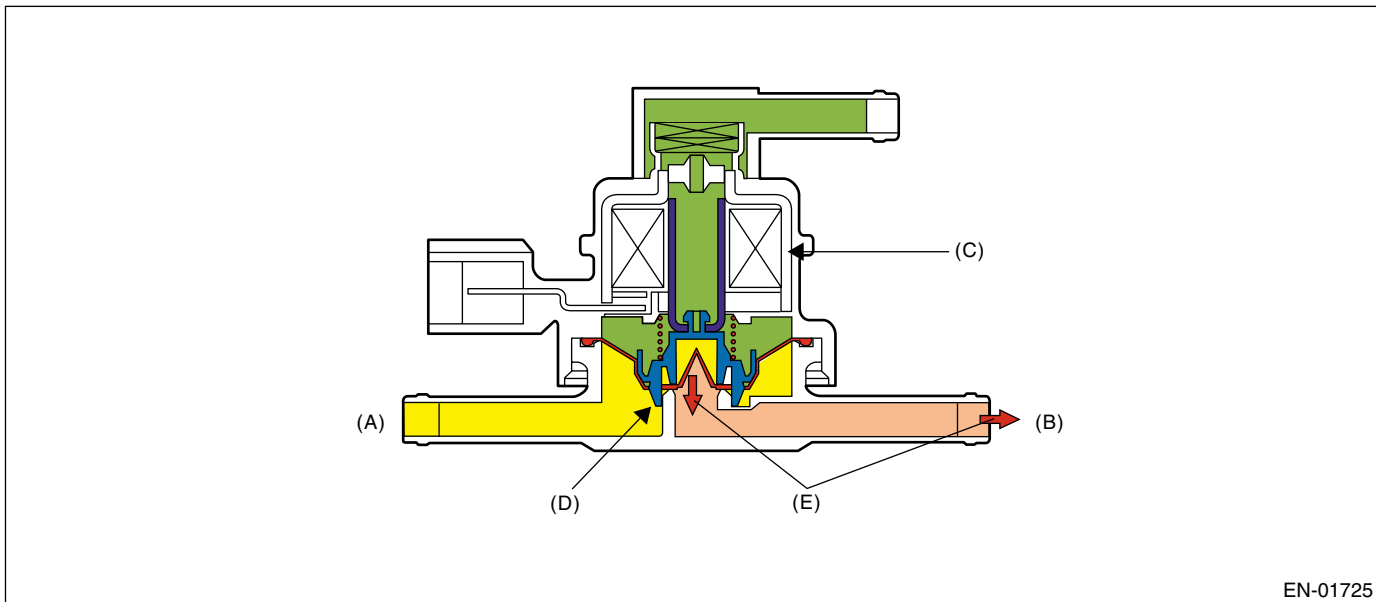
EN-01725

(A) To fuel tank

(B) To canister (Negative pressure)

(C) Solenoid ON

(D) Valve cannot be open.

(E) Negative pressure

## • Diagnostic method

CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.
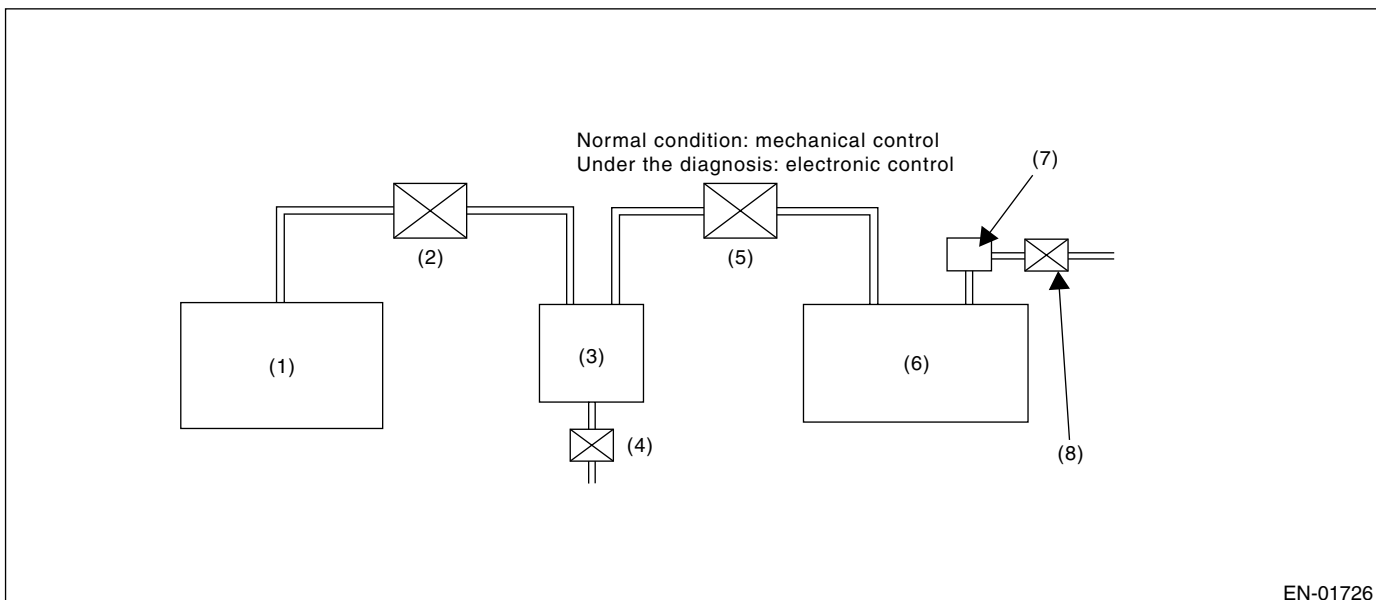


EN-01726

(1) Engine

(2) Purge control solenoid valve

(3) Canister

(4) Drain valve

(5) Pressure control solenoid valve

(6) Fuel tank

(7) Fuel tank pressure sensor

(8) Tank pressure switching solenoid valve

## • Normal Operation



EN-01873
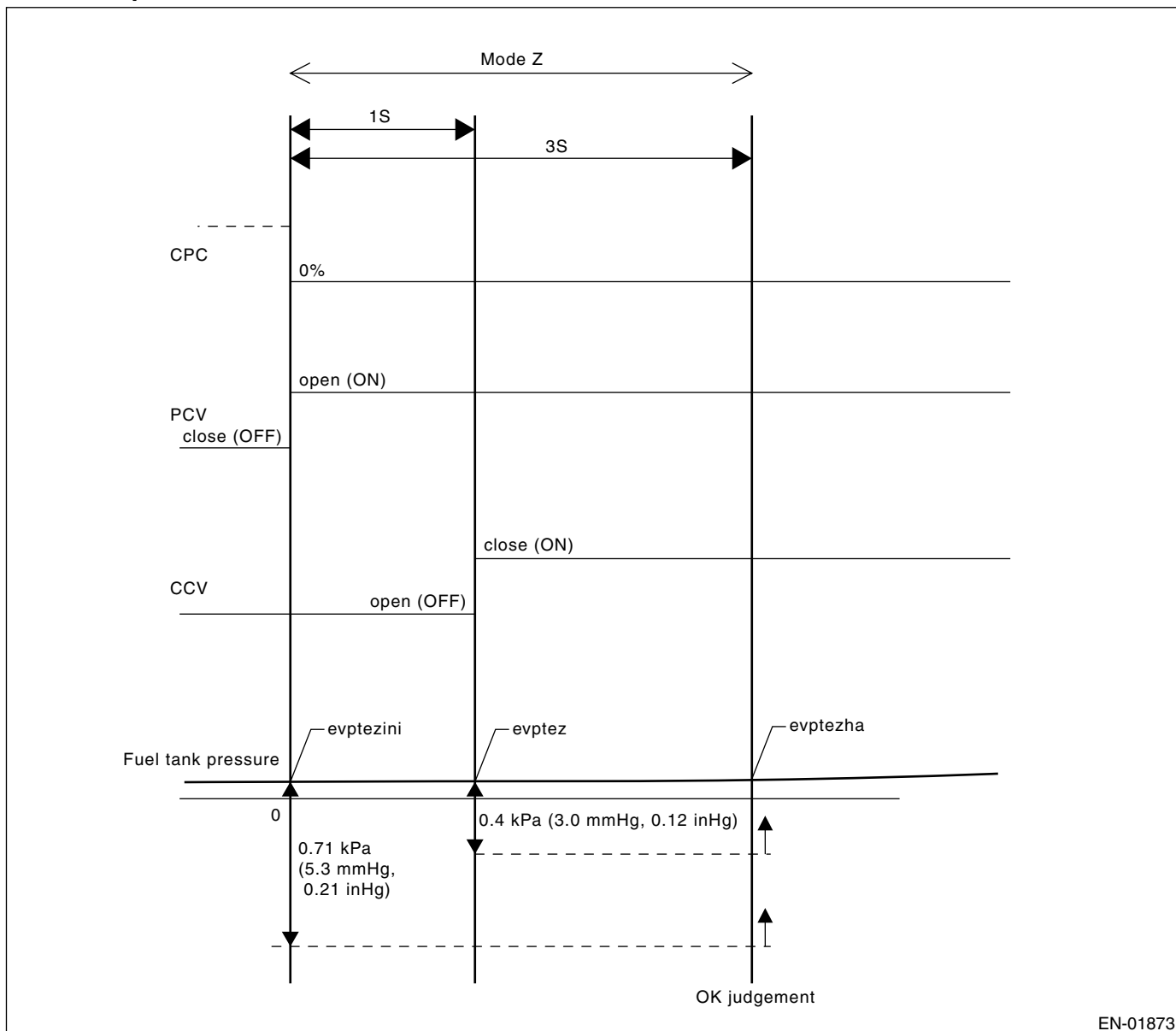
- evptez − evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
- evptezini − evptezha ≤ 0.71 kPa (5.3 mmHg, 0.21 inHg)

Judge normal when these calculations are completed.

• **Purge Control Solenoid Valve Open Fixation**



EN-01874
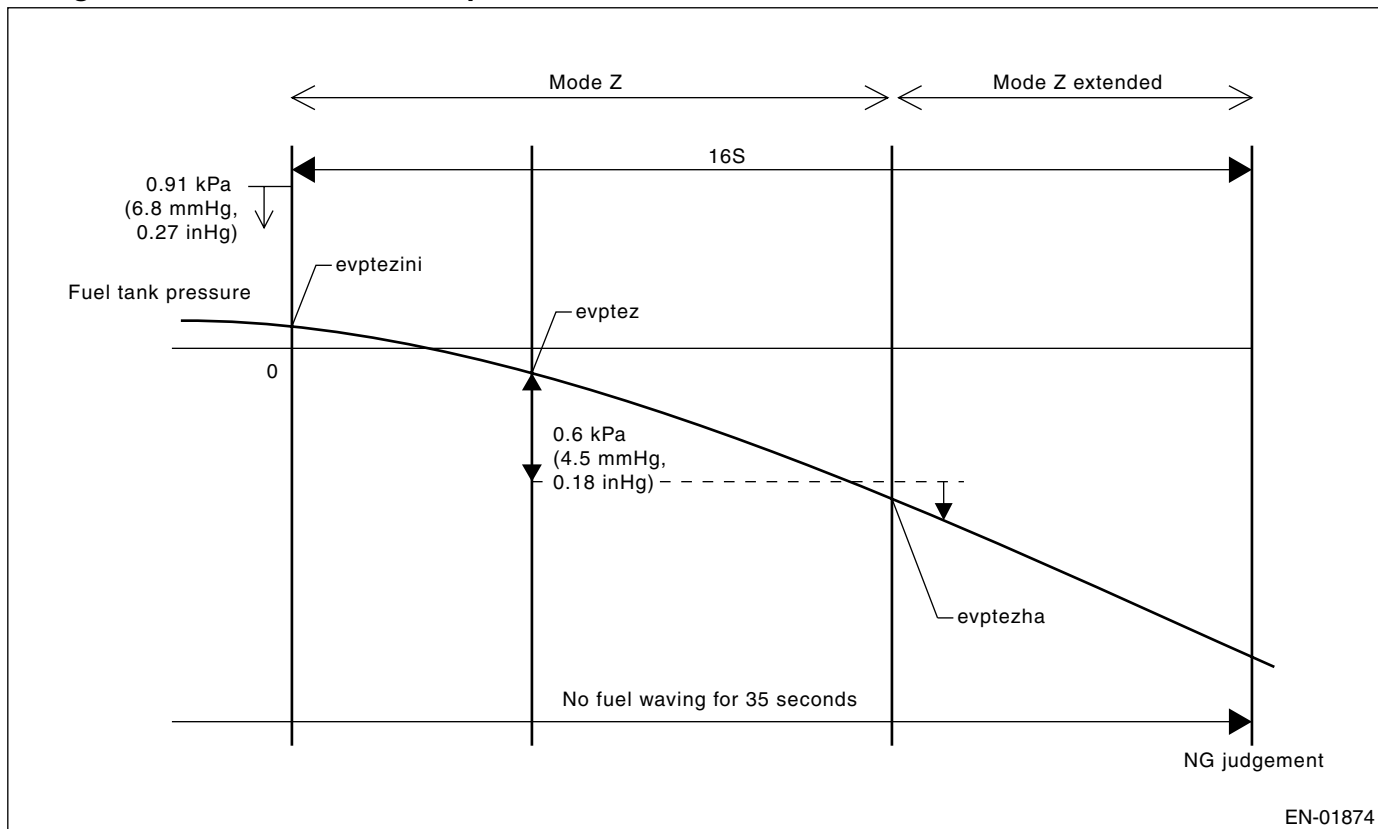
- $evptez - evptezha > 0.6$ kPa (4.5 mmHg, 0.18 inHg)
- $evptezini \leq 0.91$ kPa (6.8 mmHg, 0.27 inHg)
- No fuel rolling of above 3 ℓ (0.79 US gal, 0.67 Imp gal) for more than 35 seconds.

Judge normal when these calculations are completed.

**• Drain Valve close fixation**



Mode Z

Mode Z extended

16S

evptezini

Fuel tank pressure

evptez

0.91 kPa
(6.8 mmHg,
0.27 inHg)

0.71 kPa
(5.3 mmHg,
0.21 inHg)

0

evptezha

No fuel waving for 35 seconds

NG judgement

EN-01875
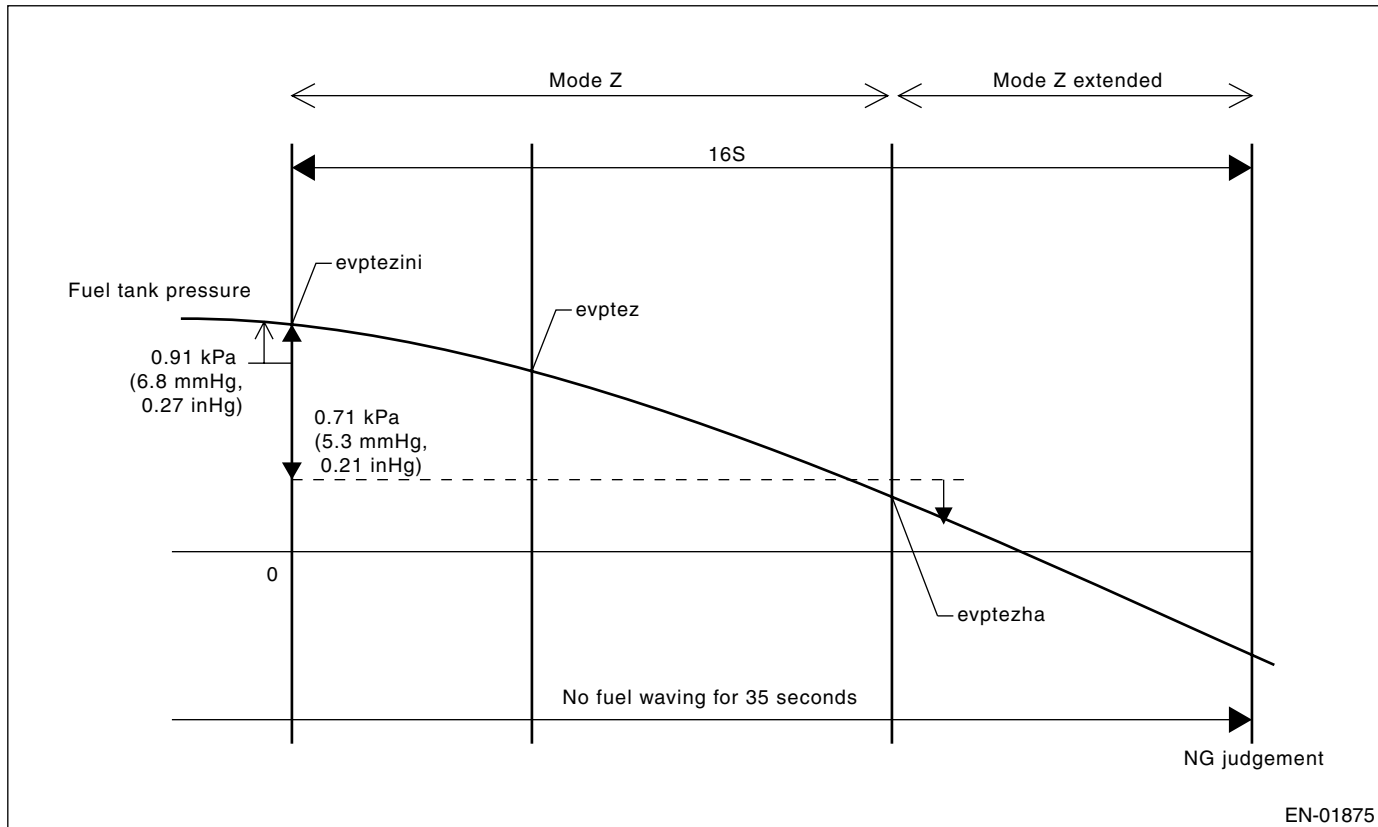
• evptezini − evptezha > 0.71 kPa (5.3 mmHg, 0.21 inHg)
• evptezini > 0.91 kPa (6.8 mmHg, 0.27 inHg)
• No fuel rolling of above 3 ℓ (0.79 US gal, 0.67 Imp gal) for more than 35 seconds
Judge normal when these calculations are completed.

### • Diagnosing Function of CCV [P1443]

CCV functional diagnosis (closed fixation) is performed by closing CPC and opening pressure control solenoid valve.

If the CCV is normal, the canister pressure is always kept close to atmospheric air pressure because the CCV is usually open. Therefore, the tank pressure when CPC is closed and pressure control solenoid valve is opened becomes close to atmospheric air pressure.

However, if CCV closed fixation trouble occurred, negative pressure is generated in the canister before the diagnosis because the negative pressure in the intake manifold is introduced to the canister by opening CPC.

If CPC is closed and pressure control solenoid valve is opened in this status, negative pressure is generated in the tank because the negative pressure in the canister is introduced to the tank.

CCV functional diagnosis is performed by monitoring the tank pressure variation when CPC is closed and pressure control solenoid valve is opened.

### Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

### Judgment Value

| Malfunction Criteria | Threshold Value | DTC |
|---|---|---|
| (Tank pressure when drain valve open → close) – (Tank pressure when Mode Z finished) | ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg) | P1443 |
| (Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished) | ≤ 0.7 kPa (5.3 mmHg, 0.21 inHg) | P0457 |

### 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) | |
| No fuel locking time | ≥ 35 seconds | |

**Time Needed for Diagnosis:** 16 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

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

**• Diagnosing function of CPC [P0457]**

Perform CPC functional diagnosis (open fixation) by closing CCV when CPC is closed and pressure control solenoid valve is opened.
If CPC is normal, the tank pressure does not vary even when CCV is closed.
However, if CPC open fixation trouble occurred, the negative pressure in the intake manifold is introduced to the tank when CCV is closed, generating negative pressure in the tank.
CPC functional diagnosis is performed by monitoring the tank pressure when CCV is closed.
**Normality Judgment**
Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.
Both diagnostic method and judgment value are the same as PCV normality judgment.
**Abnormality Judgment**
If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.
**Judgment Value**

| Malfunction Criteria | Threshold Value | DTC |
|---|---|---|
| (Tank pressure when drain valve open → close) − (Tank pressure when Mode Z finished) | > 0.6 kPa (4.5 mmHg, 0.17 inHg) | P0457 |
| Tank pressure when Mode Z started | ≤ 0.91 kPa (6.8 mmHg, 0.27 inHg) | |
| No fuel locking time | ≥ 35 seconds | |

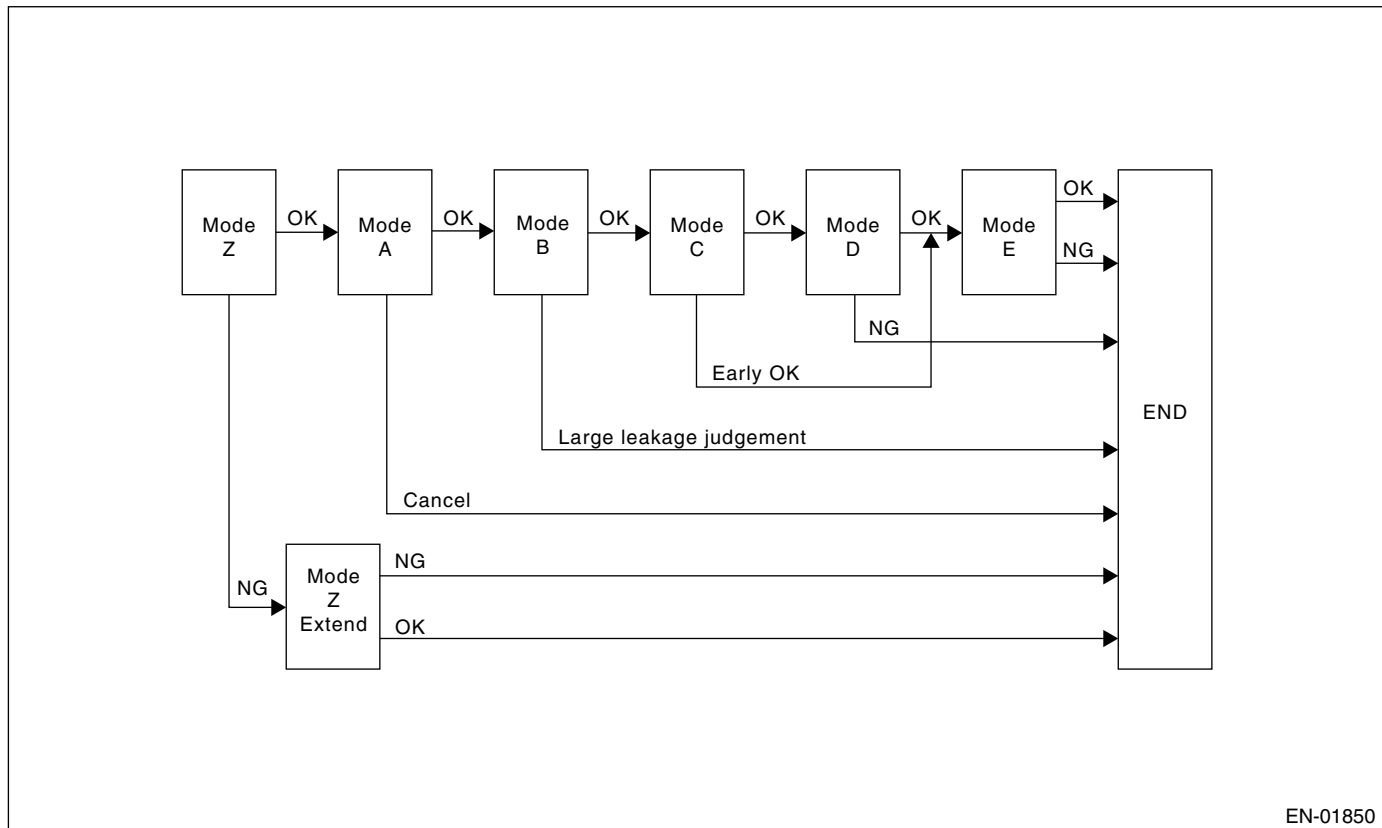**Time Needed for Diagnosis:** 16 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.
Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.
Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

**• Leak Diagnosis**

DTC P0442
DTC P0456
DTC P0457

**• Diagnostic method**

• The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
• The diagnosis is divided into the following five phases.

**Mode A; (Estimation of evaporation gas yield)**

Because CPC and CCV are closed, the tank pressure increases in proportion to evaporator generation. This tank pressure variation amount is P1. After calculating P1, change to Mode B.

**Mode B; (Seal negative pressure)**

Open CPC and introduce the negative pressure in the intake manifold to the tank.

Approx. $0 \rightarrow -1.4$ kPa $(0 \rightarrow -10.5$ mmHg, $0 \rightarrow -0.41$ inHg) (0.04-in diagnosis)

Approx. $0 \rightarrow -3.05$ kPa $(0 \rightarrow -22.9$ mmHg, $0 \rightarrow -0.9$ inHg) (0.02-in diagnosis)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.

Judge NG when the malfunction criteria below is completed.

Finish the Evap. diagnosis when judging large leak (10 seconds or 25 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (10 to 20 seconds) in 0.02-inch diagnosis.

**Abnormality Judgment**

Judge NG (large leak) when the criteria below are completed in the specified time.

**Judgment Value**

| Malfunction Criteria | Threshold Value | DTC |
|---|---|---|
| (0.04-inch diagnosis) | | P0457 |
| Time for reaching desired negative pressure | $\geq$ 25 seconds | |
| Or time for Mode B | $\geq$ 10 seconds | |
| (Min. value of tank pressure during Mode B) − (Tank pressure when Mode B started) | $< -5$ kPa $(-4$ mmHg, $-0.16$ inHg) | |

**Mode C; (Check increasing pressure)**

Stop the introduction of negative pressure by shutting the purge control solenoid valve. (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 with CPC closed. 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.

**• 0.04-inch Diagnosis**

**Abnormality Judgment**

Judge NG when the criteria below are completed and judge OK when not completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value | DTC |
|---|---|---|
| $P2 - 1.5 \times P1$<br><br>P2: Change of tank pressure within 16 seconds on Mode D<br><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) | 0.49 kPa (3.68 mmHg, 0.14 inHg) | 0.49 kPa (3.68 mmHg, 0.14 inHg) | 0.53 kPa (3.95 mmHg, 0.16 inHg) | 0.54 kPa (4.07 mmHg, 0.16 inHg) | 0.56 kPa (4.17 mmHg, 0.16 inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal) | 0.50 kPa (3.77 mmHg, 0.15 inHg) | 0.51 kPa (3.79 mmHg, 0.15 inHg) | 0.53 kPa (4.01 mmHg, 0.16 inHg) | 0.56 kPa (4.17 mmHg, 0.16 inHg) | 0.57 kPa (4.27 mmHg, 0.17 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal) | 0.51 kPa (3.85 mmHg, 0.15 inHg) | 0.52 kPa (3.90 mmHg, 0.15 inHg) | 0.54 kPa (4.06 mmHg, 0.16 inHg) | 0.57 kPa (4.27 mmHg, 0.17 inHg) | 0.60 kPa (4.48 mmHg, 0.18 inHg) |
| 40 L (10.6 US gal, 8.8 Imp gal) | 0.65 kPa (4.88 mmHg, 0.19 inHg) | 0.65 kPa (4.90 mmHg, 0.19 inHg) | 0.66 kPa (4.98 mmHg, 0.20 inHg) | 0.71 kPa (5.32 mmHg, 0.21 inHg) | 0.76 kPa (5.73 mmHg, 0.23 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.79 kPa (5.96 mmHg, 0.23 inHg) | 0.79 kPa (5.96 mmHg, 0.23 inHg) | 0.79 kPa (5.96 mmHg, 0.23 inHg) | 0.85 kPa (6.38 mmHg, 0.25 inHg) | 0.88 kPa (6.60 mmHg, 0.26 inHg) |

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

• **0.02-inch Diagnosis**

**Abnormality Judgment**

Judge NG when the criteria below are 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 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) | 0.56 kPa (4.19 mmHg, 0.16 inHg) | 0.59 kPa (4.40 mmHg, 0.18 inHg) | 0.62 kPa (4.66 mmHg, 0.18 inHg) | 0.66 kPa (4.92 mmHg, 0.19 inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal) | 0.63 kPa (4.70 mmHg, 0.19 inHg) | 0.65 kPa (4.88 mmHg, 0.19 inHg) | 0.70 kPa (5.27 mmHg, 0.21 inHg) | 0.79 kPa (5.89 mmHg, 0.23 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal) | 0.69 kPa (5.20 mmHg, 0.20 inHg) | 0.71 kPa (5.35 mmHg, 0.21 inHg) | 0.78 kPa (5.87 mmHg, 0.23 inHg) | 0.83 kPa (6.20 mmHg, 0.24 inHg) |
| 40 L (10.6 US gal, 8.8 Imp gal) | 0.75 kPa (5.65 mmHg, 0.22 inHg) | 0.78 kPa (5.83 mmHg, 0.23 inHg) | 0.85 kPa (6.39 mmHg, 0.25 inHg) | 0.88 kPa (6.58 mmHg, 0.26 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.81 kPa (6.10 mmHg, 0.24 inHg) | 0.84 kPa (6.30 mmHg, 0.25 inHg) | 0.92 kPa (6.90 mmHg, 0.27 inHg) | 0.95 kPa (7.10 mmHg, 0.28 inHg) |

**Normality Judgment**

Judge OK when the criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value | DTC |
|---|---|---|
| P2 − 1.5 × P1 | < Valve on map 9. | P0456 |

**Map 9.**

| Fuel temperature & Fuel level | 15°C (59°F) | 25°C (77°F) | 35°C (95°F) | 40°C (104°F) |
|---|---|---|---|---|
| 10 L (2.6 US gal, 2.2 Imp gal) | 2.00 kPa (15.0 mmHg, 0.59 inHg) | 3.33 kPa (25.0 mmHg, 0.98 inHg) | 4.66 kPa (35.0 mmHg, 1.38 inHg) | 5.33 kPa (40.0 mmHg, 1.57 inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal) | 0.36 kPa (2.69 mmHg, 0.11 inHg) | 0.39 kPa (2.90 mmHg, 0.11 inHg) | 0.42 kPa (3.16 mmHg, 0.12 inHg) | 0.46 kPa (3.42 mmHg, 0.13 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal) | 0.43 kPa (3.20 mmHg, 0.12 inHg) | 0.45 kPa (3.38 mmHg, 0.13 inHg) | 0.50 kPa (3.77 mmHg, 0.15 inHg) | 0.59 kPa (4.39 mmHg, 0.17 inHg) |
| 40 L (10.6 US gal, 8.8 Imp gal) | 0.49 kPa (3.70 mmHg, 0.15 inHg) | 0.51 kPa (3.85 mmHg, 0.15 inHg) | 0.58 kPa (4.37 mmHg, 0.17 inHg) | 0.63 kPa (4.70 mmHg, 0.19 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.61 kPa (4.60 mmHg, 0.18 inHg) | 0.64 kPa (4.80 mmHg, 0.19 inHg) | 0.72 kPa (5.40 mmHg, 0.21 inHg) | 0.75 kPa (5.60 mmHg, 0.22 inHg) |

If not judged OK or NG, repeat the diagnosis until judged OK or NG.

EN-01728
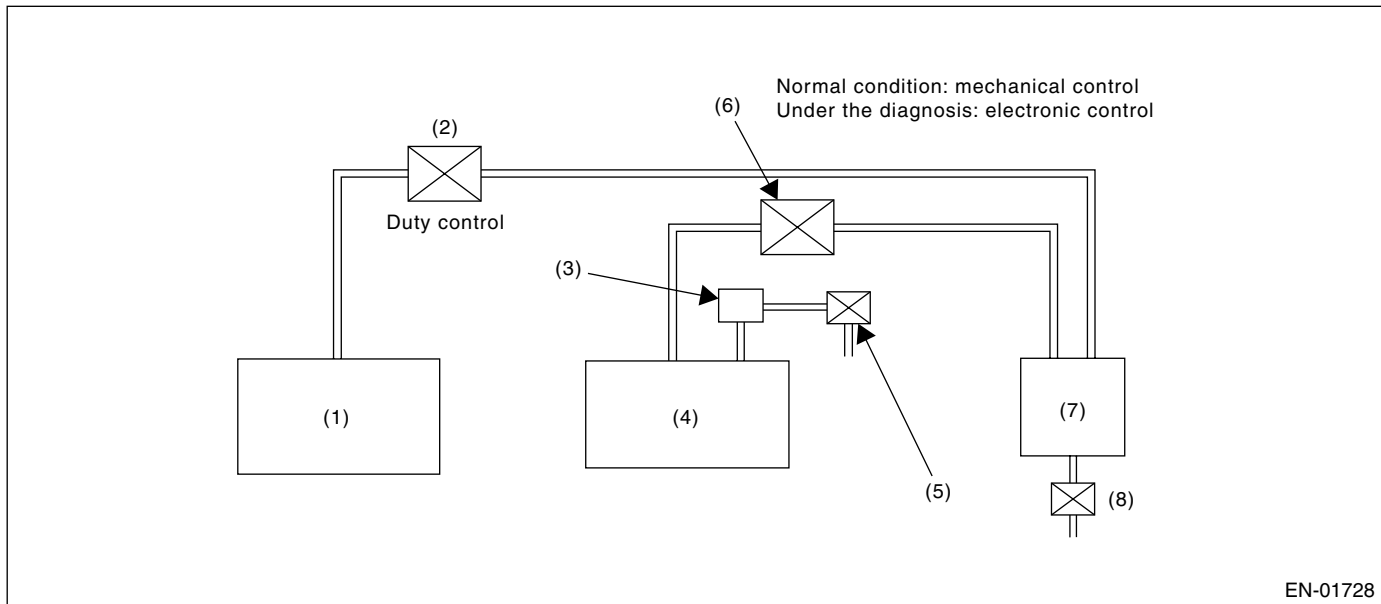
(1) Engine

(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

Diagnosis start

Mode Z | Mode A | Mode B | Mode C | Mode D | Mode E

Purge control solenoid valve — Open / Close

Pressure control solenoid valve — Open / Close

Drain valve — Open / Close

Fuel tank internal pressure — 0 / Negative pressure

P1

P2

-15 mmHg

Small leakage
$P2 - 1.5 \times P1 >$ Threshold value

EN-01729

**• CCV Property Diagnosis [P1443]**

**Mode E;**

The tank pressure must become again as high as the atmospheric air pressure, because the closed CCV becomes open 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:                 50 — 70 seconds

0.02-inch:                 90 — 105 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

## 9. ECM OPERATION AT DTC SETTING

• Memorize the freeze frame data. (For test mode $02)
• Memorize the diagnostic value and trouble standard value. (For test mode $06)

## BB:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01730
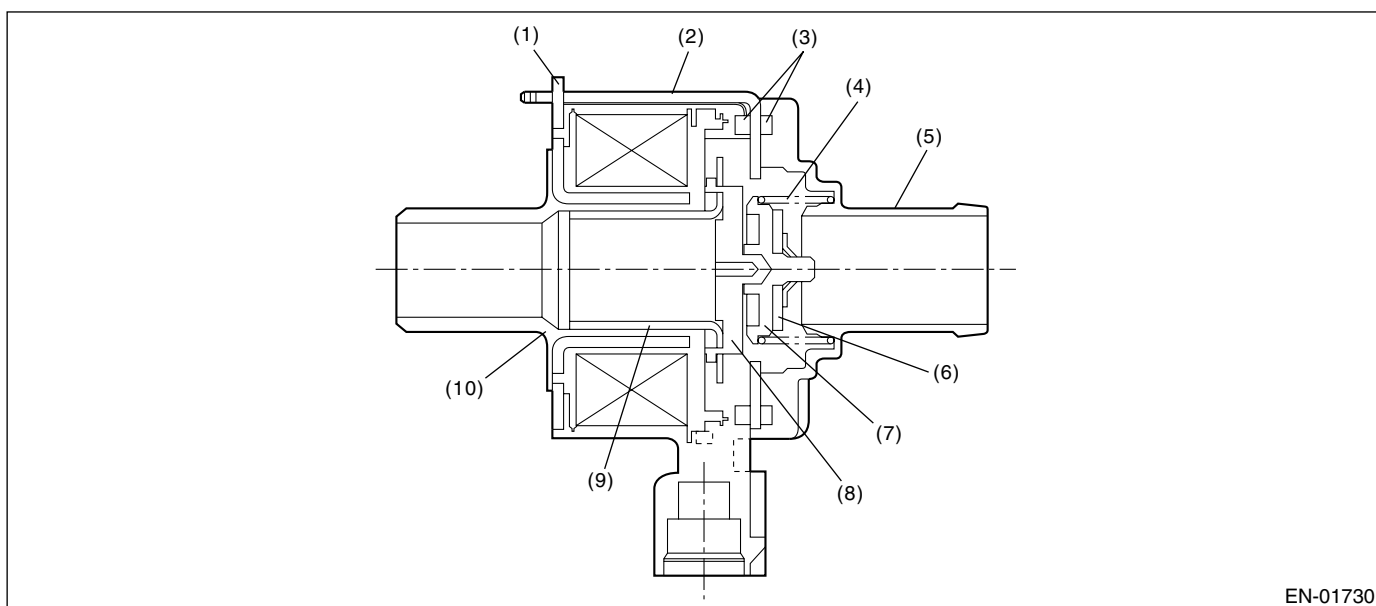
| | | | |
|---|---|---|---|
| (1) | Magnetic plate | (6) | Valve |
| (2) | Yoke | (7) | Plate |
| (3) | Packing | (8) | Retainer |
| (4) | Spring | (9) | Movable core |
| (5) | Valve seat | (10) | Bobbin |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| After engine starting | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | Low |

**Time Needed for Diagnosis:** 2.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| After engine starting | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | High |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

**GD(STi)-145**

## 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



EN-01730

(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat

(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
| --- | --- |
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| After engine starting | 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 | ≥ 10.9 V |
| After engine starting | 1 second or more |
| Terminal output voltage when ECM sends ON signal | Low |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

### 2. COMPONENT DESCRIPTION
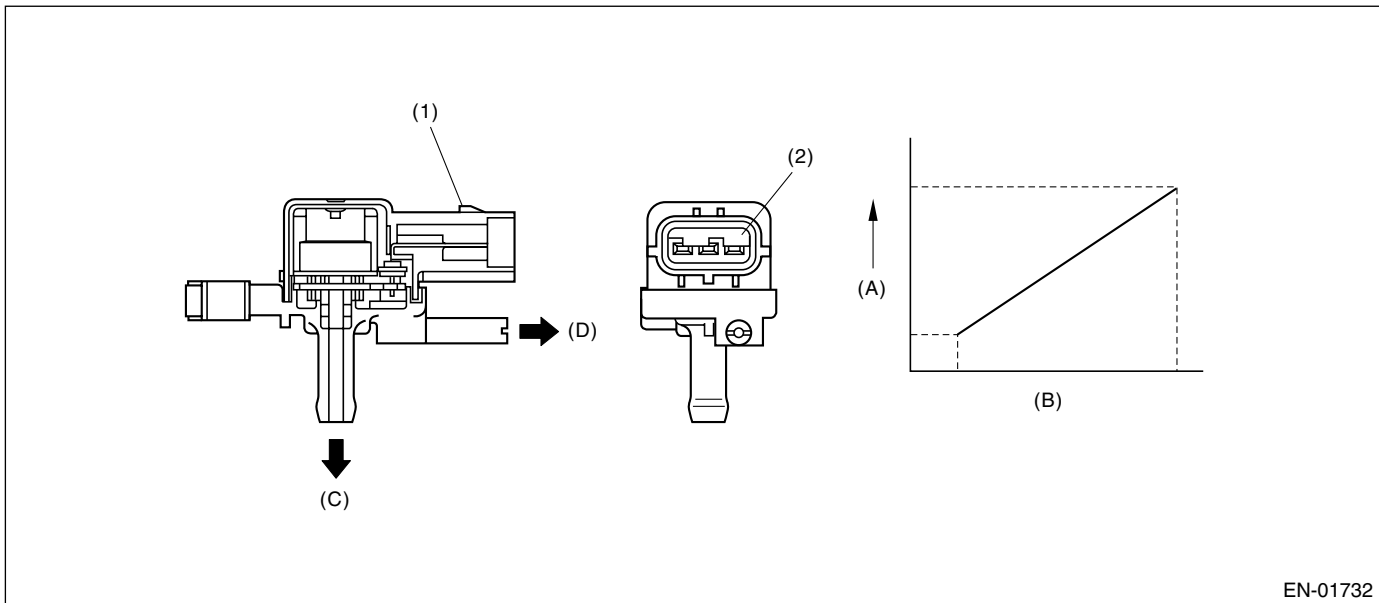
EN-01732

| | | | |
|---|---|---|---|
| (1) | Connector | (A) | Output voltage |
| (2) | Terminal | (B) | Input voltage |
| | | (C) | To fuel tank |
| | | (D) | To atmospheric pressure switching solenoid |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| After starting the engine | 60 second or more |
| Fuel level | ≥ 18 ℓ (4.76 US gal, 3.96 Imp gal) |
| Fuel temperature | < 35°C (95°F) |
| Battery voltage | ≥ 10.9 V |
| Atmospheric pressure | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Engine speed | < 6500 rpm |

### 4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Number of times when the difference between the Max. fuel level and the Min., fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44 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 2 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. − Min.) is more than 2 ℓ .

**Time Needed for Diagnosis:** 1 second × 16 times or more

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Max. − Min. tank pressure | ≥ 0.05 kPa (0.375 mmHg, 0.02 inHg) |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01732
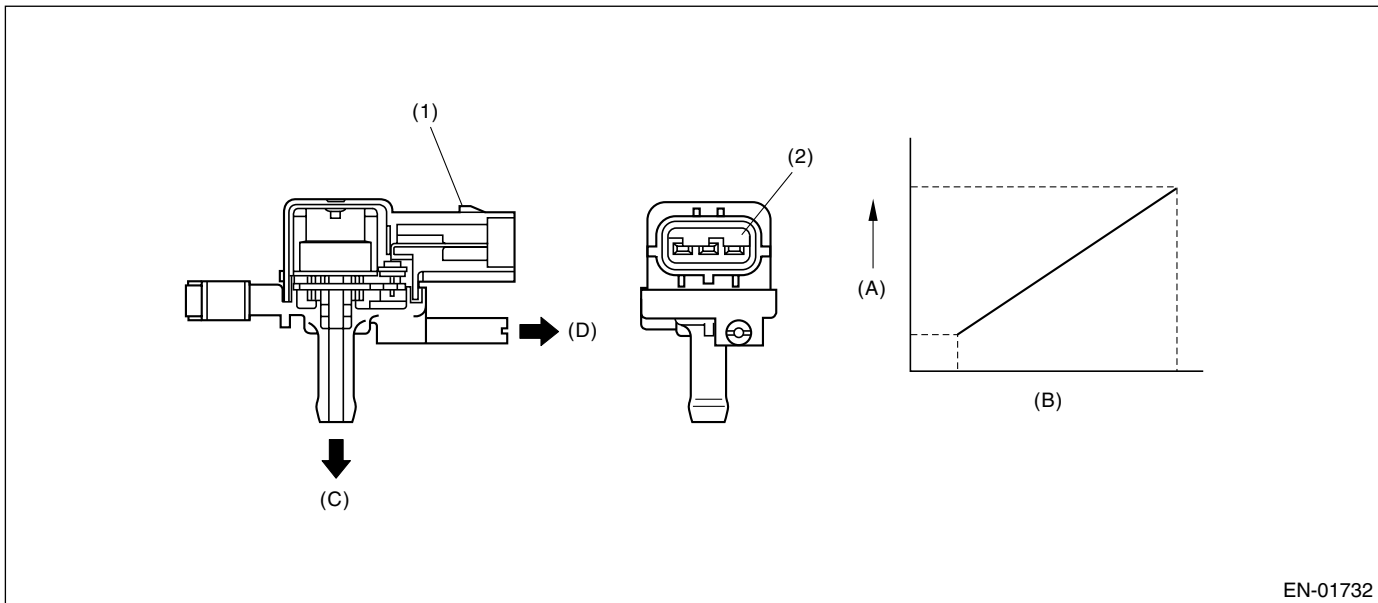
| (1) | Connector | (A) | Output voltage |
| (2) | Terminal | (B) | Input voltage |
| | | (C) | To fuel tank |
| | | (D) | To atmospheric pressure switching solenoid |

### 3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMAL JUDGMENT)

| Secondary Parameters | Enable Conditions |
| --- | --- |
| Continuous time of completing all condition | ≥ 5 seconds |
| Vehicle speed | ≥ 2 km/h (1 MPH) |
| All conditions of EVAP canister purge | Possible |
| Learning value of EVAP conc. during purge | ≤ 0.08 |
| Feedback lambda coefficient | ≥ 0.9 |
| Battery voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Fuel tank pressure | < −7.45 kPa (−55.85 mmHg, −2.20 inHg) |
| Feedback lambda coefficient | ≥ 0.9 |

**Time Needed for Diagnosis:** 15 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.
**• Normality Judgment**

Judge OK when the malfunction criteria below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Fuel tank pressure | ≥ −7.33 kPa (−55 mmHg, −2.17 inHg) |
| Feedback lambda coefficient | ≥ 0.9 |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01732
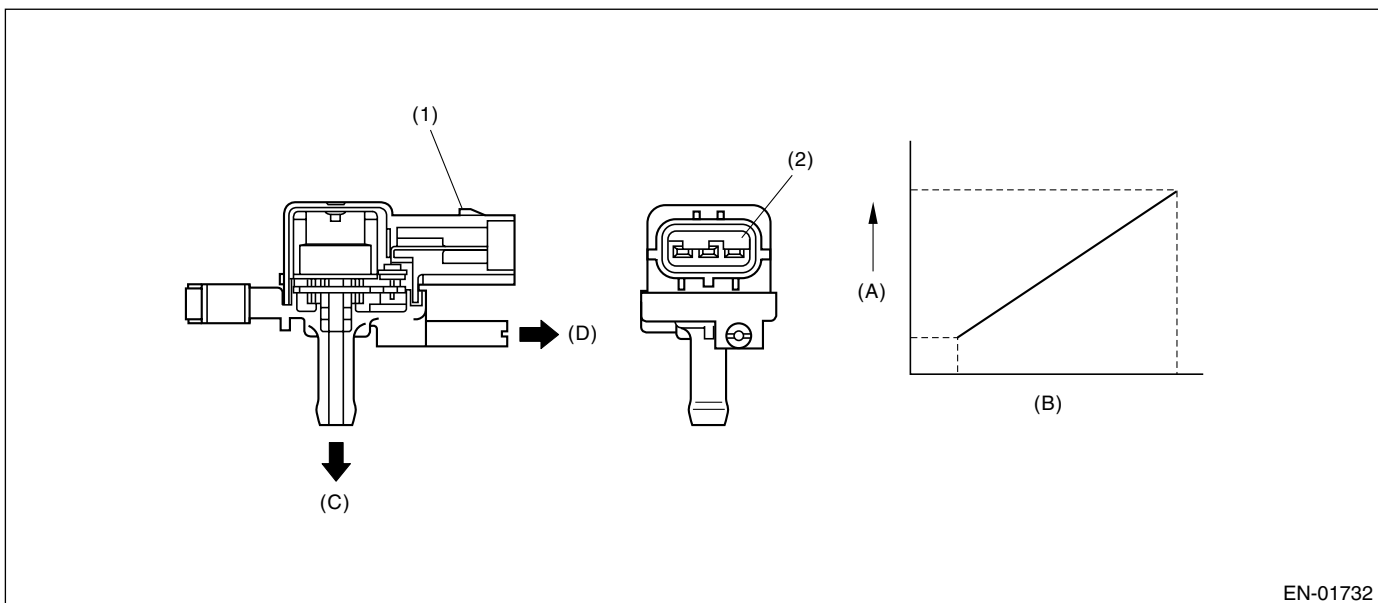
(1)  Connector

(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. | ≥ 5 seconds |
| Vehicle speed | ≥ 2 km/h (1.24 MPH) |
| All conditions of EVAP canister purge | Complete |
| Evaporation gas density learning value | ≤ 0.08 |
| Main feedback compensation coefficient | ≥ 0.9 |
| Battery voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

## 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Fuel tank pressure | ≥ 7.98 kPa (59.85 mmHg, 2.36 inHg) |
| Fuel temperature | < 35°C (95°F) |
| Atmospheric pressure | ≥ 75.1 kPa (563 mmHg, 22.2 inHg) |

**Time Needed for Diagnosis:** 15 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.
**• Normality Judgment**

Judge OK when the malfunction criteria below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Fuel tank pressure | ≥ 7.33 kPa (55 mmHg, 2.17 inHg) |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## BG:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DE- TECTED (VERY SMALL LEAK) —

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DE-TECTED (SMALL LEAK). <Ref. to GD(STi)-117, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

## BH:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DE- TECTED (FUEL CAP LOOSE/OFF) —

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DE-TECTED (SMALL LEAK). <Ref. to GD(STi)-117, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

## 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 | ≥ 10.9 V |
| After engine starting | 1 second or more |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Continuous time of completing criteria below. | ≥ 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.

**GD(STi)-155**

**• Normality Judgment**

Judge OK and clear NG when the malfunction criterion below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Terminal output voltage | High |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

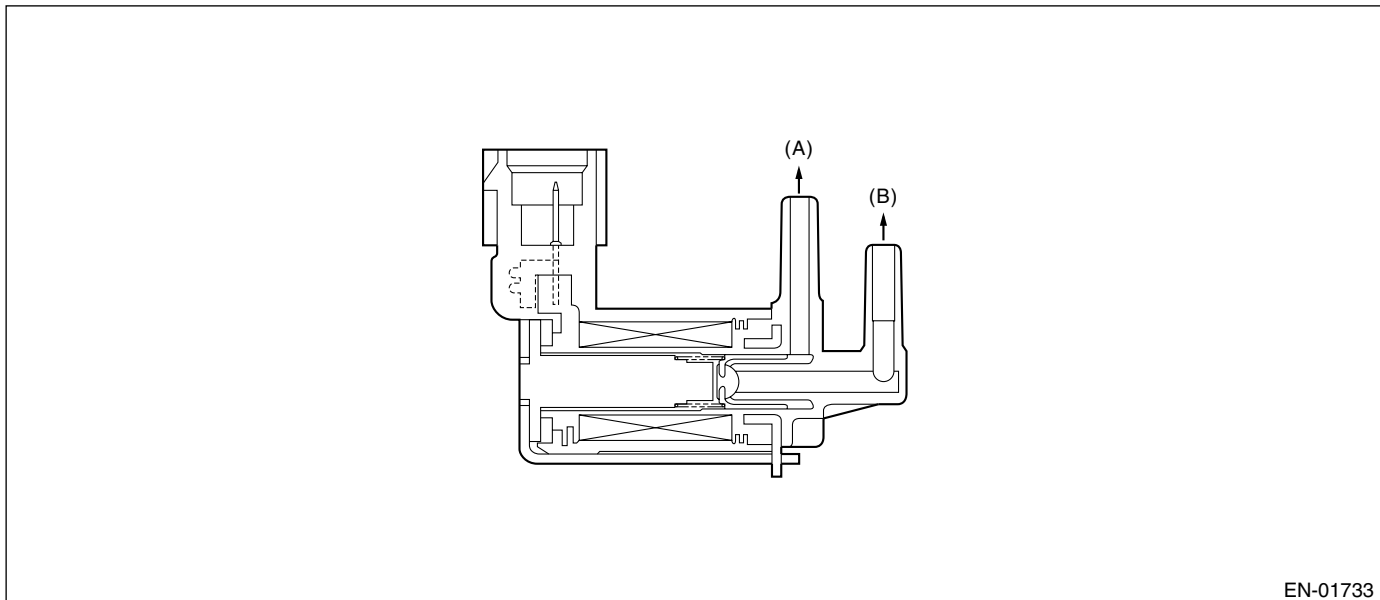Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01733

(A)   To canister
(B)   To intake manifold

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| After engine starting | 1 second or more |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Continuous time of completing criteria below. | ≥ 2.5 seconds |
| Duty ratio of 'ON' | ≥ 25% |
| Terminal output voltage | High |

**Time Needed for Diagnosis:** 2.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

**• Normality Judgment**

Judge OK and clear NG when the malfunction criterion below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Terminal output voltage | Low |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## BK:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

### 2. COMPONENT DESCRIPTION



EN-01734

### 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 malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Accumulated amount of intake air | > 331 kg (729.7 lb) |
| Max.– Min. fuel level output | < 2.6 ℓ (0.69 US gal, 0.57 Imp gal) |
| Battery voltage | ≥ 10.9 V |
| Engine speed | < 6500 rpm |
| After engine start | More than 5 seconds |

**Time Needed for Diagnosis:** To be determined.
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Accumulated amount of intake air | > 331 kg (729.7 lb) |
| Max.– Min. fuel level output | ≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal) |
| Battery voltage | ≥ 10.9 V |
| Engine speed | < 6500 rpm |
| After engine start | More than 5 seconds |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01735

(1) Engine control module (ECM)

(2) Fuel level sensor

(3) Fuel sub level sensor

(4) Detecting circuit

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Battery voltage | $\geq 10.9$ V |
| After engine starting | 3 seconds or more |
| Output voltage | < 0.015 V |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

**GD(STi)-161**

**• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| After engine starting | 3 seconds or more |
| Output voltage | ≥ 0.015 V |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING
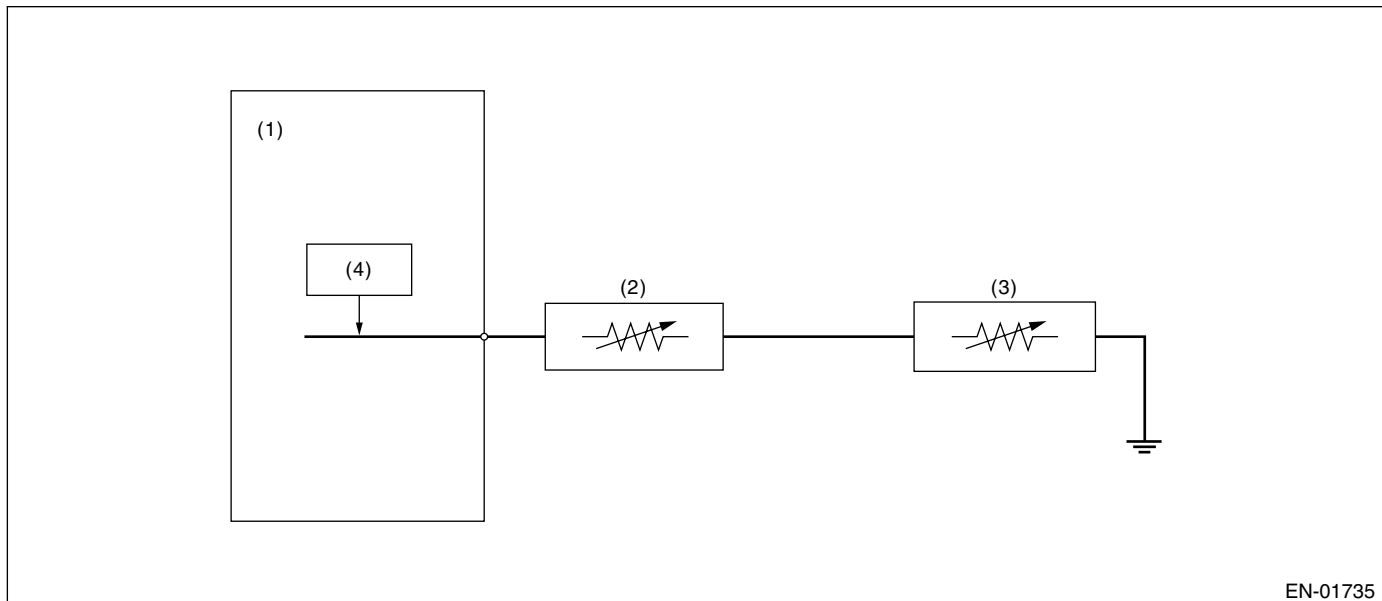
Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01735

(1) Engine control module (ECM)

(2) Fuel level sensor

(3) Fuel sub level sensor

(4) Detecting circuit

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (one second).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| After engine starting | 3 seconds or more |
| Output voltage | ≥ 4.958 V |

**Time Needed for Diagnosis:** 1 second
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

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• **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 engine starting | 3 seconds or more |
| Output voltage | $< 4.958$ V |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.
Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Engine speed | $\geq$ 500 rpm |
| After engine starting | 1 second or more |
| Ignition switch | ON |
| Battery voltage | > 10.9 V |
| Idle switch | ON |
| Fuel level | 9 $\leftrightarrow$ 51 $\ell$ (2.4 $\leftrightarrow$ 13.4 US gal, 1.98 $\leftrightarrow$ 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.

### 4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.3 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



Diagnosis condition

12.3S

Diagnosis timer

Malfunction

Fuel level sensor A/D value

Normal

Amount of Fuel level output voltage variation

Calculate the Max. value (delvflmx) and the cumulative value (sumvfl).

Diagnosis counter

0 1 2 3 4 5 6

NG at 6 counts

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• **Abnormality Judgment**

Judge NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Integrated times of the condition reaching follows,<br>DELFLMAX ≥ 0.2 V or SUMFL ≥ 15 V<br>where,<br>DELFLMAX is Max. deviation of sensor output during 12.3 seconds.<br>SUMFL is integrated value of sensor output deviation during 12.3 seconds. | ≥ 4 times |

Do not count the diagnosis counter up when the following conditions are completed during 12.3 seconds.

| | |
|---|---|
| Max − Min of tank pressure during 12.3 seconds | ≥ 0.05 kPa (0.375 mmHg, 0.02 inHg) |
| Max − Min of battery voltage during 12.3 seconds | ≥ 0.4 V |

**Time Needed for Diagnosis:** 12.3 seconds × 4 times
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| DELFLMAX | < 0.2 V |
| SUMFL<br>Where,<br>DELFLMAX is Max. deviation of sensor output during 12.3 seconds.<br>SUMFL is integrated value of sensor output deviation during 12.3 seconds. | < 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)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.
Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

### 2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

| Secondary Parameters | Enable Conditions |
|---|---|
| Engine Speed | 600 — 900 rpm |
| Idle switch | ON |
| Vehicle speed | < 2 km/h (1.2 MPH) |
| Battery voltage | ≥ 10.9 V |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Engine coolant temperature | ≥ 96°C (204.8°F) |
| Engine coolant temperature sensor A/D value – Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON) | < 15 mV (Approx. 1°C (1.8°F)) |
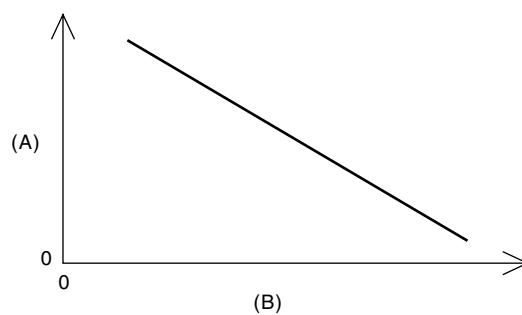


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(A)    Engine coolant temperature °C (°F)

(B)    A/D value (V)

**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 |
|---|---|
| Engine coolant temperature sensor A/D value − Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON) | ≥ 15 mV (Approx. 1°C (1.8°F)) |

## 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)

## 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. | Operating |
| Battery voltage | ≥ 10.9 V |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Vehicle speed | < 1 |

**Time Needed for Diagnosis:** 4 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Vehicle speed | ≥ 1 |
| Starter switch | OFF |
| Time after starter switch ON → OFF | ≥ 3 seconds |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Engine speed | < 4000 rpm |
| Fuel cut in decel. | Operating |
| Battery voltage | ≥ 10.9 V |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

### 4. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Vehicle speed | ≥ 240 |

**Time Needed for Diagnosis:** 4 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**• Normality Judgment**

Judge OK and clear the NG when all malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Vehicle speed | ≥ 300 |
| Starter switch | OFF |
| Time after starter switch ON → OFF | ≥ 3 seconds |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Engine coolant temperature | ≥ 75°C (167°F) |
| Battery voltage | ≥ 10.9 V |
| Atmospheric pressure | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Fuel level | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| After engine starting | 10 seconds or more |
| Feedback in ISC | In operation |
| Measured lambda | 0.90 ↔ 1.1 |
| After air condition switching ON-OFF, OFF-ON | 5 seconds or more |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | > 5 seconds |
| After neutral switch ON-OFF event | > 5 seconds |
| Vehicle speed | 0 km/h (0 MPH) |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Actual – target engine speed | < −100 rpm |
| Feedback correction for idle air control solenoid valve | Max. |

**Time Needed for Diagnosis:** 10 seconds × 3 times
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Actual – target engine speed | ≥ −100 rpm |

### 5. DTC CLEAR CONDITION

• When the OK idling cycle 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

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
Knock compensation:
• Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
• AT normal: Knock compensation value = Fixed on 0°CA
• AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
• Not allowed to refresh learning compensation coefficient
• Not allowed to calculate partial learning zone compensation value

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Engine coolant temperature | ≥ 75°C (167°F) |
| Battery voltage | ≥ 10.9 V |
| Atmospheric pressure | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Fuel level | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| After engine starting | 10 seconds or more |
| Feedback in ISC | In operation |
| Lambda | 0.90 ↔ 1.1 |
| After air condition switching ON-OFF, OFF-ON | 5 seconds or more |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | > 5 seconds |
| After neutral switch ON-OFF event | > 5 seconds |
| Vehicle speed | 0 km/h (0 MPH) |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Actual – target eng. speed | ≥ 200 rpm |
| Feedback correction for idle air control solenoid valve | Min. |

**Time Needed for Diagnosis:** 10 seconds × 3 times
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge 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 rpm |

### 5. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

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## 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

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)

## 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 SW | ON |
| Battery voltage | > 8 V |

**Time Needed for Diagnosis:** 180 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Starter SW | OFF |
| Battery voltage | > 8 V |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## 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 | ≥ 10.9 V |
| Feedback in ISC | In operation |
| Vehicle speed | < 4 km/h (2.49 MPH) |
| After engine starting | 1 seconds or more |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment 1

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Engine speed – target eng. speed | ≥ 1000 rpm |
| Feedback value for ISC | ≤ 0 |
| Engine speed change every 180 degree engine rev. | ≥ −5 rpm |

#### • Abnormality Judgment 2

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Engine speed – target eng. speed | ≥ 1000 rpm |
| Feedback value for ISC | ≤ 0 |

**Time Needed for Diagnosis:** 2 seconds or 5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Engine speed – target eng. speed | < 200 rpm |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).
Judge NG when either the main CPU normal RAM or sub CPU normal RAM is abnormal. Judge OK when both of them are normal.
At initial routine, write the data to all area of RAM. Judge OK when same data can be read out, and judge NG when same data cannot be read out.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

Perform the diagnosis in the initial routine.

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Main CPU normal RAM abnormality | |
| Write 5AA5A55A, and read out. (All area of RAM) | Cannot be read out 5AA5A55A. |
| Or write A55A5AA5, and read out. (All area of RAM) | Cannot be read out A55A5AA5. |
| Sub CPU normal RAM abnormality. | |
| Write 5AA5, and read out. (All area of RAM) | Cannot be read out 5AA5. |
| Or write A55A, and read out. (All area of RAM) | Cannot be read out A55A. |

**Time Needed for Diagnosis:** 100 milliseconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Main CPU normal RAM abnormality | |
| Write 5AA5A55A, and read out. (All area of RAM) | Cannot be read out 5AA5A55A. |
| Or write A55A5AA5, and read out. (All area of RAM) | Cannot be read out A55A5AA5. |
| Sub CPU normal RAM abnormality. | |
| Write 5AA5, and read out. (All area of RAM) | Cannot be read out 5AA5. |
| Or write A55A, and read out. (All area of RAM) | Cannot be read out A55A. |

### 5. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

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## 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)

## BW: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)
• Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

## BX: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
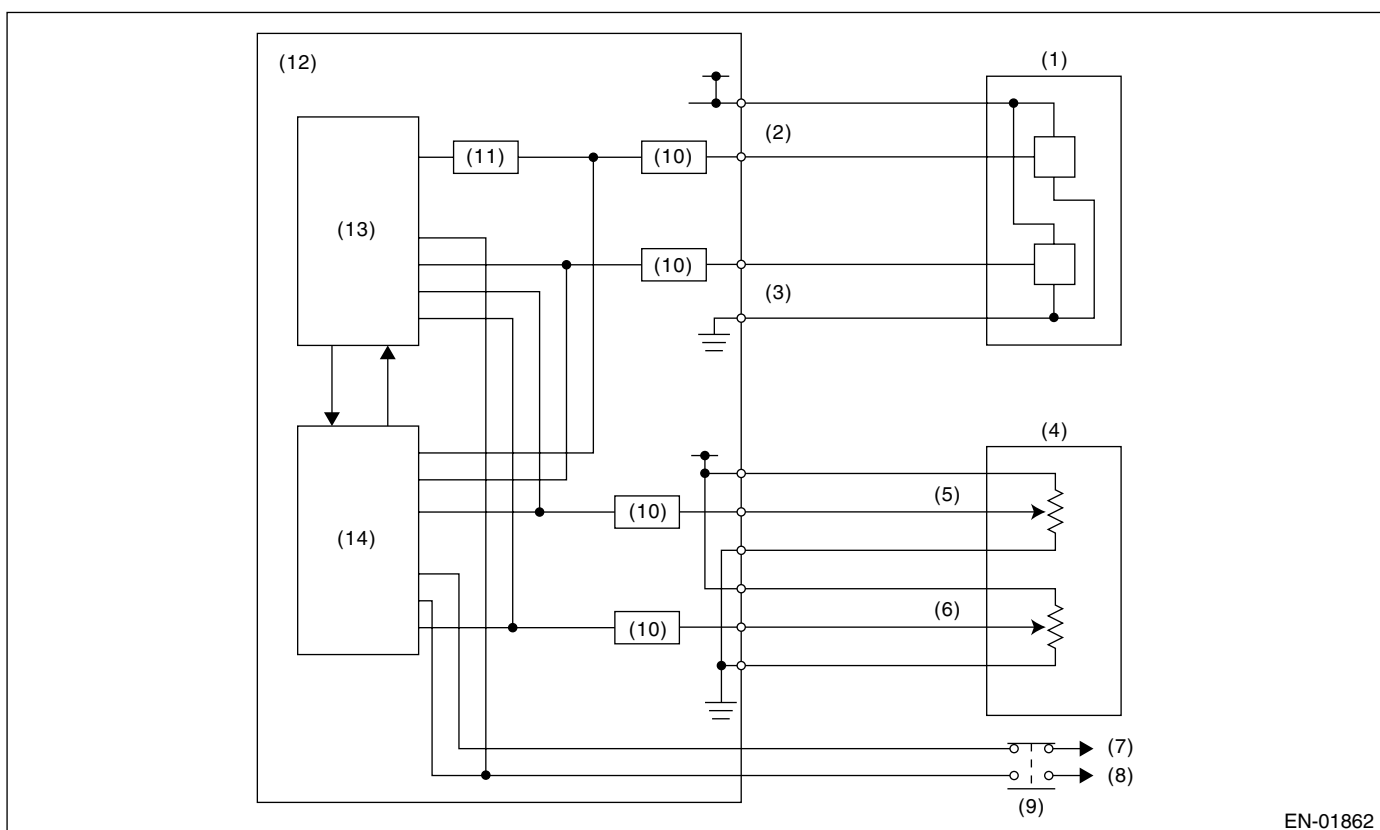
| | | | |
|---|---|---|---|
| (1) | Throttle position sensor | (8) | Stop light |
| (2) | Throttle position sensor 1 | (9) | Brake switch |
| (3) | Throttle position sensor 2 | (10) | I/F circuit |
| (4) | Accelerator pedal position sensor | (11) | Amplifier circuit |
| (5) | Accelerator pedal position sensor 1 | (12) | Engine control module (ECM) |
| (6) | Accelerator pedal position sensor 2 | (13) | Sub CPU |
| (7) | Battery | (14) | Main CPU |

## 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 $+3.4°$ 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

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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)
- Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

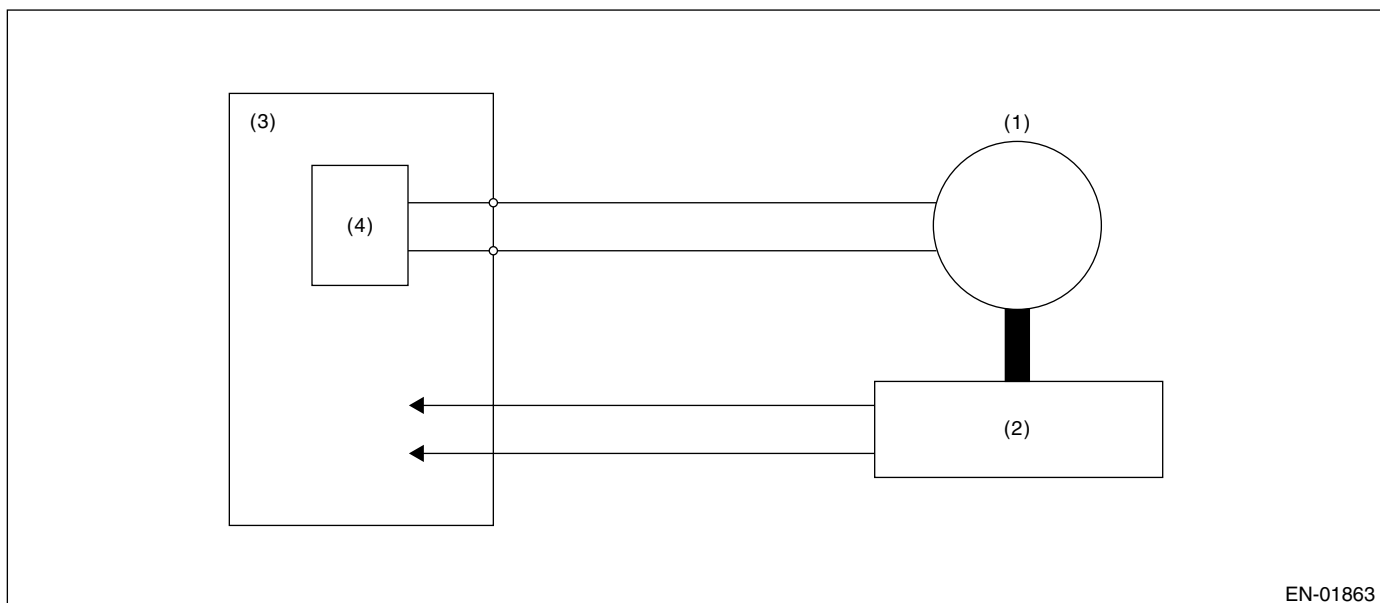## BY:DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

### 2. COMPONENT DESCRIPTION



EN-01863

(1) Motor

(2) Throttle position sensor

(3) Engine control module (ECM)

(4) Drive circuit

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |
| Normal operation of 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)
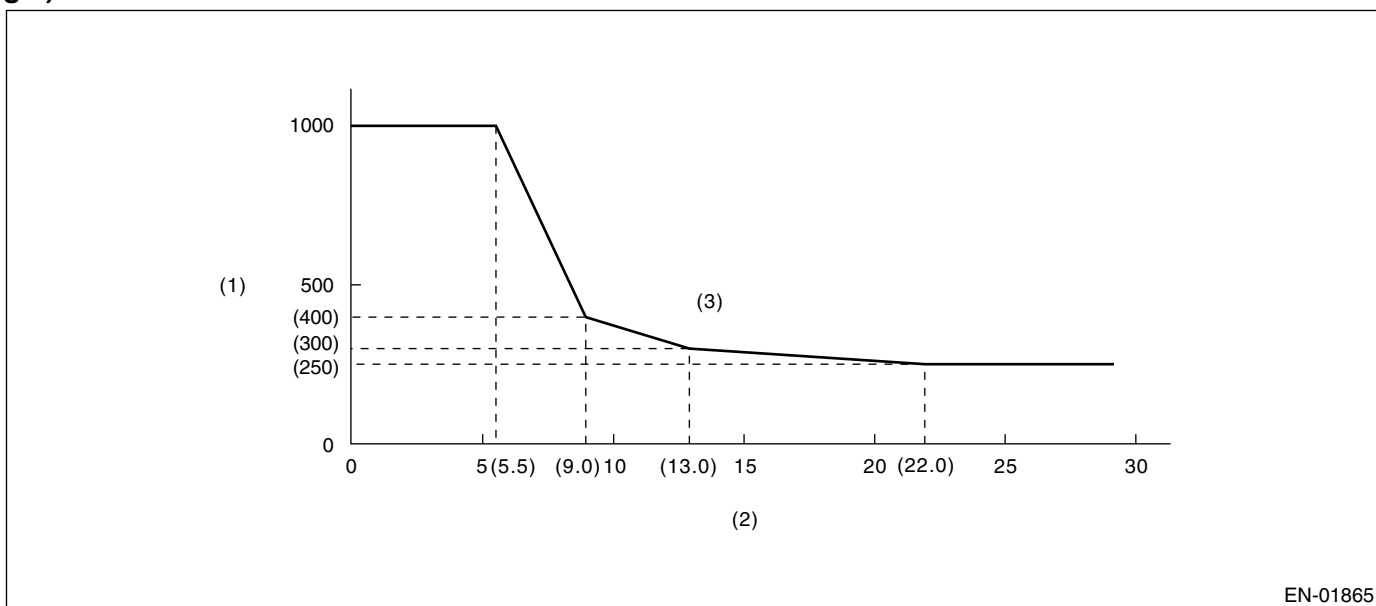Output duty to drive circuit: 2000 milliseconds

**GD(STi)-187**

**Details of Judgment**



EN-01864
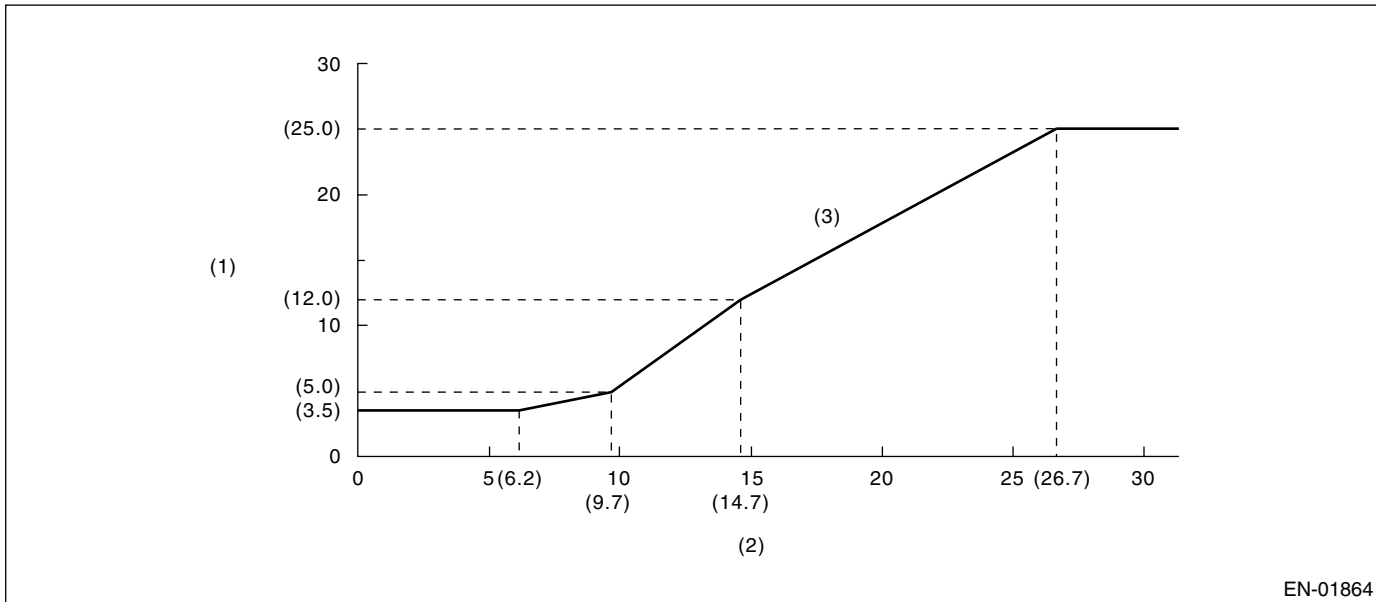
(1)  Difference between target opening angle and actual opening angle (°)

(2)  Target throttle opening angle (°)

(3)  NG area

**Details of Judgment (Always 1000 milliseconds when the actual opening angle ≤ target opening angle)**



EN-01865

(1)  Judgment time (milliseconds)

(2)  Throttle position sensor 1 opening angle

(3)  NG area

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed (Only 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)
- Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

## BZ:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| After starting the engine | 1 seconds or more |
| Engine speed | ≥ 500 rpm |
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| Terminal voltage level when ECM transmits OFF signal | Low level |

**Time Needed for Diagnosis:** 2.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| After starting the engine | 1 seconds or more |
| Engine speed | ≥ 500 rpm |
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| Terminal voltage level when ECM transmits OFF signal | High level |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## CA:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| After starting the engine | 1 seconds or more |
| Engine speed | ≥ 500 rpm |
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| Terminal voltage level when ECM transmits ON signal | High level |

**Time Needed for Diagnosis:** 2.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| After starting the engine | 1 seconds or more |
| Engine speed | ≥ 500 rpm |
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| Terminal voltage level when ECM transmits ON signal | Low level |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| After starting the engine | 2 seconds or more |
| Starter switch | OFF |
| Engine speed | ≥ 500 rpm |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Neutral switch signal (while changing from a to b below) | ON continues |
| Driving condition change | a) to b) |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm | |
| b) Vehicle speed = 64 km/h (40 MPH) & engine speed 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)

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

### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |
| Battery voltage | ≥ 10.9 V |
| After starting the engine | 2 seconds or more |
| Starter switch | OFF |
| Engine speed | ≥ 500 rpm |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Neutral switch signal (while changing from a to b below) | OFF continues |
| Driving condition change | a) to b) |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm | |
| b) Vehicle speed = 64 km/h (40 MPH) & engine speed 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
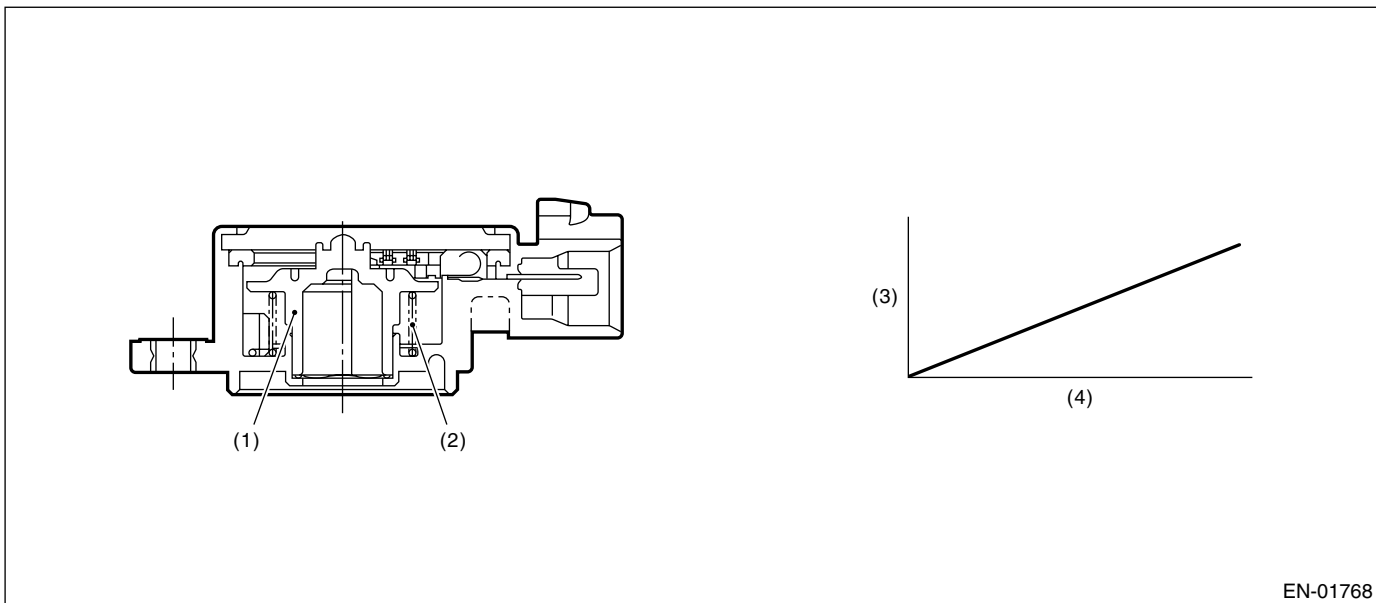
Memorize the freeze frame data. (For test mode $02)

## CD: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

**GD(STi)-194**

## 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)

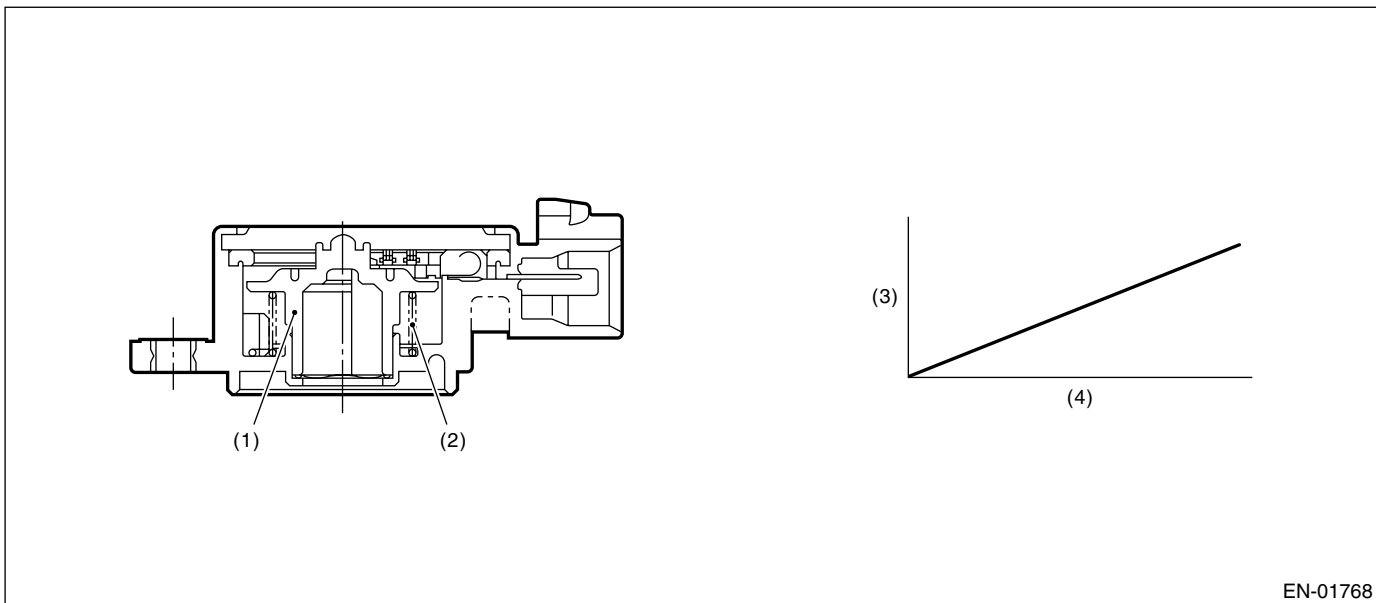## CE:DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —

### 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 | ≥ 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

## 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)

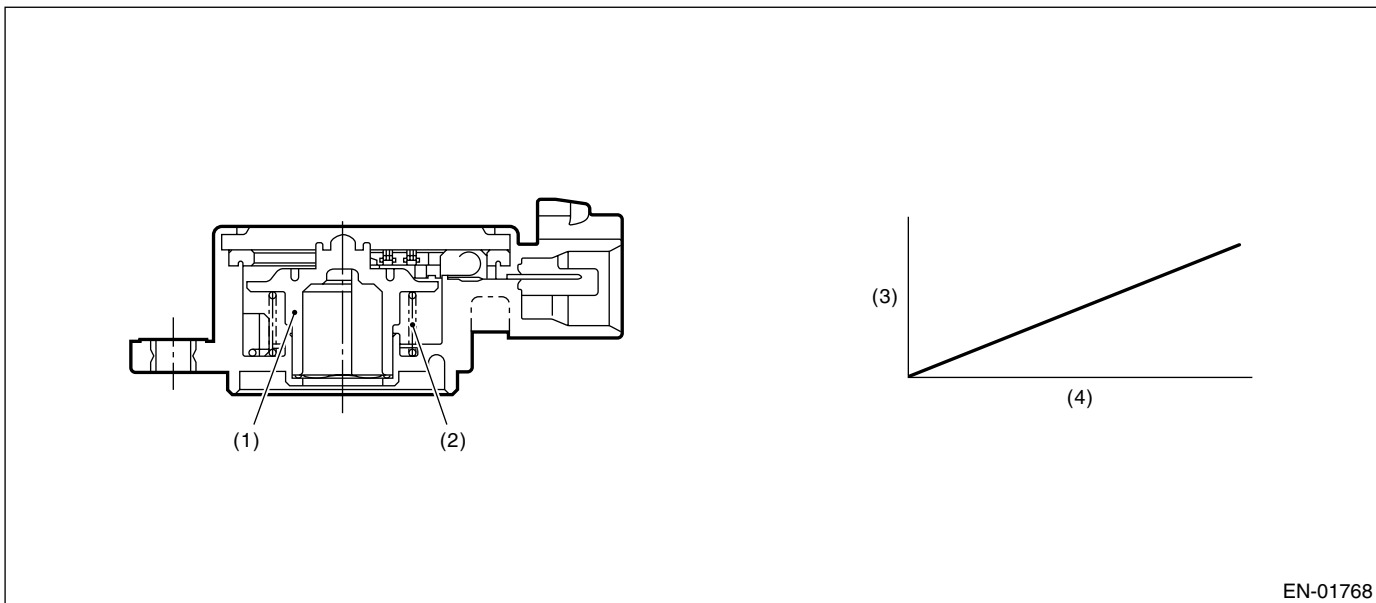## CF:DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

### 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

**GD(STi)-198**

## 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)

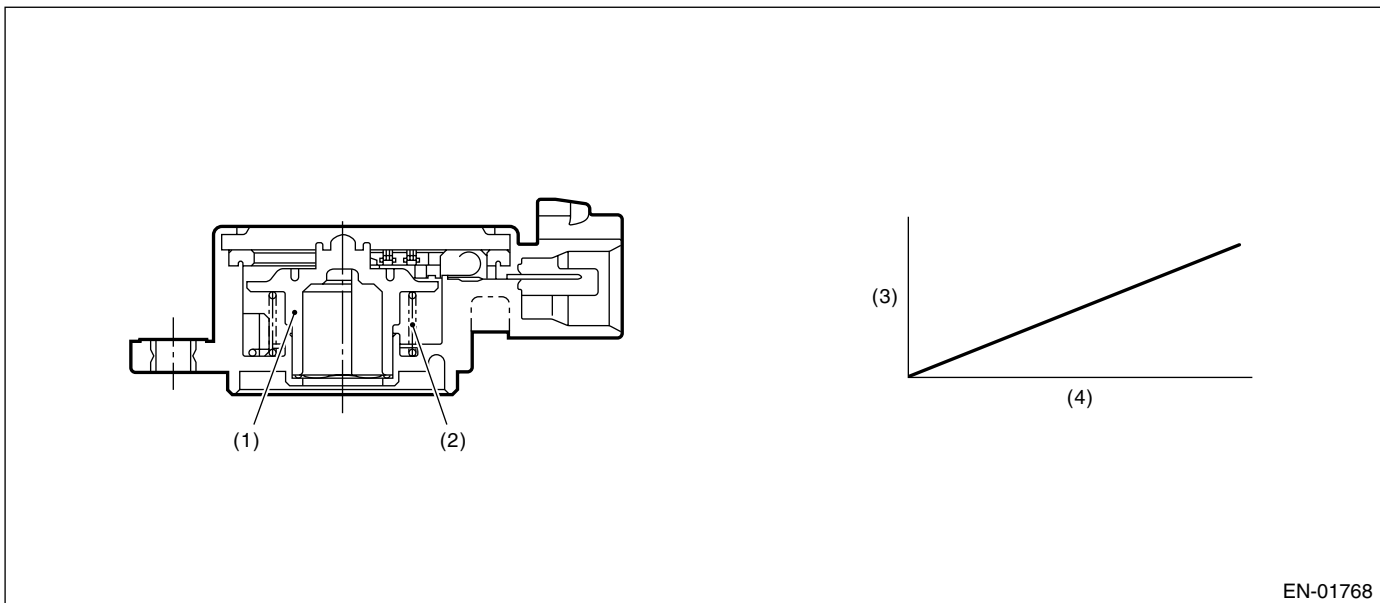## CG:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

### 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 | ≥ 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

**GD(STi)-200**

## 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)

## CH: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 open driving.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | $\geq 10.9$ V |
| Engine coolant temperature | $\geq 0°C$ (32°F) |
| Ambient temperature | $\geq 0°C$ (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 | $\geq 67.4°$ |
| 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 | $< 67.4°$ |
| 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)

## CI: 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 V |
| Engine coolant temperature | $\geq$ 0°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° |
| Tumble generated valve "open" signal output | 1.4 seconds or more |

**Time Needed for Diagnosis:** 3 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.
#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Tumble generated valve angle | $\geq$ 67.4° |
| Tumble generated valve "open" signal output | 1.4 seconds or more |

### 5. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

### 7. FAIL SAFE

Tumble 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)

## CJ: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 V |
| Engine coolant temperature | $\geq$ 0°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° |
| 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° |
| 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)

## CK: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 | $\geq 10.9$ V |
| Engine coolant temperature | $\geq 0°C$ (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 | $< 67.4°$ |
| Tumble generated valve "open" signal output | 1.4 seconds or more |

**Time Needed for Diagnosis:** 3 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Tumble generated valve angle | $\geq 67.4°$ |
| Tumble generated valve "open" signal output | 1.4 seconds or more |

### 5. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

### 7. FAIL SAFE

Tumble 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

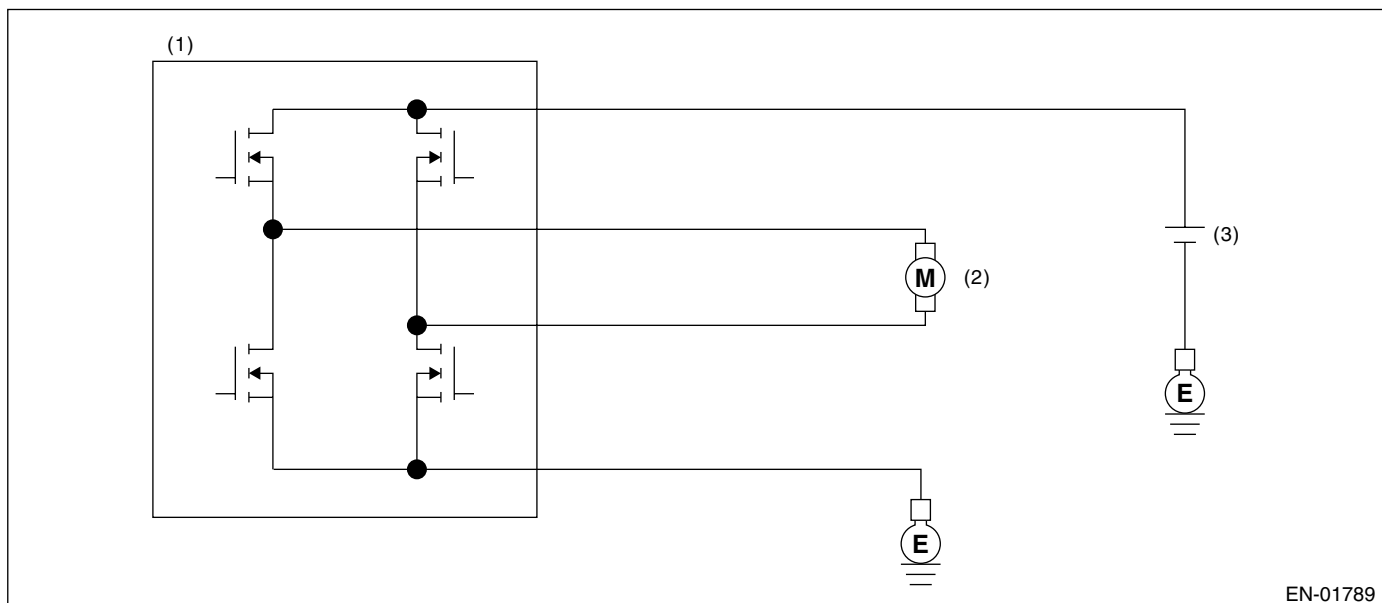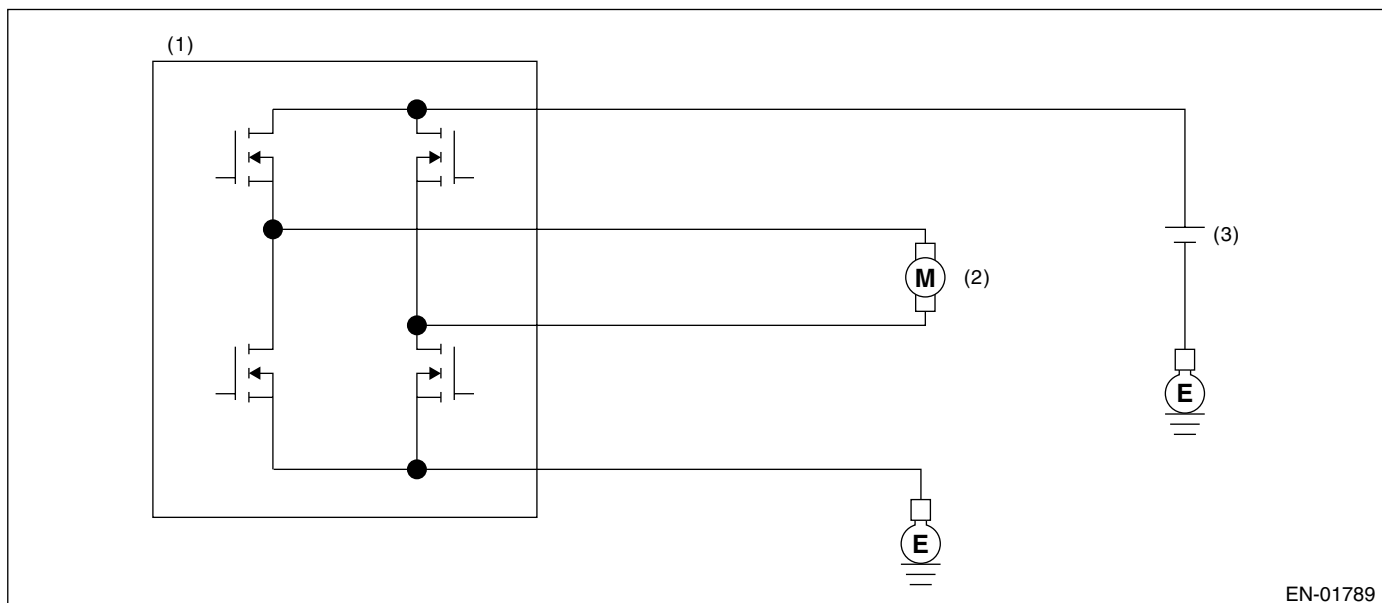Memorize the freeze frame data. (For test mode $02)

## CL: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



EN-01789

(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble 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 20 times in a row.
Judge OK and clear the NG when the OK signal is sent.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Current | < 5 mA |

**Time Needed for Diagnosis:** 2 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

**GD(STi)-206**

## 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

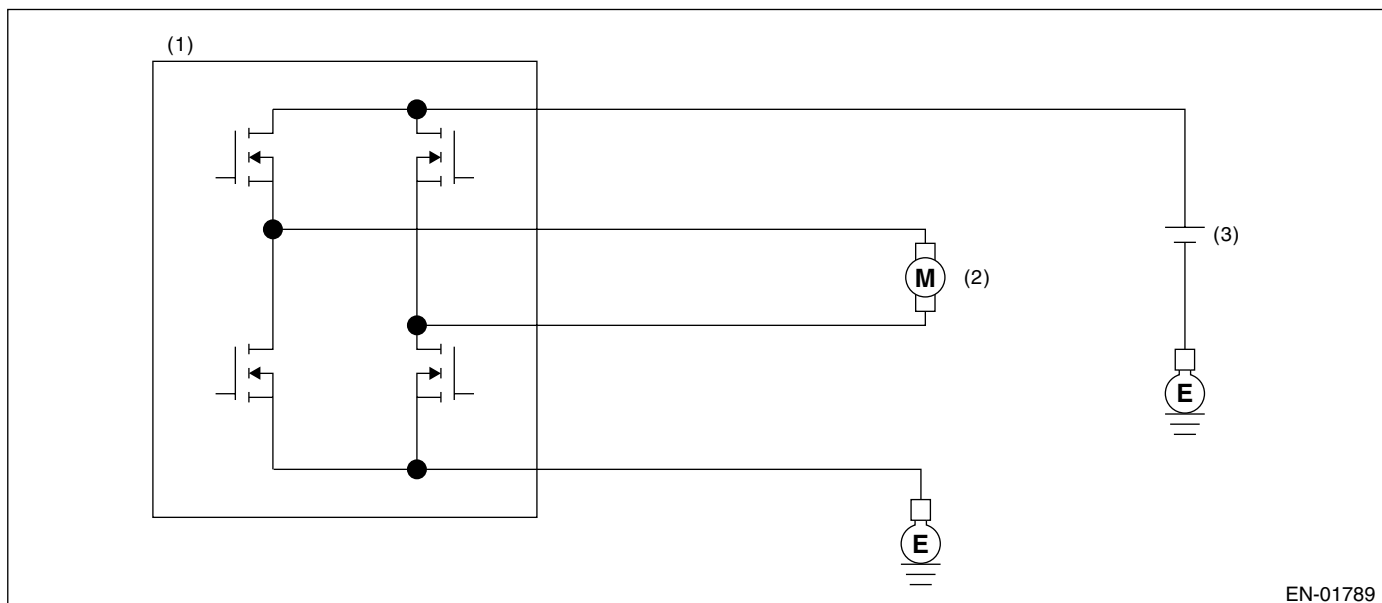Memorize the freeze frame data. (For test mode $02)

## CM: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 | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble 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 10 times in a row.
Judge OK and clear the NG when the OK signal is sent.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
| --- | --- |
| Current | > 3 A |

**Time Needed for Diagnosis:** 1 second
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 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

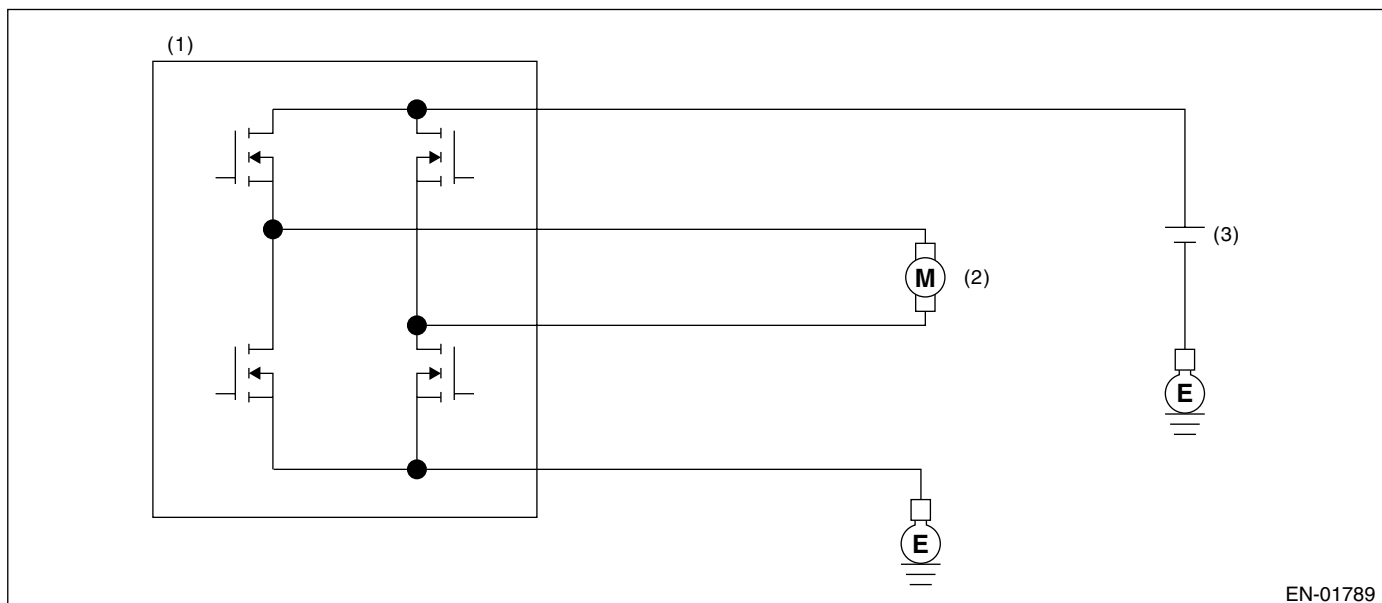Memorize the freeze frame data. (For test mode $02)

## CN: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 | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble 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 20 times in a row.
Judge OK and clear the NG when the OK signal is sent.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Current | < 5 mA |

**Time Needed for Diagnosis:** 2 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

**GD(STi)-210**

## 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)

## CO:DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MAL-FUNCTION (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 | ≥ 10.9 V |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble 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 10 times in a row.
Judge OK and clear the NG when the OK signal is sent.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Current | > 3 A |

**Time Needed for Diagnosis:** 1 second
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

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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 control: Not allowed to move tumble generated valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## CP:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNC-TION (LOW INPUT) —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Output voltage | < 0.118 V |

**Time Needed for Diagnosis:** 0.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Ignition switch | ON |
| Output voltage | ≥ 0.118 V |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## CQ: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 | ≥ 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)

## CR:DTC P1152 — O$_2$ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

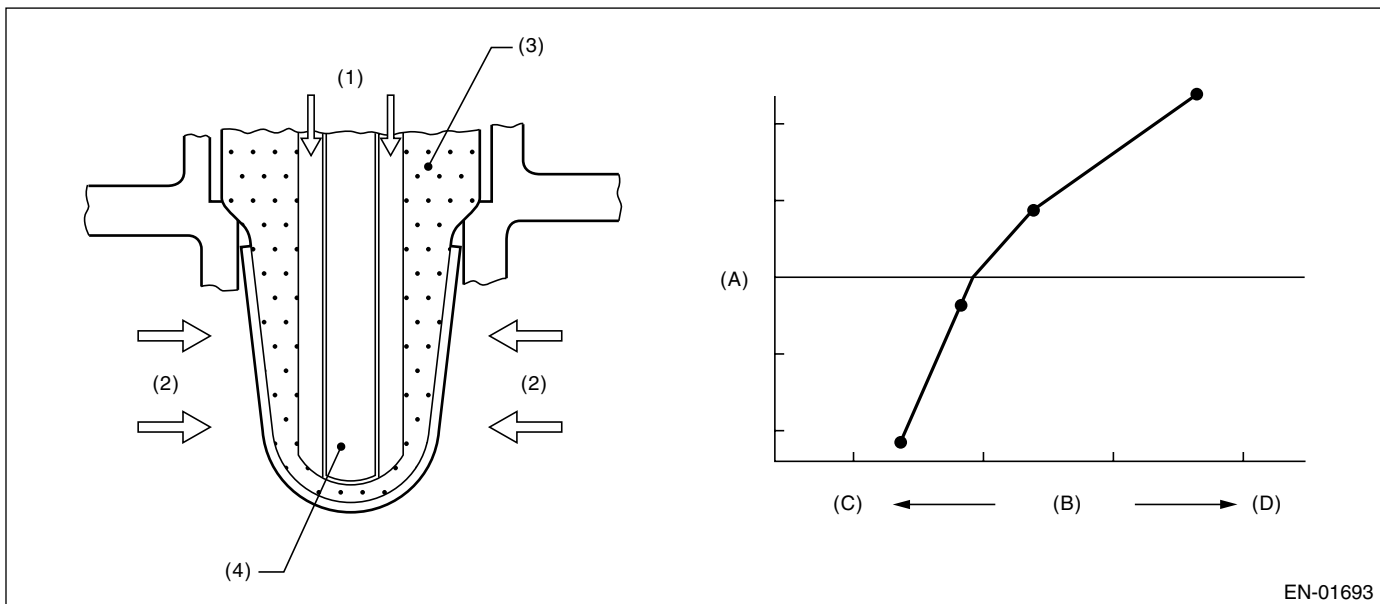### 1. OUTLINE OF DIAGNOSIS

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 | (A) | Electromotive force |
| (2) | Exhaust | (B) | Air fuel ratio |
| (3) | ZrO$_2$ | (C) | Lean |
| (4) | Ceramic heater | (D) | Rich |

## 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| All secondary parameters to be in enable conditions | 4 seconds or more |
| Battery voltage | > 10.9 V |
| Atmospheric pressure | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback | Operating |
| Rear oxygen sensor output voltage − feedback target voltage | −0.2 V ↔ 0.1 V |
| or rear oxygen sensor sub feedback compensation coefficient | On Min. |
| or rear oxygen sensor sub feedback compensation coefficient | On Max. |
| After engine starting | 60 seconds or more |
| Engine coolant temperature | ≥ 75°C (167°F) |
| Vehicle speed | ≥ 20 km/h (12 MPH) |
| Amount of intake air | ≥ 6 g/s |
| Load change during 0.5 engine rev. | ≤ 0.01 g/rev |
| Impedance of front oxygen (A/F) sensor | 0 ↔ 50 Ω |
| Learning value of evaporation gas density | ≤ 0.2 |
| 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 | ≤ 0.85 |

**Time Needed for Diagnosis:** 10 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## CS:DTC P1153 — O$_2$ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

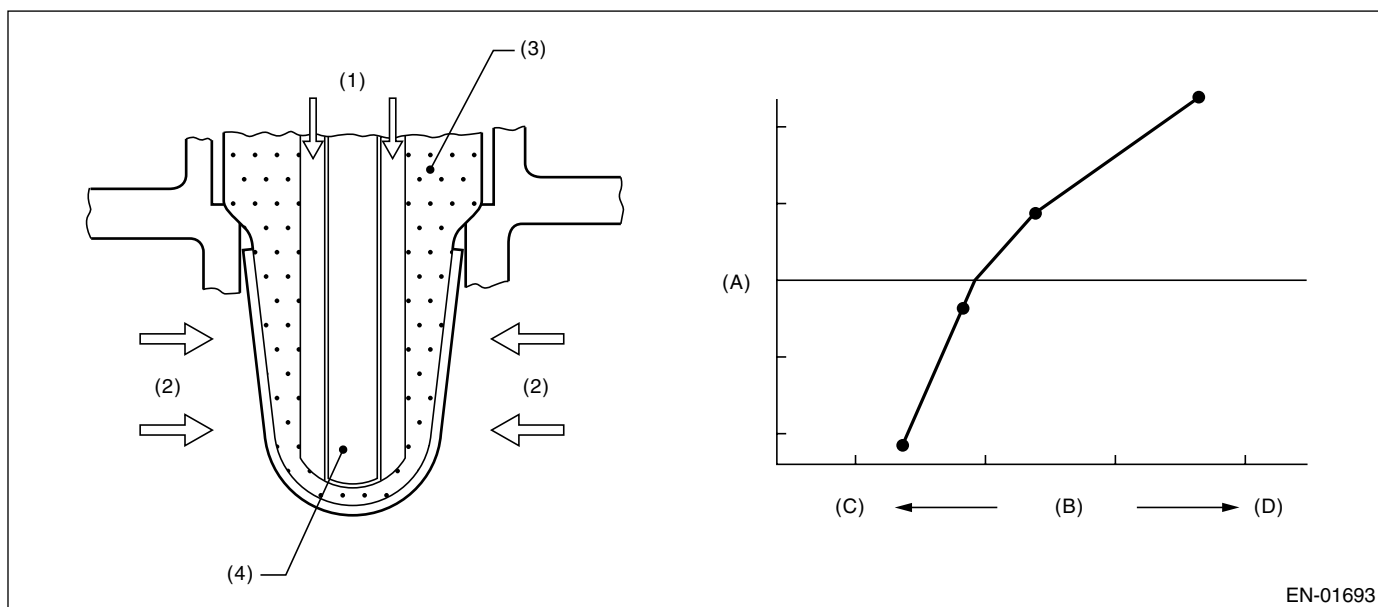### 1. OUTLINE OF DIAGNOSIS

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 | (A) | Electromotive force |
| (2) | Exhaust | (B) | Air fuel ratio |
| (3) | ZrO$_2$ | (C) | Lean |
| (4) | Ceramic heater | (D) | Rich |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| All secondary parameters to be in enable conditions | 4 seconds or more |
| Battery voltage | > 10.9 V |
| Atmospheric pressure | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback | Operating |
| Rear oxygen sensor output voltage − feedback target voltage | −0.2 V ↔ 0.1 V |
| or rear oxygen sensor sub feedback compensation coefficient | On Min. |
| or rear oxygen sensor sub feedback compensation coefficient | On Max. |
| After engine starting | 60 seconds or more |
| Engine coolant temperature | ≥ 75°C (167°F) |
| Vehicle speed | ≥ 20 km/h (12 MPH) |
| Amount of intake air | ≥ 6 g/s |
| Load change during 0.5 engine rev. | ≤ 0.01 g/rev |
| Impedance of front oxygen (A/F) sensor | 0 ↔ 50 Ω |
| Learning value of evaporation gas density | ≤ 0.2 |
| 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 $O_2$ sensor sub feedback compensation coefficient value being at not low limit | ≥ 1.15 |

**Time Needed for Diagnosis:** 10 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

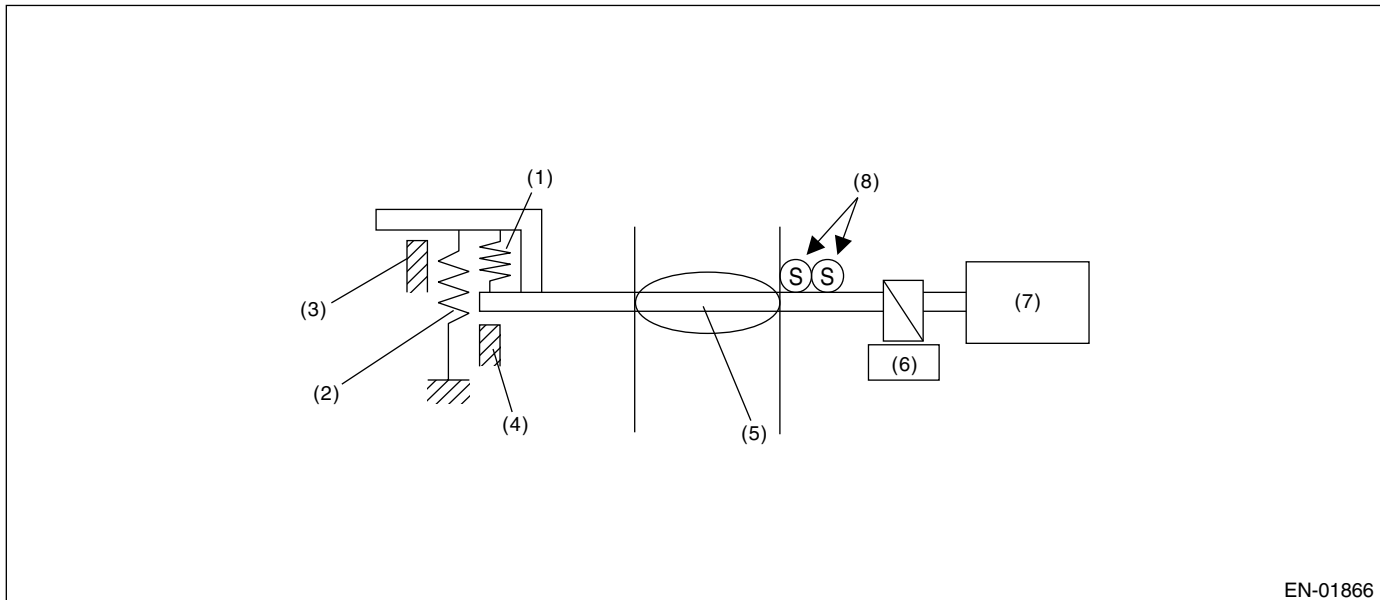## CT:DTC P1160 — RETURN SPRING FAILURE —

### 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
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper

(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle sensor

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Throttle opening | 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 | $\geq 2°$ |

**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)

## 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)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

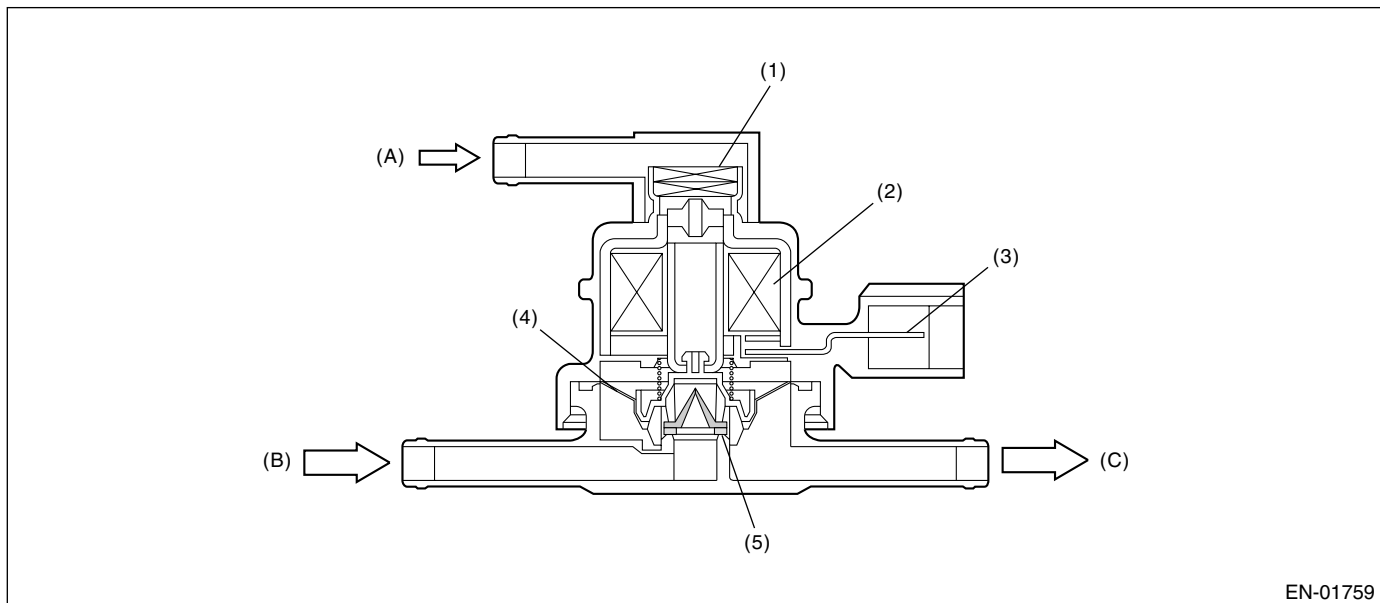## CU:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIR-CUIT LOW —

### 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



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 | ≥ 10.9 V |
| After engine starting | 1 second or more |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

Judge 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.

## 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)

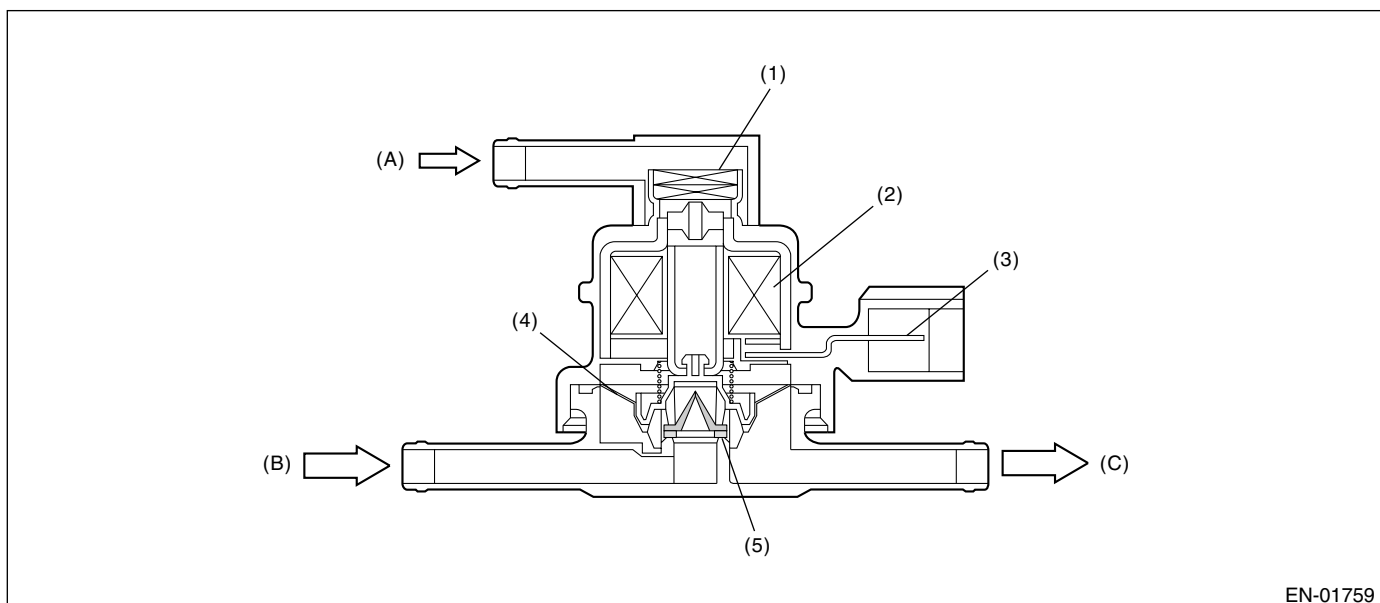## CV:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

### 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 | ≥ 10.9 V |
| After engine starting | 1 second or more |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

Judge 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.

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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

## 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)

## CW:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DE-TECTED (SMALL LEAK). <Ref. to GD(STi)-117, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>
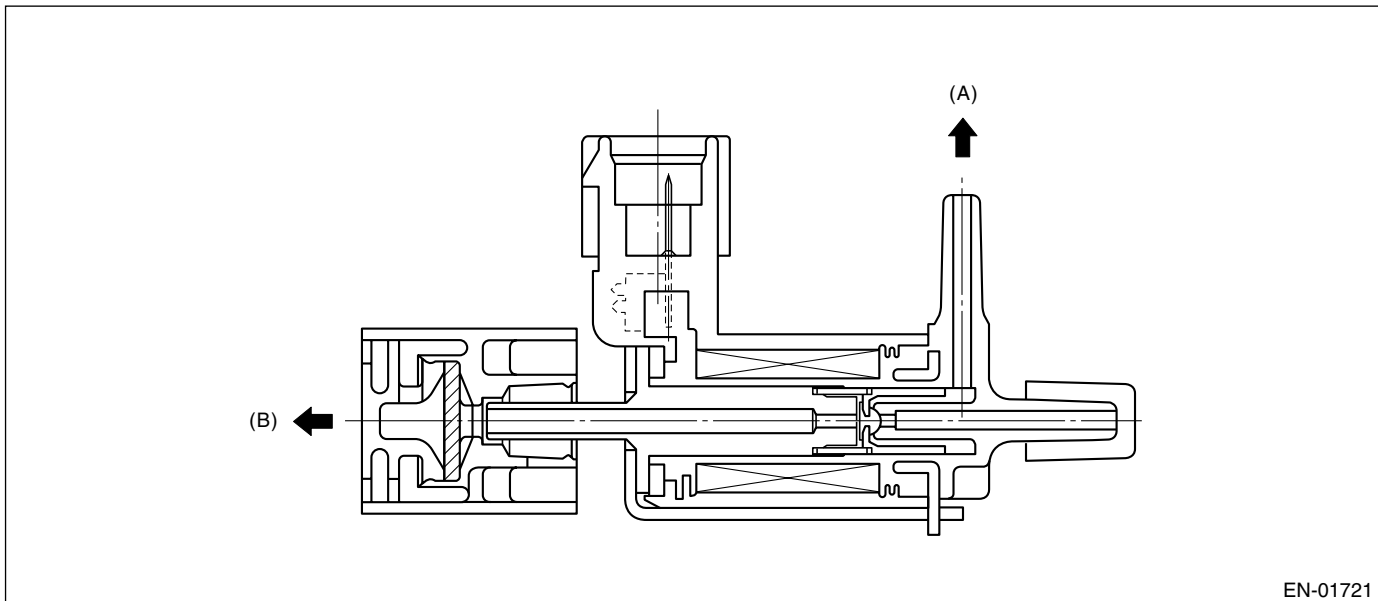
## CX:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

### 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.

### 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 | ≥ 10.9 V |
| After engine starting | 1 second or more |
| Terminal output voltage when ECM sent OFF signals | Low |

**Time Needed for Diagnosis:** 2.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

**GD(STi)-229**

• **Normality Judgment**

Judge OK when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Battery voltage | ≥ 10.9 V |
| After engine starting | 1 second or more |
| Terminal output voltage when ECM sent OFF signals | High |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle is completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle is completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

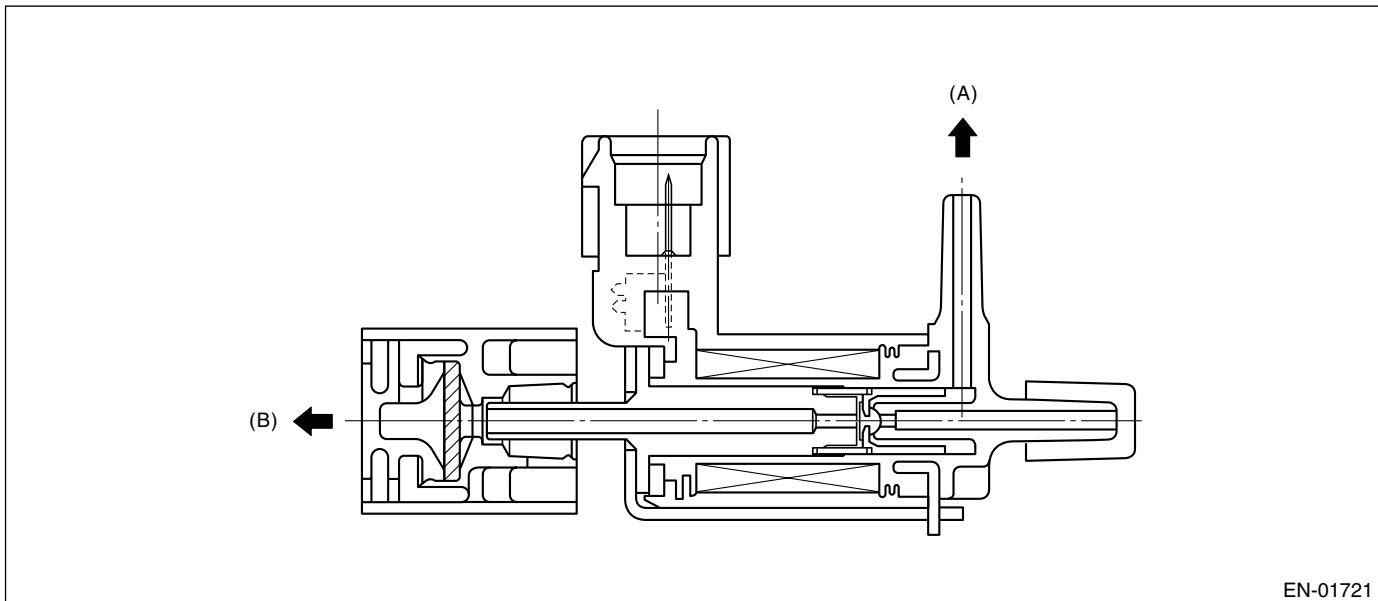## CY:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

### 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



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.

### 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 | ≥ 10.9 V |
| After engine starting | 1 second or more |
| Terminal output voltage when ECM sent ON signals | High |

**Time Needed for Diagnosis:** 2.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

• **Normality Judgment**

Judge OK when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Battery voltage | ≥ 10.9 V |
| After engine starting | 1 second or more |
| Terminal output voltage when ECM sent OFF signals | Low |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle is completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle is completed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

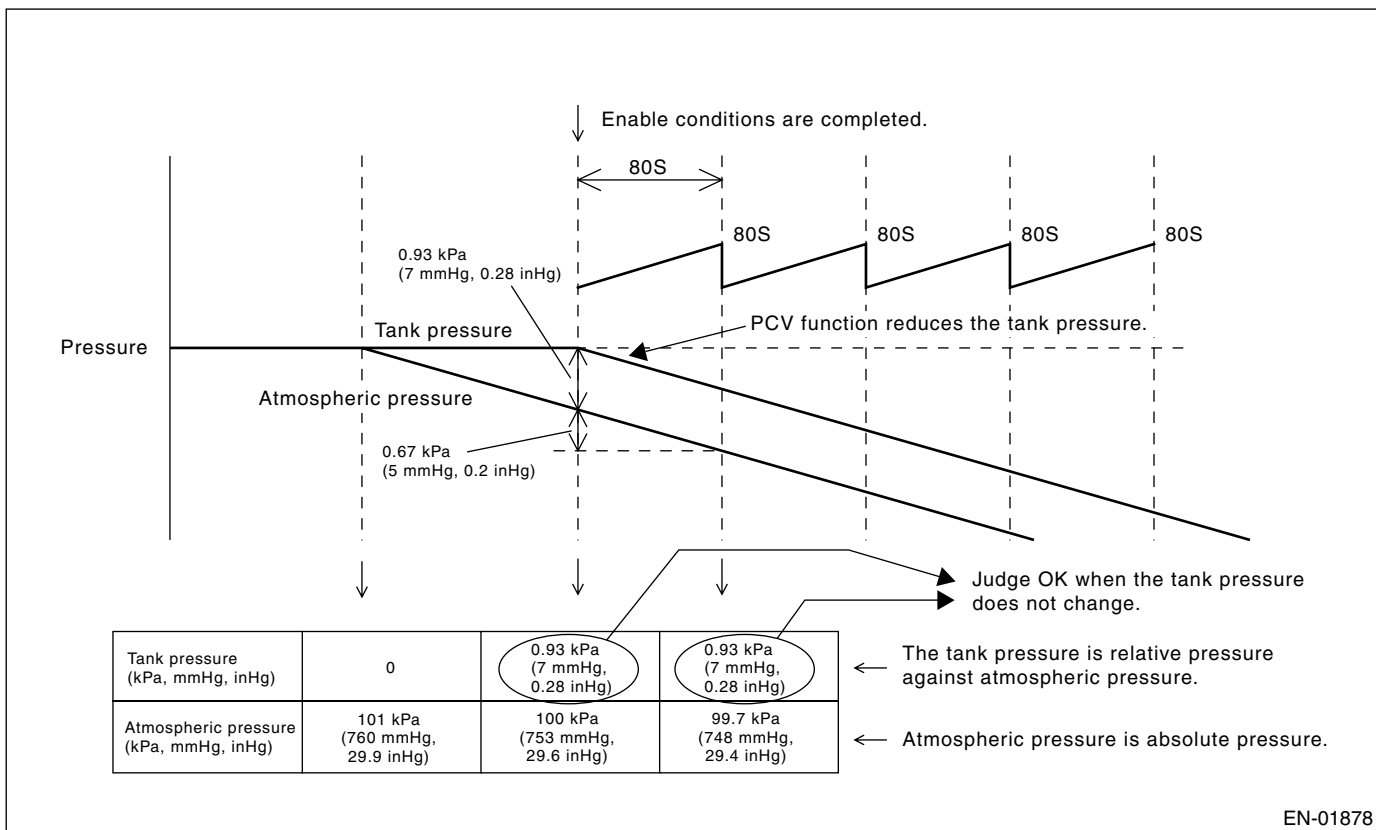## CZ:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —

### 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.
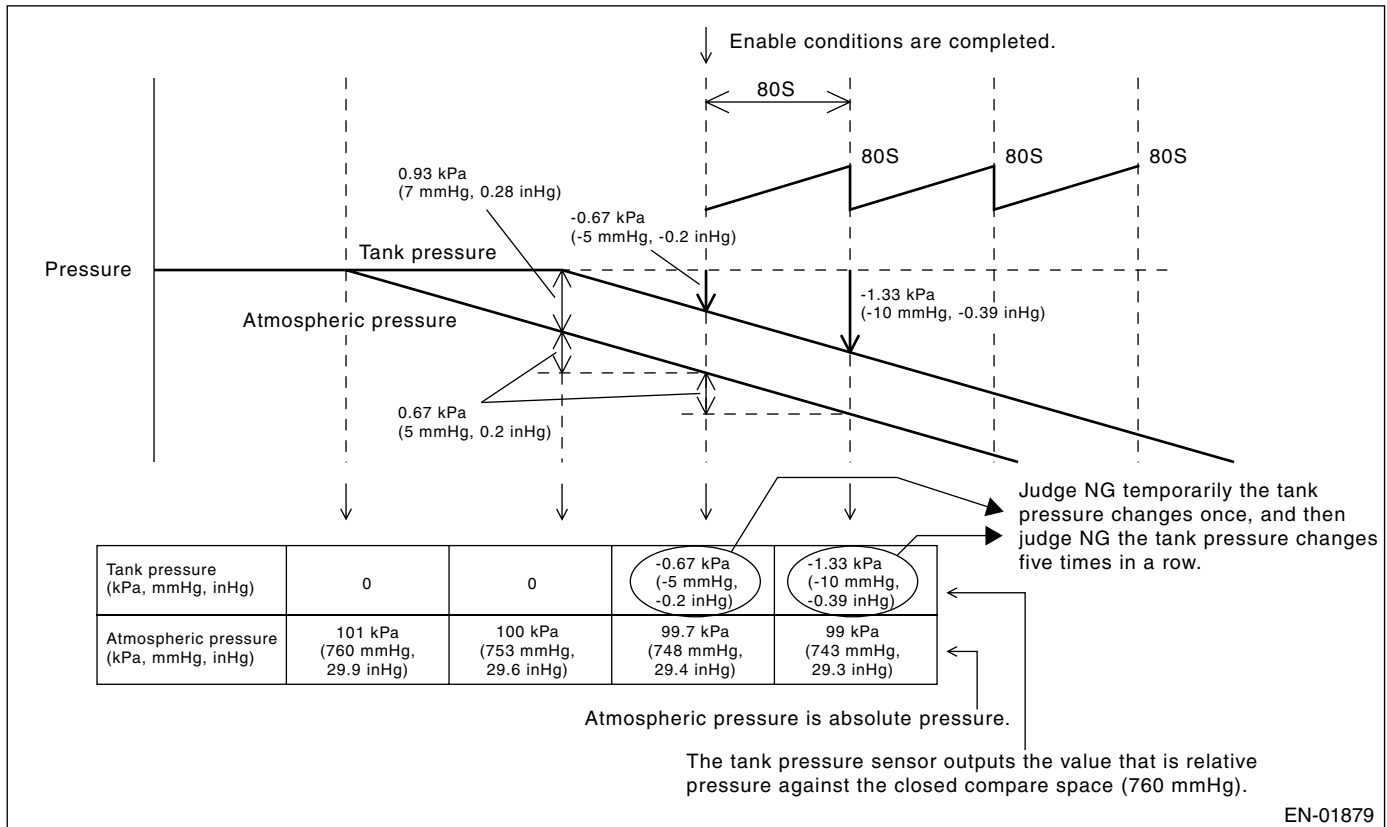


| | | | |
|---|---|---|---|
| Tank pressure (kPa, mmHg, inHg) | 0 | 0.93 kPa (7 mmHg, 0.28 inHg) | 0.93 kPa (7 mmHg, 0.28 inHg) |
| Atmospheric pressure (kPa, mmHg, inHg) | 101 kPa (760 mmHg, 29.9 inHg) | 100 kPa (753 mmHg, 29.6 inHg) | 99.7 kPa (748 mmHg, 29.4 inHg) |

EN-01878
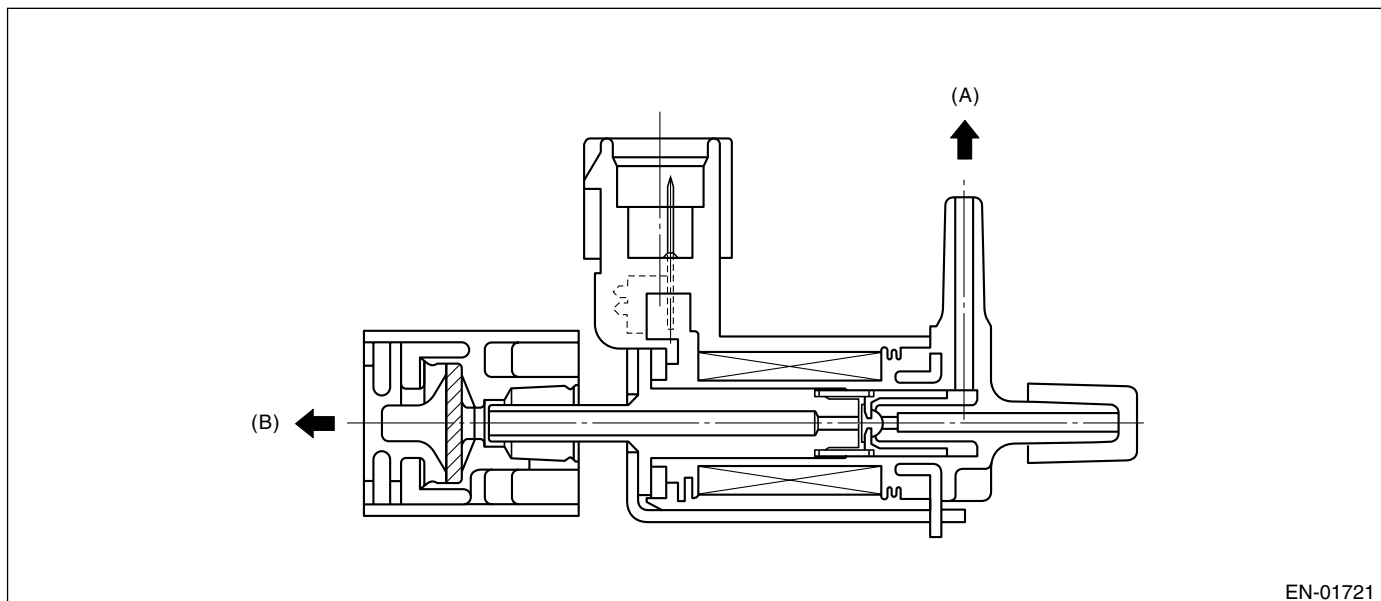
**GD(STi)-233**

# DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

**• 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.



| Tank pressure (kPa, mmHg, inHg) | 0 | 0 | -0.67 kPa (-5 mmHg, -0.2 inHg) | -1.33 kPa (-10 mmHg, -0.39 inHg) |
|---|---|---|---|---|
| Atmospheric pressure (kPa, mmHg, inHg) | 101 kPa (760 mmHg, 29.9 inHg) | 100 kPa (753 mmHg, 29.6 inHg) | 99.7 kPa (748 mmHg, 29.4 inHg) | 99 kPa (743 mmHg, 29.3 inHg) |

Atmospheric pressure is absolute pressure.

The tank pressure sensor outputs the value that is relative pressure against the closed compare space (760 mmHg).

EN-01879

## 2. COMPONENT DESCRIPTION



EN-01721

(A)  Fuel tank pressure sensor

(B)  Ambient air

## 3. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---|---|
| Battery voltage | ≥ 10.9 V |
| Fuel level | 9 ↔ 51 ℓ<br>(2.38 ↔ 13.3 US gal,<br>1.98 ↔ 11.2 Imp gal) |
| Evaporation system diagnosis | Not in operation |
| After starting the engine | 80 seconds or more |
| Fuel tank pressure | < −0.67 kPa<br>(−5 mmHg, −0.2 inHg)<br>or > −0.93 kPa (7<br>mmHg, 0.28 inHg) |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Atmospheric air change in 80 seconds | ≥ 0.67 kPa (4.5 mmHg, 0.2 inHg) |
| Fuel tank pressure change in 80 seconds | ≥ 0.67 kPa (4.5 mmHg, 0.2 inHg) |
| Fuel level change | < 2.25 ℓ (0.59 US gal, 0.49 Imp gal) |

**Time Needed for Diagnosis:** 80 seconds × 5 times
**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Atmospheric air change in 80 seconds | ≥ 0.60 kPa (4.5 mmHg, 0.18 inHg) |
| Fuel tank pressure change in 80 seconds | < 0.60 kPa (4.5 mmHg, 0.18 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)

**GD(STi)-235**

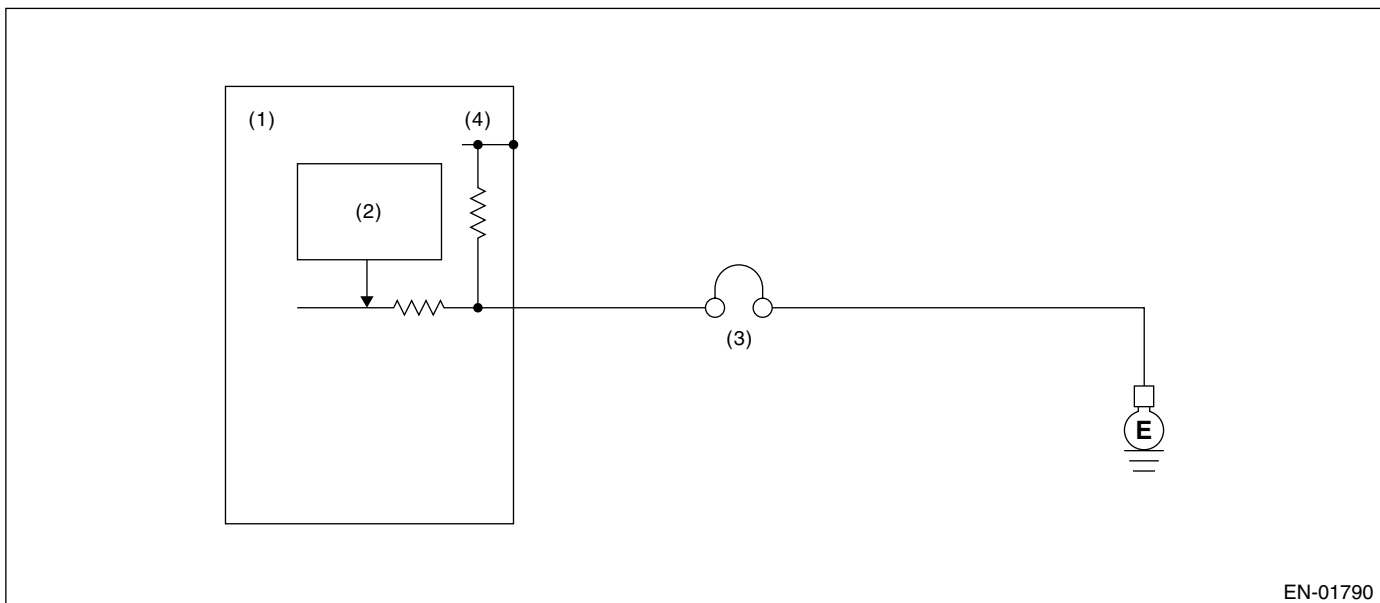## DA:DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —

### 1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge NG when the diagnosis terminal voltage is high.

### 2. COMPONENT DESCRIPTION



EN-01790

(1) Engine control module (ECM)

(2) Detecting circuit

(3) PCV diagnosis connector

(4) 5 V

### 3. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---|---|
| None | |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSIS METHOD

**• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 1 second.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Battery voltage | > 10.9 V |
| Before and after starting the engine | After starting the engine |
| Positive crankcase ventilation diagnosis voltage | High |

**Time Needed for Diagnosis:** 2.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

• **Normality Judgment**

Judge OK and clear NG when the malfunction criteria below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Battery voltage | > 10.9 V |
| Before and after starting the engine | After starting the engine |
| Positive crankcase ventilation diagnosis voltage | Low |

## 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was performed 3 times in a row
• When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

• Memorize the freeze frame data. (For test mode $02)
• Memorize the diagnosis value and trouble standard value. (For test mode $06)

## DB:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge OFF NG when it turns to "after engine starting" while the starter has never been set to ON.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| None | |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge OFF NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Vehicle speed | < 1 km/h (0.62 MPH) |
| It took more than 0.8 seconds at engine starting, and then it turned after engine starting. | |
| Starter ON | Not experienced |
| Starter ON diagnosis | Not diagnosed |
| Battery voltage | > 8 V |

**Time Needed for Diagnosis:**
Not determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Starter ON | Experienced |
| Starter ON diagnosis | Diagnosed |
| Battery voltage | > 8 V |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## DC:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.
Judge NG when the back-up voltage becomes smaller than the battery voltage.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---|---|
| None | |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Voltage of back-up power | Low |
| Battery voltage | ≥ 10.9 V |
| Before and after starting the engine | After starting the engine |

**Time Needed for Diagnosis:** 2.5 seconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

**• Normality Judgment**

Judge OK and clear NG when the malfunction criteria below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Voltage of back-up power supply | High |
| Battery voltage | ≥ 10.9 V |
| Before and after starting the engine | After starting the engine |

### 5. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## DD:DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| OCV control duty | ≥ 99.61% |
| OCV control present current | < 0.309 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 | ≥ 0.14% |
| \| Target current value of OCV – Control current value of OCV \| | ≥ 0.08 A |

### 5. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## DE:DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| OCV control duty | < 0.39% |
| OCV control present current | < 0.306 A |

**Time Needed for Diagnosis:** 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 A |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## DF:DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| OCV control duty | ≥ 99.61% |
| OCV control present current | < 0.306 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 | ≥ 0.14% |
| \| Target current value of OCV − Control current value of OCV \| | ≥ 0.08 A |

### 5. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

• When the OK driving cycle was completed 3 times in a row
• When "Clear Memory" was performed

## 7. FAIL SAFE

- Ignition timing whole learning compensation:
    - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
    - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
    - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
    - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
    - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
    - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
    - Make the OCV driving Duty to be the given value (9.36%).

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

**GD(STi)-245**

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

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---|---|
| Battery voltage | ≥ 10.9 V |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| OCV control duty | < 0.39% |
| OCV control present current | ≥ 0.306 A |

**Time Needed for Diagnosis:** 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 A |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

## DH: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
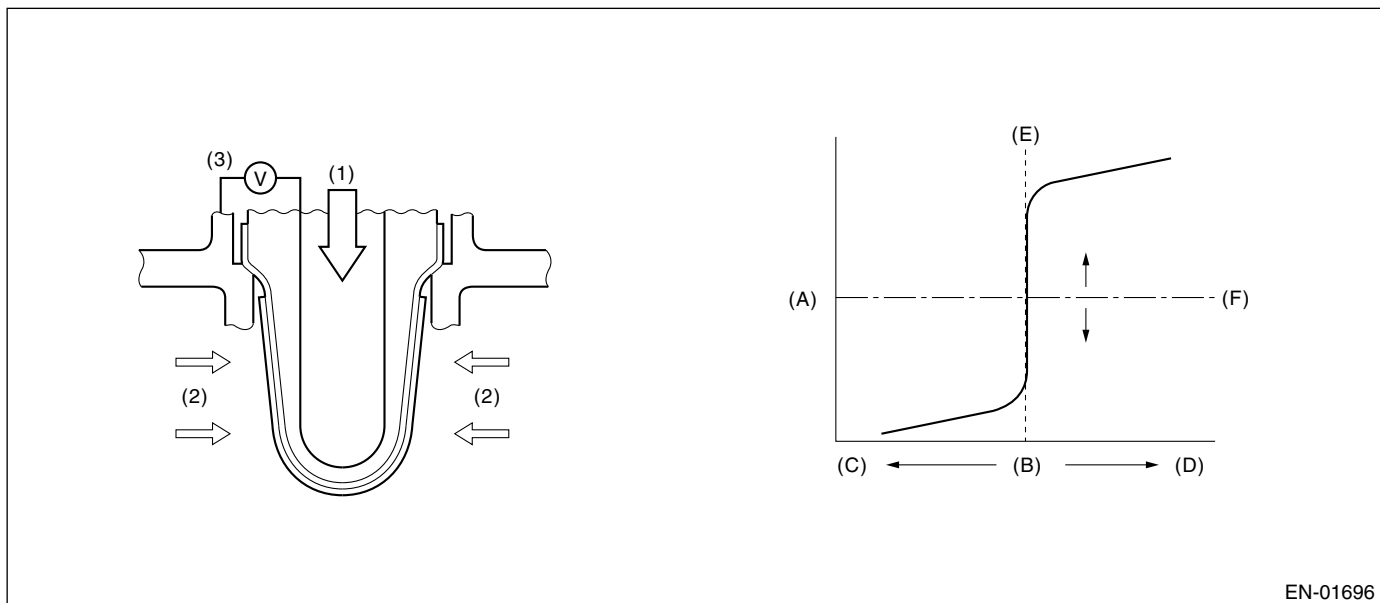
(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force

(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 | ≥ 15 g/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).

**GD(STi)-248**

## 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Calculate the continuous time from the sticking of sub feedback control amount to lean side and cumulative deviation (sumdelo 2) 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) where: rvo2 = sensing voltage of $O_2$ sensor rsl = target voltage of $O_2$ sensor | > −1700 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)

**GD(STi)-249**

## DI: 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
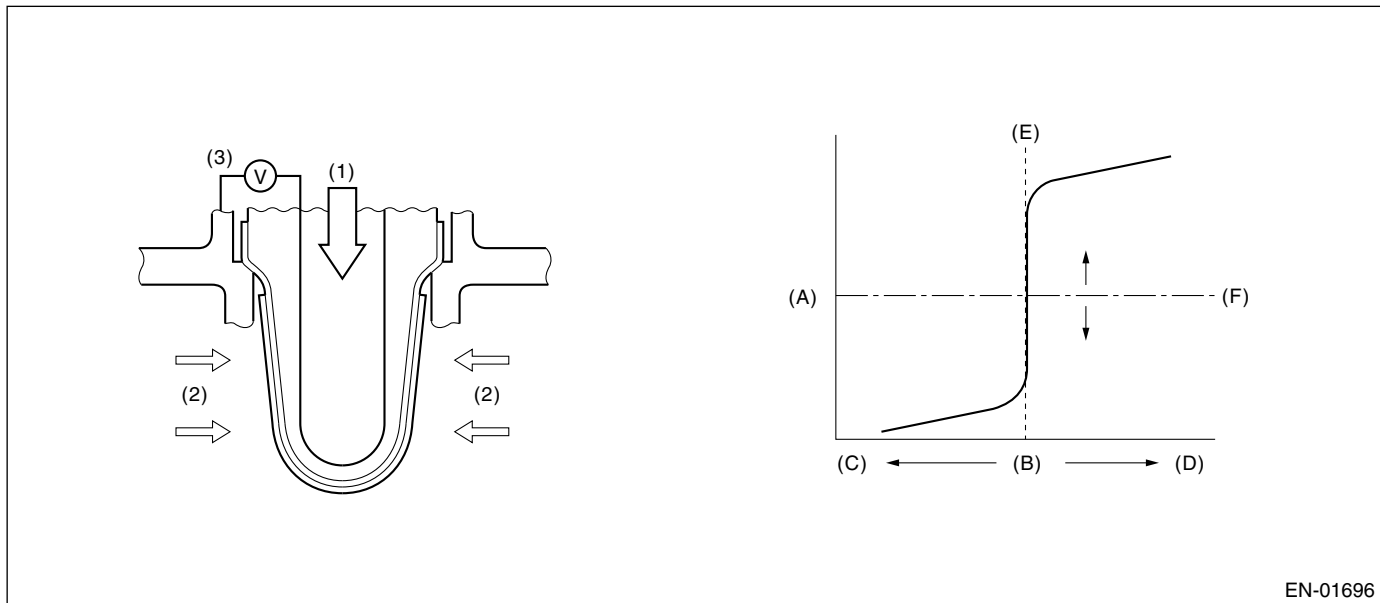
(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force

(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 | ≥ 15 g/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).

## 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Calculate the continuous time from the sticking of sub feedback control amount to rich side and cumulative deviation (sumdelo 2) 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>where:<br>rvo2 = sensing voltage of $O_2$ sensor<br>rsl = target voltage of $O_2$ 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)

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

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

### 2. COMPONENT DESCRIPTION



EN-01867
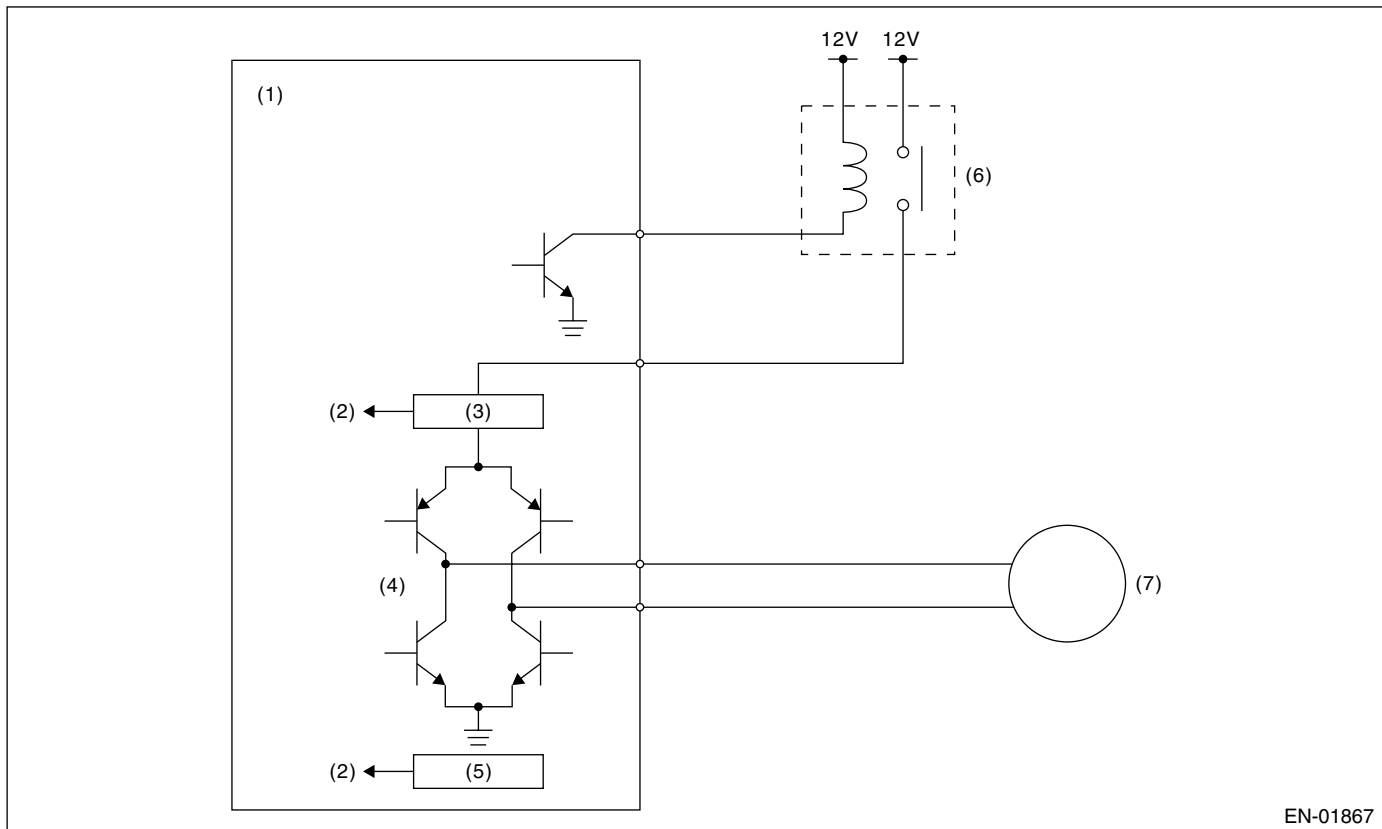
| | | | |
|---|---|---|---|
| (1) | Engine control unit (ECM) | (5) | Temperature detection circuit |
| (2) | Detection circuit | (6) | Electronic control throttle relay |
| (3) | Overcurrent detection circuit | (7) | Motor |
| (4) | Drive circuit | | |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Under control of electronic control throttle | ON |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5.  DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Motor current | ≤ 8 A |
| Drive circuit inner temperature | ≤ 175°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)
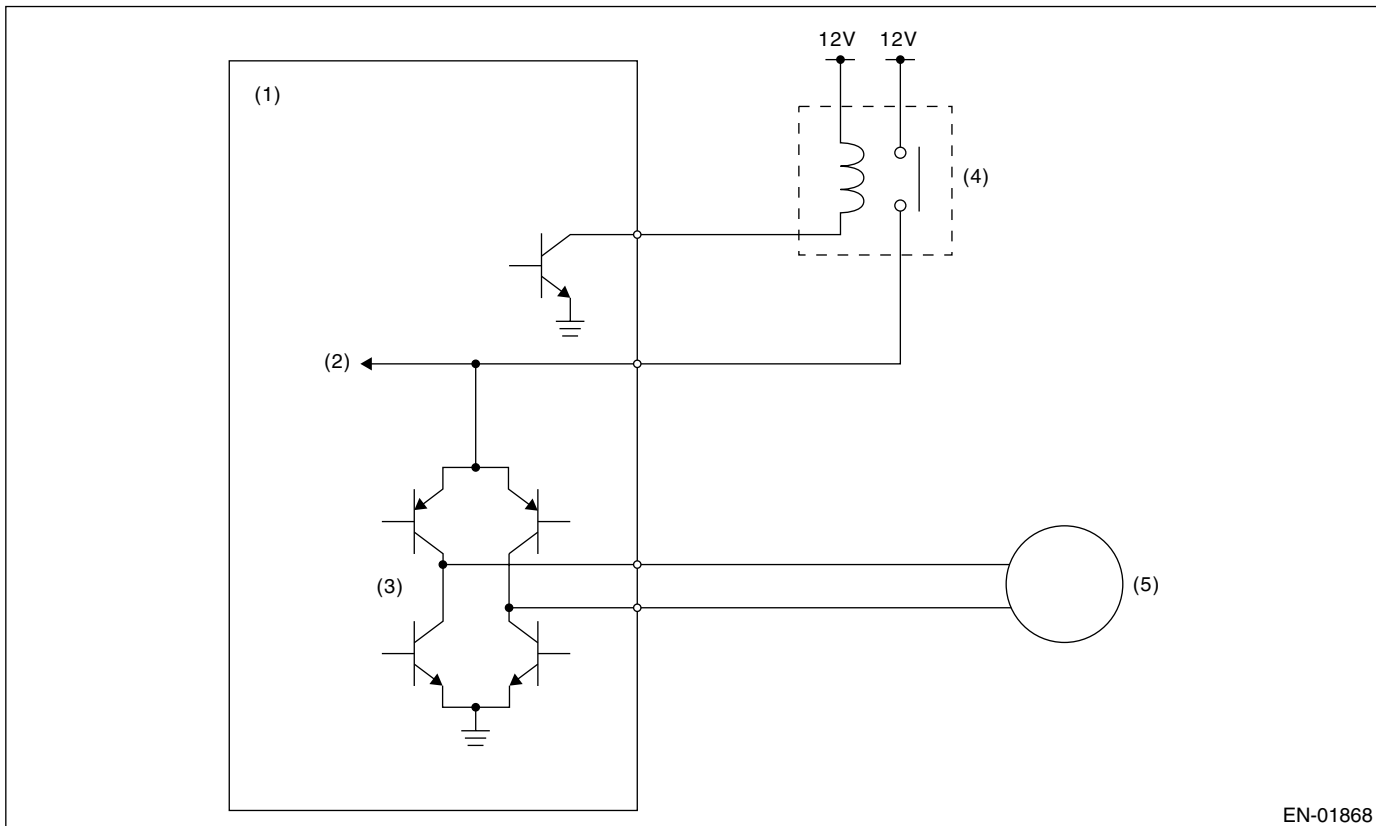- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DK: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)

(2) Voltage detection circuit

(3) Drive circuit

(4) Electronic control throttle relay

(5) Motor

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Electronic control throttle relay output | ON |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Motor power voltage | ≥ 5 V |

**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)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DL:DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to OFF.

### 2. COMPONENT DESCRIPTION



EN-01868

   (1)   Engine control module (ECM)

   (2)   Voltage detection circuit

   (3)   Drive circuit

   (4)   Electronic control throttle relay

   (5)   Motor

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
| --- | --- |
| Electronic control throttle relay output | OFF |

### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

## 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Motor power voltage | ≤ 5 V |

**Time Needed for Diagnosis:**
- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only 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)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DM: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



EN-01869
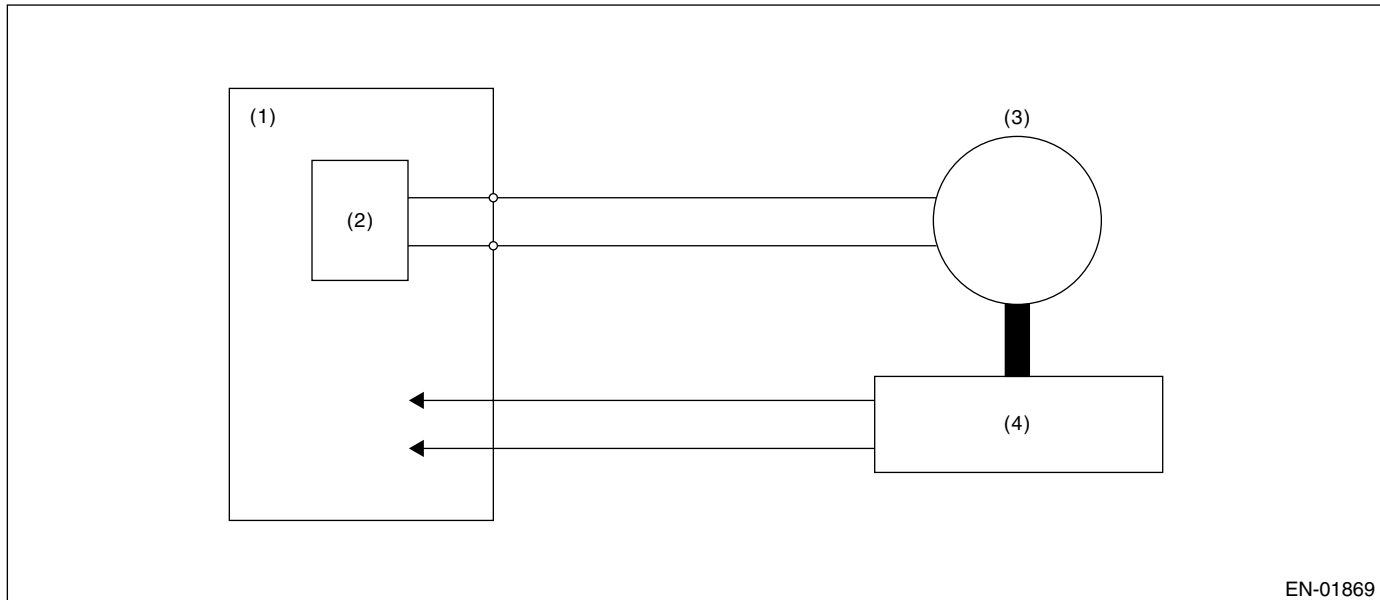
(1) Engine control module (ECM)
(2) Drive circuit
(3) Motor
(4) Throttle position sensor

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON → OFF |
| Ignition switch (after clear memory only) | OFF → ON |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

### 5. DIAGNOSTIC METHOD

**• Abnormality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Throttle sensor voltage at all close point learning | 0.41 — 0.79 V |
| Time for all close point learning completion | Within 80 milliseconds |

**Time Needed for Diagnosis:** None
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 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)
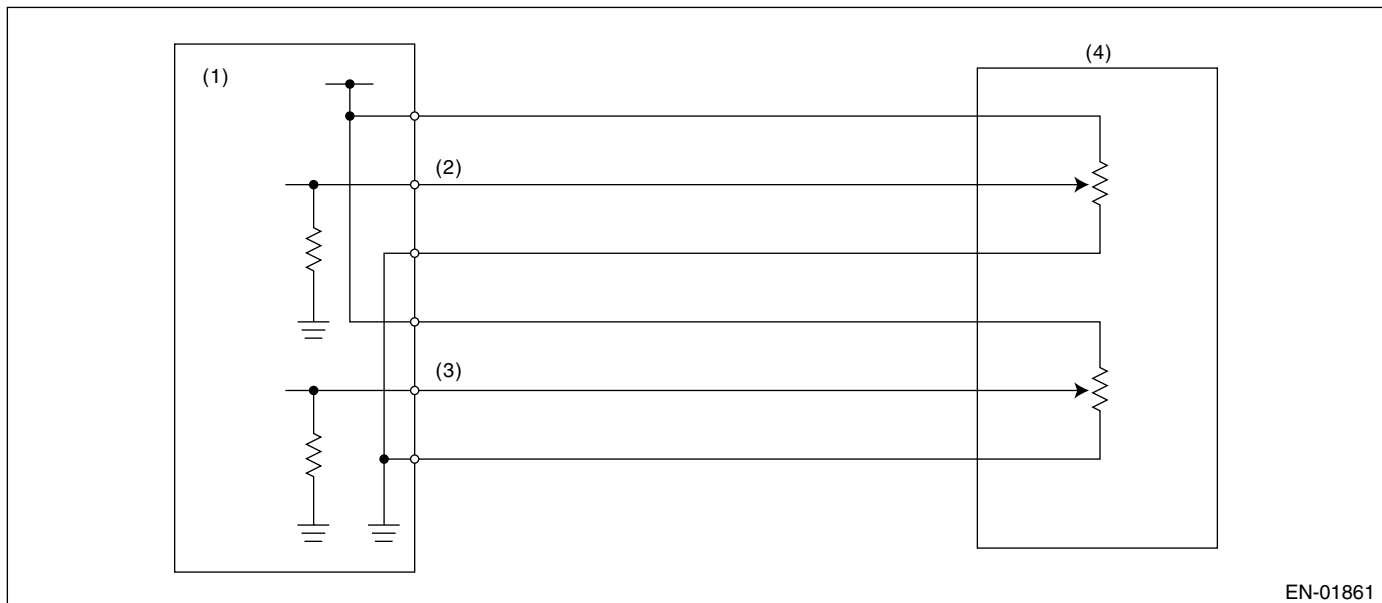- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DN: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



EN-01861

(1) Engine control module (ECM)

(2) Accelerator pedal position sensor 1 signal.

(3) Accelerator pedal position sensor 2 signal.

(4) Accelerator pedal position sensor

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Sensor 1 input voltage | ≥ 0.308 V |

**Time Needed for Diagnosis:** 100 milliseconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only 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

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
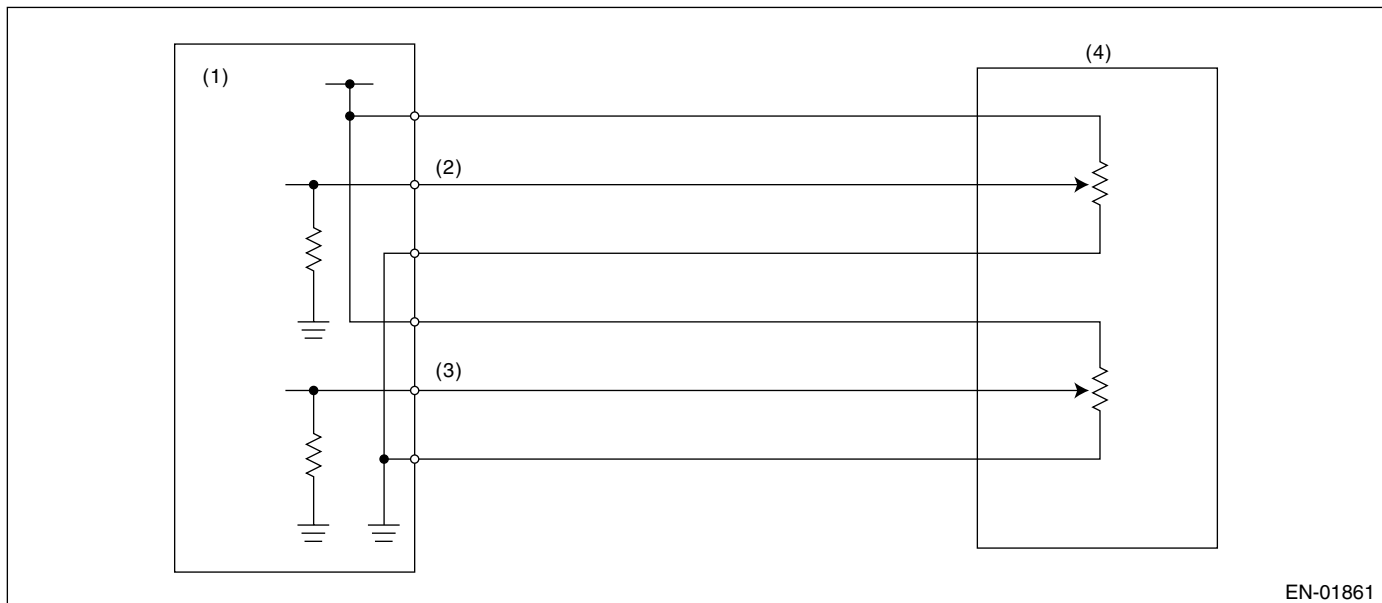- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DO: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



EN-01861

(1) Engine control module (ECM)

(2) Accelerator pedal position sensor 1 signal.

(3) Accelerator pedal position sensor 2 signal.

(4) Accelerator pedal position sensor

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|---|---|
| Ignition switch | ON |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Sensor 1 input voltage | ≤ 4.856 V |

**Time Needed for Diagnosis:** 100 milliseconds
**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

• When the OK idling cycle was completed 40 times in a row
• When "Clear Memory" was performed (Only 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

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
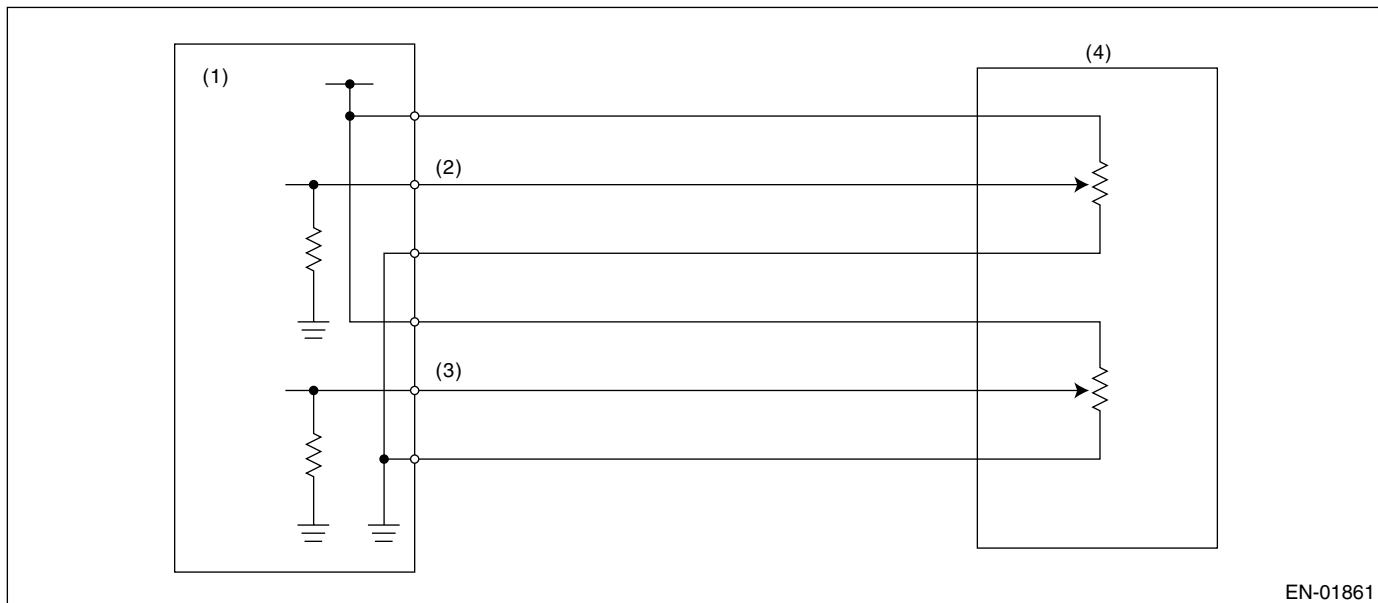- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DP: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



EN-01861

(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)

### 8. FAIL SAFE

• Single malfunction: Control with normal sensor
• Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

• Memorize the freeze frame data. (For test mode $02)
• Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DQ:DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIR-CUIT 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



EN-01861

(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)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DR:DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE RATIONALITY —

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

### 2. COMPONENT DESCRIPTION



EN-01859

(1)  Throttle position sensor 1 signal.

(2)  Throttle position sensor 2 signal.

(3)  Throttle position sensor

(4)  Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
| --- | --- |
| Ignition switch | ON |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

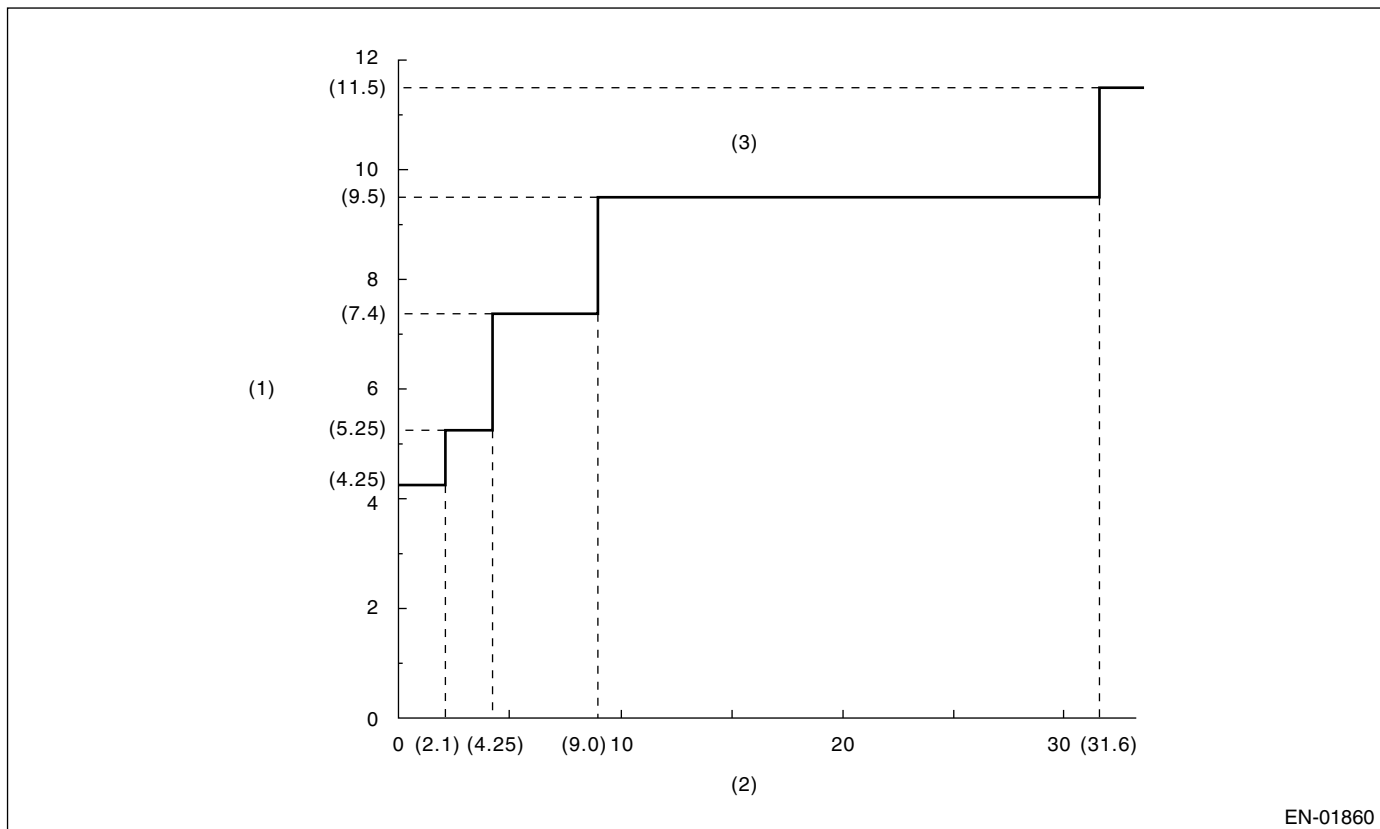Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value |
| --- | --- |
| Signal difference between two sensors | ≤ 4.25 |

**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)
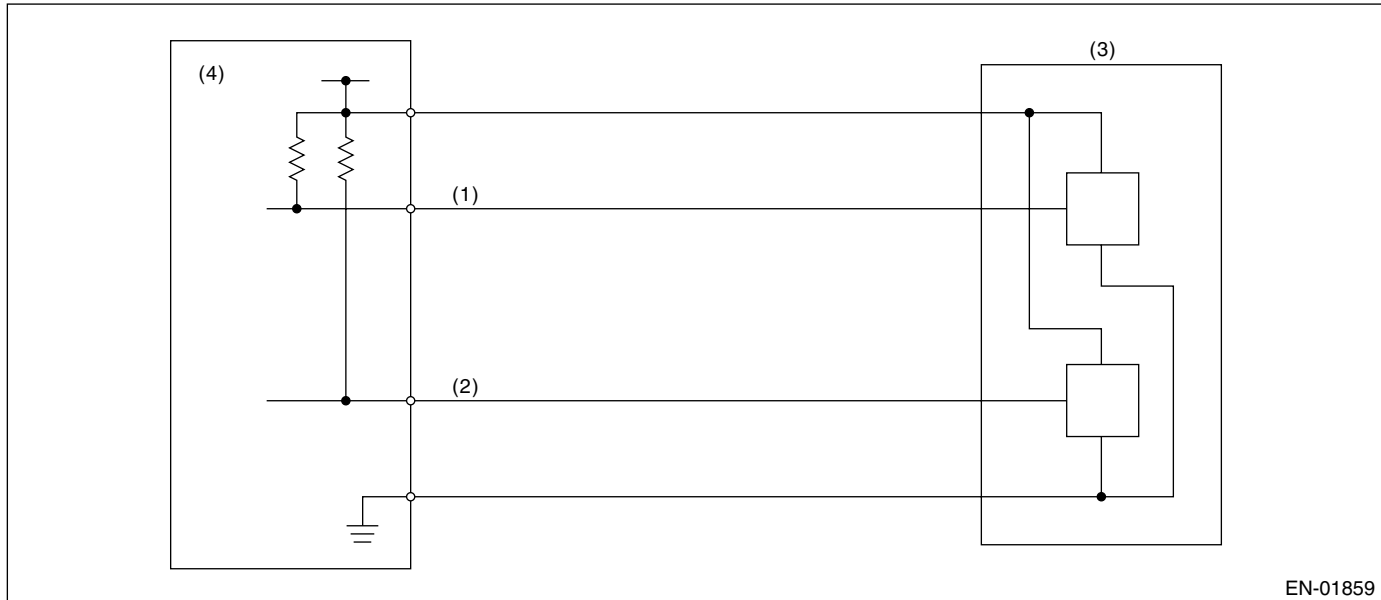- Memorize the diagnostic value and trouble standard value. (For test mode $06)

## DS: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.
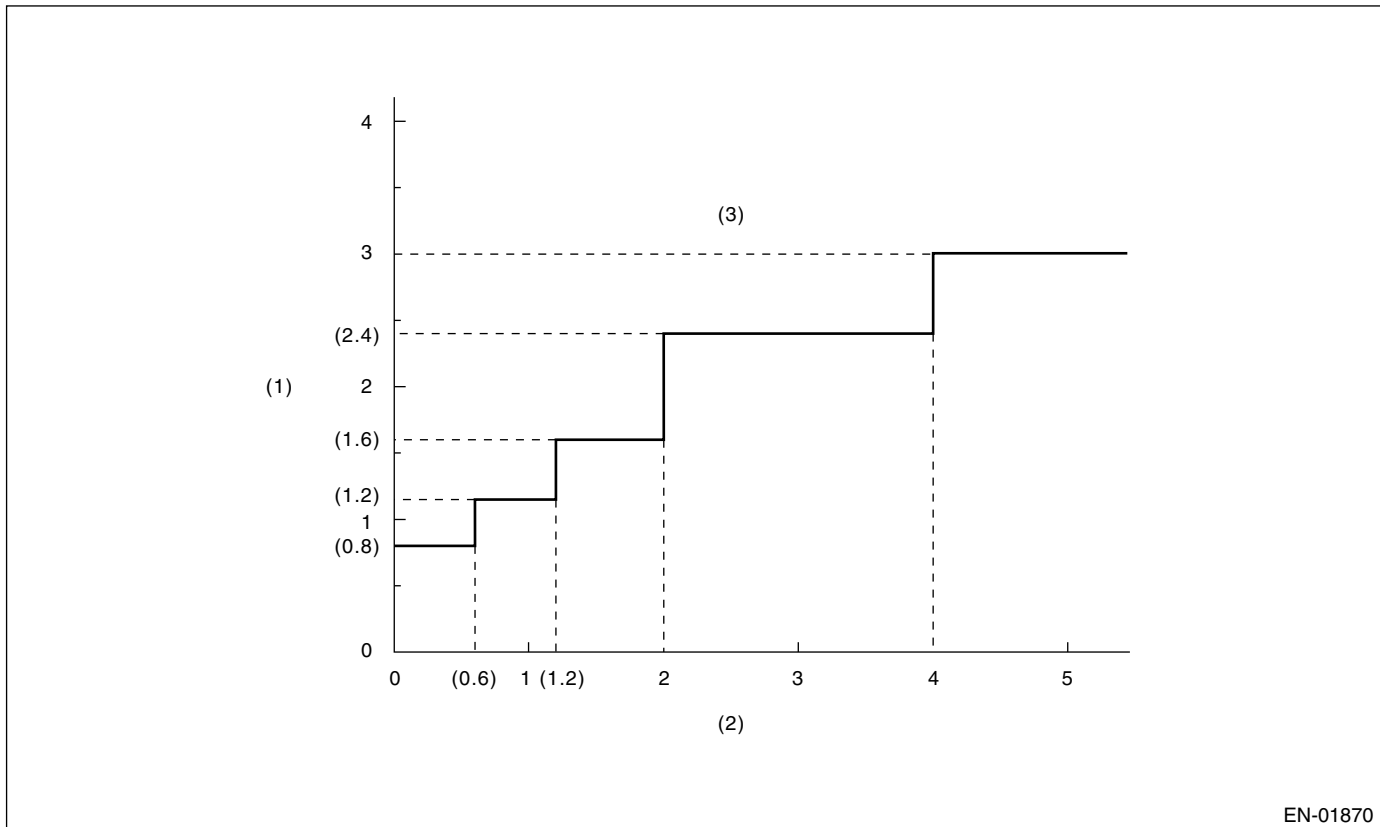
**Judgment Value**

| Malfunction Criteria | Threshold Value |
|---|---|
| Signal difference between two sensors | $\leq 0.8°$ |

**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)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)