

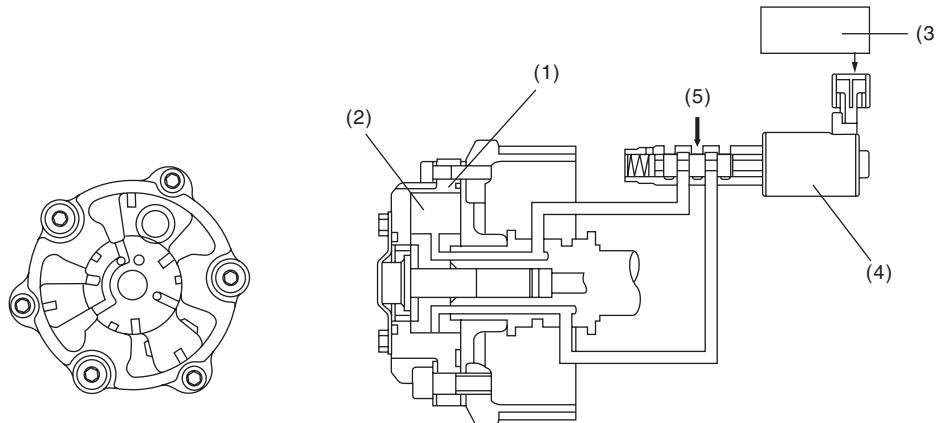
## 2. Diagnostic Trouble Code (DTC) Detecting Criteria

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

#### 2. COMPONENT DESCRIPTION



EN-01852

- |                            |                                     |                  |
|----------------------------|-------------------------------------|------------------|
| (1) AVCS timing controller | (3) Engine control module (ECM)     | (5) Oil pressure |
| (2) Vane                   | (4) Oil flow control solenoid valve |                  |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Time of establishing all secondary parameter conditions	≥ 3 seconds
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Engine coolant temperature	≥ 50°C (122°F)
AVCS control	Operation
Target advance angle	0°CA or more
Target timing advance change amount	< 1.07°CA/64 ms

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after warming up when the engine speed increases and AVCS operates.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 5. DIAGNOSTIC METHOD

- 1) When the conditions during which the differences of AVCS target timing advance amount and AVCS actual timing advance amount is large continues for certain amount of time.
- 2) When the differences of AVCS target timing advance amount and AVCS actual timing advance amount is calculated for certain amount of time and the difference is the specified value or larger.

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 30 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
$\Sigma(\text{Target position} - \text{actual position})$ or $\Sigma(\text{Target position} - \text{actual position})$	$> 12000^{\circ}\text{CA}$ or $< -2500^{\circ}\text{CA}$

#### Time Needed for Diagnosis:

30 seconds

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

#### • Normality Judgment

- 1) Judge as OK and clear the NG when the continuous time of meeting the following criteria is 1 second or more.
- 2) OK, when the following criteria are satisfied.

#### Judgment Value

Malfunction criteria	Threshold value
$\Sigma(\text{Target position} - \text{actual position})$	$\leq 12000^{\circ}\text{CA}$ and $\geq -2500^{\circ}\text{CA}$

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

Fix valve lift amount to High

### 9. ECM OPERATION AT DTC SETTING

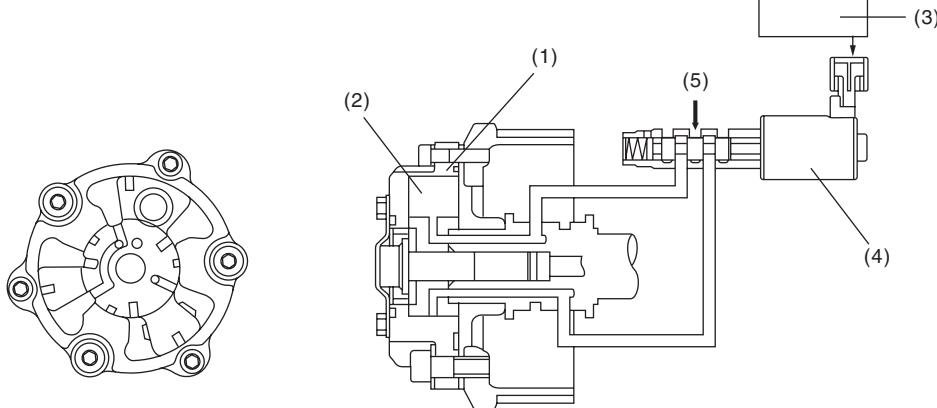
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

#### 2. COMPONENT DESCRIPTION



EN-01852

(1) AVCS timing controller

(3) Engine control module (ECM)

(5) Oil pressure

(2) Vane

(4) Oil flow control solenoid valve

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
Engine speed	$\geq 500$ rpm
Engine coolant temperature	$\geq 50^{\circ}\text{C}$ ( $122^{\circ}\text{F}$ )
AVCS	Uncontrolled

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after warming up the engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 5. DIAGNOSTIC METHOD

Judge as NG when the camshaft sensor input position is not within the normal range.

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 20 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Camshaft input position	< BTDC 22°CA or > BTDC 58°CA

**Time Needed for Diagnosis:** 20 seconds

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

#### • Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the following criteria is 1 second or more.

#### Judgment Value

Malfunction criteria	Threshold value
Camshaft input position	$\geq$ BTDC 22°CA and $\leq$ BTDC 58°CA

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

Fix valve lift amount to High

### 9. ECM OPERATION AT DTC SETTING

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

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

#### NOTE:

For diagnostic procedures, refer to DTC P0016. <Ref. to GD(H6DO)-11, DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

#### NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H6DO)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### E: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG with either Low NG or High NG.

A variable valve lift diagnosis oil pressure switch is installed for diagnosis. It is possible to determine whether the intake valve is in high mode (increase the amount of lift) or in low mode (suppressing the amount of lift) when the variable valve lift diagnosis oil pressure switch is turned ON or OFF.

##### • Normal

Oil switching solenoid valve duty	Intake valve	Variable valve lift diagnosis oil pressure switch
Large	High mode	OFF
Minimum	Low mode	ON

##### • Low NG

When the variable valve lift diagnosis oil pressure switch remains ON even though the intake valve tried to enter high mode (oil switching solenoid valve duty is large), this is judged as a Low NG.

##### • High NG

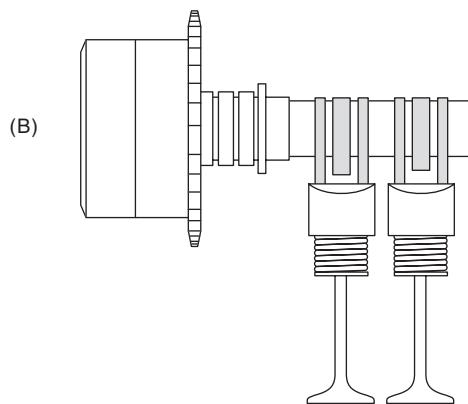
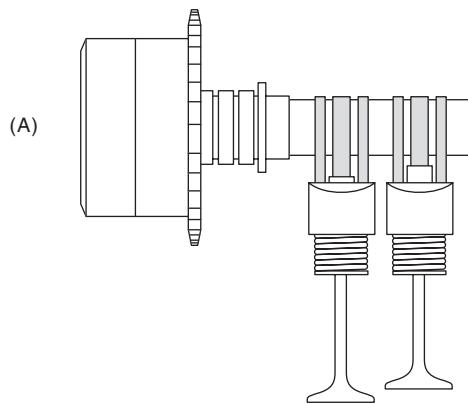
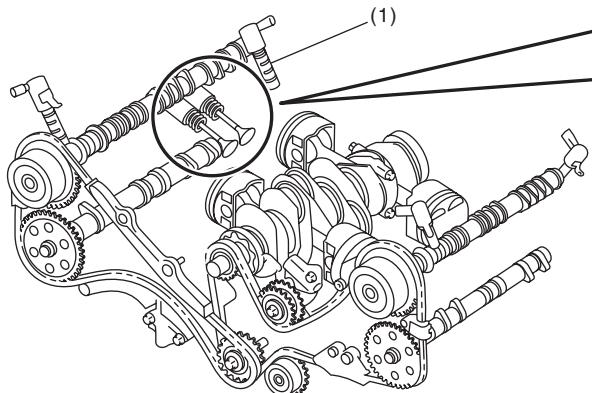
When the variable valve lift diagnosis oil pressure switch remains OFF even though the intake valve tried to enter low mode (oil switching solenoid valve duty is small), this is judged as a High NG.

## Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

## 2. COMPONENT DESCRIPTION

The variable valve lift system optimizes the intake valve lift by switching between the low lift cam and the high lift cam according to the engine speed. The amount of intake valve lift is varied by controlling the oil switching solenoid valve duty according to signals from the ECM.



EN-03119

- (1) Oil switching solenoid valve (A) When at low speed  
(B) When at high speed

### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
After engine starting	$\geq 6$ seconds
Engine oil temperature	$\geq 0^{\circ}\text{C}$ ( $0^{\circ}\text{F}$ )
Variable valve lift control	Operation

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously 6 seconds after engine start while variable valve lift is being controlled

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

#### Judgment Value

Malfunction criteria	Threshold value
Low NG	
Duty ratio	≥ 62%
Variable valve lift diagnosis oil pressure switch	ON
High NG	
Duty ratio	< 33%
Variable valve lift diagnosis oil pressure switch	OFF

#### Time Needed for Diagnosis:

Low side: 0.784 seconds

High side: 3.0 seconds

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

### • Normality Judgment

Judge as OK and clear the NG if the continuous time while the following criteria are met is more than the pre-determined time.

#### Judgment Value

Malfunction criteria	Threshold value
Low OK	
Duty ratio	≥ 62%
Variable valve lift diagnosis oil pressure switch	OFF
High OK	
Duty ratio	< 33%
Variable valve lift diagnosis oil pressure switch	ON

#### Time Needed for Diagnosis:

Low side: 0.208 seconds

High side: 3.0 seconds

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

## F: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2)

#### NOTE:

For diagnostic procedures, refer to DTC P0026. <Ref. to GD(H6DO)-13, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

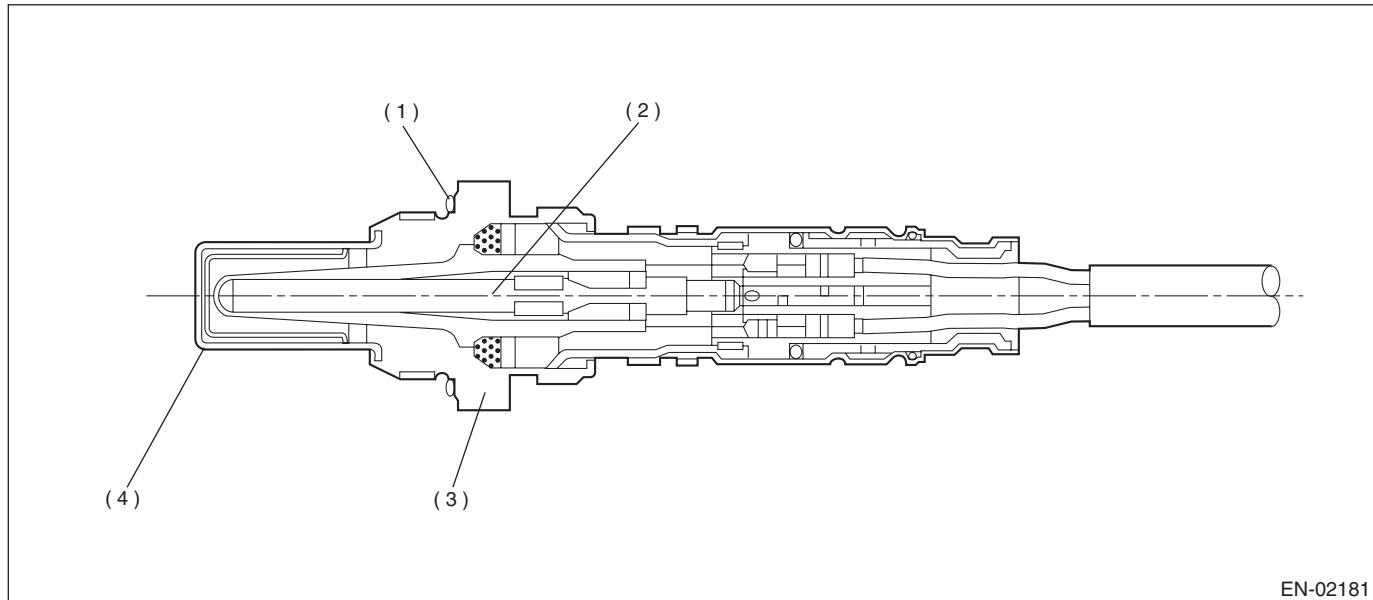
### G: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect functional errors of the front oxygen (A/F) sensor heater.

Judge as NG when it is determined that the front oxygen (A/F) sensor impedance is large when looking at engine status such as deceleration fuel cut.

#### 2. COMPONENT DESCRIPTION



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

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Condition established time	30 seconds or more
Battery voltage	> 10.9 V
Control duty $\geq$ 35%	Experienced
After fuel cut	20 seconds or more

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 30 seconds or more have passed since the engine started.

### 5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear NG when the continuous time of not completing the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

#### Judgment Value

Malfunction criteria	Threshold value
Front oxygen (A/F) sensor impedance	> 50 Ω

**Time Needed for Diagnosis:** 10 seconds

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Rear oxygen sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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

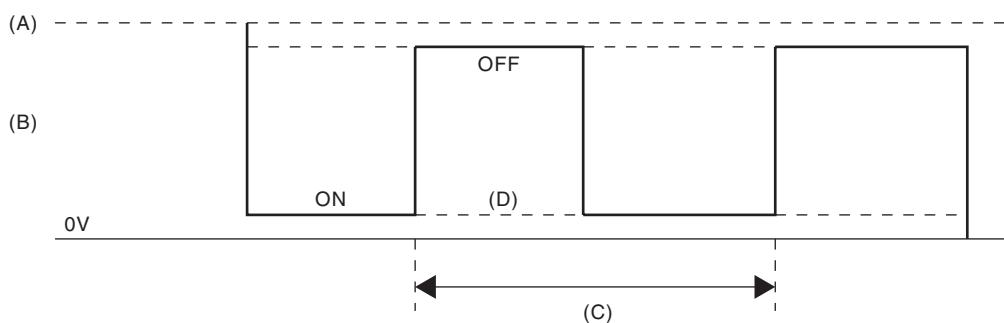
#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge as NG when the terminal voltage remains Low.

#### 2. COMPONENT DESCRIPTION



EN-01792

(A) Battery voltage

(C) 128 milliseconds

(D) Low error

(B) Front oxygen (A/F) sensor heater output voltage

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG if the duration of time while the following criteria are met is 1 second (8 cycles) or more.

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5%

**Time Needed for Diagnosis:** 1 second

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage level	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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

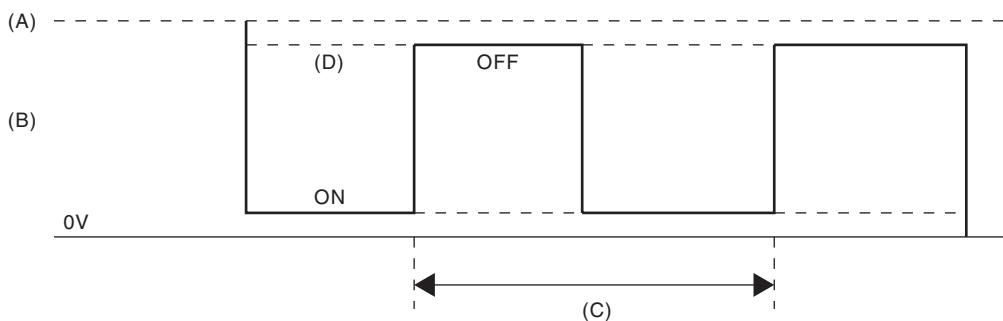
#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge as NG when the terminal voltage remains High.

#### 2. COMPONENT DESCRIPTION



EN-01793

(A) Battery voltage

(C) 128 milliseconds

(D) High error

(B) Front oxygen (A/F) sensor heater output voltage

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG if the duration of time while the following criteria are met is 1 second (8 cycles) or more.

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	$\geq 12.5\%$

**Time Needed for Diagnosis:** 1 second

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage level	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be  $0.3 \rightarrow 0$ , normally.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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

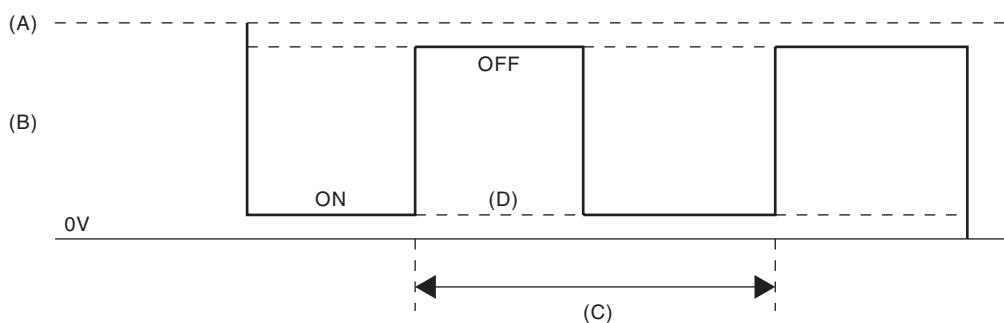
#### 1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge as NG when the terminal voltage remains Low.

#### 2. COMPONENT DESCRIPTION



EN-01792

(A) Battery voltage

(C) 256 milliseconds (cycles)

(D) Low error

(B) Output voltage of the rear oxygen sensor heater

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	> 10.9 V

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

**Time Needed for Diagnosis:** 2.56 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage level	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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

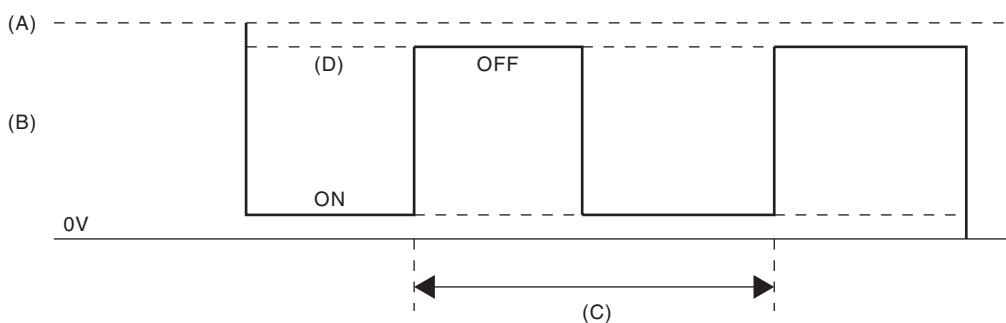
#### 1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge as NG when the terminal voltage remains High.

#### 2. COMPONENT DESCRIPTION



EN-01793

(A) Battery voltage

(C) 256 milliseconds (cycles)

(D) High error

(B) Output voltage of the rear oxygen sensor heater

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	> 10.9 V

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage level	High
Rear oxygen sensor heater control duty	$\geq 15\%$

**Time Needed for Diagnosis:** 2.56 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage level	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### **L: DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0030. <Ref. to GD(H6DO)-16, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **M: DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0031. <Ref. to GD(H6DO)-18, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **N: DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0032. <Ref. to GD(H6DO)-20, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **O: DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)**

#### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0037. <Ref. to GD(H6DO)-22, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **P: DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)**

#### **1. OUTLINE OF DIAGNOSIS**

NOTE:

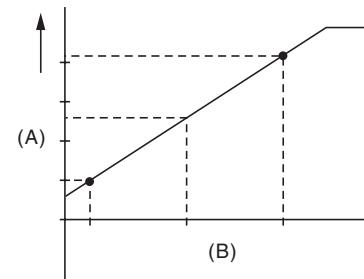
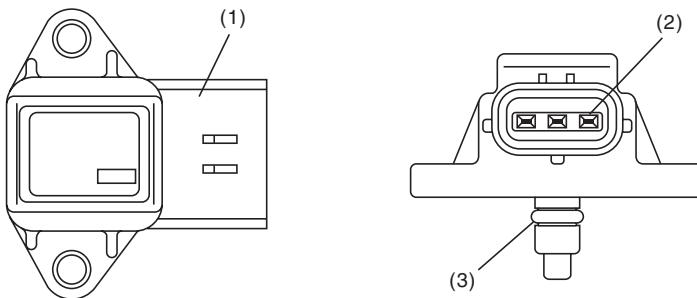
For the detection standard, refer to DTC P0038. <Ref. to GD(H6DO)-24, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### Q: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

#### 1. OUTLINE OF DIAGNOSIS

Detect problems in the intake manifold pressure sensor output properties. Judge as NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

#### 2. COMPONENT DESCRIPTION



EN-01765

(1) Connector  
(2) Terminals

(3) O-ring

(A) Output voltage  
(B) Absolute pressure

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when either Low side or High side becomes NG.

Judge as NG if the continuous time while the following criteria are met exceeds the determined time.

##### Judgment Value

Malfunction criteria	Threshold value
Low side	
Engine speed	$< 2500$ rpm
Throttle position	$\geq 15^{\circ}$
Output voltage	$< 2.12$ V
Engine load	$> 0.87$ g/rev
High side	
Engine speed	$500 \leftrightarrow 850$ rpm
Throttle position	$< 3.5^{\circ}$
Output voltage	$\geq 2.66$ V
Engine load	$< 0.6$ g/rev

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### Time Needed for Diagnosis:

3 seconds (Low side)

10 seconds (High side)

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

### • Normality Judgment

Judge as OK and clear the NG when both Low side and High side become OK.

Judge as OK when the criteria below are met.

### Judgment Value

Malfunction criteria	Threshold value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 15°
Output voltage	≥ 2.12 V
Engine load	> 0.87 g/rev
High side	
Engine speed	500 ↔ 850 rpm
Throttle position	< 3.5°
Output voltage	< 2.66 V
Engine load	< 0.6 g/rev

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from the engine speed and size of the throttle opening. When the throttle opening is also NG, fix at 66.7 kPa (500 mmHg, 19.69 inHg).
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Fuel cut will operate at engine high speed.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knocking compensation

When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value

Failure: learned ignition advance value =  $-6^{\circ}\text{CA}$ . ( $6^{\circ}\text{CA}$  retard)

Knock F/B advance angle value =  $0^{\circ}\text{CA}$

Whole learning prohibited

Portional learning prohibited

- ISC control: ISC feedback amount calculation prohibited

Amount of ISC open-loop compensation = Fixed at 6.82%

- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

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

### R: DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open circuit of the oil switching solenoid valve.

Judge as NG when the current is small even though the output duty is large.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the following conditions is 2 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Duty ratio	$\geq 30\%$
Control current	$< 0.026$ A

**Time Needed for Diagnosis:** 2 seconds

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

##### • Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the following conditions is 2 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
$ Oil$ switching solenoid valve target current value – oil switching solenoid valve current value	$< 0.08$ A
Target current	$\geq 0.11$ A

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### S: DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect short circuits of the oil switching solenoid valve.

Judge as a short NG when the current is large even though the output duty is small.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the following conditions is 2 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Duty ratio	< 7%
Control current	$\geq 0.465$ A

**Time Needed for Diagnosis:** 2 seconds

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

##### • Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the following conditions is 2 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Oil switching solenoid valve target current value – oil switching solenoid valve current value	< 0.08 A

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

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

### **T: DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2)**

#### **1. OUTLINE OF DIAGNOSIS**

##### **NOTE:**

For the detection standard, refer to DTC P0076. <Ref. to GD(H6DO)-29, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **U: DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2)**

#### **1. OUTLINE OF DIAGNOSIS**

##### **NOTE:**

For the detection standard, refer to DTC P0077. <Ref. to GD(H6DO)-30, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

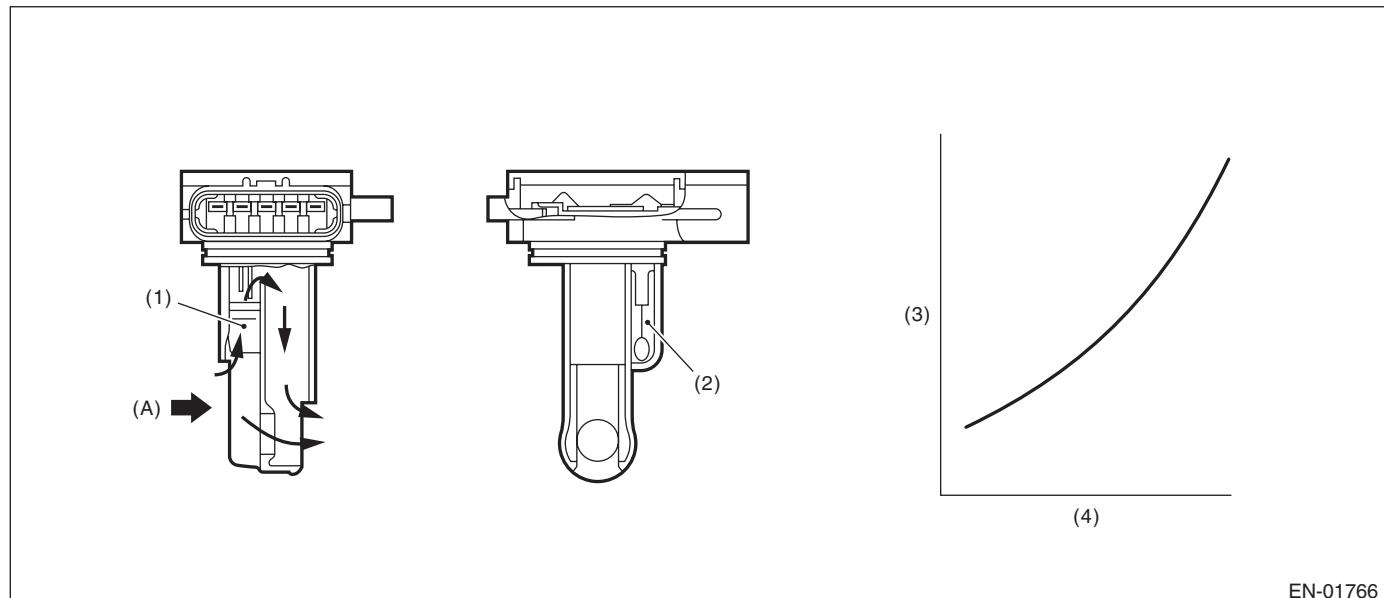
### V: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output properties.

Judge as a low side NG when the air flow voltage indicates a small value regardless of running in a state where the air flow voltage increases. Judge as a high side NG when the air flow voltage indicates a large value regardless of running in a state where the air flow voltage decreases. Judge air flow sensor property NG when the Low side or High side becomes NG.

#### 2. COMPONENT DESCRIPTION



(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Amount of intake air (kg/s)

(A) Air

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG if the continuous time while the following criteria are met exceeds the determined time.

#### Judgment Value

Malfunction criteria	Threshold value
Low side error	
Output voltage	< 1.79 V
Engine speed	≥ 2000 rpm
Throttle valve angle	≥ 15°
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
High side error (1)	
Output voltage	≥ 1.83 V
Engine speed	500 ←→ 850 rpm
Throttle valve angle	< 3.5°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
High side error (2)	
Output voltage	≥ 1.73 V
Engine speed	500 ←→ 850 rpm
Throttle valve angle	< 3.5°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
Fuel system diagnosis	Rich side malfunction

#### Time Needed for Diagnosis:

Low side: 5 seconds

High side: 10 seconds

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

### • Normality Judgment

Judge as OK if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
(Low side error)	
Output voltage	≥ 1.79 V
Engine speed	≥ 2000 rpm
Throttle valve angle	≥ 15°
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
(High side error)	
Output voltage	< 1.83 V
Engine speed	500 ←→ 850 rpm
Throttle valve angle	< 3.5°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
Fuel system diagnosis	Rich side normal

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

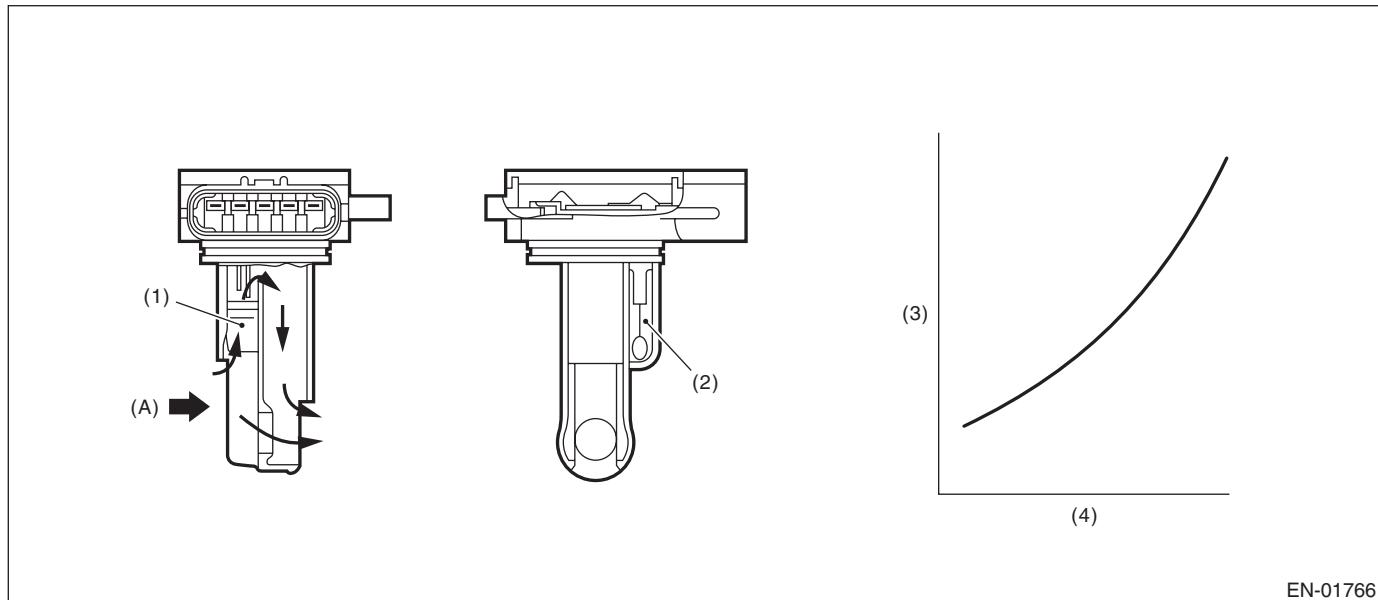
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01766

- |                                   |                                      |         |
|-----------------------------------|--------------------------------------|---------|
| (1) Air flow sensor               | (3) Voltage (V)                      | (A) Air |
| (2) Intake air temperature sensor | (4) Amount of intake air (kg (lb)/s) |         |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\leq 0.2$ V

**Time Needed for Diagnosis:** 0.5 seconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
  - When normal: Knock compensation value = Fixed at 0°CA
  - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
  - Whole learning compensation coefficient update not allowed
  - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g (0.04 oz)/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

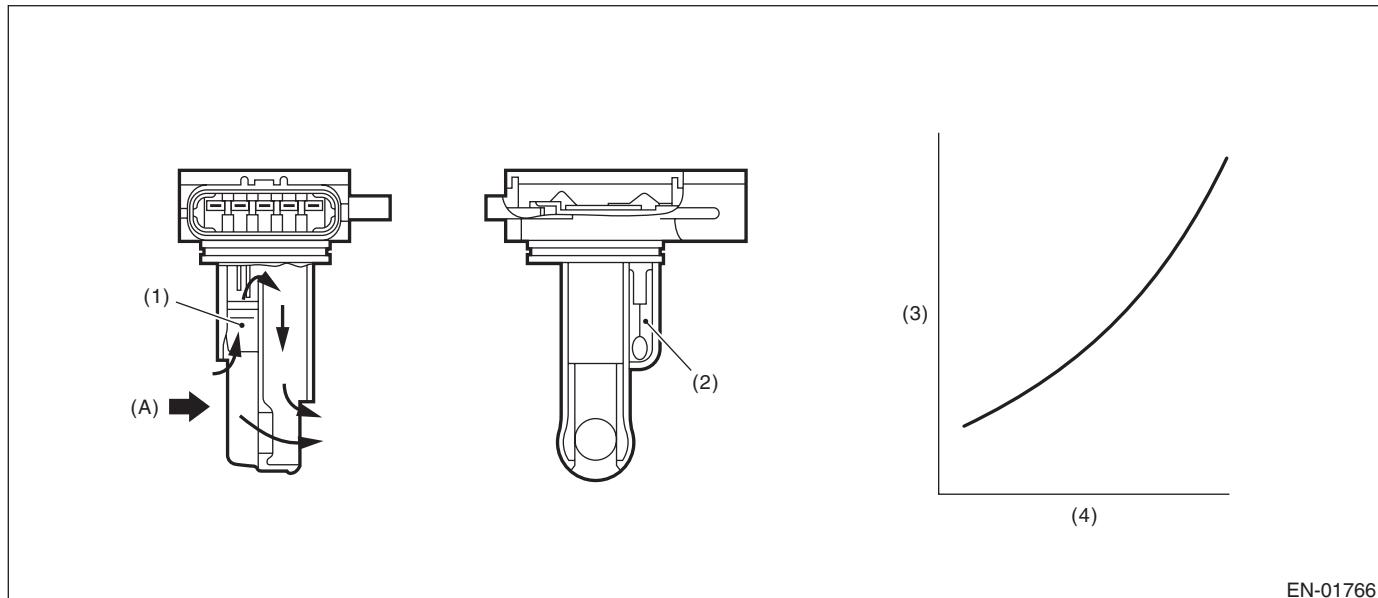
Memorize the freeze frame data. (For test mode \$02)

### X: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01766

- |                                   |                                      |         |
|-----------------------------------|--------------------------------------|---------|
| (1) Air flow sensor               | (3) Voltage (V)                      | (A) Air |
| (2) Intake air temperature sensor | (4) Amount of intake air (kg (lb)/s) |         |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the criteria below is 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.985$ V

**Time Needed for Diagnosis:** 0.5 seconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
  - When normal: Knock compensation value = Fixed at 0°CA
  - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
  - Whole learning compensation coefficient update not allowed
  - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g (0.04 oz)/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

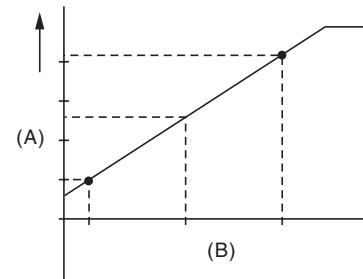
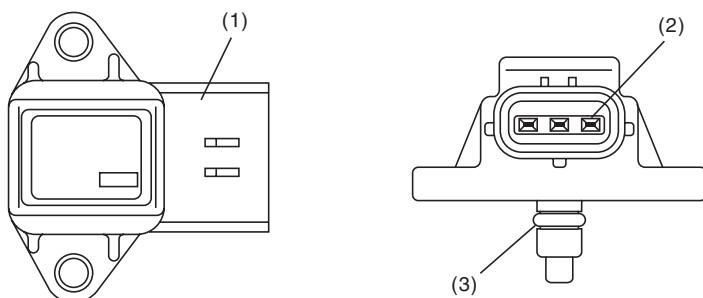
Memorize the freeze frame data. (For test mode \$02)

### Y: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01765

(1) Connector  
(2) Terminals

(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 as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.568 V

**Time Needed for Diagnosis:** 0.5 seconds

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

#### 6. DTC CLEAR CONDITION

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

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from the engine speed and size of the throttle opening. When the throttle opening is also NG, fix at 66.7 kPa (500 mmHg, 19.69 inHg).
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Fuel cut will operate at engine high speed.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knocking compensation

When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value

Failure: learned ignition advance value =  $-6^{\circ}\text{CA}$ . ( $6^{\circ}\text{CA}$  retard)

Knock F/B advance angle value =  $0^{\circ}\text{CA}$

Whole learning prohibited

Portional learning prohibited

- ISC control: ISC feedback amount calculation prohibited

Amount of ISC open-loop compensation = Fixed at 6.82%

- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

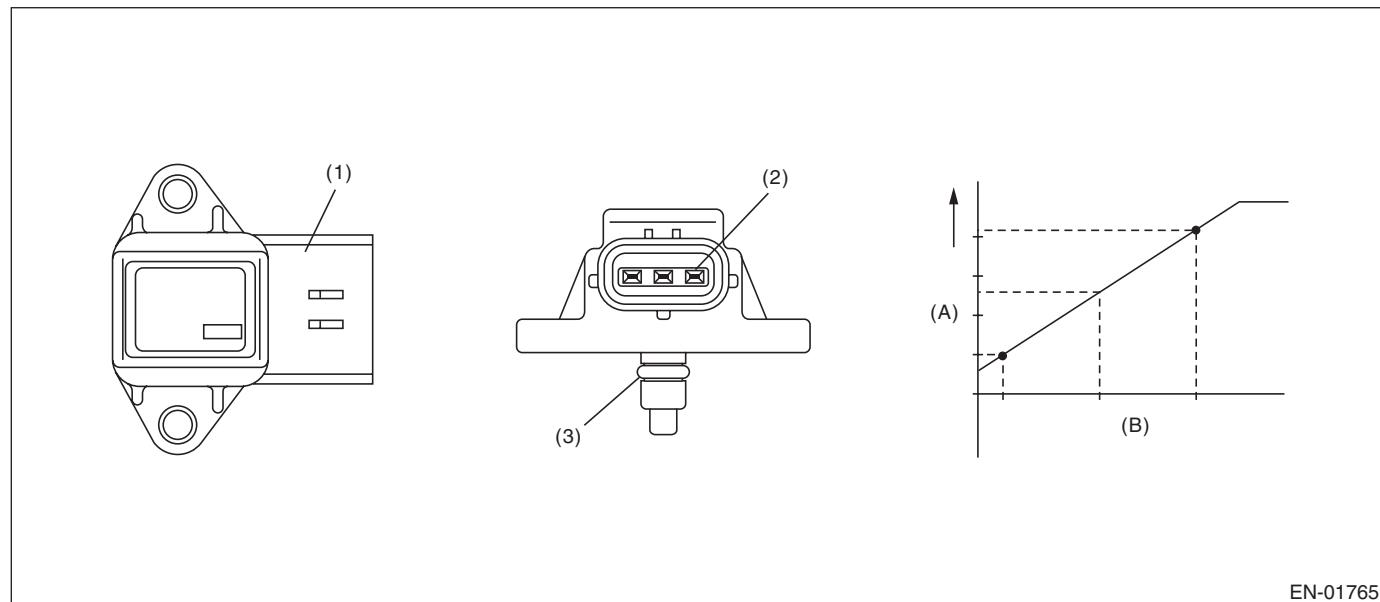
Memorize the freeze frame data. (For test mode \$02)

### Z: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01765

(1) Connector  
(2) Terminals

(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 as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.921$ V

**Time Needed for Diagnosis:** 0.5 seconds

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

#### 6. DTC CLEAR CONDITION

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

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from the engine speed and size of the throttle opening. When the throttle opening is also NG, fix at 66.7 kPa (500 mmHg, 19.69 inHg).
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Fuel cut will operate at engine high speed.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knocking compensation

When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value

Failure: learned ignition advance value =  $-6^{\circ}\text{CA}$ . ( $6^{\circ}\text{CA}$  retard)

Knock F/B advance angle value =  $0^{\circ}\text{CA}$

Whole learning prohibited

Portional learning prohibited

- ISC control: ISC feedback amount calculation prohibited

Amount of ISC open-loop compensation = Fixed at 6.82 %

- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

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

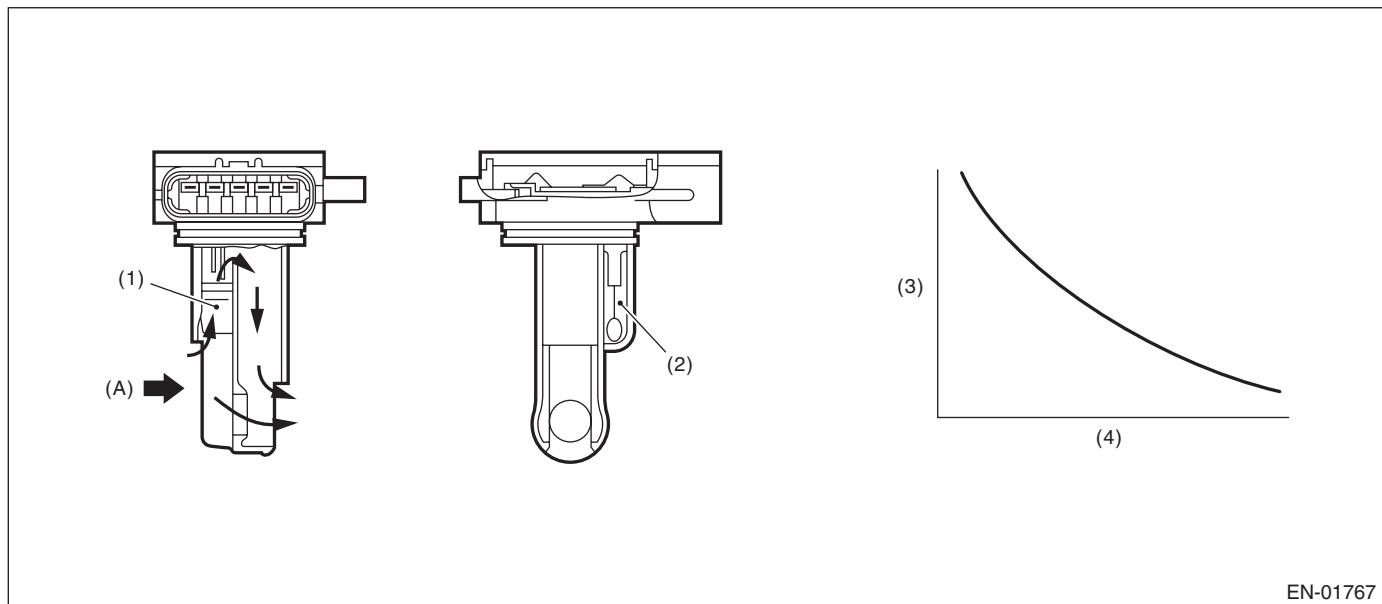
### AA:DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.

Judge as NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

#### 2. COMPONENT DESCRIPTION



EN-01767

- |                                   |                                    |         |
|-----------------------------------|------------------------------------|---------|
| (1) Air flow sensor               | (3) Resistance value (Ω)           | (A) Air |
| (2) Intake air temperature sensor | (4) Intake air temperature °C (°F) |         |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Coolant temp. before engine start	< 30°C (86°F)
Engine coolant temperature	> 95°C (203°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 60 km/h (37 MPH)	600 seconds or more

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is met after warming up from a cold condition.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage difference between Max. and Min.	< 20 mV (Equivalent to approximately 0.5°C (0.9°F) near 25°C)

**Time Needed for Diagnosis:** 1 second

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

#### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage difference between Max. and Min.	≥ 20 mV

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

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

### 9. ECM OPERATION AT DTC SETTING

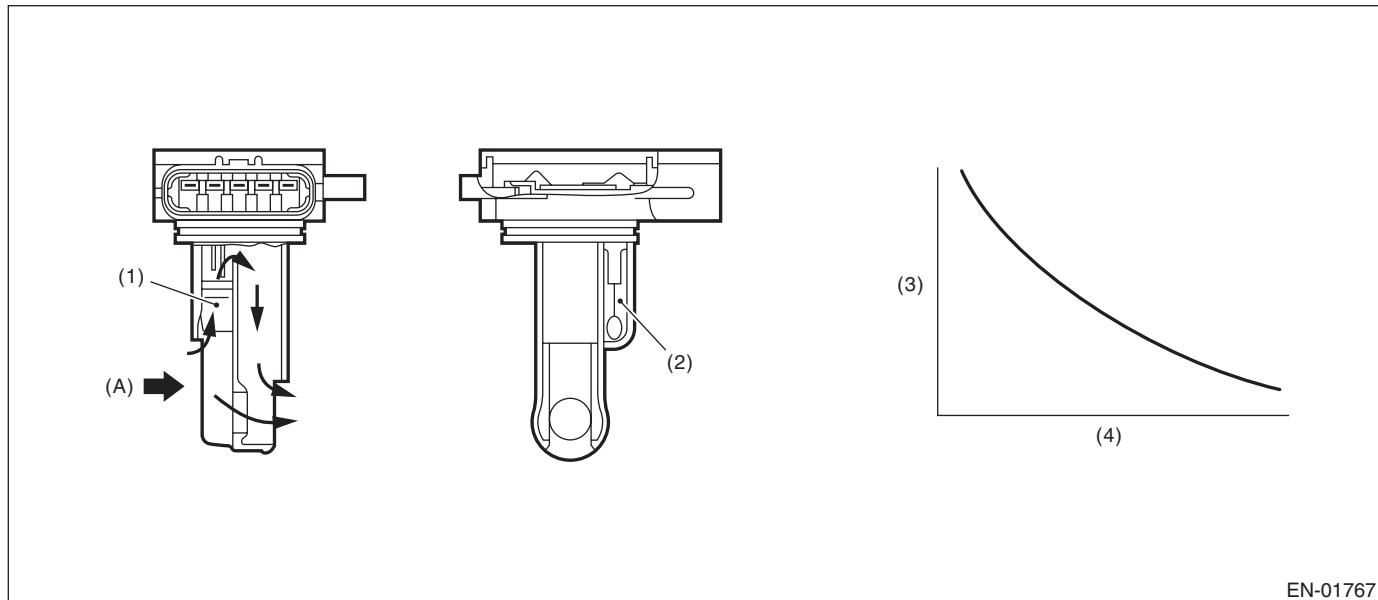
Memorize the freeze frame data. (For test mode \$02)

### AB:DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01767

- |                                   |                                    |         |
|-----------------------------------|------------------------------------|---------|
| (1) Air flow sensor               | (3) Resistance value ( $\Omega$ )  | (A) Air |
| (2) Intake air temperature sensor | (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 as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.166 V
Ignition switch	ON

**Time Needed for Diagnosis:** 0.5 seconds

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

- **Normality Judgment**

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

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 0.166$ V
Ignition switch	ON

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

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

### 9. ECM OPERATION AT DTC SETTING

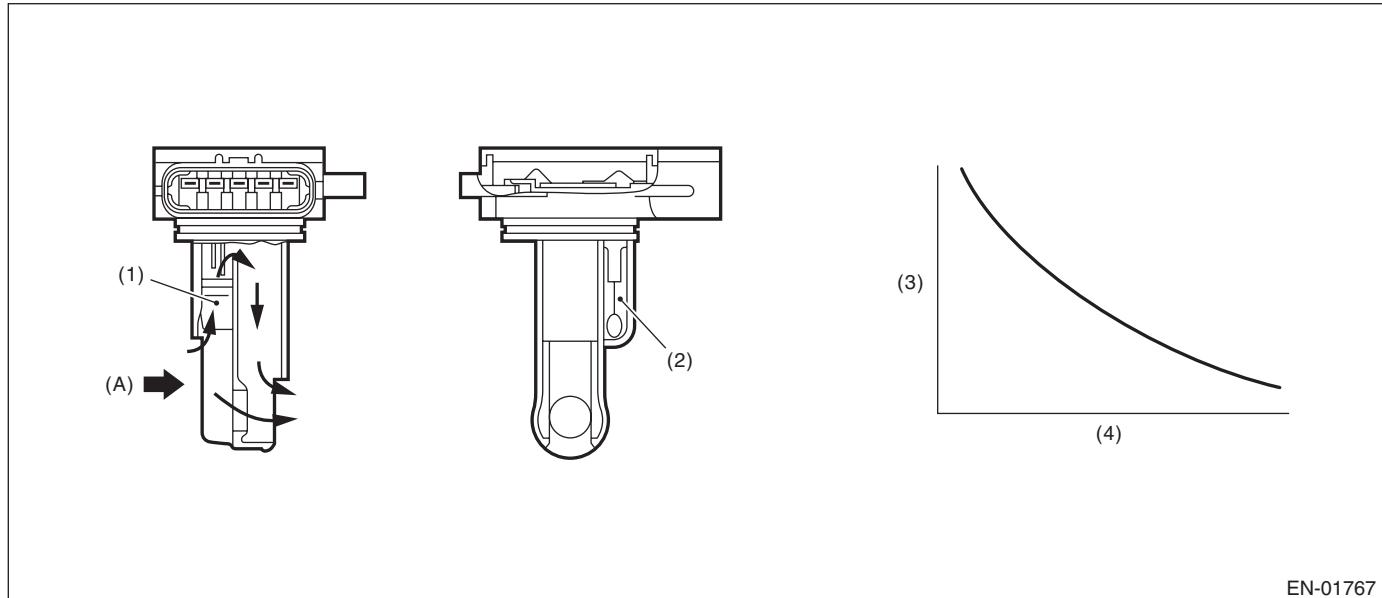
Memorize the freeze frame data. (For test mode \$02)

### AC:DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01767

- |                                   |                                    |         |
|-----------------------------------|------------------------------------|---------|
| (1) Air flow sensor               | (3) Resistance value ( $\Omega$ )  | (A) Air |
| (2) Intake air temperature sensor | (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 as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.716$ V
Ignition switch	ON

**Time Needed for Diagnosis:** 0.5 seconds

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

- **Normality Judgment**

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

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$< 4.716$ V
Ignition switch	ON

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

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

### 9. ECM OPERATION AT DTC SETTING

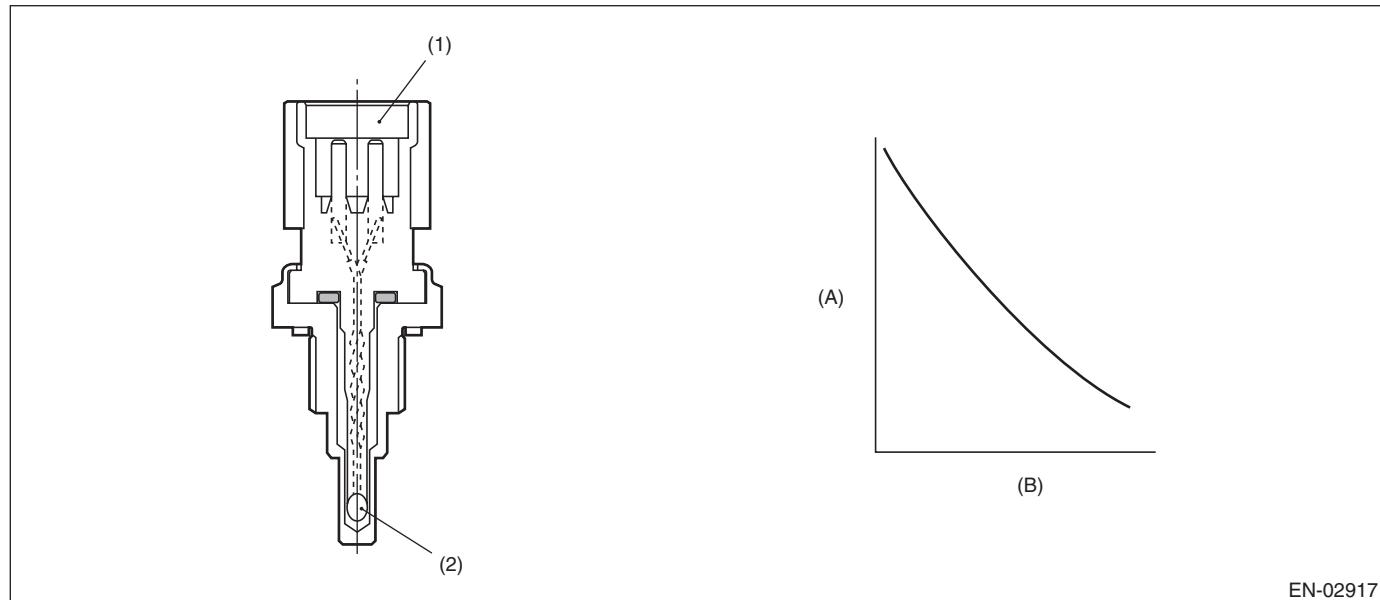
Memorize the freeze frame data. (For test mode \$02)

### AD:DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-02917

- |                        |                           |
|------------------------|---------------------------|
| (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 as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.166 V

**Time Needed for Diagnosis:** 0.5 seconds

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

#### 6. DTC CLEAR CONDITION

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

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.

### 9. ECM OPERATION AT DTC SETTING

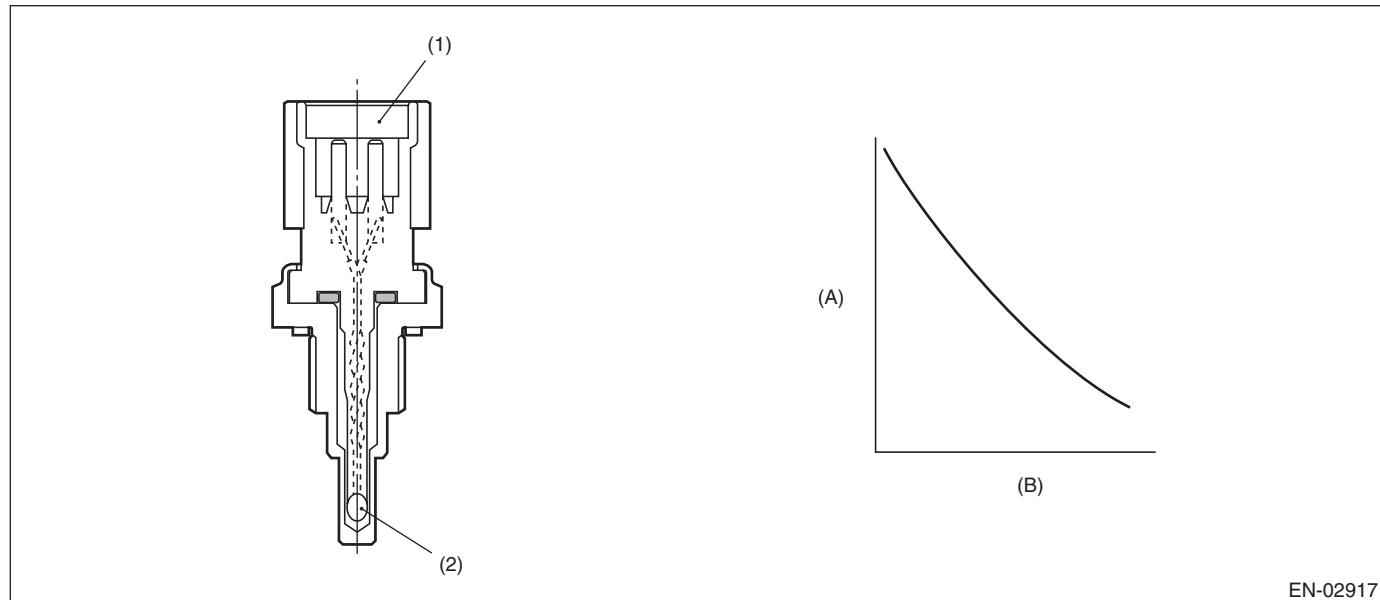
Memorize the freeze frame data. (For test mode \$02)

### AE:DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-02917

- |                        |                           |
|------------------------|---------------------------|
| (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 as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.716$ V

**Time Needed for Diagnosis:** 0.5 seconds

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

#### 6. DTC CLEAR CONDITION

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

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.

### 9. ECM OPERATION AT DTC SETTING

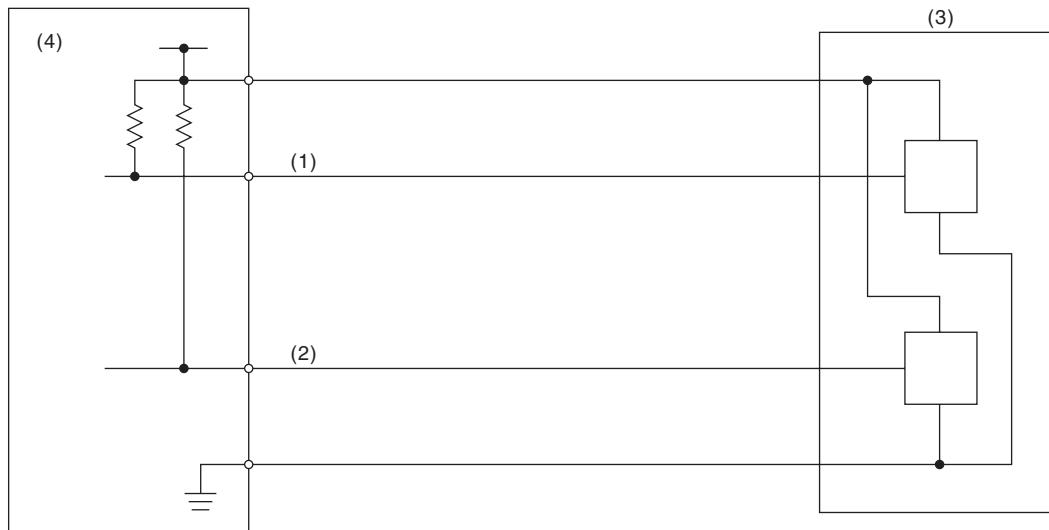
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge as NG if out of specification.

#### 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 as OK and clear the NG when the malfunction criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	$\geq 0.224$ V

**Time Needed for Diagnosis:** 24 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

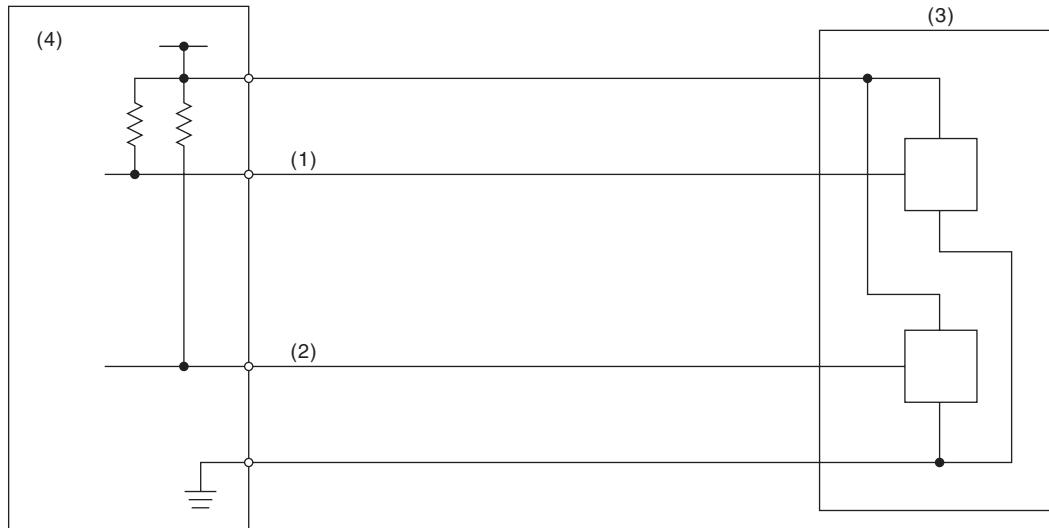
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge as NG if out of specification.

#### 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 as OK and clear the NG when the malfunction criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	$\leq 4.851$ V

**Time Needed for Diagnosis:** 24 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

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

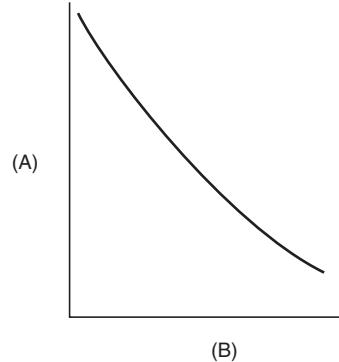
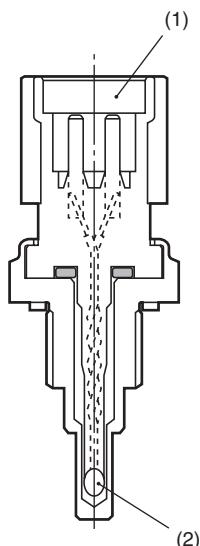
### AH:DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property.

Judge as NG when the engine coolant temperature does not rise in driving conditions where it should.

#### 2. COMPONENT DESCRIPTION



EN-02917

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

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine speed	$\geq 500$ rpm
Battery voltage	$> 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG if the criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature	$< 20^{\circ}\text{C}$ ( $68^{\circ}\text{F}$ )
Timer for diagnosis after engine start	$\geq$ Judgment value of timer after engine start

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

Timer for diagnosis after engine start

- a. Timer stop at fuel cut
- b. During the driving conditions except a) above, timer counts up as follows.  
64 milliseconds + TWCNT milliseconds (the time of at 64 milliseconds)

TWCNT is defined as follows,

TWCNT = 0 at idle switch ON,

TWCNT show on the following table at idle switch OFF.

		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)
Temperature °C (°F)	-20 (-4)	0 ms	37.1 ms	74.3 ms	111.4 ms	126.7 ms	141.9 ms	163.6 ms	185.3 ms
	-10 (-14)	0 ms	27.4 ms	54.8 ms	82.2 ms	99.7ms	117.1 ms	136.0 ms	154.8 ms
	0 (32)	0 ms	17.6 ms	35.3 ms	52.9 ms	72.6 ms	92.3 ms	108.3 ms	124.3 ms
	10 (50)	0 ms	7.9 ms	15.8 ms	23.7 ms	45.6 ms	67.6 ms	80.7 ms	93.9 ms
	20 (68)	0 ms	7.9 ms	15.8 ms	23.7 ms	45.6 ms	67.6 ms	80.7 ms	93.9 ms

Judgment value of timer after engine starting

$$t = 429.5 - 28.605 \times T_i$$

$T_i$  : The lowest coolant temperature after engine start

**Time Needed for Diagnosis:** To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature	$\geq 20^\circ\text{C}$ ( $68^\circ\text{F}$ )

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at  $70^\circ\text{C}$  ( $158^\circ\text{F}$ )
- ISC Feedback: Calculate target engine speed as engine coolant temperature  $70^\circ\text{C}$  ( $158^\circ\text{F}$ ).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.

## 9. ECM OPERATION AT DTC SETTING

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

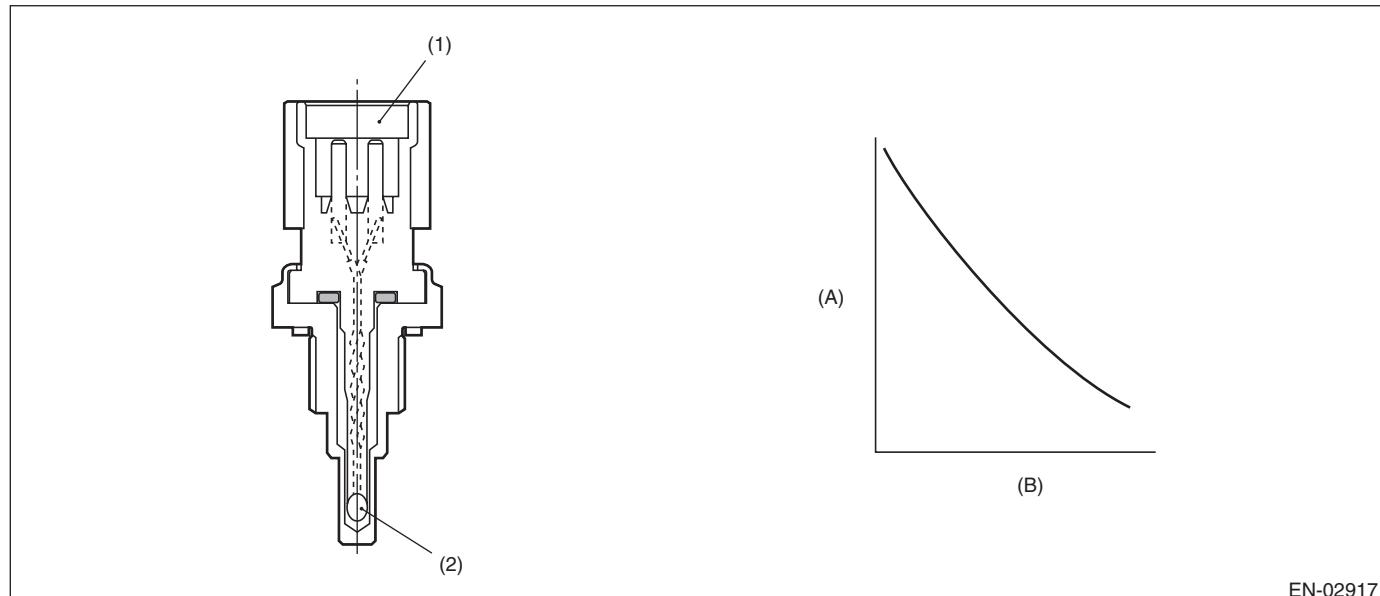
### AI: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.

Memorize the engine coolant temperature and fuel temperature at the last engine stop, and use them to judge as NG when the engine coolant temperature does not decrease when it should.

#### 2. COMPONENT DESCRIPTION



EN-02917

(A) Resistance value (kΩ)

(B) Temperature °C (°F)

(1) Connector

(2) Thermistor element

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
Refueling from the last engine stop till the current engine start	None
Fuel level	$\geq 15$ ℥
Engine coolant temperature at the last engine stop	$\geq 75^{\circ}\text{C}$ (167°F) and $< 95^{\circ}\text{C}$ (203°F)

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

## 5. DIAGNOSTIC METHOD

### Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions is 2.5 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	< 2.5°C (4.5°F)
Fuel temperature at the last engine stop — fuel temperature	≥ 5°C (9°F)
Intake air temperature — fuel temperature	< 2.5°C (4.5°F)
Fuel temperature	< 35°C (95°F)

**Time Needed for Diagnosis:** 2.5 seconds

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

### Normality Judgment

When the following conditions are established, judged as OK.

#### Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	≥ 2.5°C (4.5°F)

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

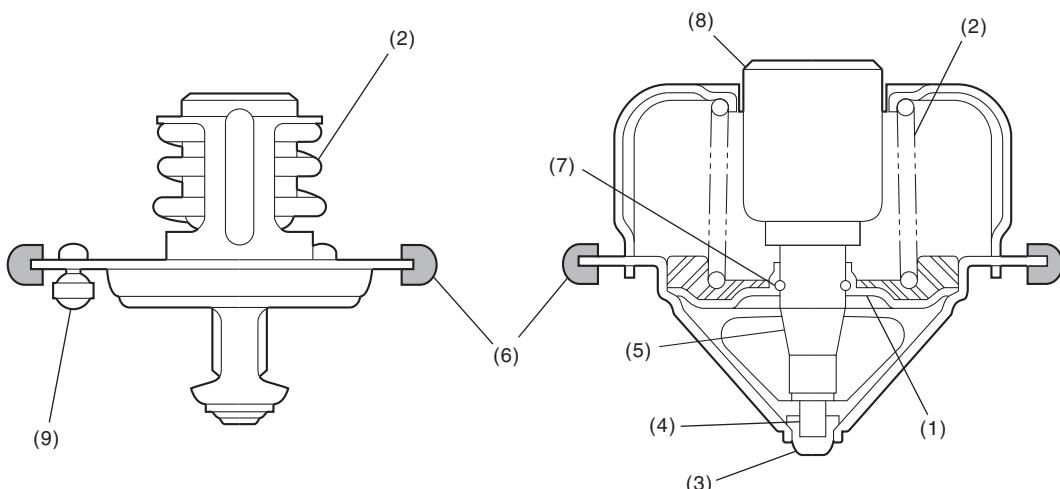
### AJ:DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

#### 1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.

Judge as NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge as OK when the engine coolant temperature becomes to 75°C (167°F), and the difference is small, before judging NG.

#### 2. COMPONENT DESCRIPTION



EN-01692

- |             |                 |                  |
|-------------|-----------------|------------------|
| (1) Valve   | (4) Piston      | (7) Stop ring    |
| (2) Spring  | (5) Guide       | (8) Wax element  |
| (3) Stopper | (6) Rubber seal | (9) Jiggle valve |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 23 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9$ V
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Estimated coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Engine coolant temperature	$\leq 75^{\circ}\text{C}$ (167°F)
(Estimated – measured) Engine coolant temperature	$> 20^{\circ}\text{C}$ (36°F)
Vehicle speed	$\geq 20$ km/h (12 MPH)

**Time Needed for Diagnosis:** 23 seconds

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

#### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9$ V
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
(Estimated – measured) Engine coolant temperature	$\leq 20^{\circ}\text{C}$ (36°F)

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

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

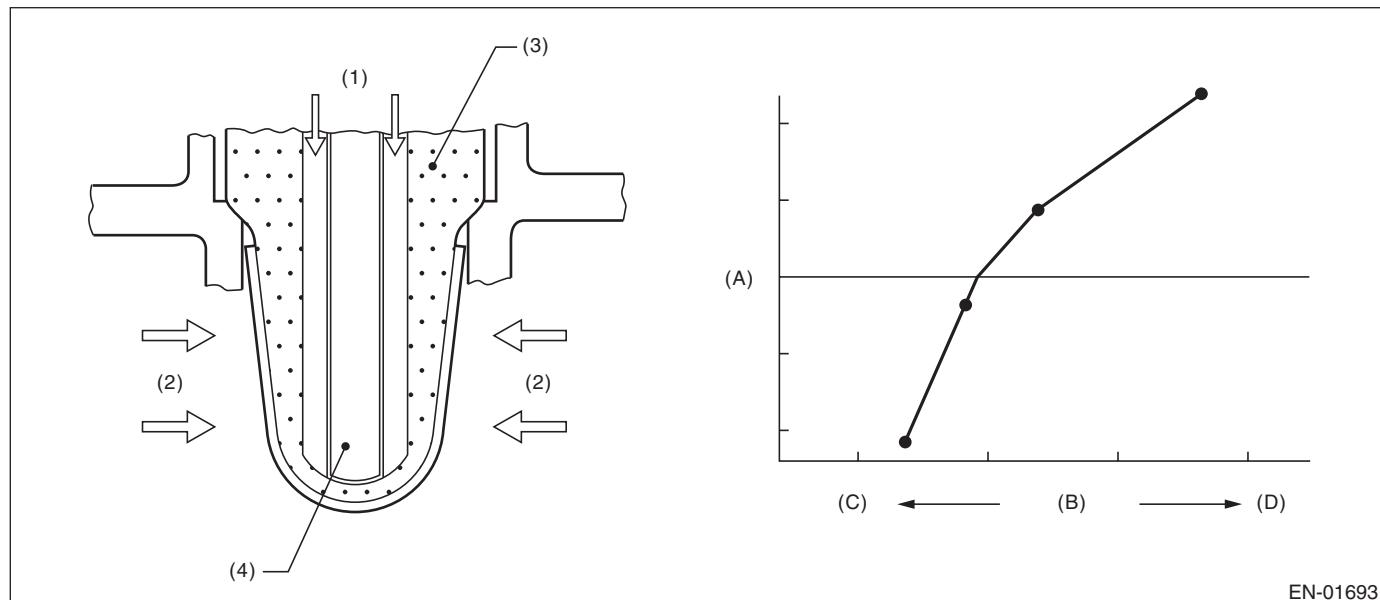
### AK:DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG when the element applied 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 gas      | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Voltage	$\geq 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is 1 second or more.

##### Judgment Value

Malfunction criteria	Threshold value
Input voltage	$< 1.8$ V
Input current	$< -0.005$ A

**Time Needed for Diagnosis:** 1 second

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

#### 6. DTC CLEAR CONDITION

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

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.06 → 0, normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

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

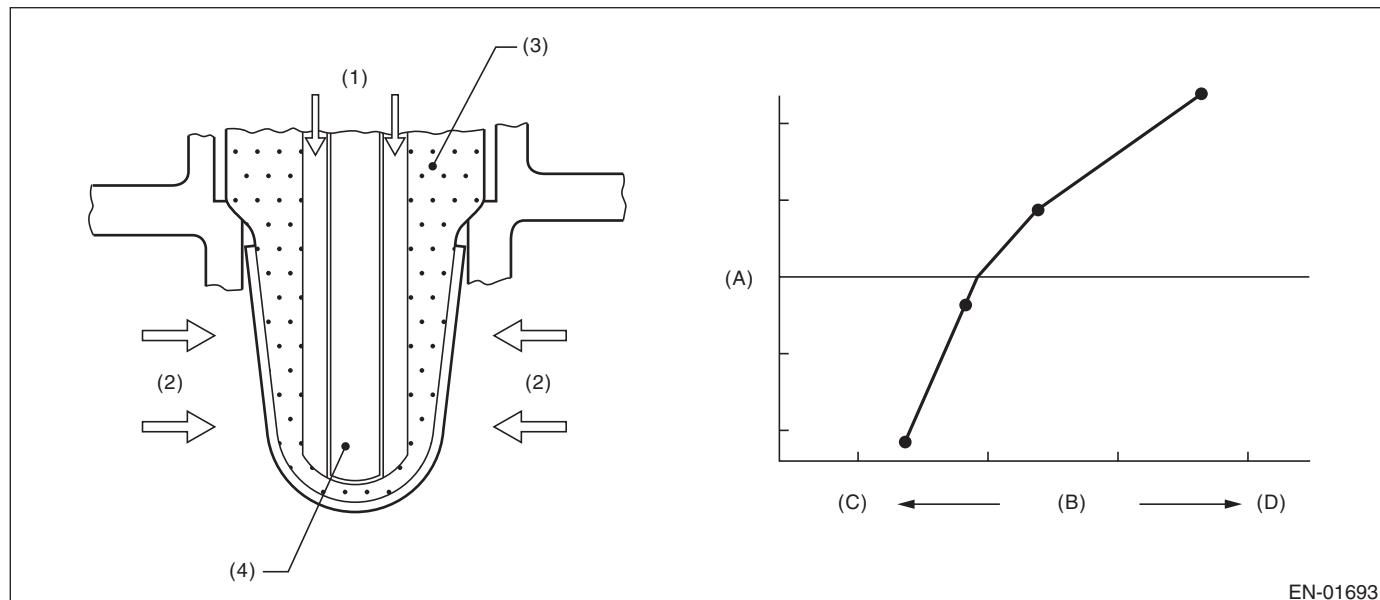
### AL:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG when the element applied voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust gas      | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Voltage	$\geq 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is 1 second or more.

##### Judgment Value

Malfunction criteria	Threshold value
Input voltage	$\geq 3.8$ V
Input current	$\geq 0.005$ A

**Time Needed for Diagnosis:** 1 second

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

#### 6. DTC CLEAR CONDITION

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

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.06 → 0, normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

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

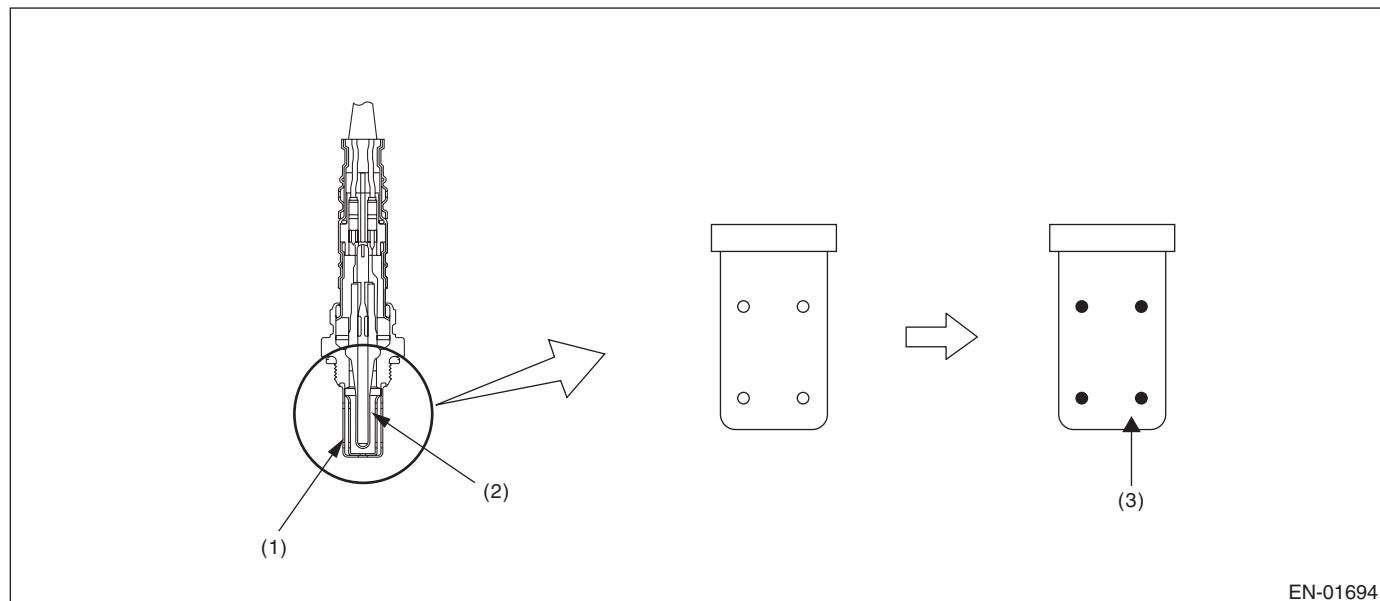
### AM:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.

Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.

When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the sensor cover holes are clogged, the rich to lean judgment in the ECM is delayed when the actual change from rich to lean occurs. Judge as NG when the actual movement in comparison to the ECM control amount is slow.



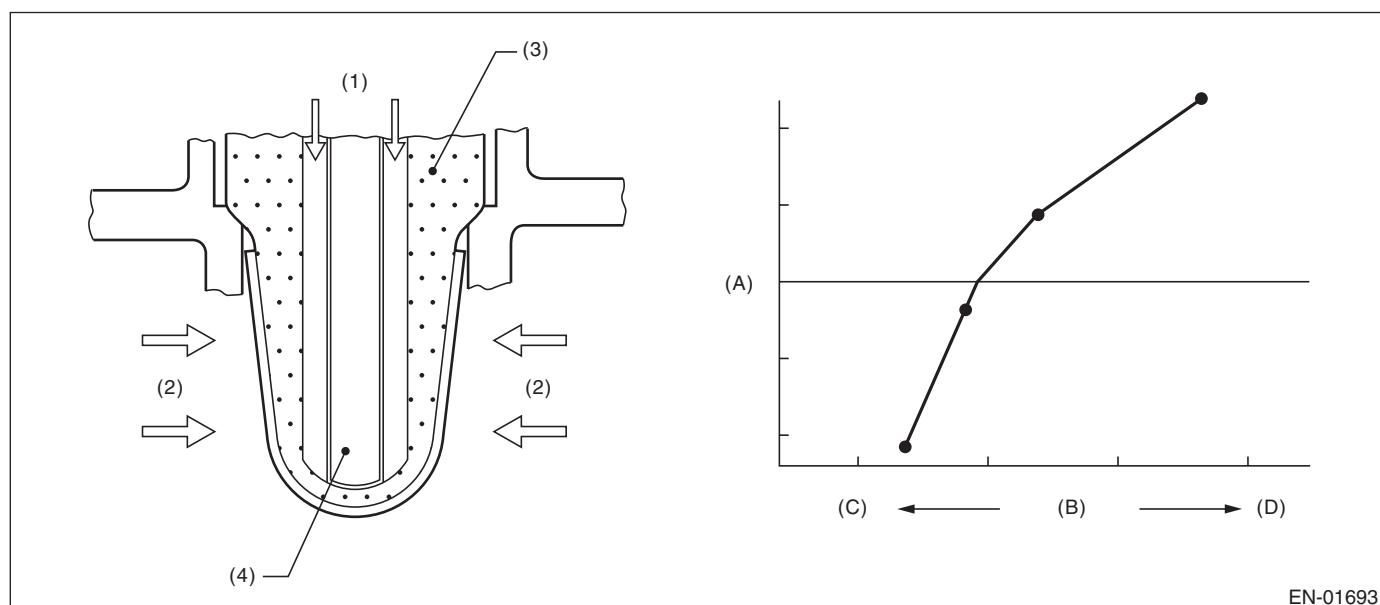
EN-01694

(1) Cover

(2) Zirconia

(3) Clogging

#### 2. COMPONENT DESCRIPTION



EN-01693

(1) Atmosphere

(2) Exhaust gas

(3)  $ZrO_2$

(4) Ceramic heater

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
All secondary parameters enable conditions	1 second or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	0 $\longleftrightarrow$ 50 $\Omega$
After engine starting	120 seconds or more
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Engine speed	1000 $\longleftrightarrow$ 2500 rpm
Vehicle speed	10 $\longleftrightarrow$ 120 km/h (6.21 $\longleftrightarrow$ 74.6 MPH)
Amount of intake air	10 $\longleftrightarrow$ 40 g/s
Engine load	< 0.02 g/rev
Learning value of EVAP conc. during purge	$\leq 0.2$
Total time of operating canister purge	20 seconds or more

### 4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) 60 seconds or more after starting the engine.

### 5. DIAGNOSTIC METHOD

Calculate  $\text{faf}$  difference every 128 milliseconds, and the  $\lambda$  value difference. Calculate the diagnosis value after calculating 1,640 times (210 seconds).

Judge as NG if the criteria below are met. Judge as OK and clear the NG when the malfunction criteria below are not met.

#### Judgment Value

Malfunction criteria	Threshold value
$\text{parafca} = \text{td2faf}/\text{td2lmd}$ where, $\text{td2faf (N)} = \text{td2faf (n-1)} +  \text{d2faf (n)} $ $\text{td2lmd (N)} = \text{td2lmd (n-1)} +  \text{d2lmd (n)} $ add up to a total of 210 seconds $\text{d2faf (n)} = (\text{faf (n)} - \text{faf (n-1)}) - (\text{faf (n-1)} - \text{faf (n-2)})$ $\text{d2lmd (n)} = (\text{lmd (n)} - \text{lmd (n-1)}) - (\text{lmd (n-1)} - \text{lmd (n-2)})$ $\text{faf} = \text{main feedback compensation coefficient every 128 milliseconds}$ $\text{lmd} = \text{output lambda every 128 milliseconds}$	$\geq 0.325$

**Time Needed for Diagnosis:** 210 seconds

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

### 6. DTC CLEAR CONDITION

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

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Rear oxygen sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

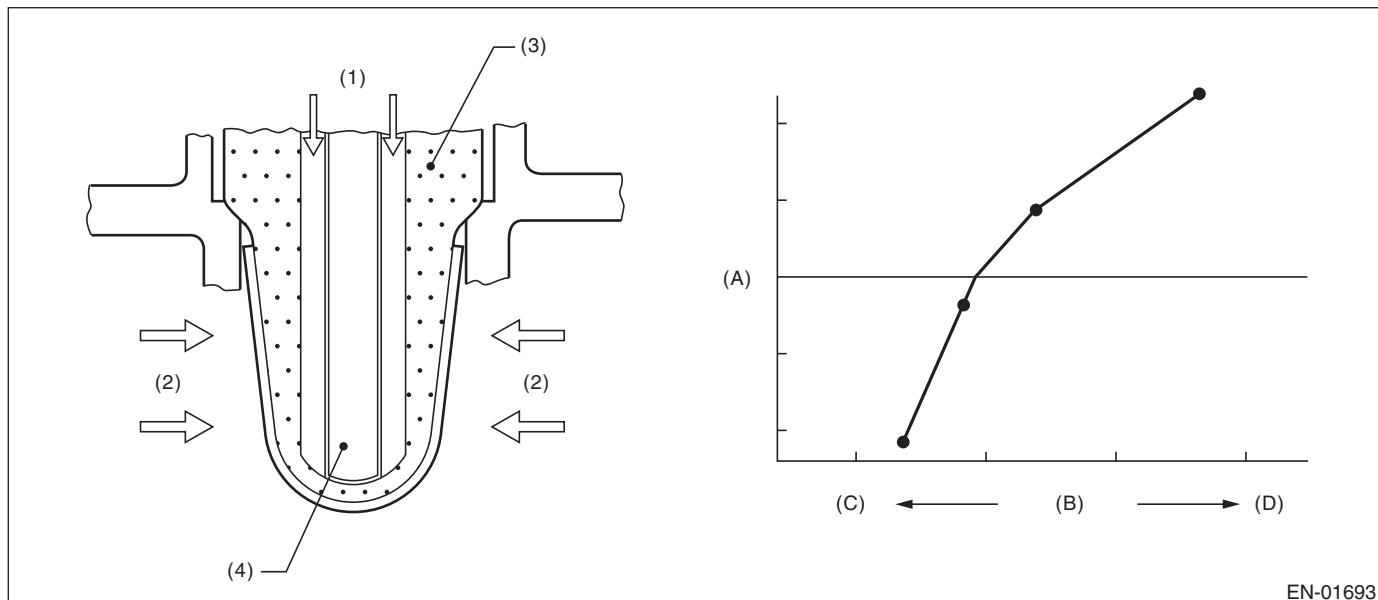
### AN:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.

Judge as NG when the impedance of the element is large.

#### 2. COMPONENT DESCRIPTION



EN-01693

- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust gas      | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Voltage	$\geq 10.9 \text{ V}$
Time of heater control duty at 70% or more	$\geq 30 \text{ seconds}$
Front oxygen (A/F) sensor impedance.	$\geq 500 \Omega$

**Time Needed for Diagnosis:** 5 seconds

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

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor IC communication: Not allowed to communicate.
- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

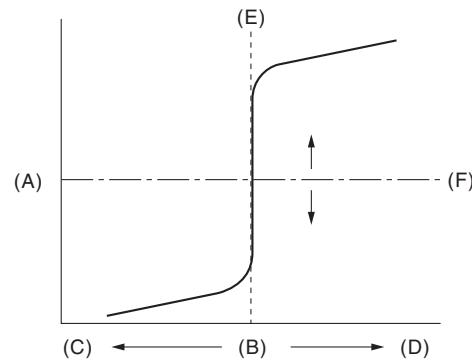
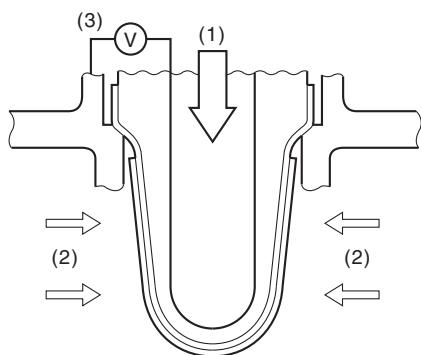
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect continuity NG of the oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

#### 2. COMPONENT DESCRIPTION



EN-01696

- |                         |                 |                                |
|-------------------------|-----------------|--------------------------------|
| (A) Electromotive force | (C) Rich        | (E) Theoretical air fuel ratio |
| (B) Air fuel ratio      | (D) Lean        | (F) Comparative voltage        |
| (1) Atmosphere          | (2) Exhaust gas | (3) Electromotive force        |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

#### Used for Abnormality Judgment

Secondary parameters	Enable conditions
High side Closed loop control at the oxygen sensor Misfire detection every 200 rotations Front oxygen (A/F) sensor compensation coefficient Battery voltage	In operation < 7 times Not in limit value > 10.9 V
Low side 1 Closed loop control at the oxygen sensor Misfire detection every 200 rotations Front oxygen (A/F) sensor compensation coefficient Battery voltage Amount of intake air	In operation < 7 times Not in limit value > 10.9 V $\geq 10$ g/second
Low side 2 Closed loop control at the oxygen sensor Misfire detection every 200 rotations Front oxygen (A/F) sensor compensation coefficient Battery voltage Amount of intake air Current continuation time of the rear oxygen sensor heater	In operation < 5 times Not in limit value > 10.9 V $< 10$ g/second 25 seconds or more
Low side 3 Closed loop control at the oxygen sensor Misfire detection every 200 rotations Front oxygen (A/F) sensor compensation coefficient Battery voltage Amount of intake air Current continuation time of the rear oxygen sensor heater Fuel cut	In operation < 7 times Not in limit value > 10.9 V $< 10$ g/second 25 seconds or more Experienced

#### Used for normality judgment

Secondary parameters	Enable conditions
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V

### 4. GENERAL DRIVING CYCLE

After starting the engine, continuously perform the diagnosis with the same engine condition.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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## 5. DIAGNOSTIC METHOD

### Abnormality Judgment

Judge as NG if the continuous time during which the following conditions are established exceeds the pre-determined time, and judge as OK if it does not.

#### Judgment Value

Malfunction criteria	Threshold value	DTC
High side Maximum output voltage without continuity	$\geq 1200$ mV	P0138
Low side Minimum output voltage without continuity	$< 30$ mV	P0137

#### Time Needed for Diagnosis

- High side: 2.5 seconds
- Low side 1: 20 seconds
- Low side 2: 40 seconds
- Low side 3: Value from Map

#### Map

Fuel Cut Time (Second)	Time needed for diagnosis (second)
0	40
2	40
10	60

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

## 6. DTC CLEAR CONDITION

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

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

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

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

#### NOTE:

For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-72, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the slow response of the oxygen sensor.

Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and Judge as OK if both are OK.

[Rich → lean diagnosis response]

1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to rich to lean. If the measured response time is larger than the threshold value, it is NG. If it is smaller, it is OK.

2. Judge as NG when the oxygen sensor voltage is large (rich) when recovering from a deceleration fuel cut.

[Lean → rich diagnosis response]

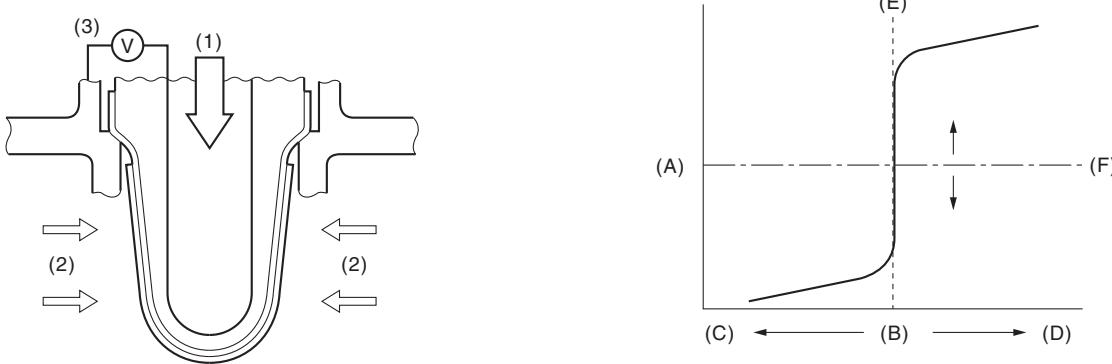
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to lean to rich. If the measured response time is larger than the threshold value, it is NG.

2. Judge as NG when the oxygen sensor voltage remains small when recovering from a deceleration fuel cut.

#### DIAGNOSTIC METHOD

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes to rich to lean. And Judge as NG when the measured response time is larger than the threshold value.

#### 2. COMPONENT DESCRIPTION



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- |                         |                         |                                |
|-------------------------|-------------------------|--------------------------------|
| (1) Atmosphere          | (A) Electromotive force | (D) Lean                       |
| (2) Exhaust gas         | (B) Air fuel ratio      | (E) Theoretical air fuel ratio |
| (3) Electromotive force | (C) Rich                | (F) Comparative voltage        |

#### 3. ENABLE CONDITION

Rich → lean diagnosis response

Secondary parameters	Enable conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
Deceleration fuel cut time is 5 seconds or more.	Experienced
After fuel cut	≥ 2 seconds
Current calculation time of the rear oxygen sensor heater	≥ 40 seconds
Current continuation time of the rear oxygen sensor heater	≥ 20 seconds
Estimated catalyst temperature	≥ 400°C (752°F)

# Diagnostic Trouble Code (DTC) Detecting Criteria

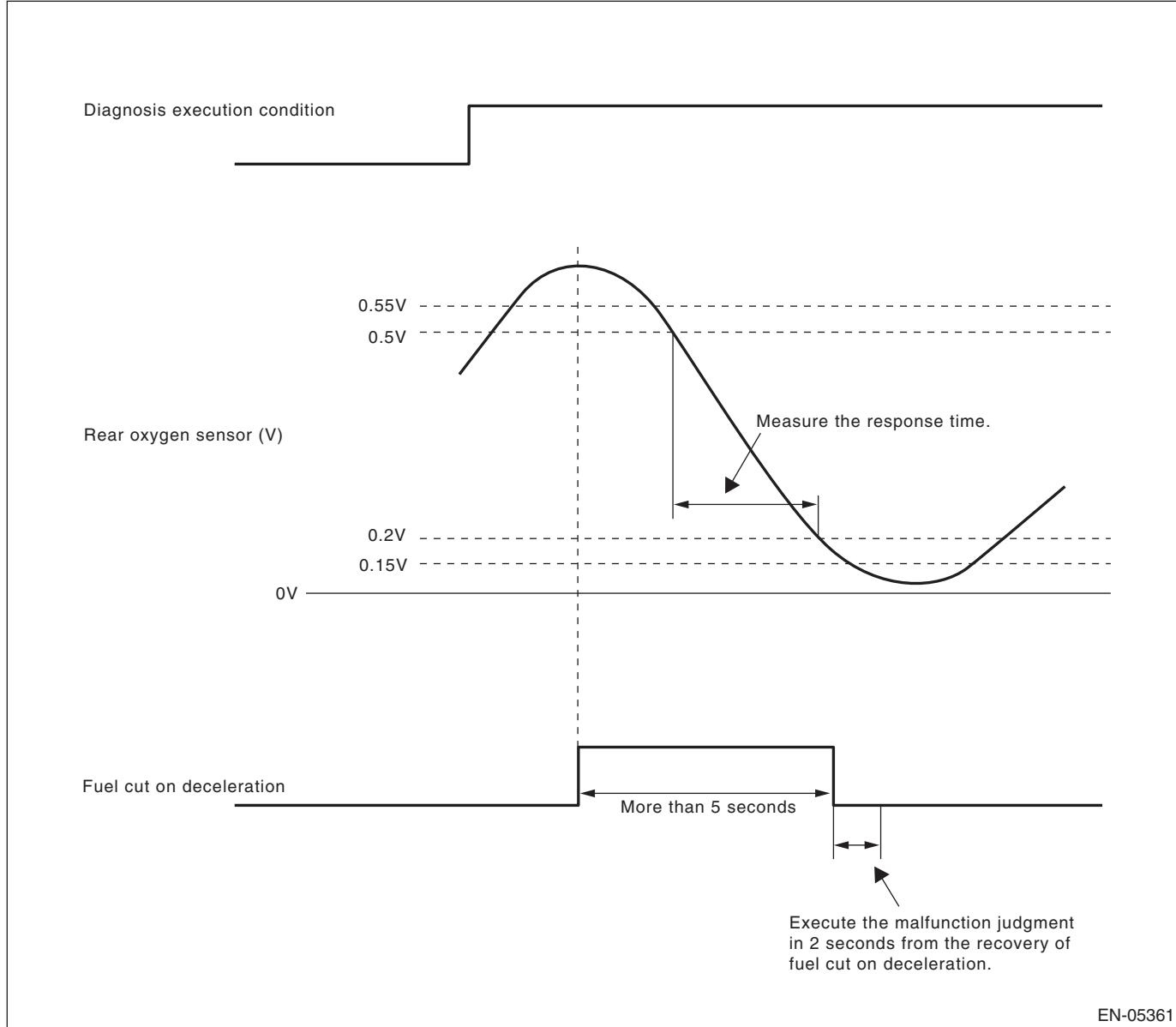
## GENERAL DESCRIPTION

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

### 5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



#### • Abnormality Judgment

- 1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.  
Response time (diagnosis value) > threshold value → abnormal

#### NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel cut in deceleration. NG judgment should be performed after deceleration fuel cut. Even without deceleration fuel cut, judge as OK if the value is below the threshold.

When the deceleration fuel cut time is 5 seconds or more, judge as NG if the following criteria are met 2 seconds after recovering from the deceleration fuel cut.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

2) Judge as NG when the oxygen sensor voltage at recovery from a deceleration fuel cut, is large. If the fuel cut time in a deceleration fuel cut is long (5 s or more), and even after recovering from a deceleration fuel cut, the oxygen sensor voltage is high (0.55 V or more), judge as NG.

### Judgment Value

Malfunction criteria	Threshold value
Shortest time change from rich (500 mV O <sub>2</sub> output) to lean (200 mV) when voltage reduces from 550 mV to 150 mV	> 0.491 seconds
or Longest time over 550 mV	> 2 seconds

**Time Needed for Diagnosis:** 1 time

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

### • Normality Judgment

1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.

Response time (diagnosis value)  $\leq$  threshold value  $\rightarrow$  normal

2) Do not judge as a normal condition.

Judge as OK when the criteria below are met.

### Judgment Value

Malfunction criteria	Threshold value
Shortest time change from rich (500 mV O <sub>2</sub> output) to lean (200 mV) when voltage reduces from 550 mV to 150 mV	$\leq$ 0.491 seconds

## 6. DTC CLEAR CONDITION

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

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

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

## 10.ENABLE CONDITION

- Lean  $\rightarrow$  rich response diagnosis

Secondary parameters	Enable conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
5 seconds or more deceleration fuel cut.	Experienced
After fuel cut	$\geq$ 2 seconds

## 11.GENERAL DRIVING CYCLE

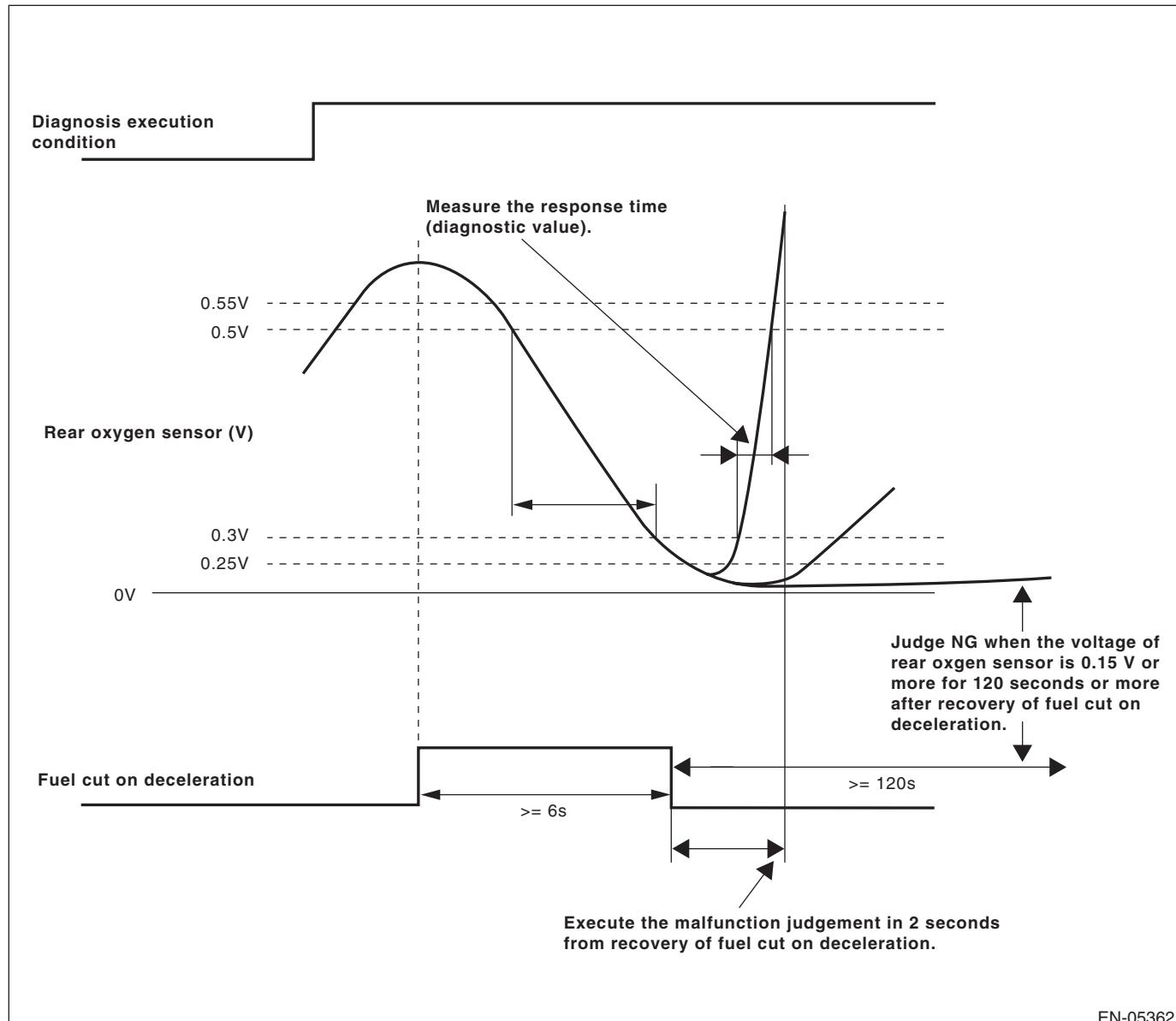
Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 12. DIAGNOSTIC METHOD

Calculate the minimum value of 0.3 V to 0.5 V output change response time as judgment value, when the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich).



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Abnormality Judgment

- 1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.  
Response time (diagnosis value) > threshold value → abnormal
- 2) If the oxygen sensor voltage is small after recovering from a deceleration fuel cut, and remains small, judge as NG.

### Judgment Value

Malfunction criteria	Threshold value
Shortest time change from lean (300 mV O <sub>2</sub> output) to rich (500 mV) when voltage changes from 250 mV to 550 mV	> 2 seconds
or	
Longest time under 150 mV	> 120 seconds

**Time Needed for Diagnosis:** 1 time

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

### • Normality Judgment

- 1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.  
Response time (diagnosis value) ≤ threshold value → normal
- 2) Do not judge as a normal condition.  
Judge as OK when the criteria below are met.

### Judgment Value

Malfunction criteria	Threshold value
Shortest time change from lean (300 mV O <sub>2</sub> output) to rich (500 mV) when voltage changes from 250 mV to 550 mV	≤ 2 seconds

## 13.DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 15.FAIL SAFE

Sub feedback control: Not allowed

## 16.ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

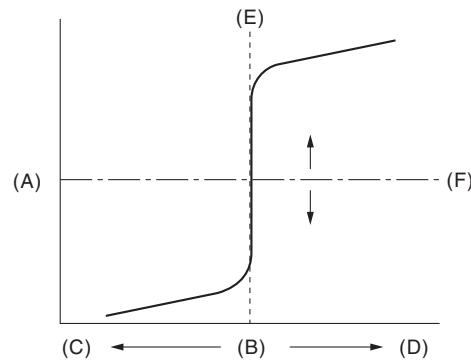
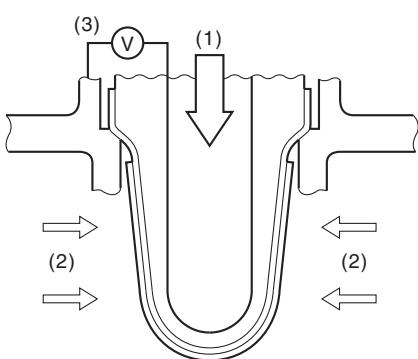
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor open or short circuit. Judge as NG when the rear oxygen sensor voltage can be determined to be abnormal considering conditions such as intake air amount, engine coolant temperature, main feedback control and deceleration fuel cut.

#### 2. COMPONENT DESCRIPTION



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- |                         |                 |                                |
|-------------------------|-----------------|--------------------------------|
| (A) Electromotive force | (C) Rich        | (E) Theoretical air fuel ratio |
| (B) Air fuel ratio      | (D) Lean        | (F) Comparative voltage        |
| (1) Atmosphere          | (2) Exhaust gas | (3) Electromotive force        |

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

Secondary parameters	Enable conditions
Closed loop control at the rear oxygen sensor	In operation
Target output voltage of rear oxygen sensor	$\geq 0.6$ V
Amount of intake air	$\geq 10$ g/second
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Misfire detection every 200 rotations	$\leq 7$ 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
Deceleration fuel cut of 5 seconds or more.	Experienced

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Minimum output voltage	> 150 mV
Maximum output voltage	< 500 mV

**Time Needed for Diagnosis:** 200 seconds

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

### • Normality Judgment

Judge as OK if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Diagnosis of the rear oxygen sensor voltage low side	Incomplete
Minimum output voltage	$\leq 150$ mV
Maximum output voltage	$\geq 500$ mV

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### **AS:DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

##### NOTE:

For the detection standard, refer to DTC P0131. <Ref. to GD(H6DO)-63, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AT:DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

##### NOTE:

For the detection standard, refer to DTC P0132. <Ref. to GD(H6DO)-65, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AU:DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

##### NOTE:

For the detection standard, refer to DTC P0133. <Ref. to GD(H6DO)-67, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AV:DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

##### NOTE:

For the detection standard, refer to DTC P0134. <Ref. to GD(H6DO)-70, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AW:DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2)**

#### **1. OUTLINE OF DIAGNOSIS**

##### NOTE:

For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-72, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AX:DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2)**

#### **1. OUTLINE OF DIAGNOSIS**

##### NOTE:

For the detection standard, refer to DTC P0138. <Ref. to GD(H6DO)-74, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AY:DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2)**

#### **1. OUTLINE OF DIAGNOSIS**

##### NOTE:

For the detection standard, refer to DTC P0139. <Ref. to GD(H6DO)-75, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AZ:DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 2)**

#### **1. OUTLINE OF DIAGNOSIS**

##### NOTE:

For the detection standard, refer to DTC P0140. <Ref. to GD(H6DO)-80, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### BA:DTC P0171 SYSTEM TOO LEAN (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

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

#### 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	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Engine load	$\leq 0.02 \text{ g/rev}$
Amount of intake air	$\geq \text{Map 5}$

#### Map 5

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Measured value (g(oz)/rev)	na	0.357 (0.013)	0.25 (0.009)	0.25 (0.009)	0.317 (0.011)	0.326 (0.011)	0.337 (0.012)	0.397 (0.014)	0.439 (0.015)	0.454 (0.016)	0.454 (0.016)

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for 50 seconds or more, judge that there is a fault in the fuel system.

##### Judgment Value

Malfunction criteria	Threshold value
$\text{fsobd} = (\text{sglmd} - \text{tglmida}) + \text{faf} + \text{flaf}$ In this case: sglmd = measured lambda, tglmida = target lambda,faf = main feedback compensation coefficient (every 64 milliseconds), flaf = main feedback learning compensation coefficient	$\geq \text{fsobdL1}$ See Map 4 fsobdL1 = lean side threshold value of fsobd

#### Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdL1 (%)	40	40	33.2	26.5	26.5	26.5	26.5

**Time Needed for Diagnosis:** 10 seconds  $\times$  5 times

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

##### • Normality Judgment

Judge as OK when the malfunction criteria below are met for 10 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
$\text{fsobd} = (\text{sglmd} - \text{tglmida}) + \text{faf} + \text{flaf}$	< 20%

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

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

### BB:DTC P0172 SYSTEM TOO RICH (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

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

#### 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	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Engine load	$\leq 0.02 \text{ g/rev}$
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
Intake manifold absolute pressure	$\geq \text{Map 5}$

#### Map 5

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Measured value (g/oz)/rev	na	0.357 (0.013)	0.25 (0.009)	0.25 (0.009)	0.317 (0.011)	0.326 (0.011)	0.337 (0.012)	0.397 (0.014)	0.439 (0.015)	0.454 (0.016)	0.454 (0.016)

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria are met continues for 50 seconds or more, judge that there is a fault in the fuel system.

##### Judgment Value

Malfunction criteria	Threshold value
$fsobd = (sglmd - tglmda) +faf + flaf$ In this case: sglmd = measured lambda, tglmda = target lambda, faf = main feedback compensation coefficient (every 64 milliseconds), flaf = main feedback learning compensation coefficient	$\leq fsobdR1$ Refer to Map 4. fsobdR1 = rich side threshold value of fsobd

#### Map 4

Amount of air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdR1 (%)	-40	-40	-31.2	-26.5	-26.5	-26.5	26.5

**Time Needed for Diagnosis:** 10 seconds  $\times$  5 times

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge as OK when the malfunction criteria below continues for 10 seconds.

#### Judgment Value

Malfunction criteria	Threshold value
$fsobd = (sglmd - tglmda) + faf + flaf$	$\geq -20\%$

## 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

## 7. FAIL SAFE

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

## 8. ECM OPERATION AT DTC SETTING

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

## BC:DTC P0174 SYSTEM TOO LEAN (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

#### NOTE:

For the detection standard, refer to DTC P0171. <Ref. to GD(H6DO)-83, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## BD:DTC P0175 SYSTEM TOO RICH (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

#### NOTE:

For the detection standard, refer to DTC P0172. <Ref. to GD(H6DO)-85, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

#### 1. OUTLINE OF DIAGNOSIS

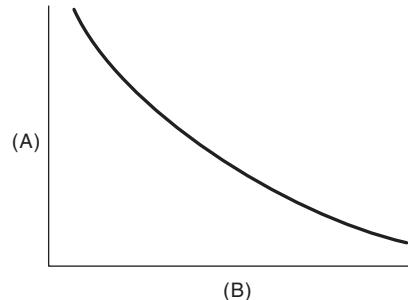
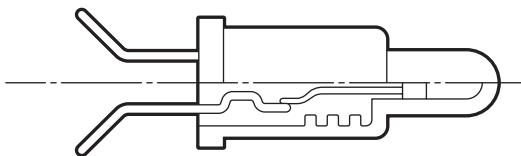
Detect faults in the fuel temperature sensor output properties.

Diagnosis is performed in two methods (drift diagnosis and stuck diagnosis). If either is NG, judge as NG. If both are OK, Judge as OK and clear the NG.

#### Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

#### 2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) Fuel temperature °C (°F)

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#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 120 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Fuel level	$\geq 9.6 \text{ l}$ (25.4 US gal, 2.11 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature - engine coolant temperature at engine starting	$> 10^\circ\text{C}$ (18°F)
Fuel temperature – Engine coolant temperature	$\geq 10^\circ\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$

**Time Needed for Diagnosis:** 120 seconds

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

#### • Normality Judgment

Judge as OK if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Fuel level	$\geq 9.6 \text{ l}$ (25.4 US gal, 2.11 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature - engine coolant temperature at engine starting	$> 10^\circ\text{C}$ (18°F)
Fuel temperature – Engine coolant temperature	$< 10^\circ\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$
Engine coolant temperature	$< 75^\circ\text{C}$ (167°F)

#### • Stuck Diagnosis

As the engine warms up (cumulative amount of intake air after starting is large), if the fuel temperature which should rise does not, determine as being stuck and NG.

### 6. ENABLE CONDITION

Secondary parameters	Enable conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

### 7. GENERAL DRIVING CYCLE

Always perform diagnosis after 20 seconds have passed since the engine started.

### 8. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG if the criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	$\geq 551$ kg (1215 lb)
Fuel temperature difference between Max. and Min.	$< 2^{\circ}\text{C}$ ( $3.6^{\circ}\text{F}$ )

**Time Needed for Diagnosis:** Undetermined

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

#### • Normality Judgment

Judge as OK if the criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	$\geq 551$ kg (1215 lb)
Fuel temperature difference between Max. and Min.	$\geq 2^{\circ}\text{C}$ ( $3.6^{\circ}\text{F}$ )

### 9. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 10. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 11. FAIL SAFE

None

### 12. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

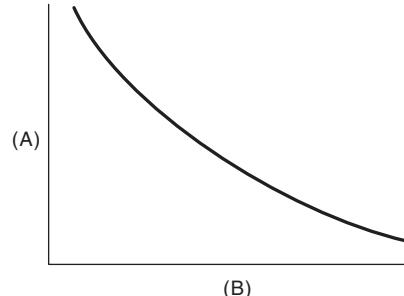
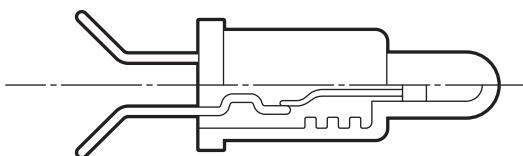
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$< 0.166 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

**Time Needed for Diagnosis:** 2.5 seconds

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 0.166 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

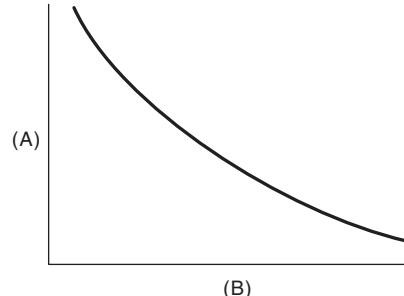
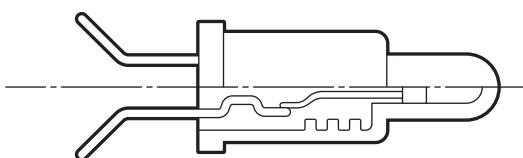
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.716 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

**Time Needed for Diagnosis:** 2.5 seconds

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$< 4.716 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BH:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect for abnormal values in the oil temperature sensor output properties.

Judge as NG when the oil temperature does not rise even though the engine is running under a condition where it should rise.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
Engine speed	500 rpm

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

If the following conditions are met, judge as NG.

##### Judgment Value

Malfunction criteria	Threshold value
Engine oil temperature	$< 15^{\circ}\text{C}$ (59°F)
After engine start oil temperature sensor characteristic diagnosis timer.	$\geq$ Judgment value for after engine start oil temperature sensor characteristic diagnosis timer

After engine start oil temperature sensor characteristic diagnosis timer (timer for diagnosis).

- Timer stop at fuel cut
- During the driving conditions except a) above, timer counts up as follows.

64 milliseconds + TOILCNT milliseconds (at the time of 64 milliseconds).

Where, TOILCNT is determined as follows,

TOILCNT = 0 at idle switch ON

For TOILCNT at Idle switch off, refer to the following table.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (10)	24 (15)	32 (20)	40 (25)	48 (30)	56 (35)
Temperature °C (°F)	-40 (-40)	0 milliseconds	32 milliseconds	76 milliseconds	130 milliseconds	149 milliseconds	171 milliseconds	176 milliseconds	181 milliseconds
	-30 (-22)	67 milliseconds	93 milliseconds	121 milliseconds	157 milliseconds	170 milliseconds	184 milliseconds	193 milliseconds	203 milliseconds
	-20 (-4)	98 milliseconds	123 milliseconds	148 milliseconds	184 milliseconds	193 milliseconds	204 milliseconds	214 milliseconds	226 milliseconds
	-10 (14)	145 milliseconds	166 milliseconds	187 milliseconds	208 milliseconds	223 milliseconds	239 milliseconds	242 milliseconds	245 milliseconds
	0 (32)	161 milliseconds	187 milliseconds	212 milliseconds	243 milliseconds	252 milliseconds	262 milliseconds	266 milliseconds	270 milliseconds

After engine start oil temperature characteristic diagnosis timer judgment value (t).

$$t = 2400000 - 60000 \times Ti \quad (t \geq 2400000)$$

Ti = The lowest coolant temperature after starting the engine.

**Time Needed for Diagnosis:** Undetermined

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

- **Normality Judgment**

When the following conditions are established, judged as OK.

**Judgment Value**

Malfunction criteria	Threshold value
Engine oil temperature	$\geq 15^{\circ}\text{C}$ (59°F)

## 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at  $70^{\circ}\text{C}$  (158°F).

## 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### BI: DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.  
Judge as NG when out of the possible range.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is 0.5 seconds or more. Judge as OK and clear the NG when the following conditions are not established.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\leq 0.166$ V

**Time Needed for Diagnosis:** 0.5 seconds

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

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

#### 7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at 70°C (158°F).

#### 8. ECM OPERATION AT DTC SETTING

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

## BJ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.  
Judge as NG when outside of the judgment value.

### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is 0.5 seconds or more. Judge as OK and clear the NG when the following conditions are not established.

#### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.716$ V

**Time Needed for Diagnosis:** 0.5 seconds

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

### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at 70°C (158°F).

### 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

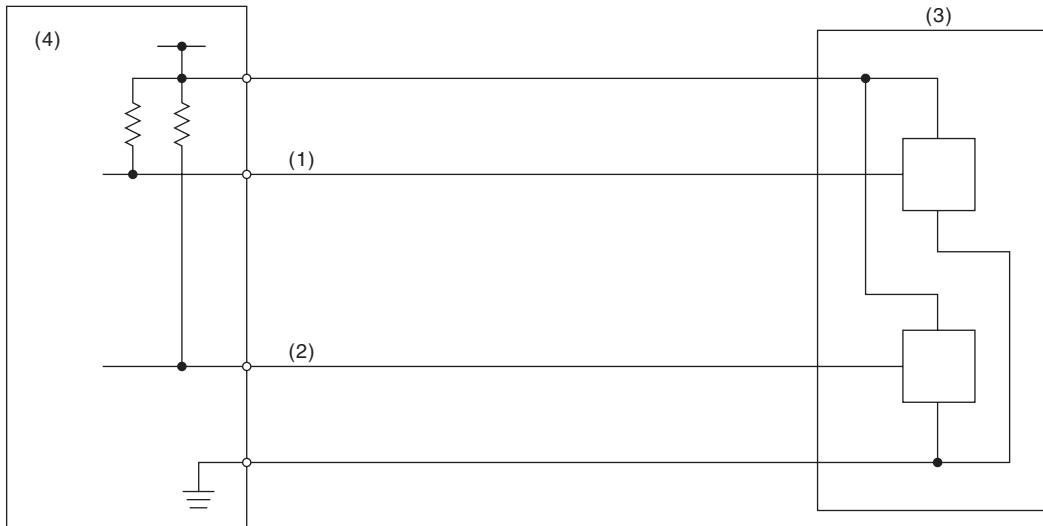
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.  
Judge as NG if out of specification.

#### 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 as OK and clear the NG when the malfunction criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$\geq 0.224$ V

**Time Needed for Diagnosis:** 24 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

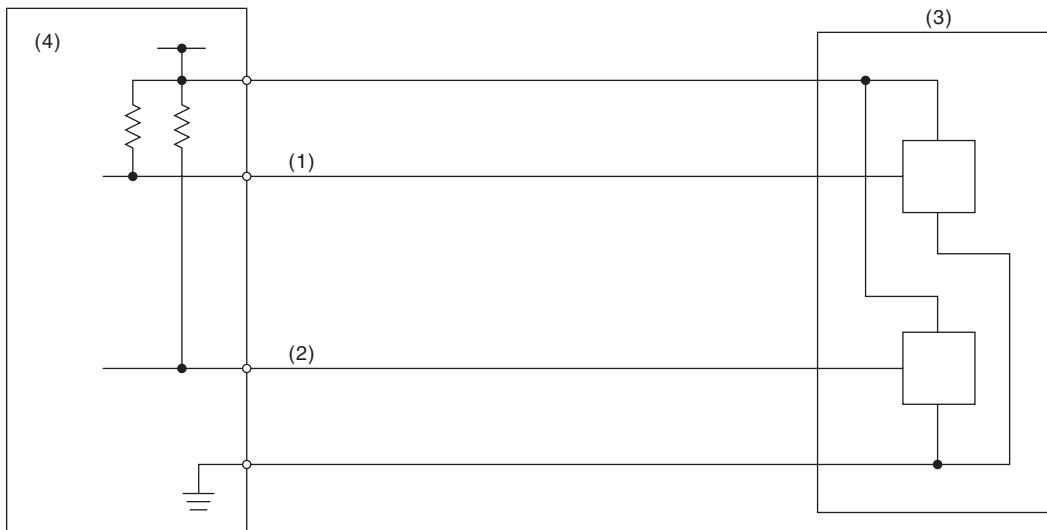
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal  
(2) Throttle position sensor 2 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

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

##### Judgment Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$\leq 4.851$ V

**Time Needed for Diagnosis:** 24 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

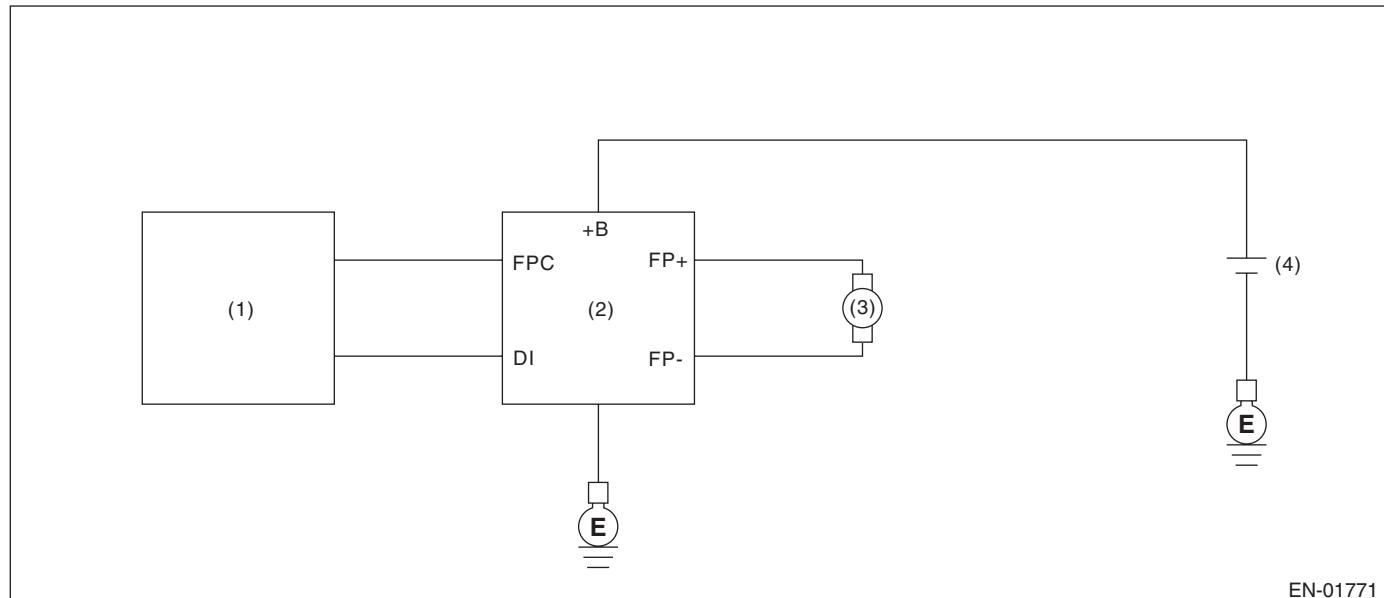
### BM:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit.

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

#### 2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Fuel pump

(4) Battery

(2) Fuel pump control unit

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 8$ V
Fuel level	$\geq 9.6$ l (2.54 US gal, 2.11 Imp gal)
Fuel pump control unit output diagnosis signal	Low
Elapsed time after engine starting	$\geq 180$ seconds

**Time Needed for Diagnosis:** 2.5 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 8$ V
Fuel level	$\geq 9.6$ l (2.54 US gal, 2.11 Imp gal)
Fuel pump control unit output diagnosis signal	High
Elapsed time after engine starting	$\geq 180$ seconds

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BN:DTC P0301 CYLINDER 1 MISFIRE DETECTED

#### 1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence. (Revolution fluctuation method)

Monitoring Misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below. :

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 120° Interval Difference Method
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or more)

2) Misfire every time: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
All secondary parameters enable conditions	1 second or more
Intake manifold pressure change at 120°CA	< 20 kPa (150 mmHg, 5.9 inHg)
Throttle position change during 16 milliseconds	< 20°
Fuel shut-off function	Not in operation
Fuel level	≥ 9.6 ℥ (2.54 US gal, 2.11 Imp gal)
Vehicle dynamic control or AT torque control	Not in operation
Evaporative system leak check	Not in operation
Engine speed	400 — 8000 rpm
Intake manifold pressure	> Value of Map 3 or more
Battery voltage	≥ 8 V
Barometric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Fuel parameter determination	Not extremely low volatility

#### Map 3

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
kPa (mmHg, inHg)	26.7 (200.0, 7.87)	26.7 (200.0, 7.87)	24.0 (180.0, 7.09)	24.1 (181.0, 7.13)	24.3 (182.0, 7.17)	24.7 (185.0, 7.28)	28.3 (212.3, 8.36)	30.9 (232.1, 9.14)	32.9 (247.0, 9.72)	33.1 (248.0, 9.76)	34.3 (257.0, 10.12)	38.1 (286.0, 11.26)	41.9 (314.0, 12.36)	48.9 (367.0, 14.45)

#### 3. GENERAL DRIVING CYCLE

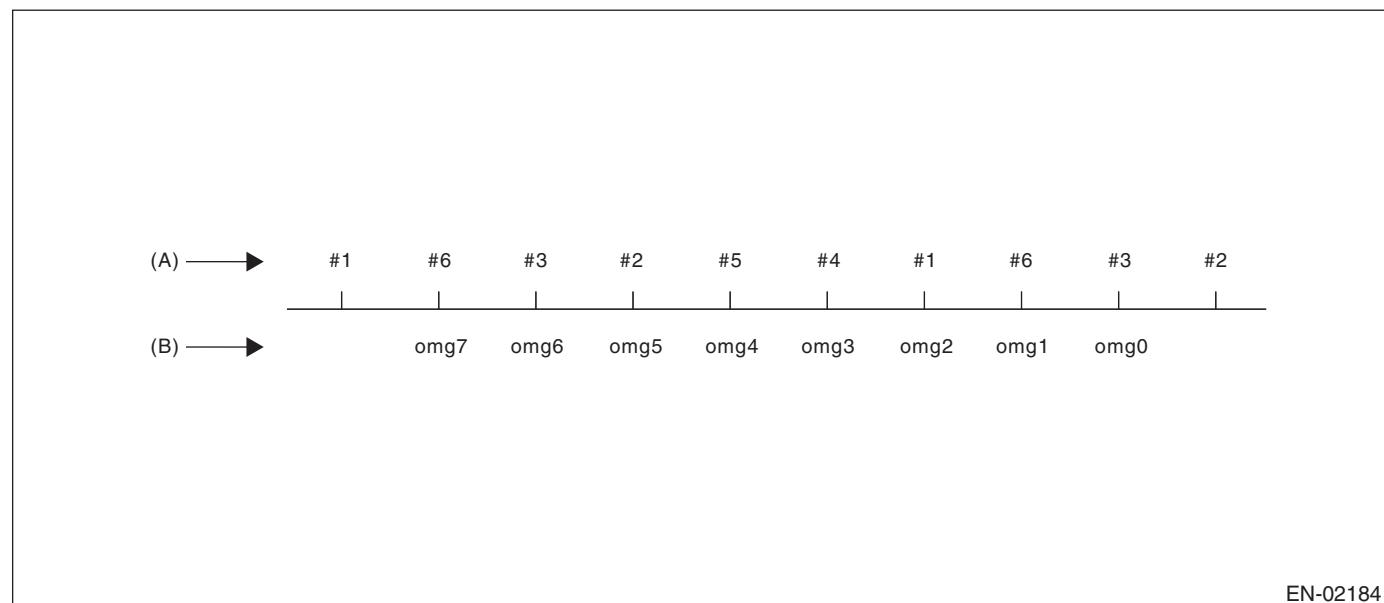
- If conditions are met, detect misfire from idling to high rotation.
- Perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

When a misfire occurs, the engine speed will decrease and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires. If the misfire ratio is higher during 1000 revs. or 200 revs., Judge corresponding cylinders as NG.

Diagnostic value calculation (Calculate from angle speed) →	Misfire detection every single ignition (Compare diagnostic value with judgment value) →	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment)
	<ul style="list-style-type: none"><li>• 120° Interval Difference Method</li><li>• 360° Interval Difference Method</li><li>• 720° Interval Difference Method</li></ul>	<ul style="list-style-type: none"><li>• FTP 1.5 times misfire NG judgment</li><li>• Catalyst damage misfire NG judgment</li></ul>

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



EN-02184

(A) Ignition order

(B) Crankshaft position speed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

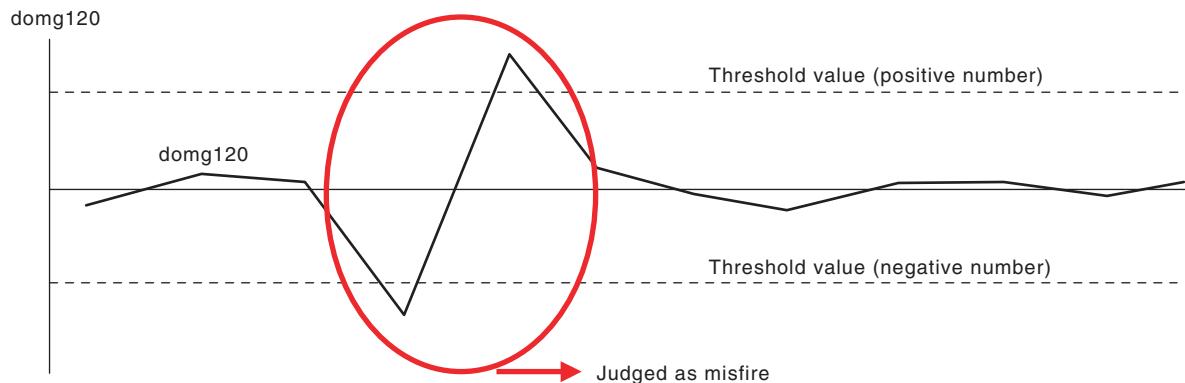
### • 120° Interval Difference Method

Diagnostic value	$domg\ 120 = (omg\ 1 - omg\ 0) - (omg\ 7 - omg\ 1) / 6$
------------------	---

Judge as a misfire in the following cases.

- $domg\ 120 >$  judgment value of positive side
- $domg\ 121 \leq$  judgment value of negative side

(Judgment value before 120° CA)

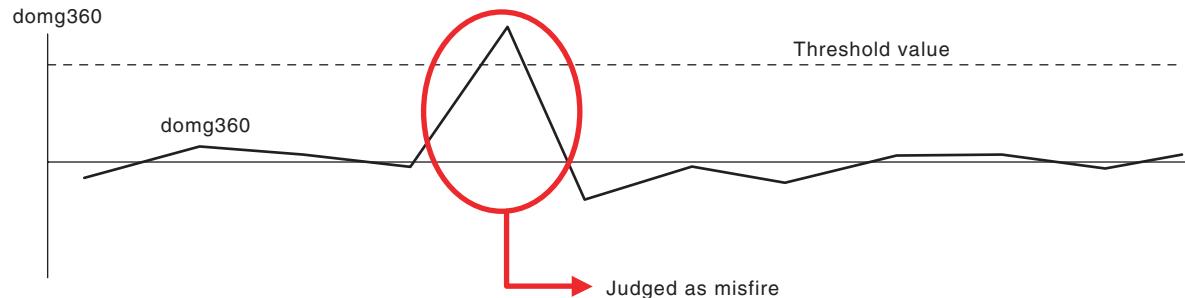


EN-02185

### • 360° Interval Difference Method

Diagnostic value	$domg\ 360 = (omg\ 1 - omg\ 0) - (omg\ 4 - omg\ 3)$
------------------	---

Misfire judgment:  $domg\ 360 >$  Judgment value → Judge as misfire



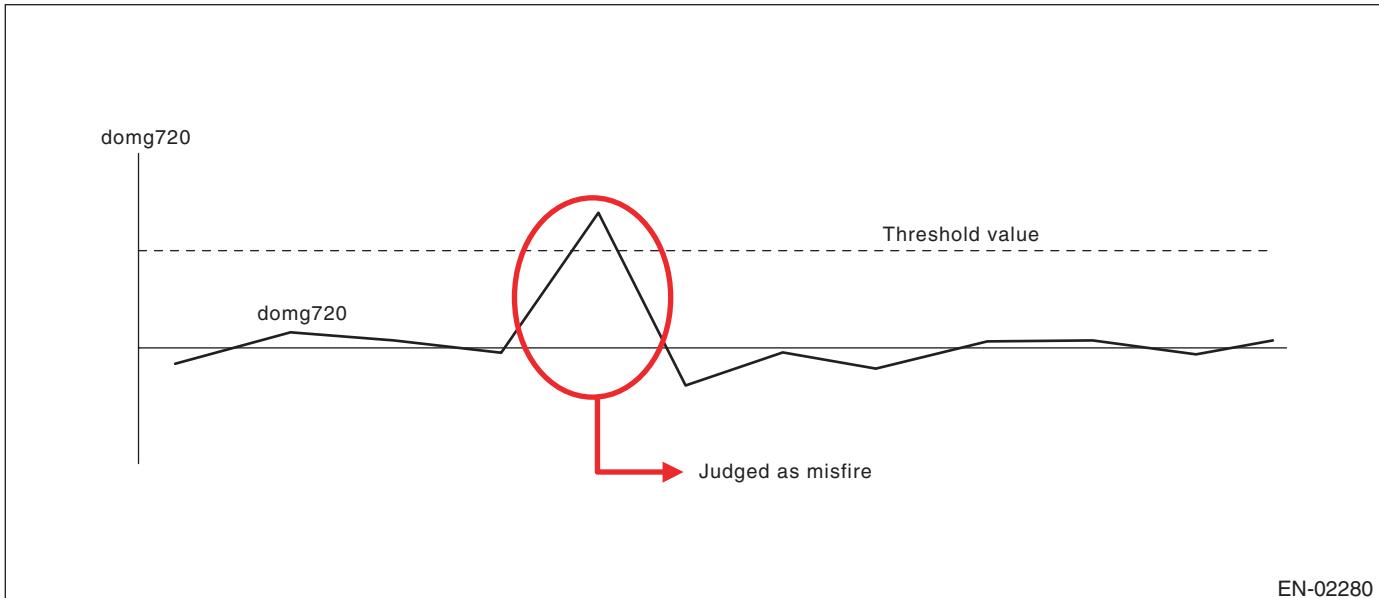
EN-02279

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

- **720° Interval Difference Method**

Diagnostic value	$domg\ 720 = (omg\ 1 - omg\ 0) - (omg\ 7 - omg\ 6)$
Misfire judgment	$domg\ 720 > Judgment\ value \rightarrow Judge\ as\ misfire$



EN-02280

- **FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)**

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)**

Malfunction criteria	Threshold value
FTP emission judgment value	> 1.0 % in 1000 revs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

**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

Malfunction criteria	Threshold value
Catalyst damage misfire judgment value	Refer to Map.

## Map

		Intake air (g/oz)/rev									
		0.2 (0.035)	0.4 (0.014)	0.6 (0.021)	0.8 (0.028)	1 (0.035)	1.2 (0.042)	1.4 (0.049)	1.6 (0.056)	1.8 (0.063)	2 (0.071)
Engine speed (rpm)	700	90	90	88	76	68	78	78	78	78	78
	1000	90	90	88	76	68	78	78	78	78	78
	1500	89	88	80	64	56	62	62	62	62	62
	2000	88	84	64	40	36	35	35	35	35	35
	2500	88	80	56	36	30	34	34	34	34	34
	3000	64	56	30	30	30	33	33	33	33	33
	3500	50	40	30	30	32	32	32	32	32	32
	4000	40	38	30	30	30	30	30	30	30	30
	4500	50	30	30	30	30	30	30	30	30	30
	5000	40	30	30	30	30	30	30	30	30	30
	5500	40	30	30	30	30	30	30	30	30	30
	6000	36	36	30	30	30	30	30	30	30	30
	6500	32	32	30	30	30	30	30	30	30	30
	7000	32	32	30	30	30	30	30	30	30	30

**Time Needed for Diagnosis:** 200 engine revs.

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

## 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

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

## **BO:DTC P0302 CYLINDER 2 MISFIRE DETECTED**

### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BP:DTC P0303 CYLINDER 3 MISFIRE DETECTED**

### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BQ:DTC P0304 CYLINDER 4 MISFIRE DETECTED**

### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BR:DTC P0305 CYLINDER 5 MISFIRE DETECTED**

### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BS:DTC P0306 CYLINDER 6 MISFIRE DETECTED**

### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

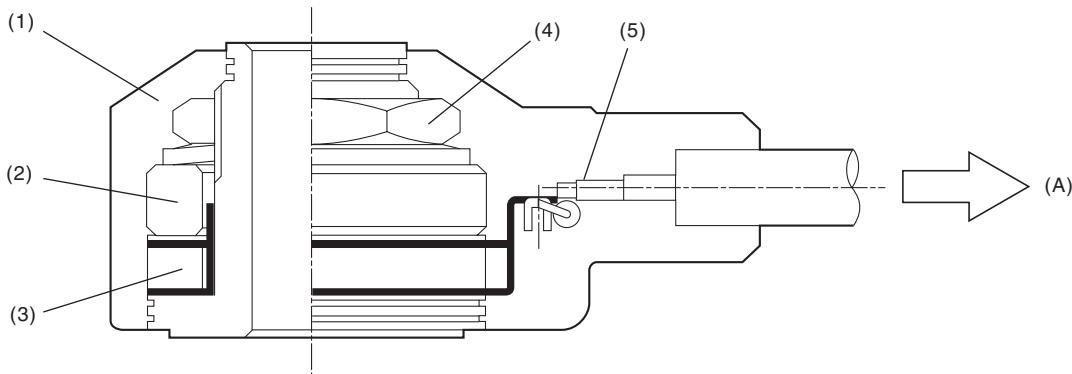
### BT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.

Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01707

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

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.238 V
Ignition switch	ON

**Time Needed for Diagnosis:** 1 second

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 0.238$ V
Ignition switch	ON

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

Knocking compensation

When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value

Failure: learned ignition advance value =  $-6^{\circ}\text{CA}$ . ( $6^{\circ}\text{CA}$  retard)

Knock F/B advance angle value =  $0^{\circ}\text{CA}$

Whole learning prohibited

Portional learning prohibited

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

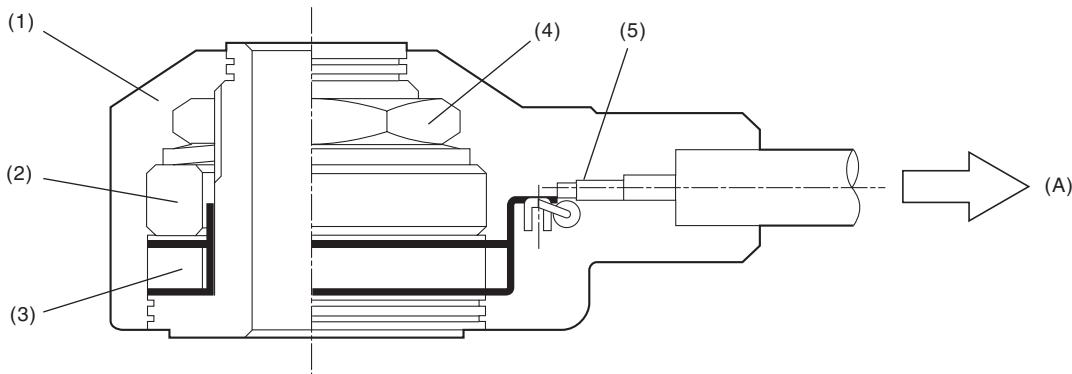
### BU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.

Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01707

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

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.714$ V
Ignition switch	ON

**Time Needed for Diagnosis:** 1 second

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Output voltage	$< 4.714$ V
Ignition switch	ON

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

Knocking compensation

When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value

Failure: learned ignition advance value =  $-6^{\circ}\text{CA}$ . ( $6^{\circ}\text{CA}$  retard)

Knock F/B advance angle value =  $0^{\circ}\text{CA}$

Whole learning prohibited

Portional learning prohibited

## 9. ECM OPERATION AT DTC SETTING

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

## **BV:DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2)**

### 1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0327. <Ref. to GD(H6DO)-110, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BW:DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2)**

### 1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0328. <Ref. to GD(H6DO)-112, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

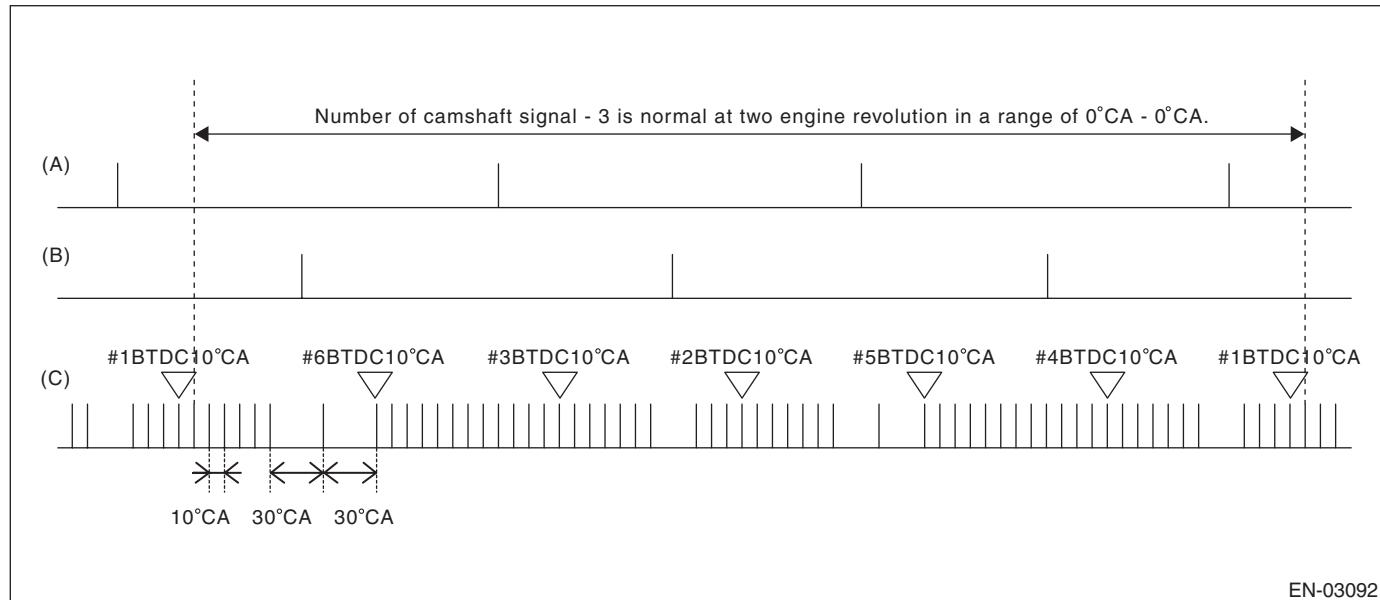
### BX:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the crankshaft position sensor.

Judge as NG when the crank signal is not input even though the starter was rotated.

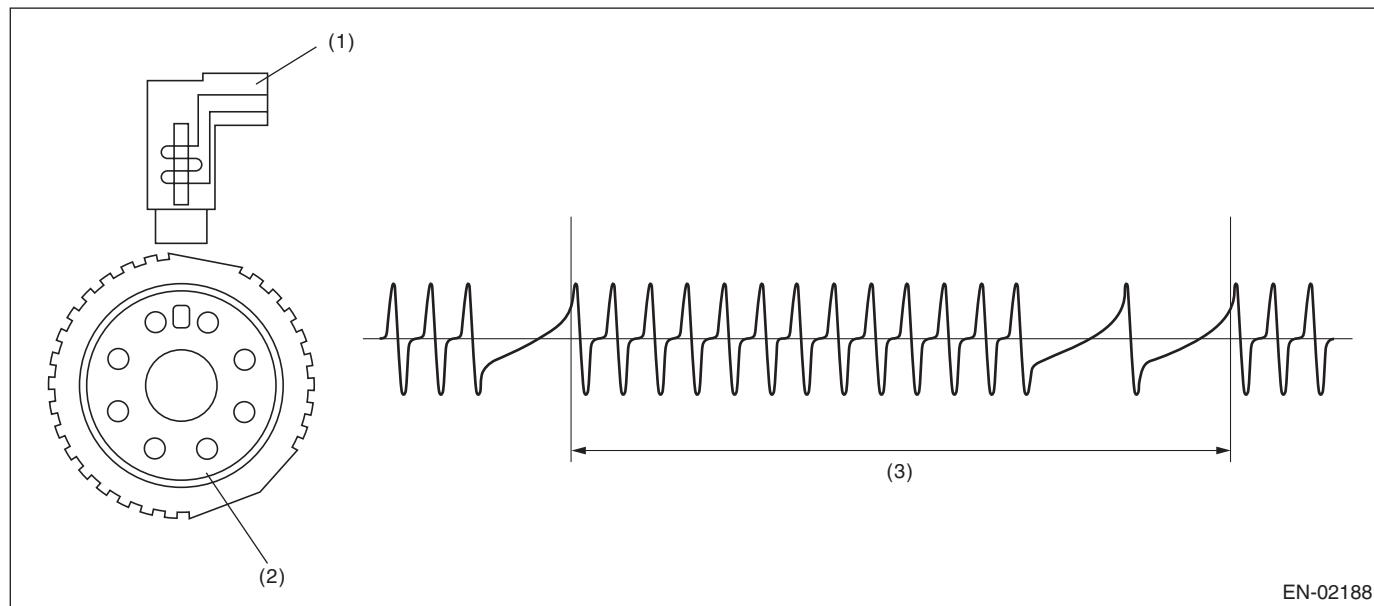
#### 2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 3 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	$\geq 8$ V

**Time Needed for Diagnosis:** 3 seconds

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

### • Normality Judgment

Judge as OK when the continuous time of meeting the malfunction criteria below is 3 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Crankshaft position sensor signal	Input exists
Battery voltage	$\geq 8$ V

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

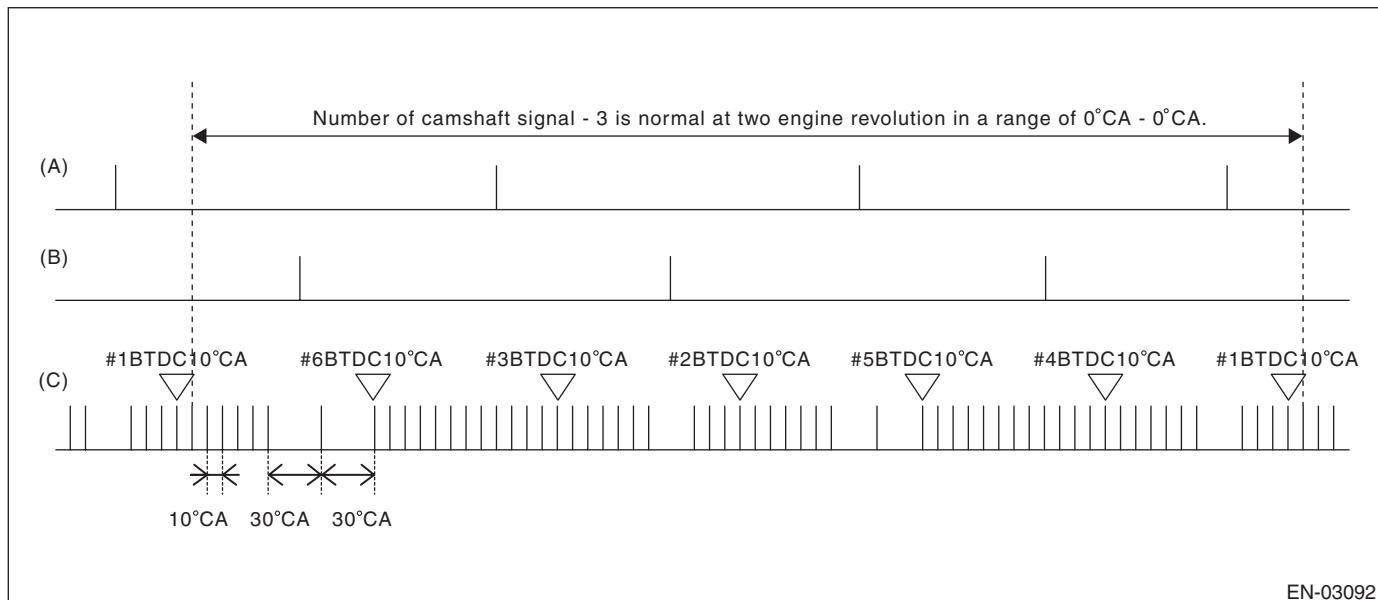
### BY:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect for faults in crankshaft position sensor output properties.

Judge as NG when there is a problem in the number of crankshaft signals for every revolution.

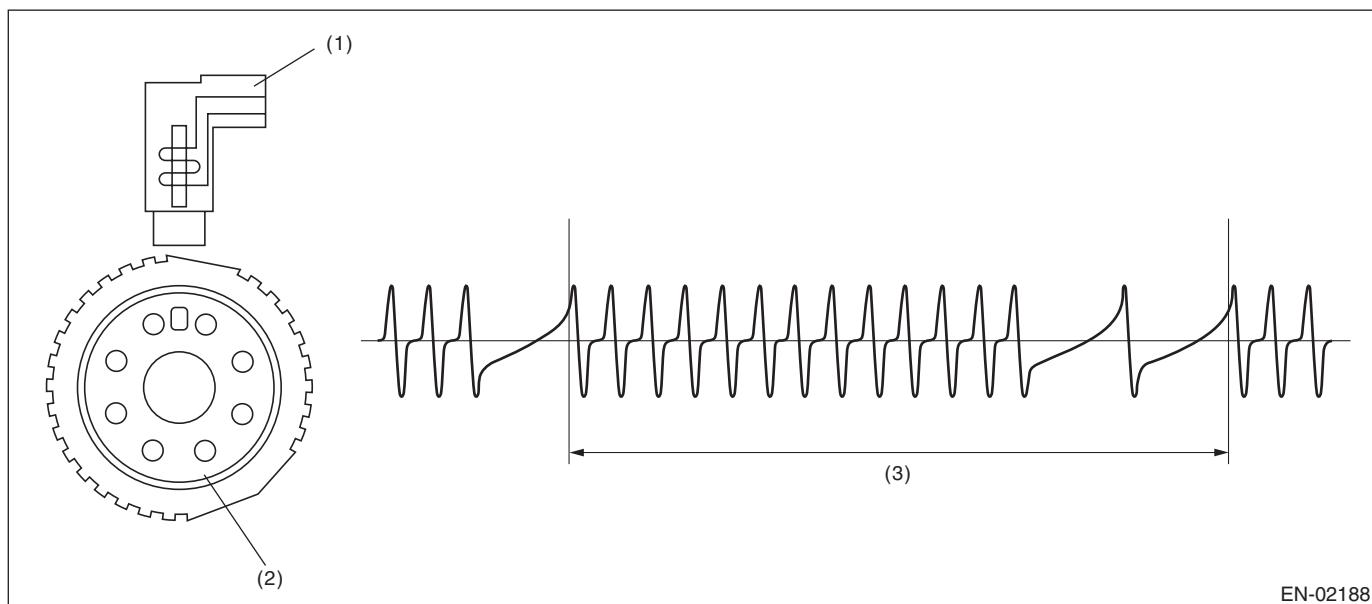
#### 2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 8$ V
Engine speed	< 3000 rpm

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG if the following criteria are met continuously 10 times or more in a row.

#### Judgment Value

Malfunction criteria	Threshold value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

**Time Needed for Diagnosis:** 10 engine revs.

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

#### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

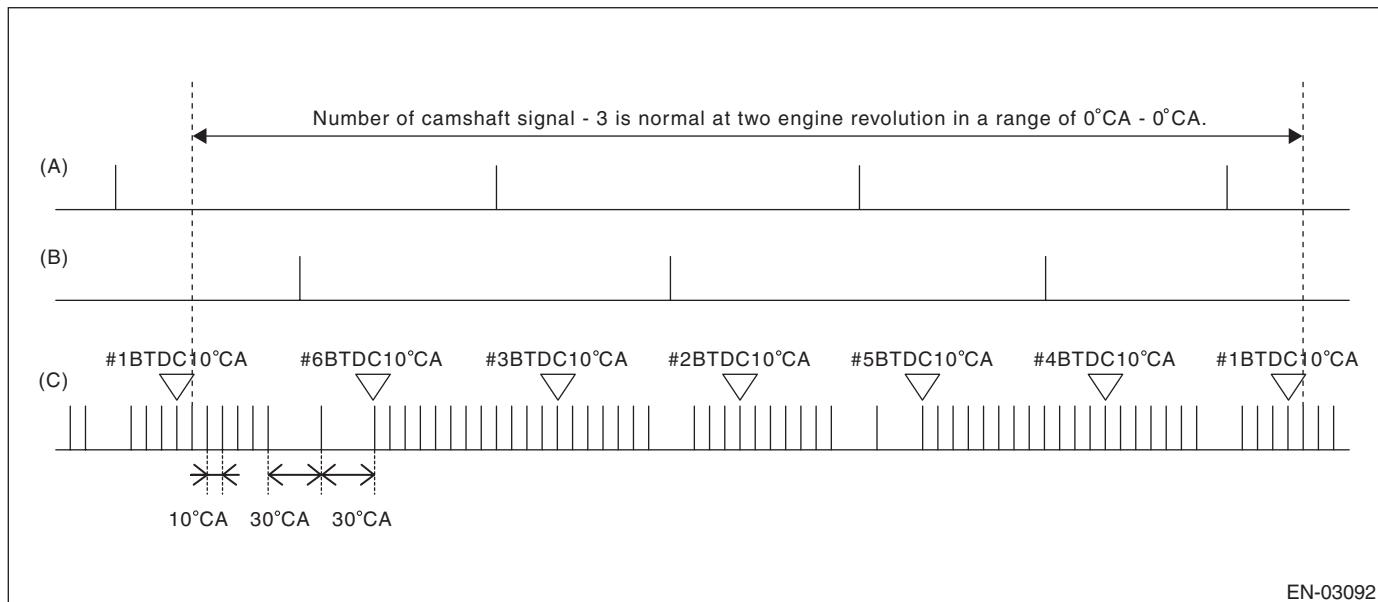
### BZ:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the camshaft position sensor.

Judge as NG when the number of camshaft signals remains abnormal.

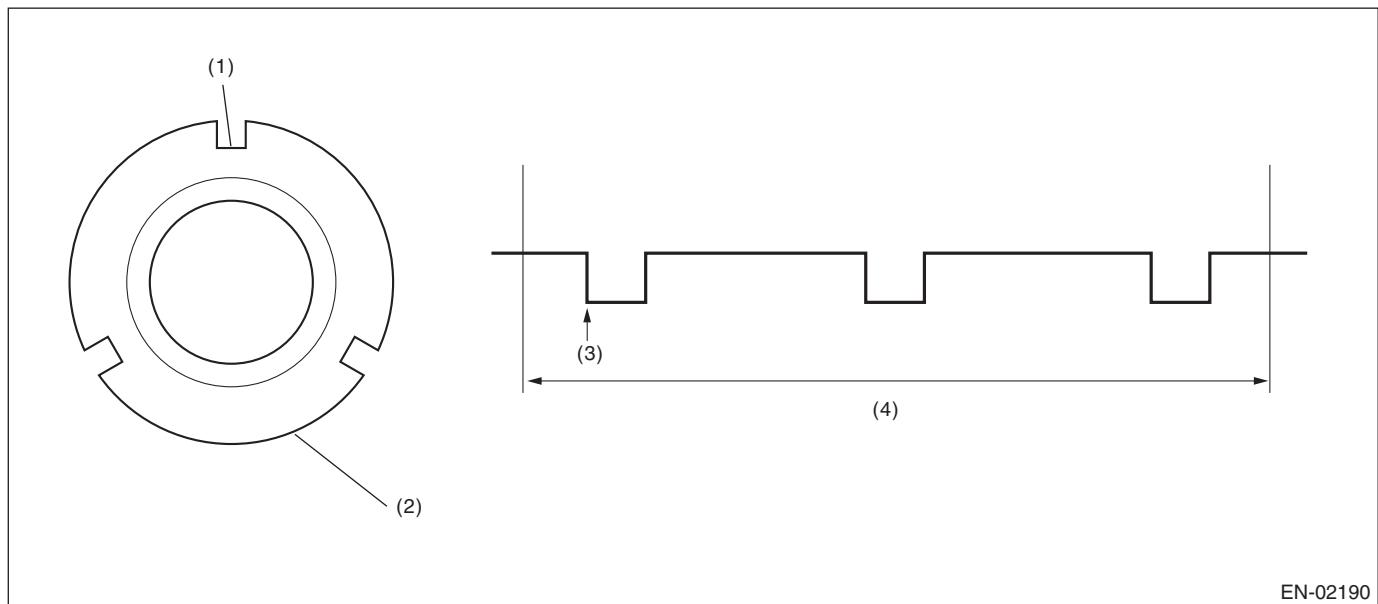
#### 2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal



(1) Throttle

(2) Camshaft plate

(3) Detecting point

(4) Camshaft one revolution (engine two revolutions)

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 8$ V

## 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment 1

Judge as NG when the condition where the number of camshaft position sensor signals are less than 3 times during 2 engine revs. continues.

#### Judgment Value

Malfunction criteria	Threshold value
Amount of camshaft sensor signal during 2 revs.	< 3

**Time Needed for Diagnosis:** 8 engine revs.

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

### • Normality Judgment 1

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

#### Judgment Value

Malfunction criteria	Threshold value
Camshaft position sensor signal	= 3

### • Abnormality Judgment 2

Judge as NG when the continuous time when the following conditions are established is 3 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Starter	ON
Camshaft position sensor signal	No input

**Time Needed for Diagnosis:** 3 seconds

### • Normality Judgment 2

Judge as OK and clear the NG when the following criteria are established.

#### Judgment Value

Malfunction criteria	Threshold value
Camshaft position sensor signal	Input exists

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 8. FAIL SAFE

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

### 9. ECM OPERATION AT DTC SETTING

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

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

### 1. OUTLINE OF DIAGNOSIS

#### NOTE:

For the detection standard, refer to DTC P0340. <Ref. to GD(H6DO)-118, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

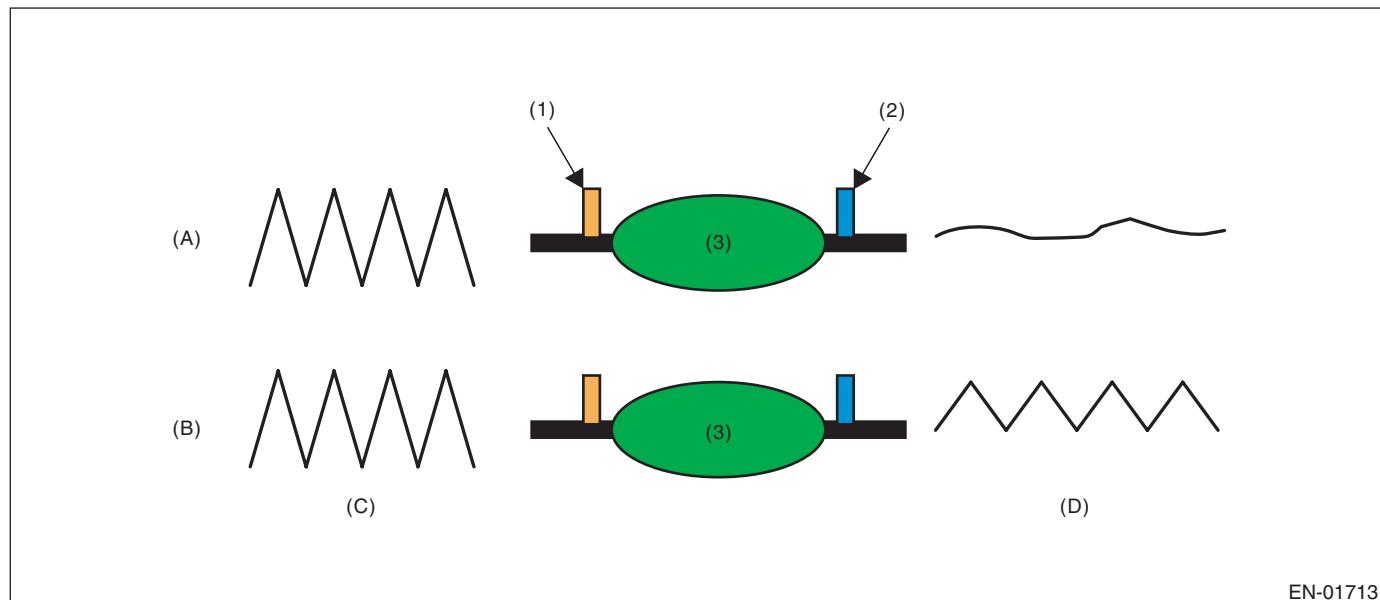
#### 1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened.

For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front oxygen (A/F) sensor output.

#### 2. COMPONENT DESCRIPTION



EN-01713

- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalytic converter

- (A) Normal
- (B) Deterioration
- (C) Output waveform from the front oxygen (A/F) sensor

- (D) Output waveform from the rear oxygen sensor

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 75°C (167°F)
Estimated catalyst temperature	≥ 580°C (1076°F)
Misfire detection every 200 rotations	< 7 times
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual and target lambda	1000 milliseconds or more
Vehicle speed	≥ 70 km/h (43 MPH)
Amount of intake air	10 ↔ 40 g (0.35 ↔ 1.41 oz)/s
Rear oxygen output change from 600 mV or lower to 600 mV or higher	Experienced after fuel cut
Load change absolute value	< 0.02 g (0.007 oz)/rev
Total time of canister purge operation	≥ 5 seconds
Learning value of evaporation gas density	≤ 0.2
After engine starting	≥ 205 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant 70 km/h (43 MPH) or higher.

### 5. DIAGNOSTIC METHOD

After the execution criteria are established, calculate the output fluctuation value of front oxygen (A/F) sensor (averaged for the right and left) and output fluctuation value of rear oxygen sensor. Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value is the specified value or more. A/F response properties and diagnosis values are parameters for the judgment value.

Judge as NG if the criteria below are met. Judge as OK if the criteria below are not met.

#### Judgment Value

Malfunction criteria	Threshold value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds × 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds × 4	≥ 20.2

**Time Needed for Diagnosis:** 30 — 55 seconds

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

None

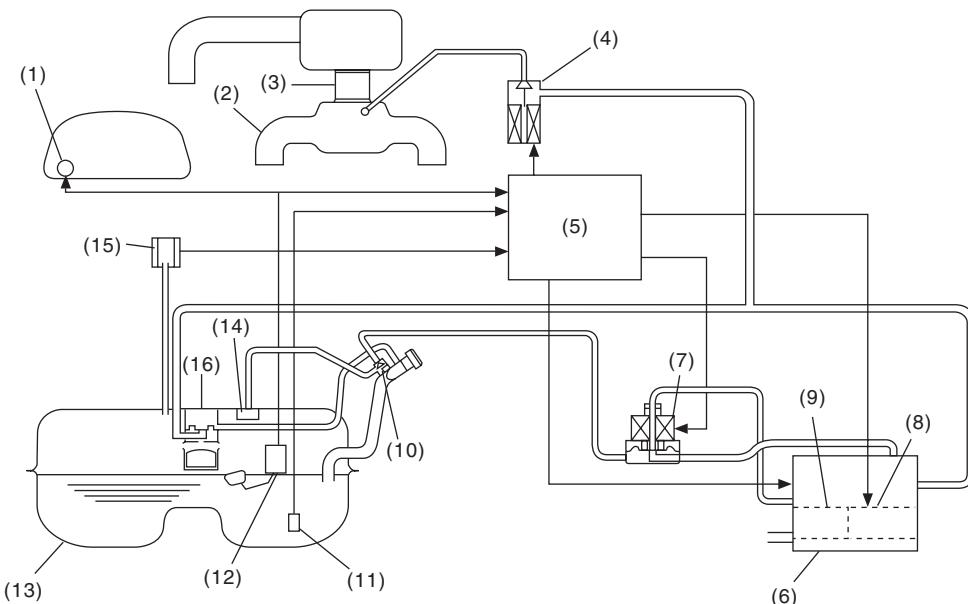
### 9. ECM OPERATION AT DTC SETTING

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

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

#### 1. OUTLINE OF DIAGNOSIS

Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



EN-04151

- |                                  |                                     |                                |
|----------------------------------|-------------------------------------|--------------------------------|
| (1) Fuel gauge                   | (7) Pressure control solenoid valve | (12) Fuel level sensor         |
| (2) Intake manifold              | (8) Drain valve                     | (13) Fuel tank                 |
| (3) Throttle body                | (9) Drain filter                    | (14) Fuel cut valve            |
| (4) Purge control solenoid valve | (10) Shut-off valve                 | (15) Fuel tank pressure sensor |
| (5) Engine control module (ECM)  | (11) Fuel temperature sensor        | (16) Vent valve                |
| (6) Canister                     |                                     |                                |

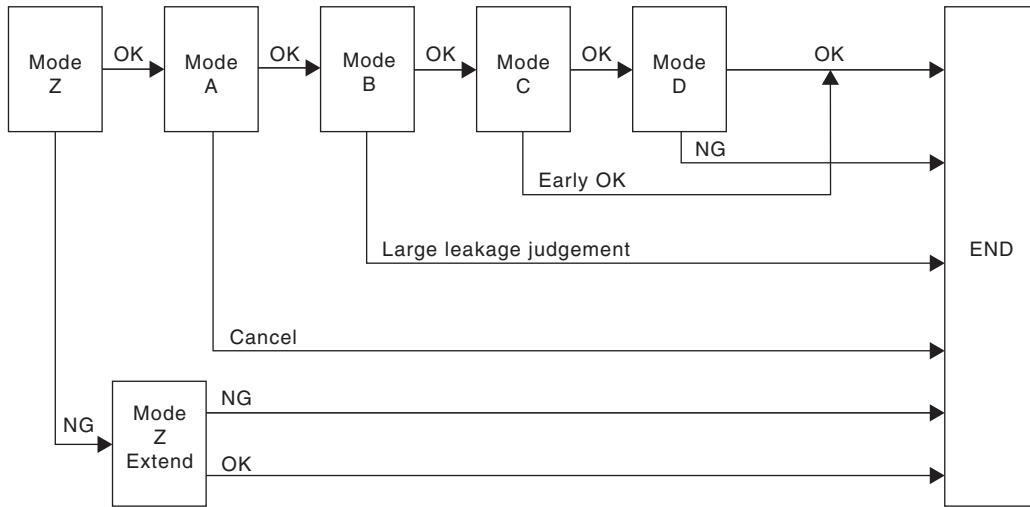
In this system diagnosis, check for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor.

When in 0.04 inch diagnosis, perform in the order of mode Z → mode A → mode B → mode C → mode D;  
When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D → mode E.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 0.04-inch Diagnosis



EN-02872

Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Decrease the pressure in the tank to the target value by introducing intake manifold pressure to the fuel tank. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 25 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure returns to the targeted pressure (start level of P2 calculation). If the tank pressure does not become the value, make advanced OK judgment.	1 — 15 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 found in Mode A. Perform the evaporation diagnosis using the diagnostic value.	10 seconds

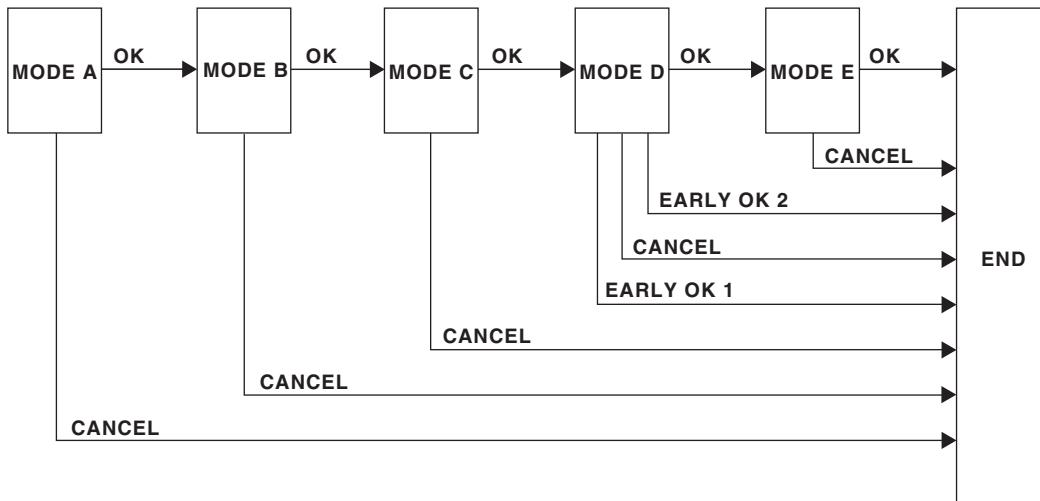
### Mode Table for Evaporative Emission Control System Diagnosis

Mode	When normal	Diagnostic item	DTC
Mode Z	Roughly same as barometric pressure (Same pressure as 0 kPa (0 mmHg, 0 inHg))	Purge control solenoid valve is judged to be open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leak	P0457
Mode C	Reaches target pressure	—	—
Mode D	Pressure change is small.	EVAP system large leak [1.0 mm (0.04 in)]	P0442

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 0.02-inch Diagnosis



EN-03044

Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When pressure in tank is high, wait for 0 point (Near 0 kPa (0 mmHg, 0 inHg)) to return.	0 — 12 seconds
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake hose pressure to the fuel tank.	0 — 27 seconds
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 20 seconds
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to return to the P2 calculation complete pressure. If the tank pressure does not return to the P2 calculation complete pressure, make advanced OK judgment.	0 — 200 seconds
Mode E (Evaporation generated amount calculation)	Calculate the amount of evaporation (P1).	0 — 280 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

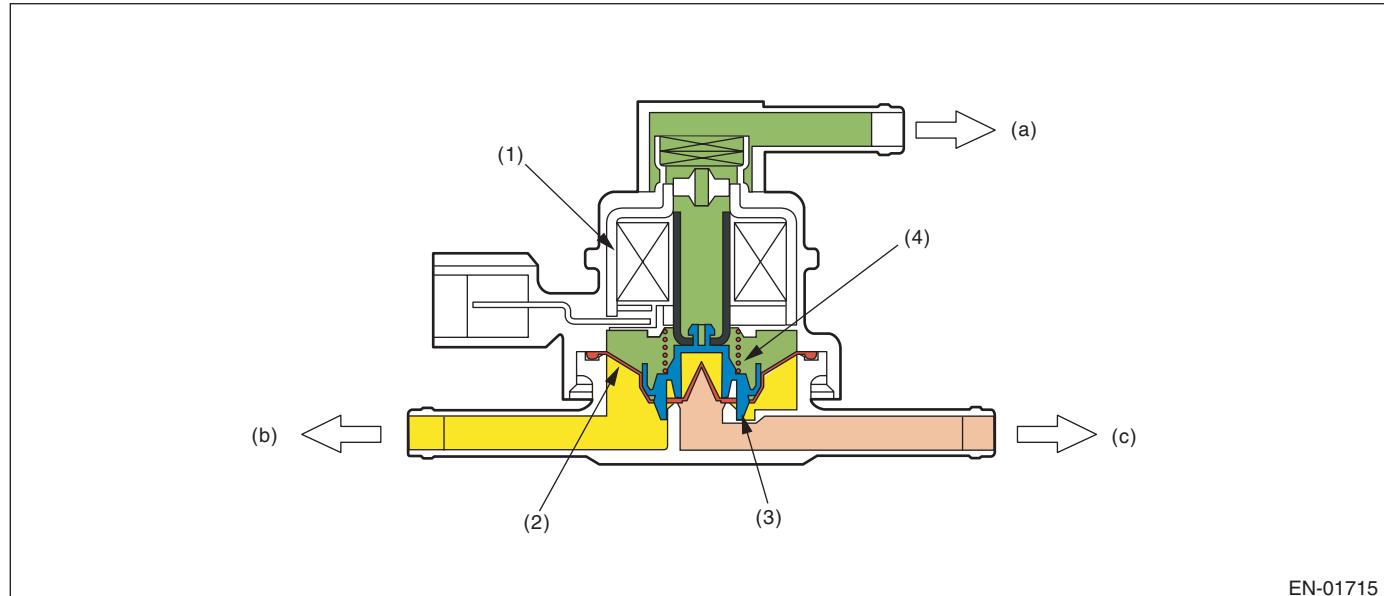
## GENERAL DESCRIPTION

### 2. COMPONENT DESCRIPTION

#### • Pressure control solenoid valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



(a) Barometric pressure

(b) Fuel tank

(c) Canister

(1) Solenoid

(3) Valve

(4) Spring

(2) Diaphragm

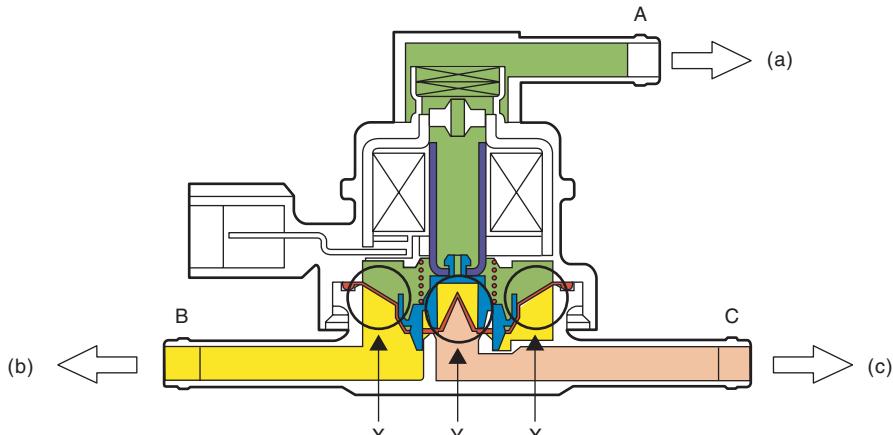
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Valve Operation and Air Flow

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

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



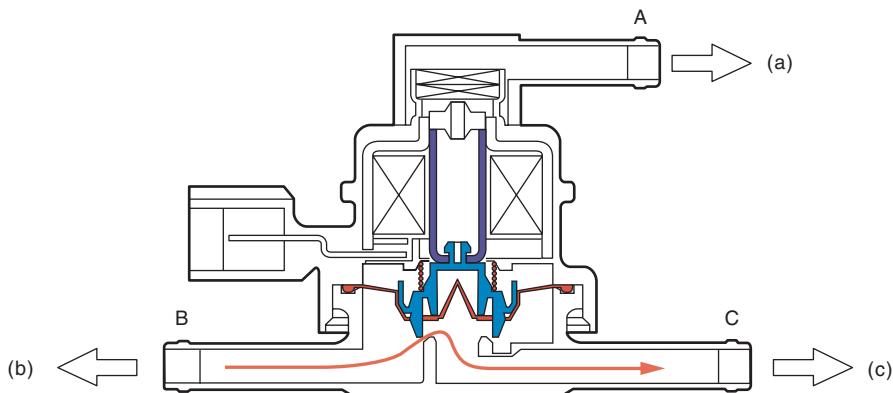
(a) Barometric pressure

(b) Fuel tank

(c) Canister

Condition of pressure	Flow
$A < B$ (solenoid OFF)	$B \rightarrow C$
$B < C$ (solenoid OFF)	$C \rightarrow B$
Solenoid ON	$B \leftrightarrow C$

### When $A < B$ (solenoid OFF)



(a) Barometric pressure

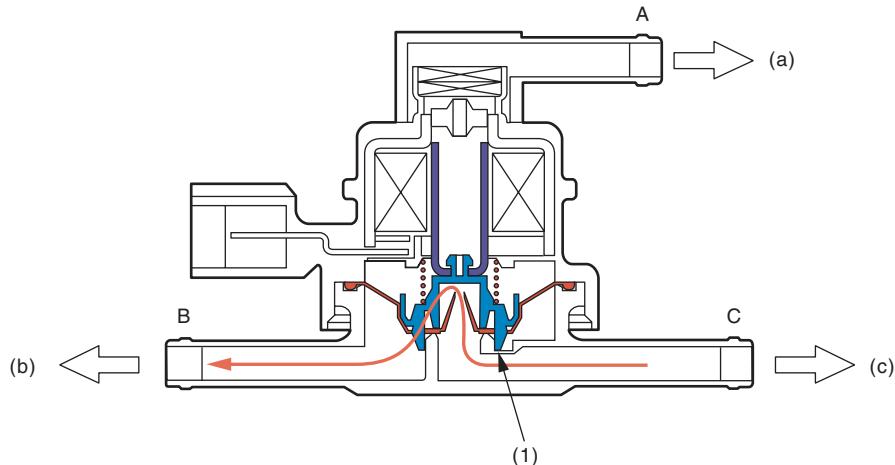
(b) Fuel tank

(c) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### When B < C (solenoid OFF)



EN-01718

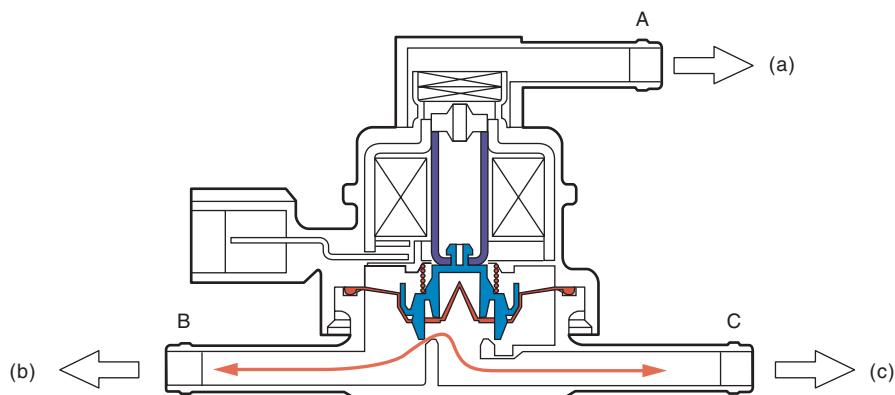
(a) Barometric pressure

(b) Fuel tank

(c) Canister

(1) Valve

### When Solenoid is ON



EN-01719

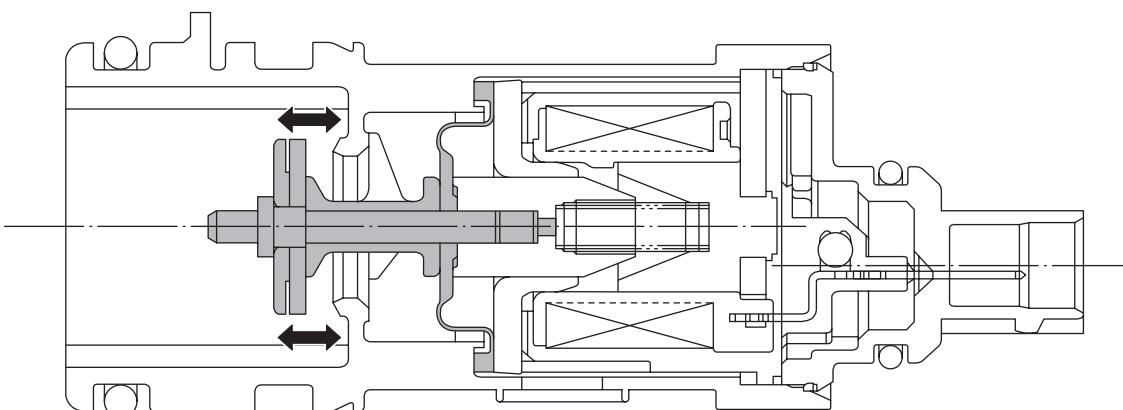
(a) Barometric pressure

(b) Fuel tank

(c) Canister

### • Drain valve

Drain valve controls the ambient air to be introduced to the canister.



EN-02293

## 3. ENABLE CONDITION

### 0.04-inch Diagnosis

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
Barometric pressure	$\geq 75.1$ 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	$\leq 0.08$
Engine speed	$1050 \longleftrightarrow 6500$ rpm
Fuel tank pressure	$\geq -4.0$ kPa (-30 mmHg, -1.18 inHg)
Intake manifold relative vacuum (relative pressure)	$< -26.7$ kPa (-200 mmHg, -7.87 inHg)
Vehicle speed	$\geq 32$ km/h (20 MPH)
Fuel level	$9.6 \longleftrightarrow 54.4$ l (2.53 $\longleftrightarrow$ 14.37 US gal, 2.11 $\longleftrightarrow$ 12.00 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	$-10 \longleftrightarrow 45^{\circ}\text{C}$ (14 $\longleftrightarrow$ 113°F)
Intake air temperature	$\geq -10^{\circ}\text{C}$ (14°F)
Pressure change every one second	$< 0.23$ kPa (1.7 mmHg, 0.07 inHg)
Minimum pressure change value every one second – Maximum pressure change value	$< 0.23$ kPa (1.7 mmHg, 0.07 inHg)
Change of fuel level	$< 2$ l (2.1 US qt, 1.76 Imp qt)/128 milliseconds
Air fuel ratio	0.76 — 1.25

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 0.02-inch Diagnosis

Secondary parameters	Enable conditions
(At starting a diagnosis)	
Evap. diagnosis	Incomplete
Battery voltage	$\geq 10.9$ V
Barometric pressure	$\geq 75.1$ kPa (563 mmHg, 22.2 inHg)
Time since the last incomplete 0.02 inch leak diagnosis (when canceled at mode A)	$> 120$ seconds
Time since the last incomplete 0.02 inch leak diagnosis (when canceled at modes other than mode A)	$> 600$ seconds
Total time of canister purge operation	120 seconds or more
After engine starting	120 seconds or more
Fuel temperature	$-10 \leftrightarrow 55^{\circ}\text{C}$ ( $14 \leftrightarrow 131^{\circ}\text{F}$ )
Fuel level	$9.6 \leftrightarrow 54.4 \text{ l}$ ( $2.54 \leftrightarrow 14.37$ US gal, $2.11 \leftrightarrow 12.00$ Imp gal)
Intake manifold relative vacuum (relative pressure)	$< -8.0$ kPa ( $-60$ mmHg, $-2.36$ inHg)
Fuel tank pressure	$-0.43 \text{ --- } 1.43$ kPa ( $-3.2 \text{ --- } 10.7$ mmHg, $-0.13 \text{ --- } 0.42$ inHg)
Vehicle speed	$\geq 50$ km/h (31 MPH) continues for 125 seconds
Closed air/fuel ratio control	In operation
Engine speed	500 — 7000 rpm
(During diagnosis)	
Change of fuel level	$\leq 5 \text{ l}$ ( $1.3$ US qt, $1.1$ Imp qt)
Pressure change every one second	$< 0.06$ kPa ( $0.44$ mmHg, $0.02$ inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	$< 0.07$ kPa ( $0.51$ mmHg, $0.02$ inHg)
Pressure change in tank every second	$\leq 0.01$ kPa ( $0.75$ mmHg, $0.03$ inHg)
Barometric pressure change (Mode D)	$-0.47 \leftrightarrow 0.32$ kPa ( $-3.5 \leftrightarrow 2.4$ mmHg, $-0.14 \leftrightarrow 0.09$ inHg)
Barometric pressure change (Mode E)	$-0.32 \leftrightarrow 0.32$ kPa ( $-2.4 \leftrightarrow 2.4$ mmHg, $-0.09 \leftrightarrow 0.09$ inHg)

### 4. GENERAL DRIVING CYCLE

#### 0.04-inch Diagnosis

Perform the diagnosis only once 856 seconds or more after starting the engine, at a constant speed of 32 km/h (20 MPH) or more.

Pay attention to the fuel temperature and fuel level.

#### 0.02-inch Diagnosis

Perform the diagnosis 120 seconds or more after starting the engine, at a constant vehicle speed of 50 km/h (31 MPH) or faster, to judge as NG or OK.

If OK/NG judgment is not possible, repeat the diagnosis.

Pay attention to the fuel temperature and fuel level.

### 5. DIAGNOSTIC METHOD

#### 0.04-inch Diagnosis

##### **Mode Z: (Purge control solenoid valve opening failure diagnosis)**

When performing the leakage diagnosis of the EVAP system, the purge control solenoid valve must operate properly. Therefore, mode Z is used to diagnose a stuck open condition of the purge control solenoid valve by monitoring the tank pressure.

Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

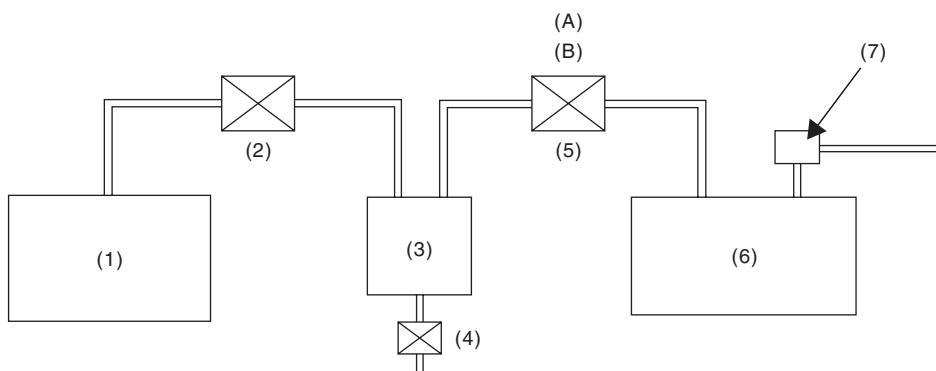
#### • PURGE CONTROL SOLENOID VALVE STUCK OPEN DIAGNOSIS

##### DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

##### • DIAGNOSTIC METHOD

Purge control solenoid valve stuck open diagnosis is performed in mode Z as shown in the figure below.



EN-04152

- |                                  |                                     |                               |
|----------------------------------|-------------------------------------|-------------------------------|
| (1) Engine                       | (4) Drain valve                     | (6) Fuel tank                 |
| (2) Purge control solenoid valve | (5) Pressure control solenoid valve | (7) Fuel tank pressure sensor |
| (3) Canister                     |                                     |                               |
- (A) Normal condition: mechanical control      (B) During diagnosis: electronic throttle control

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Purge Control Solenoid Valve Function Diagnosis

#### DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

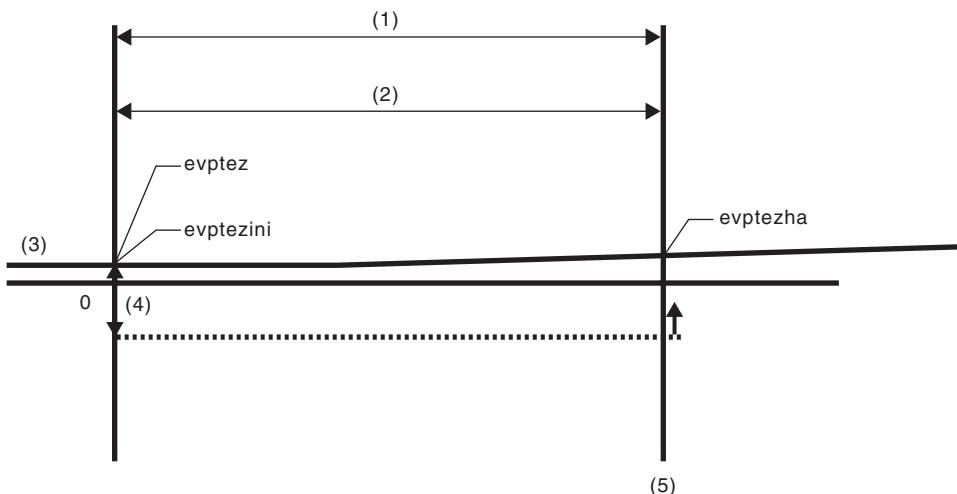
#### Normality Judgment

Make OK judgment 3 seconds after Mode Z starts, and change to Mode A if OK.

#### Judgment Value

Malfunction criteria	Threshold value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	$\leq 0.4 \text{ kPa (3 mmHg, 0.12 inHg)}$	P0457

### • Normal



EN-02869

(1) Mode Z

(2) 3 seconds

(3) Fuel tank pressure

(4) 0.4 kPa (3.0 mmHg, 0.12 inHg)

(5) OK judgment

- $\text{evptez} - \text{evptezha} \leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$

Normal when above is established

#### Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and Judge as NG when the malfunction criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	$> 0.6 \text{ kPa (4.5 mmHg, 0.18 inHg)}$	P0457
Tank pressure when Mode Z started	$\leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$	
Time of 2 ℥ or more fuel no sloshing	$\geq 40 \text{ seconds}$	

# Diagnostic Trouble Code (DTC) Detecting Criteria

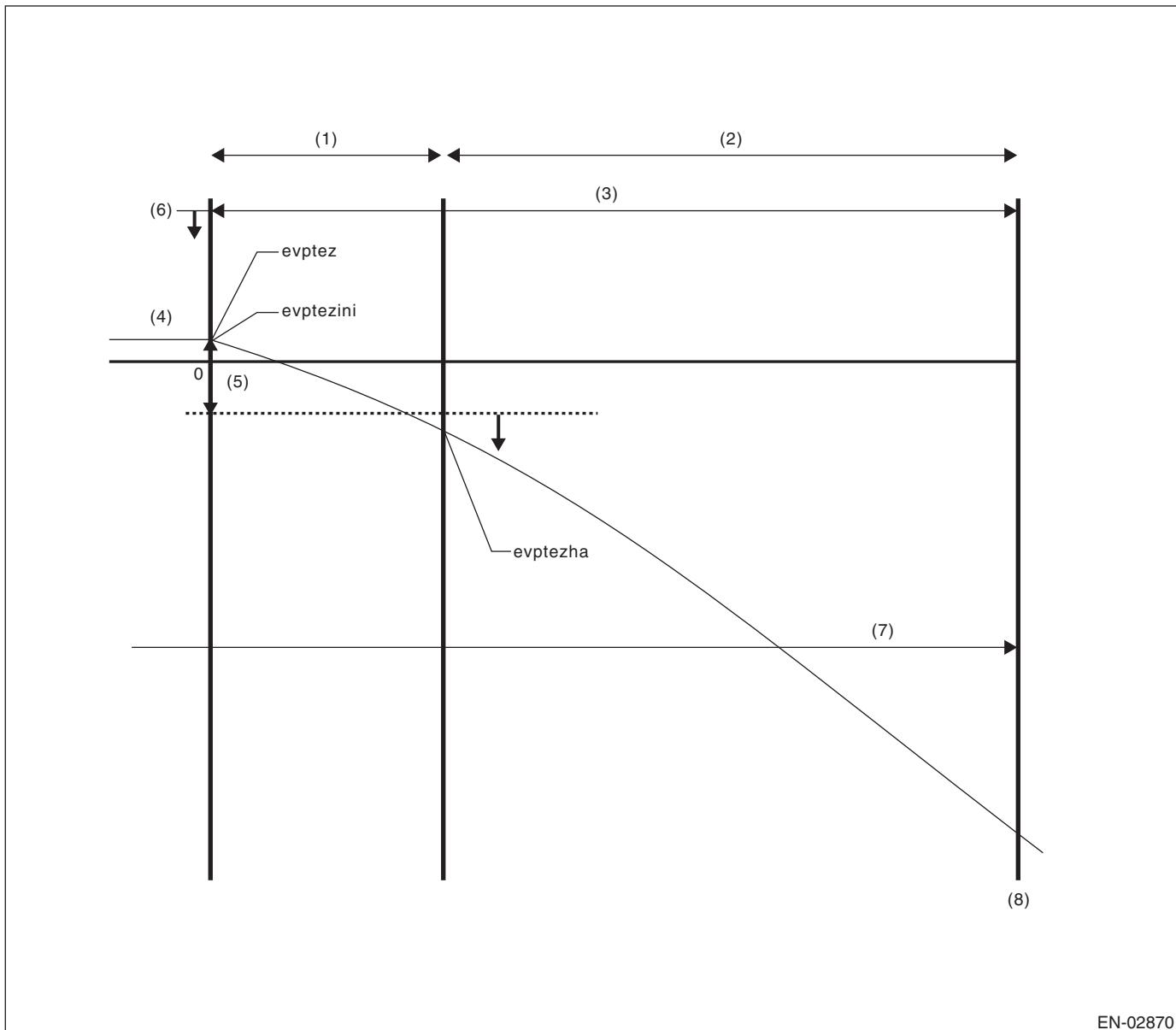
## GENERAL DESCRIPTION

**Time Needed for Diagnosis:** 16 seconds

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

When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis.

Cancel the evaporative diagnosis when the OK/NG judgment for drain valve stuck closed and purge control solenoid valve stuck open cannot be made in Mode Z.



EN-02870

- |                     |                                     |                                 |
|---------------------|-------------------------------------|---------------------------------|
| (1) Mode Z          | (4) Fuel tank pressure              | (7) 40 seconds no fuel sloshing |
| (2) Extended mode Z | (5) 0.6 kPa (4.5 mmHg, 0.18 inHg)   | (8) NG judgment                 |
| (3) 16 seconds      | (6) 1.43 kPa (10.7 mmHg, 0.42 inHg) |                                 |

- $evptezini \leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$
- $evptez - evptezha \leq 0.6 \text{ kPa (4.5 mmHg, 0.18 inHg)}$
- No fuel sloshing of over 2 ℥ (0.79 US gal, 0.67 Imp gal) lasts for more than 40 seconds. Judge as normal when all are established.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Leak Diagnosis

#### DTC

P0442 Evaporative Emission Control System Leak Detected (Small Leak)

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

### • DIAGNOSTIC METHOD

The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to barometric pressure.

#### Mode A: (Estimated evaporation gas amount)

Calculate the tank pressure change amount (P1) when using mode A. After calculating P1, switch to mode B.

#### Mode B: (Negative pressure sealed)

Introduce negative pressure in the intake manifold to the tank.

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

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

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage (10 seconds or 35 seconds) in the system.

#### Abnormality Judgment

Judge as NG (large leak) when the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value	DTC
Time to reach target negative pressure Or mode B time	$\geq 35$ seconds	P0457
(Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	$\geq 10$ seconds $< -0.33$ kPa ( $-2.5$ mmHg, $-0.1$ inHg)	

#### Mode C: (Check pressure rise)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
$-1.3$ kPa ( $-9.75$ mmHg, $-0.38$ inHg)	17 seconds

#### Mode D: (Measure amount of negative pressure change)

Monitor the tank pressure change amount when using mode D. In this case, the tank pressure increases, (nears barometric pressure) because evaporation occurs. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform a small leak diagnosis according to the items below.

#### When Mode D is ended

Assign tank variations measured in Mode A and Mode D, P1 and P2, to the formula below, judge small leaks in the system. If the measured judgment value exceeds the threshold value, it is judged to be a malfunction. Judge as NG when the criteria below are completed and Judge as OK when not completed.

#### Judgment Value

Malfunction criteria	Threshold value	DTC
P2 – $1.5 \times P1$	$>$ Value from Map 7	P0442
P2: Tank pressure that changes every 10 seconds in mode D	* Threshold value: Figure (Remaining Fuel vs Tank temperature)	
P1: Tank pressure that changes every 10 seconds in mode A		

\* 1.5: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Map 7 Failure Diagnosis Reference Limit for 0.04 in Leaks for Evaporation Diagnosis

Fuel temperature & fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.28 kPa (2.1 mmHg, 0.083 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.31 kPa (2.3 mmHg, 0.090 inHg)	0.31 kPa (2.35 mmHg, 0.092 inHg)	0.32 kPa (2.4 mmHg, 0.094 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.31 kPa (2.3 mmHg, 0.091 inHg)	0.32 kPa (2.4 mmHg, 0.094 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)	0.35 kPa (2.6 mmHg, 0.102 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.41 kPa (3.05 mmHg, 0.120 inHg)	0.42 kPa (3.15 mmHg, 0.124 inHg)	0.43 kPa (3.25 mmHg, 0.128 inHg)	0.45 kPa (3.35 mmHg, 0.134 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.42 kPa (3.15 mmHg, 0.124 inHg)	0.44 kPa (3.3 mmHg, 0.130 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.43 kPa (3.2 mmHg, 0.126 inHg)	0.44 kPa (3.3 mmHg, 0.130 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.48 kPa (3.6 mmHg, 0.142 inHg)	0.49 kPa (3.7 mmHg, 0.146 inHg)

**Time Needed for Diagnosis:** 30 — 100 seconds

#### 0.02-inch Diagnosis

##### DTC

P0456 Evaporative Emission Control System Leak Detected (very small leak)

#### • DIAGNOSTIC METHOD

The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to barometric pressure.

##### Mode A: (0 point compensation)

When pressure in tank is high, wait for 0 point 0 kPa (Near 0 mmHg, 0 inHg) to return. Shift to mode B when 0 point returns.

Cancel the diagnosis when 0 point does not return in the specified time.

##### Mode B: (Negative pressure introduced)

Introduce negative pressure in the intake manifold to the tank.

Approx. 0 → -2.0 kPa (0 mmHg → -15 mmHg, 0 → -0.59 inHg)

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

Cancel the diagnosis when the targeted pressure in the tank is not reached.

##### Mode C: (Negative pressure maintained)

Stop the introduction of negative pressure and wait until the tank pressure returns to the start level of P2 calculation.

Change to Mode D either when the tank pressure returns to the start level of P2 calculation, or when the predetermined amount of time has passed.

##### Mode D: (Calculate the amount of negative pressure change)

Monitor the tank pressure in mode D, calculate (P2) the pressure change in the tank, and measure the time (evpdset) for the tank pressure to return when calculation of P2 is completed. Shift to mode E when pressure returns. Make an advance OK judgment using the value of P2, or cancel, when the pressure in the tank does not return after calculation of P2 is completed even when the predetermined amount of time has passed.

When the following conditions are established, judged as OK.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Judgment Value

Malfunction criteria	Threshold value	DTC
Advanced OK judgment 1 When in Mode D Fuel tank pressure	$\geq 30$ s $\leq -12$ — $-13.5$ mmHg ( $-0.47$ — $-0.53$ inHg)	P0456
Advanced OK judgment 2 When in Mode D P2	$\geq 200$ s $\geq 0.9$ — $1.3$ kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg)	

### Mode E: (Evaporation occurrence amount calculation)

Calculate the change of tank pressure with the time evpdset to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).

### Abnormality Judgment

If the following conditions are met, judge as NG.

### Judgment Value

Malfunction criteria	Threshold value	DTC
P1	< Value from Map 7 * Threshold value: Figure (Residual Fuel Amount vs evpdset)	P0456

### Map 7 Failure diagnosis reference limit for 0.02 in leaks for evaporation diagnosis

Time evpdset & fuel level	0 seconds	30 seconds	50 seconds	100 seconds	160 seconds	200 seconds
10 L (2.6 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.23 kPa (1.7 mmHg, 0.067 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.23 kPa (1.7 mmHg, 0.067 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.23 kPa (1.7 mmHg, 0.067 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.25 kPa (1.85 mmHg, 0.073 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.27 kPa (2.0 mmHg, 0.079 inHg)	0.31 kPa (2.3 mmHg, 0.091 inHg)	0.31 kPa (2.3 mmHg, 0.091 inHg)	0 kPa (0 mmHg, 0 inHg)

### Normality Judgment

When the following conditions are established, judged as OK.

### Judgment Value

Malfunction criteria	Threshold value	DTC
P1	> Value from Map 8 * Threshold value: Figure (Residual Fuel Amount vs evpdset)	P0456

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Map 8

Time evpdset & fuel level	0 seconds	30 seconds	50 seconds	100 seconds	160 seconds	200 seconds
10 L (2.6 US gal, 2.2 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.56 kPa (4.2 mmHg, 0.165 inHg)	0.56 kPa (4.2 mmHg, 0.165 inHg)	0.56 kPa (4.2 mmHg, 0.165 inHg)	0.56 kPa (4.2 mmHg, 0.165 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.43 kPa (3.25 mmHg, 0.128 inHg)	0.55 kPa (4.1 mmHg, 0.161 inHg)			
30 L (7.9 US gal, 6.6 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.4 kPa (3 mmHg, 0.118 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.30 kPa (2.25 mmHg, 0.089 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)			
50 L (13.2 US gal, 11.0 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.20 kPa (1.5 mmHg, 0.059 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)

**Time Needed for Diagnosis:** 65 — 514 seconds

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

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

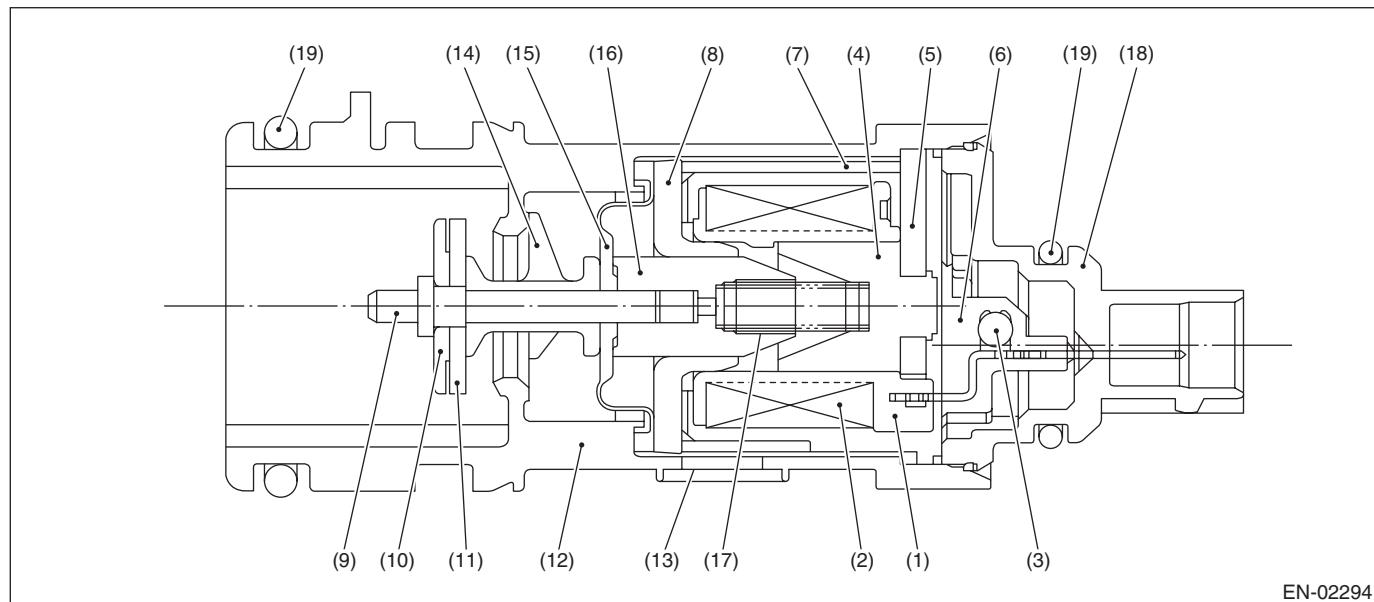
### CD:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

#### 2. COMPONENT DESCRIPTION



(1) Bobbin	(8) Magnetic plate	(14) Retainer
(2) Coil	(9) Shaft	(15) Diaphragm
(3) Diode	(10) Plate	(16) Movable core
(4) Stator core	(11) Valve	(17) Spring
(5) End plate	(12) Housing	(18) Cover
(6) Body	(13) Filter	(19) O-ring
(7) Yoke		

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

**Time Needed for Diagnosis:** 2.5 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

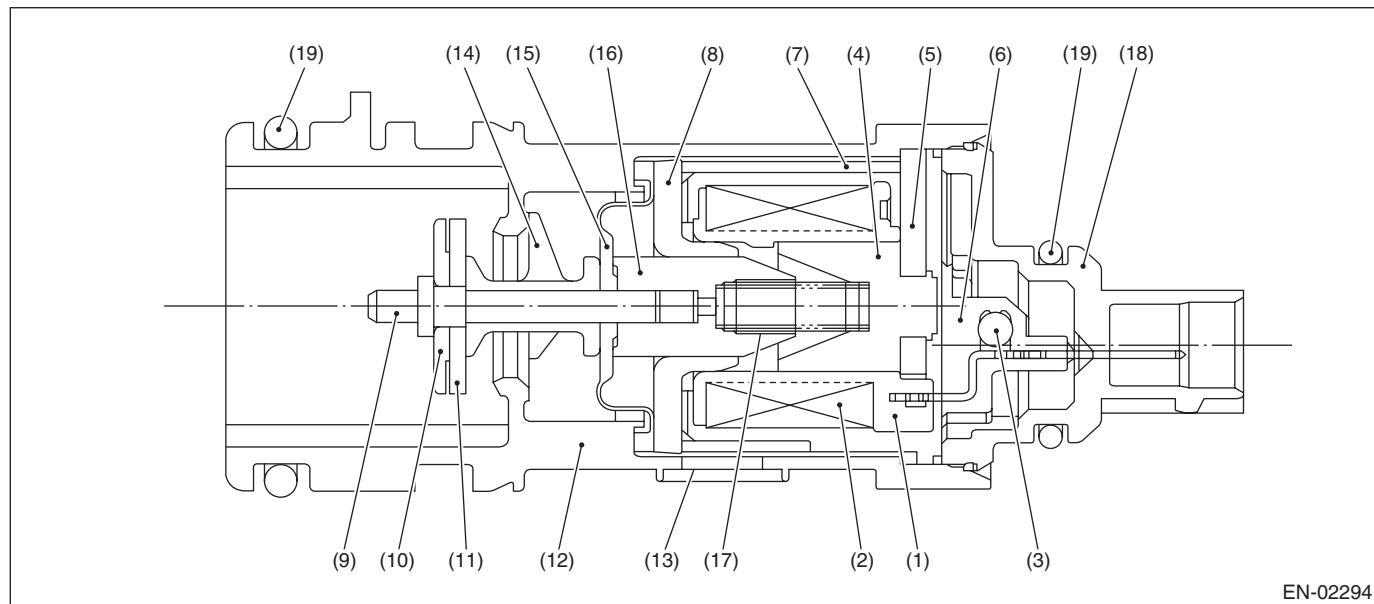
### CE:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

#### 2. COMPONENT DESCRIPTION



(1) Bobbin	(8) Magnetic plate	(14) Retainer
(2) Coil	(9) Shaft	(15) Diaphragm
(3) Diode	(10) Plate	(16) Movable core
(4) Stator core	(11) Valve	(17) Spring
(5) End plate	(12) Housing	(18) Cover
(6) Body	(13) Filter	(19) O-ring
(7) Yoke		

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

**Time Needed for Diagnosis:** 2.5 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

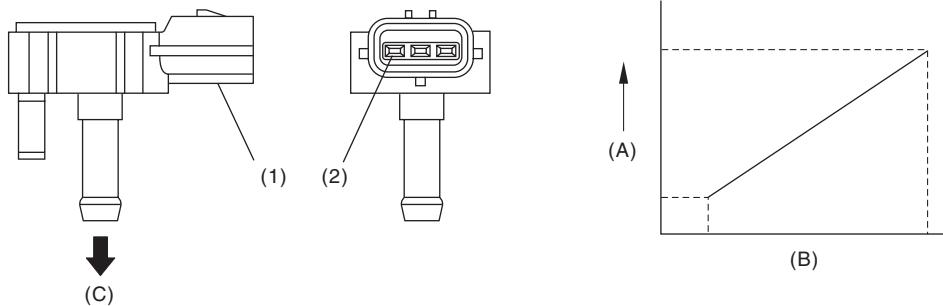
### CF:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

#### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge as NG when there is no pressure variation, which should exist in the tank, considering the engine status.

#### 2. COMPONENT DESCRIPTION



EN-04462

- |               |                    |                  |
|---------------|--------------------|------------------|
| (1) Connector | (A) Output voltage | (C) To fuel tank |
| (2) Terminals | (B) Input voltage  |                  |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
After engine starting	60 seconds or more
Fuel level	$\geq 9.6 \text{ l}$ (2.45 US gal, 2.11 Imp gal)
Fuel temperature	$< 35^\circ\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Barometric pressure	$> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)

#### 4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 seconds or more have passed since the engine started.
- Be sure to check the fuel level and fuel temperature.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Number of times the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℥ (0.52 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Maximum - Minimum Tank Pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Maximum - Minimum Fuel Temperature (with enable condition completed)	≥ 7°C (12.6°F)

If the maximum value – minimum value for the fuel level is less than 2 liters (0.52 US gal, 0.44 Imp gal) every 60 seconds, extend 60 seconds more and make judgment with the maximum and minimum values for the fuel level in 120 seconds. If a difference does not appear though the time was extended 60 seconds, extend the time (180, 240, 300 seconds) and continue the judgment. If the maximum value – minimum value for the fuel level is 2 liters (0.52 US gal, 0.44 Imp gal) or more, the diagnosis counter counts up.

**Time Needed for Diagnosis:** 60 seconds × 16 times or more

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

### • Normality Judgment

Judge as OK if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Maximum - minimum tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

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

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

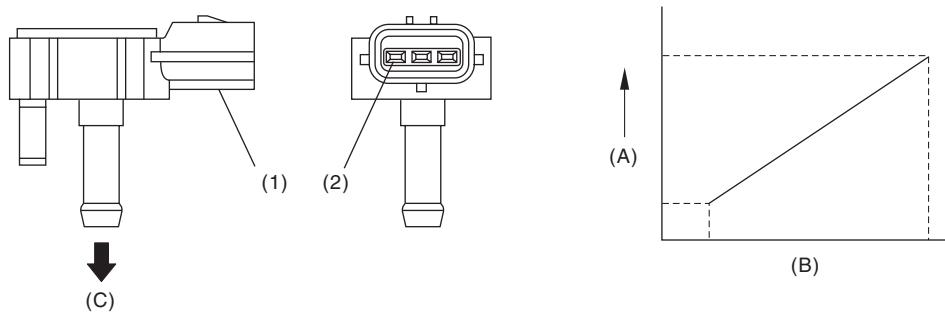
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-04462

- |               |                    |                  |
|---------------|--------------------|------------------|
| (1) Connector | (A) Output voltage | (C) To fuel tank |
| (2) Terminals | (B) Input voltage  |                  |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	< -7.4 kPa (-55.85 mmHg, -2.20 inHg)
Battery voltage	≥ 10.9 V

**Time Needed for Diagnosis:** 15 seconds

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

### • Normality Judgment

Judge as OK if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	≥ -7.4 kPa (-55.85 mmHg, -2.20 inHg)
Battery voltage	≥ 10.9 V

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

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

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

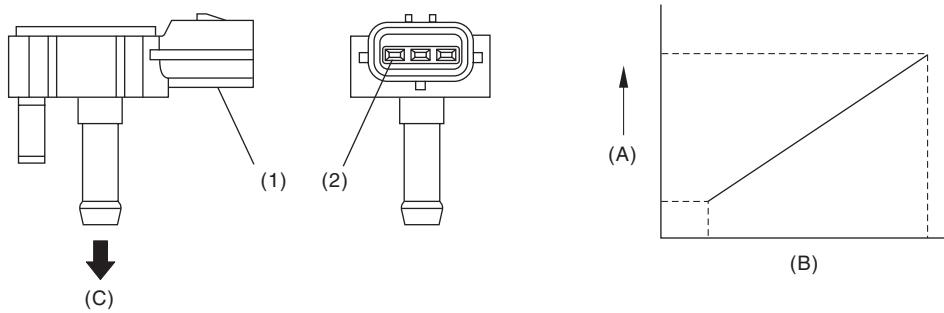
## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-04462

- |               |                    |                  |
|---------------|--------------------|------------------|
| (1) Connector | (A) Output voltage | (C) To fuel tank |
| (2) Terminals | (B) Input voltage  |                  |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Vehicle speed	$\geq 2 \text{ km/h (1.24 MPH)}$
All conditions of EVAP canister purge	Completed
Learning value of evaporation gas concentration (left and right)	$< 0.08$
Main feedback compensation coefficient (left and right)	$\geq 0.9$
Battery voltage	$\geq 10.9 \text{ V}$

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Barometric pressure	75.1 kPa (563 mmHg, 22.2 inHg)

**Time Needed for Diagnosis:** 15 seconds

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

### • Normality Judgment

Judge as OK if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	< 7.98 kPa (59.85 mmHg, 2.36 inHg)

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

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

## 9. ECM OPERATION AT DTC SETTING

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

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

### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0442 Evaporative system (Small leak). <Ref. to GD(H6DO)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0442 Evaporative system (Small leak). <Ref. to GD(H6DO)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

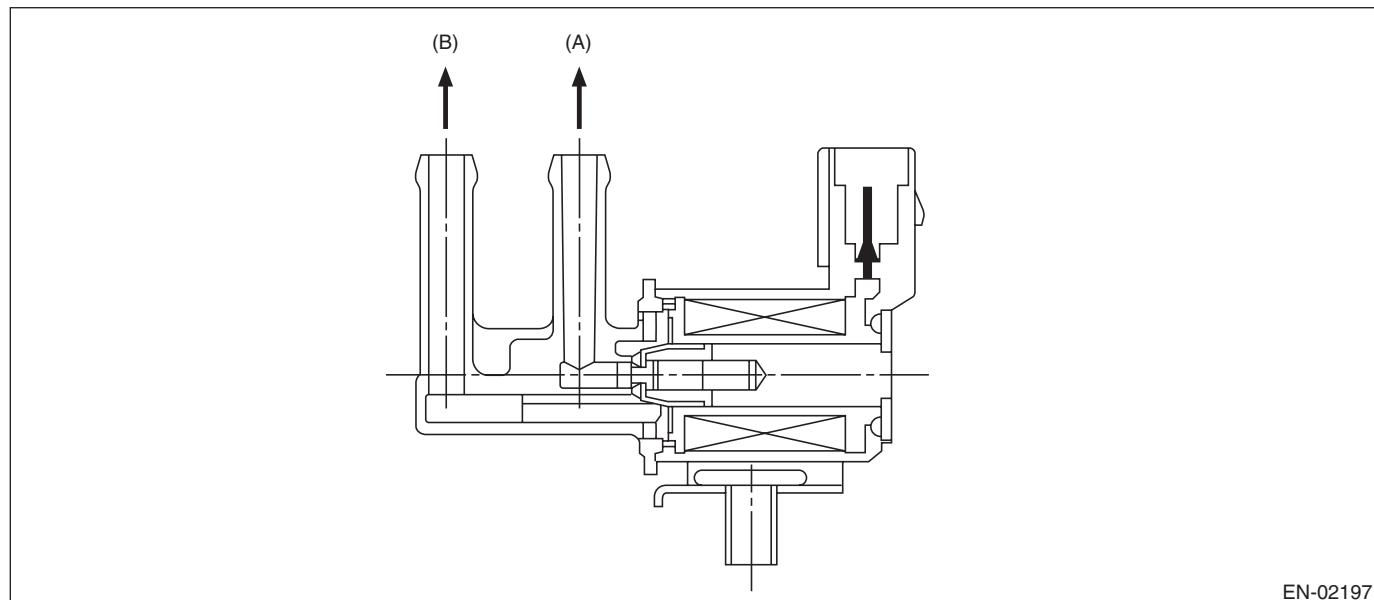
### CK:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

#### 2. COMPONENT DESCRIPTION



(A) To canister

(B) To intake manifold

EN-02197

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Duty ratio of "ON"	< 75%
Terminal output voltage	Low

**Time Needed for Diagnosis:** 2.5 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Terminal output voltage	High

## 6. DTC CLEAR CONDITION

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

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

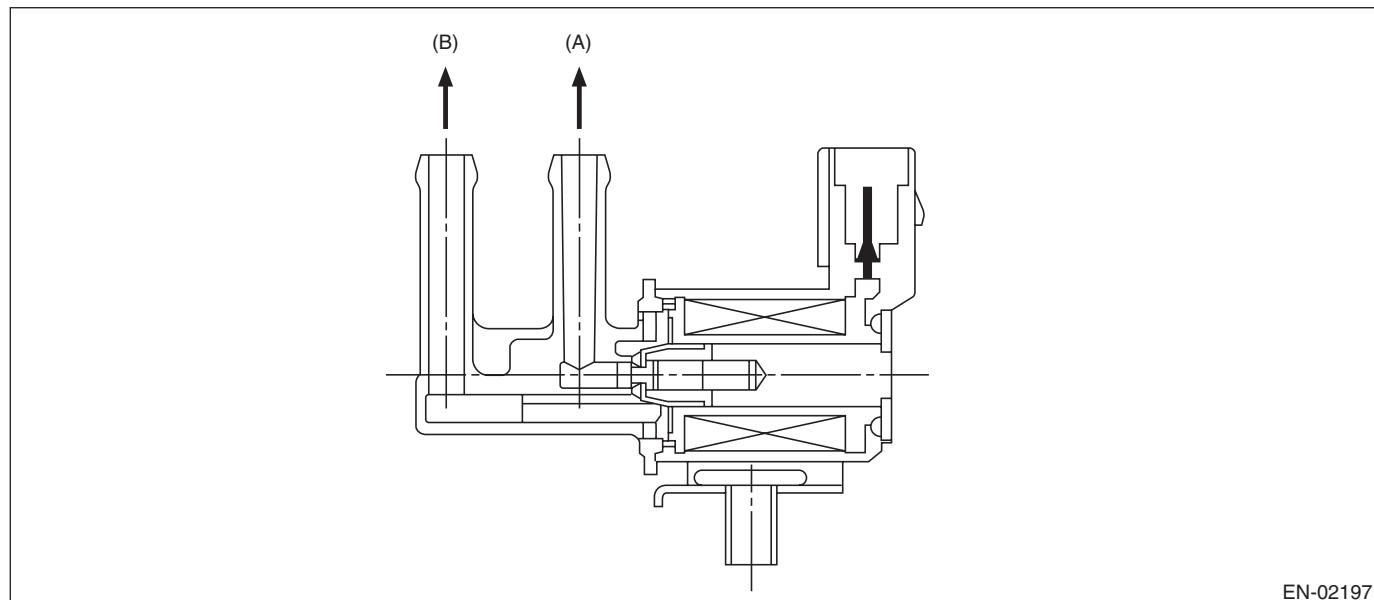
### CL:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

#### 2. COMPONENT DESCRIPTION



(A) To canister

(B) To intake manifold

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Duty ratio of "ON"	$\geq 25\%$
Terminal output voltage	High

**Time Needed for Diagnosis:** 2.5 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Terminal output voltage	Low

## 6. DTC CLEAR CONDITION

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

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

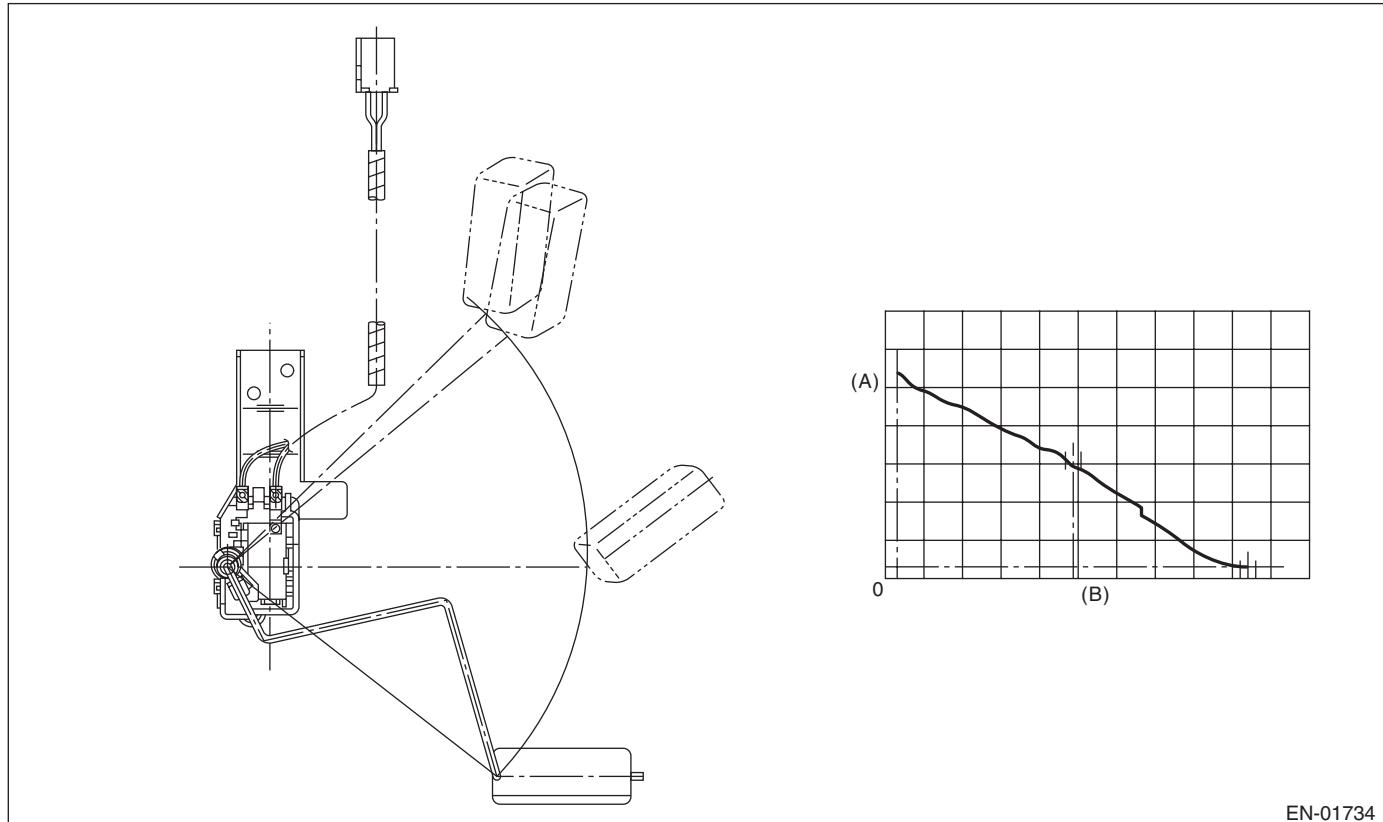
### CM:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the fuel level sensor output property.

If the fuel level does not vary in a particular driving condition / engine condition where it should, judge as NG.

#### 2. COMPONENT DESCRIPTION



EN-01734

(A) Fuel level

(B) Resistance

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – min. values of fuel level output	< 2.6 ℥ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

**Time Needed for Diagnosis:** Undetermined

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – min. values of fuel level output	≥ 2.6 ℥ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

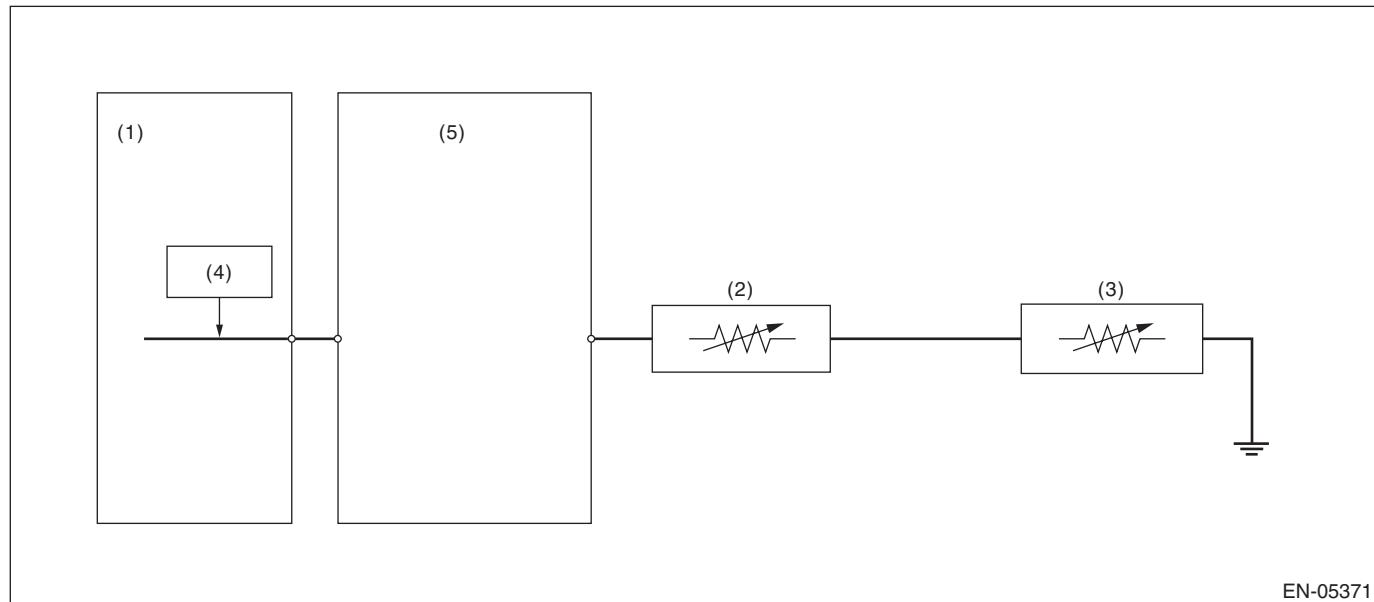
## GENERAL DESCRIPTION

### CN:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-05371

(1) Engine control module (ECM)

(2) Fuel level sensor

(3) Fuel sub level sensor

(5) Body integrated unit

(4) Detecting circuit

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	3 seconds or more
Output voltage	$< 0.173$ V

**Time Needed for Diagnosis:** 2.5 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	3 seconds or more
Output voltage	$\geq 0.173$ V

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

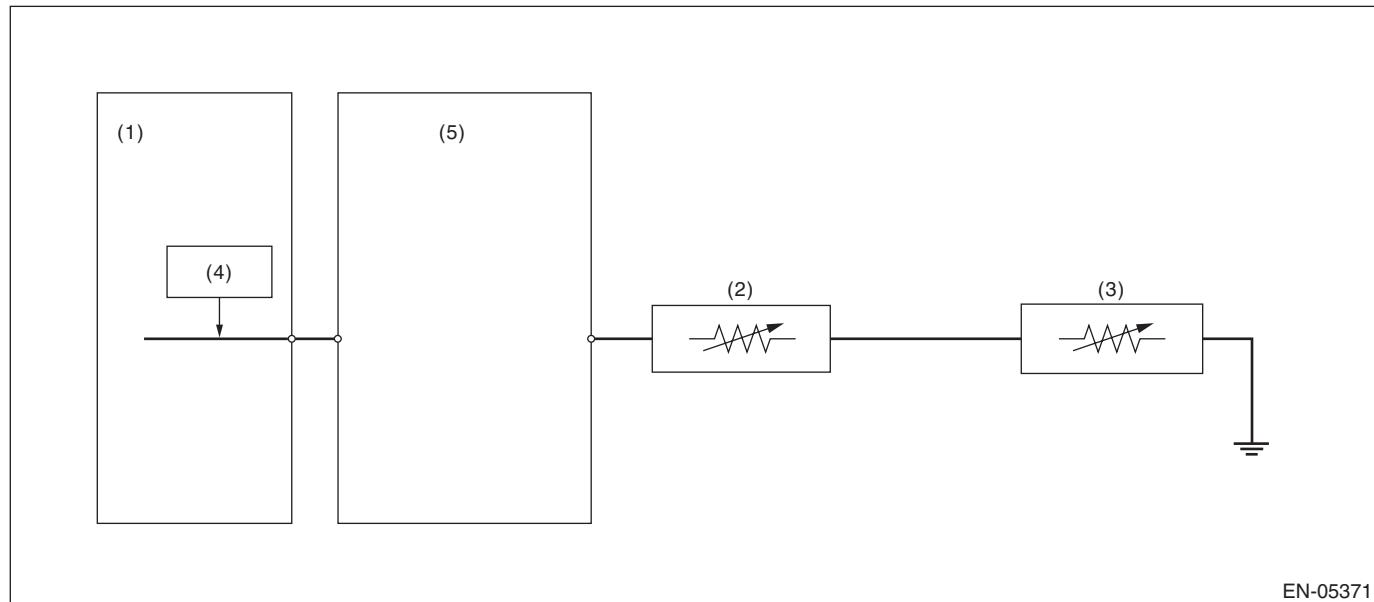
## GENERAL DESCRIPTION

### CO:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-05371

(1) Engine control module (ECM)

(2) Fuel level sensor

(3) Fuel sub level sensor

(5) Body integrated unit

(4) Detecting circuit

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below exceeds the time required 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	$\geq 7.212$ V

**Time Needed for Diagnosis:** 1 second

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	3 seconds or more
Output voltage	$< 7.212$ V

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### CP:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

#### 1. OUTLINE OF DIAGNOSIS

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

#### 2. ENABLE CONDITION

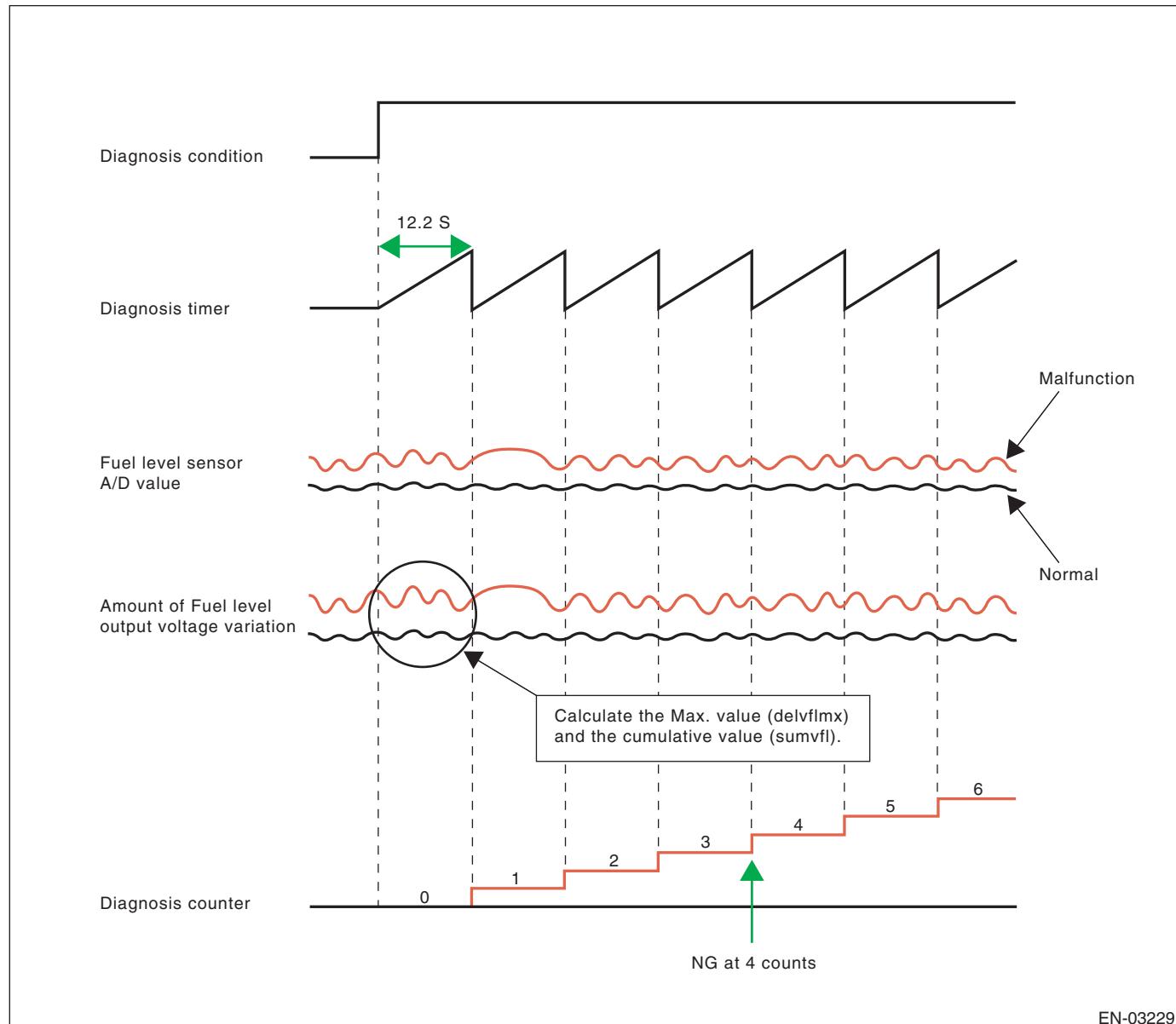
Malfunction criteria	Threshold value
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.6 ↔ 54.4 ℥ (2.54 ↔ 14.37 US gal, 2.11 ↔ 11.97 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

#### 3. GENERAL DRIVING CYCLE

- Always perform the diagnosis continuously at idle speed.
- Pay attention to the fuel level.

### 4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.2 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, the diagnosis counter counts up. Judge as NG if the counter indicated 4 counts.



EN-03229

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Abnormality Judgment

Judge as NG if the criteria below are met.

#### Judgment Value

Malfunction criteria	Threshold value
Integrated times of the condition reaching follows, DEFLMAX $0.27 \leftrightarrow 0.894$ V or SUMFL $\geq 25.92$ V At that time, DELFLMAX: Maximum difference of sensor output for 12.2 seconds; SUMFL: Integrated value of the sensor output deviation for 12.2 seconds	$\geq 4$ times

The diagnosis counter does not count up when the following conditions are completed within 12.2 seconds.

Maximum value – minimum value of change of tank pressure during 12.2 seconds	$\geq 0.05$ kPa (0.375 mmHg, 0.02 inHg)
Maximum value – minimum value of battery voltage during 12.2 seconds	$\geq 0.609$ V

**Time Needed for Diagnosis:** 12.2 seconds  $\times$  4 times

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
DEFLMAX SUMFL At that time, DELFLMAX: Maximum difference of sensor output for 12.2 seconds; SUMFL: Integrated value of the sensor output deviation for 12.2 seconds	$0.27 \leftrightarrow 0.894$ V $< 25.92$ V

## 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

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

## CQ:DTC P0483 FAN RATIONALITY CHECK

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge as NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

### 2. ENABLE CONDITION

Diagnostic enable condition is established if the radiator fan changes from OFF → ON when all of the conditions below are met.

When one of the conditions below is not met, the diagnostic enable condition is not established.

Secondary parameters	Enable conditions
Engine speed	500 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1 MPH)
Battery voltage	≥ 10.9 V

### 3. GENERAL DRIVING CYCLE

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

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 5 minutes or more.

#### Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature	≥ 102°C (216°F)
Engine coolant temperature	Does not decrease

**Time Needed for Diagnosis:** 5 minutes

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

#### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature	Decreases

### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CR:DTC P0500 VEHICLE SPEED SENSOR “A”

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the judgment value.

Judge as NG when the data received from the ABS control module and hydraulic control unit indicates the erroneous vehicle speed, and when the displayed vehicle speed data is out of the normal range.

#### 2. COMPONENT DESCRIPTION

Vehicle speed signals are taken in to the ABS control module and hydraulic control unit, and normal/erroneous data of the ABS wheel speed sensor is received by CAN communication from the ABS control module and hydraulic control unit.

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
Elapsed time after engine starting	$\geq 2$ seconds

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2 seconds after starting the engine.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Front ABS wheel speed sensor status	Malfunction
Either of the following is established	
Front left wheel speed	$\geq 300$ km/h (186 MPH)
Front right wheel speed	$\geq 300$ km/h (186 MPH)

**Time Needed for Diagnosis:** 2.5 seconds

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

##### • Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

##### Judgment Value

Malfunction criteria	Threshold value
Front left wheel speed	$> 0$ km/h (0 MPH) or $< 300$ km/h (186 MPH)
Front right wheel speed	$> 0$ km/h (0 MPH) or $< 300$ km/h (186 MPH)

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

- Accelerator sensor signal process: Not allowed full closed point learning (hold the previous value)
- ABS wheel 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 vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4400 rpm or more).
- ISC control: Open loop compensation is set to (1 g (0.04 oz) oz/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fan ON drive
- Gear ratio judgment: Gear = Control as fixed in sixth gear

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

## CS:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

### 1. OUTLINE OF DIAGNOSIS

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

### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Battery voltage	$\geq 10.9$ V
Barometric pressure	$> 75.1$ kPa (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9.6$ l (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback of ISC	In operation
Lambda value (left and right)	$0.9 \longleftrightarrow 1.1$
After switching air conditioner to ON/OFF	5.1 seconds or more
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	$> 5.1$ seconds
After neutral switch ON/OFF change	$> 5.1$ seconds
Vehicle speed	0 km/h (0 MPH)

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criterion below is 10 seconds  $\times$  3 times.

#### Judgment Value

Malfunction criteria	Threshold value
Actual - target engine speed	$< -100$ rpm
Feedback value for ISC	Max.

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

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

#### • Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

#### Judgment Value

Malfunction criteria	Threshold value
Actual - target engine speed	$\geq -100$ rpm

### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel

## 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CT:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

#### 1. OUTLINE OF DIAGNOSIS

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

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Battery voltage	$\geq 10.9$ V
Barometric pressure	$> 75.1$ kPa (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9.6$ l (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback of ISC	In operation
Lambda value (left and right)	$0.9 \longleftrightarrow 1.1$
After switching air conditioner to ON/OFF	5.1 seconds or more
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	$> 5.1$ seconds
After neutral switch ON/OFF change	$> 5.1$ seconds
Vehicle speed	0 km/h (0 MPH)

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criterion below is 10 seconds  $\times$  3 times.

##### Judgment Value

Malfunction criteria	Threshold value
Actual – Target engine speed	$\geq 200$ rpm
Feedback value for ISC	Min.

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

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

##### • Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

##### Judgment Value

Malfunction criteria	Threshold value
Actual – Target engine speed	$< 200$ rpm

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel

## 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### CU:DTC P0512 STARTER REQUEST CIRCUIT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge as ON NG when the starter SW signal remains ON.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as ON NG when the continuous time of meeting the malfunction criteria below becomes 3 minutes or more.

##### Judgment Value

Malfunction criteria	Threshold value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

**Time Needed for Diagnosis:** 180 seconds

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Starter switch	OFF
Battery voltage	> 8 V

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

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

### CV:DTC P0513 INCORRECT IMMOBILIZER KEY

#### 1. OUTLINE OF DIAGNOSIS

DTC	Item	Outline of diagnosis
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in body integrated unit)
P1570	Antenna	Faulty antenna
P1571	Reference Code Incompatibility	Reference code incompatibility between body integrated unit and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between body integrated unit and ECM
P1574	Key Communication Failure	Failure of body integrated unit to verify key (transponder) ID code or transponder failure
P1576	EGI Control Module EEPROM	ECM malfunctioning
P1577	IMM Control Module EEPROM	Body integrated unit malfunctioning
P1578	Meter Failure	Reference code incompatibility between body integrated unit and combination meter

#### 2. ENABLE CONDITION

When starting the engine.

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis only after starting the engine.

#### 4. DIAGNOSTIC METHOD

Judge as NG when the conditions for the outline of the diagnosis of the top are established.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

## CW:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect malfunctions that the engine speed continues to rise during idling.

### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
Feedback of ISC	In operation
Vehicle speed	$< 4$ km/h (2.49 MPH)
After engine starting	1 second or more

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously if the vehicle speed is at less than 4 km/h (2.49 MPH).

### 4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the all malfunction criteria below becomes the time needed for diagnosis (2 seconds) or more.

#### Judgment Value

Malfunction criteria	Threshold value
Engine speed - Targeted engine speed	$\geq 1500$ rpm
Feedback value for ISC	$\leq 0$
Change of engine speed for every engine 120°CA	$\geq -5$ rpm

**Time Needed for Diagnosis:** 2 seconds

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

#### Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting all the malfunction criteria below becomes the time needed for diagnosis (5 seconds) or more.

#### Judgment Value

Malfunction criteria	Threshold value
Engine speed - Targeted engine speed	$< 200$ rpm

### 5. DTC CLEAR CONDITION

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

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

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

### 7. FAIL SAFE

Fuel cut: Cuts off fuel only #1 and #2 cylinders, or for all cylinders according to vehicle speed, engine speed, and throttle position.

### 8. ECM OPERATION AT DTC SETTING

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

## CX:DTC P0600 SERIAL COMMUNICATION LINK

### 1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.

When CAN communications is not possible, and CAN communications with AT is not possible, judge as NG if data from the AT is not normal.

### 2. COMPONENT DESCRIPTION

ECM and TCM are connected by high speed CAN.

*(Common Specifications)*

*CAN Protocol 2.0 B (Active)*

*Frame Format: 11 Bit ID Frame (Standard Frame)*

*(High speed CAN)*

*Conforms to ISO11898*

*Communication Speed: 500 kbps*

### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
Starter switch	OFF
Engine	run

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

### 5. DIAGNOSTIC METHOD

#### Abnormality Judgment

When any one of the following conditions are established, judge as NG.

Judge as OK and clear the NG when the continuous time of meeting the following all criteria is the predetermined time (1 s) or more.

#### Judgment Value

Malfunction criteria	Threshold value
bus off flag or error warning flag	set
ID from body integrated unit is not received.	= 500 milliseconds
Data from body integrated unit is not updated.	= 500 milliseconds

**Time Needed for Diagnosis:** 1 second

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM).

When there is a problem in the main CPU normal RAM, or the sub CPU normal RAM, judge as NG. Judge as OK when both are operating properly.

If it is possible to write data to the whole area of RAM in the initial routine, and is possible to read the same data, it is judged as OK, and if not, NG.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

Diagnosis with the initial routine.

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis as soon as the ignition switch is turned to ON.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG if the criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
Main CPU normal RAM abnormal	
Write 5AA5A55A and then read. (Whole area of RAM)	5AA5A55A cannot be read.
Write A55A5AA5 and then read. (Whole area of RAM)	A55A5AA5 cannot be read.
Sub CPU normal RAM abnormal	
Write 5AA5 and then read. (Whole area of RAM)	5AA5 cannot be read.
Write A55A and then read. (Whole area of RAM)	A55A cannot be read.

**Time Needed for Diagnosis:** Undetermined

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Main CPU normal RAM abnormal	
Write 5AA5A55A and then read. (Whole area of RAM)	5AA5A55A can be read.
And write A55A5AA5 and then read. (Whole area of RAM)	A55A5AA5 can be read.
Sub CPU normal RAM abnormal	
Write 5AA5 and then read. (Whole area of RAM)	5AA5 can be read.
And write A55A and then read. (Whole area of RAM)	A55A can be read.

## 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

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

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when SUM value of ROM is outside the standard value.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### Abnormality Judgment

Judge as NG if the criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
SUM value of ROM	Standard

**Time Needed for Diagnosis:** Undetermined

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

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

#### 8. ECM OPERATION AT DTC SETTING

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

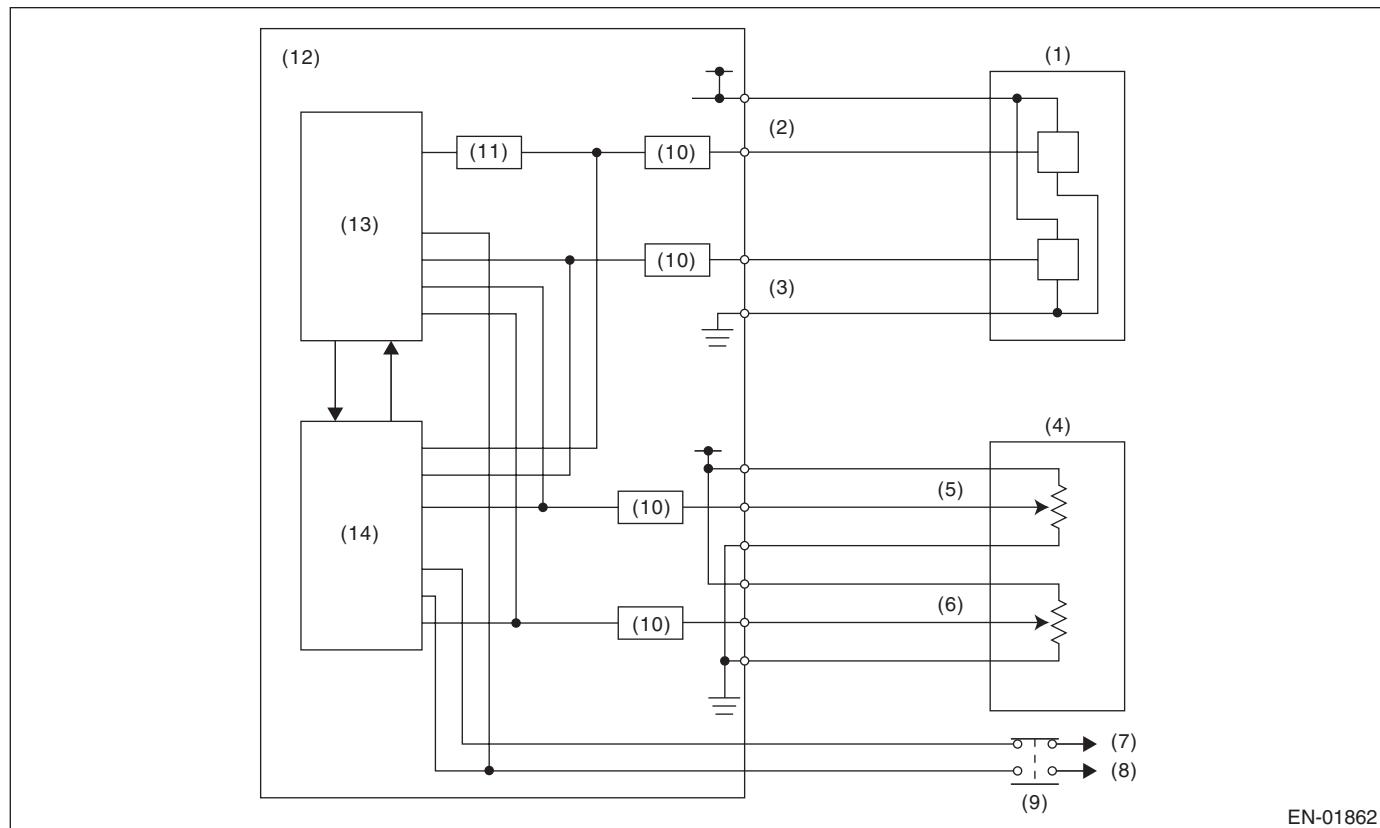
### DA:DTC P0607 CONTROL MODULE PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when any one of the followings is established.

- (1) When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- (2) When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- (3) When the sub CPU operates abnormally.
- (4) When the communication between main CPU  $\longleftrightarrow$  sub CPU is abnormal.
- (5) When the input amplifier circuit of throttle position sensor 1 is abnormal.
- (6) When the cruise control cannot be canceled correctly.
- (7) When the signal of brake SW1 and 2 is mismatched.

#### 2. COMPONENT DESCRIPTION



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

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake switch (only with cruise control)	ON
(7) None	—

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
- (5): Always perform the diagnosis continuously when idling.
- (6): Perform the diagnosis when the brake pedal is depressed.
- (7): Always perform the diagnosis continuously.
- (8): Always perform the diagnosis continuously when the cruise control pedal is not operating.
- (9): Always perform the diagnosis continuously.
- (10): Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

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

#### Judgment Value

Malfunction criteria	Threshold value
(1) Difference of CPU reading value of the throttle position sensor signal	Within 0.0858 V
(2) Difference of CPU read value of the accelerator pedal position sensor signal	Within 0.039 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	1/4 times $\pm 3$ deg
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched

#### Time Needed for Diagnosis:

- (1) : 600 milliseconds
- (2) : 800 milliseconds
- (3) : 200 milliseconds
- (4) : 200 milliseconds
- (5) : 24 milliseconds
- (6) : 250 milliseconds
- (7) : 200 milliseconds

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

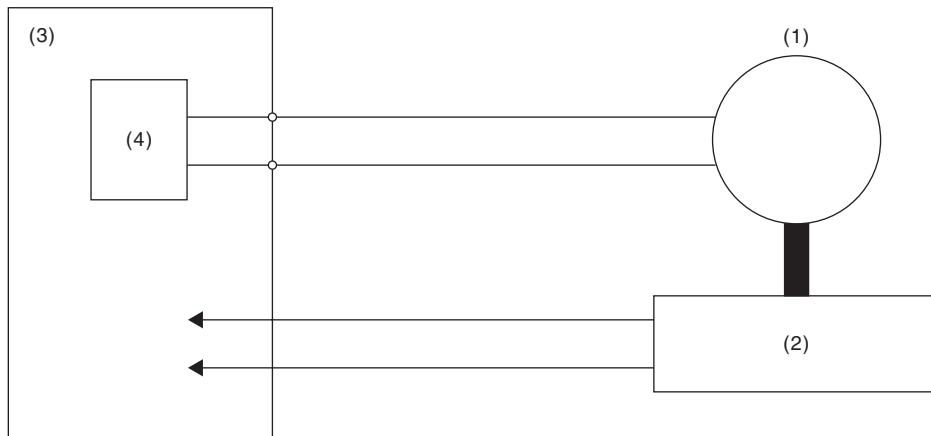
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

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

#### 2. COMPONENT DESCRIPTION



EN-01863

(1) Motor

(3) Engine control module (ECM)

(4) Drive circuit

(2) Throttle position sensor

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Normal operation of electronic throttle control	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

#### 5. DIAGNOSTIC METHOD

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

##### Judgment Value

Malfunction criteria	Threshold value
Difference between target opening angle and actual opening angle	3° or less
Output duty to drive circuit	95% or less

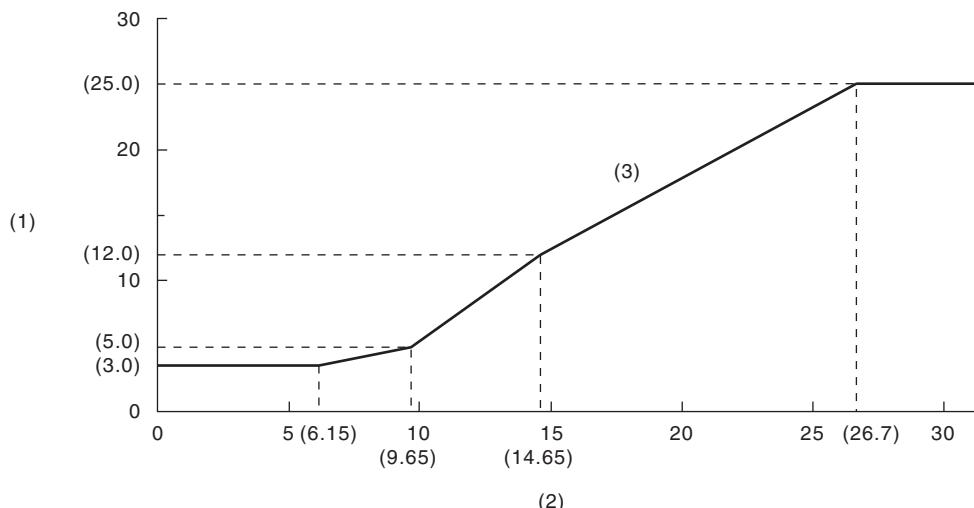
##### Time Needed for Diagnosis:

- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Details of Judgment Value



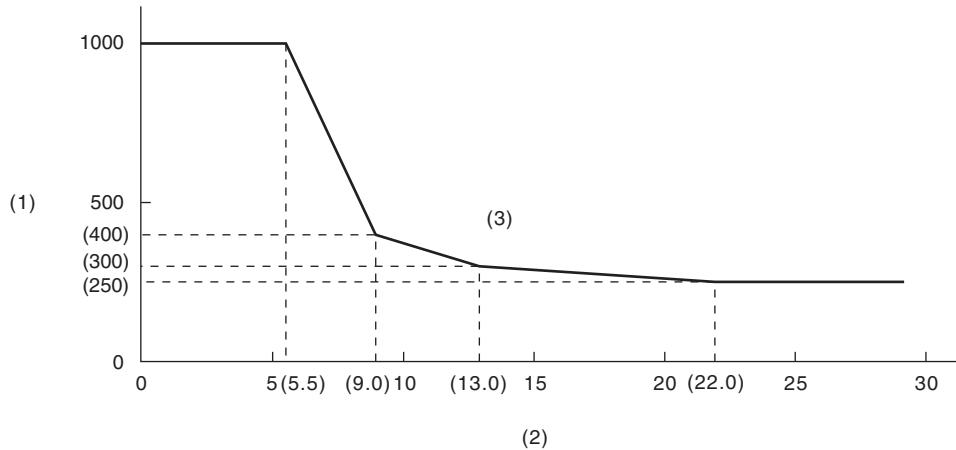
EN-05363

(1) Difference between target opening angle and actual opening angle (°)

(2) Target throttle opening angle (°)

(3) NG area

### Details of Judgment time (The actual opening angle $\leq$ target opening angle is always 1000 milliseconds)



EN-01865

(1) Judgment time (milliseconds)

(2) Throttle position sensor 1 opening angle

(3) NG area

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

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DC:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.

Judge as NG when the ECM output level differs from the actual terminal level.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	$\geq 1$ second
Engine speed	500 $\longleftrightarrow$ 850 rpm

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when idling.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Duty ratio	= 100%
Terminal voltage level	Low level
Duty ratio	5% $\longleftrightarrow$ 95%
Terminal voltage level	Low level

**Time Needed for Diagnosis:** 2.5 seconds

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Duty ratio	= 100%
Terminal voltage level	High level
Duty ratio	5% $\longleftrightarrow$ 95%
Terminal voltage level	High level

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

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

## DD:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.

Judge as NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	$\geq 1$ second
Engine speed	500 $\longleftrightarrow$ 850 rpm

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when idling.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Duty ratio	= 0%
Terminal voltage level	High level
Duty ratio	5% $\longleftrightarrow$ 95%
Terminal voltage level	High level

**Time Needed for Diagnosis:** 2.5 seconds

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

#### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Duty ratio	= 0%
Terminal voltage level	Low level
Duty ratio	5% $\longleftrightarrow$ 95%
Terminal voltage level	Low level

### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### DE:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when there is CAN communication with the AT and there is a MIL lighting request.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is the predetermined time (2.5 seconds) or more.

Judge as OK when the following conditions are not established, and clear the NG.

#### Judgment Value

Malfunction criteria	Threshold value
MIL lighting request from TCM	set

**Time Needed for Diagnosis:** 2.5 seconds

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

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

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

### DF:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect that  $\lambda$  value remains low.

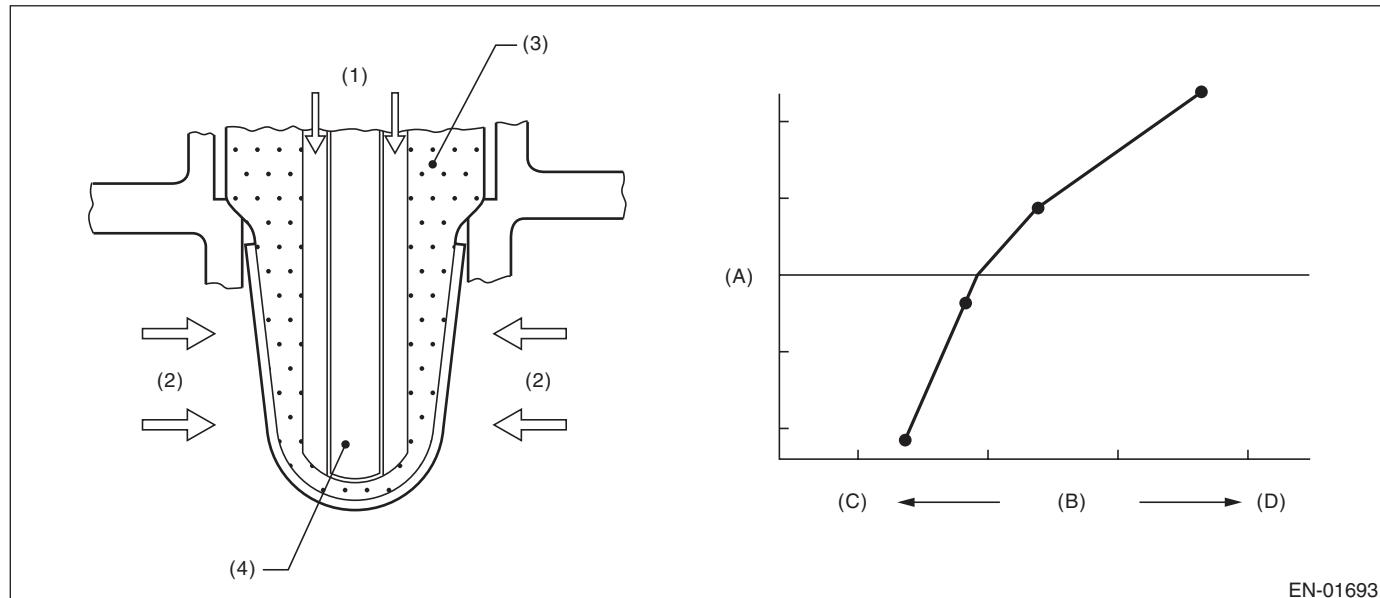
Judge as NG when lambda value is abnormal in accordance with  $\lambda$  value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

$\lambda$  value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$ : Lean

$\lambda < 1$ : Rich

#### 2. COMPONENT DESCRIPTION



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

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# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V ↔ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 8 g (0.28 oz)/s
Load change in 1/3 engine revolution.	≤ 0.02g (0.001 oz)/rev
Front oxygen (A/F) sensor impedance	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more
Targeted lambda value load compensation coefficient	–0.05 ↔ 0.05

### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more after 60 seconds have passed since the engine started.

### 5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

#### Judgment Value

Malfunction criteria	Threshold value
Output $\lambda$ value when rear oxygen sensor sub feedback compensation coefficient is not at maximum limit	≤ 0.85

**Time Needed for Diagnosis:** 10 seconds

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Rear oxygen sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

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

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

#### 1. OUTLINE OF DIAGNOSIS

Detect that  $\lambda$  value remains high.

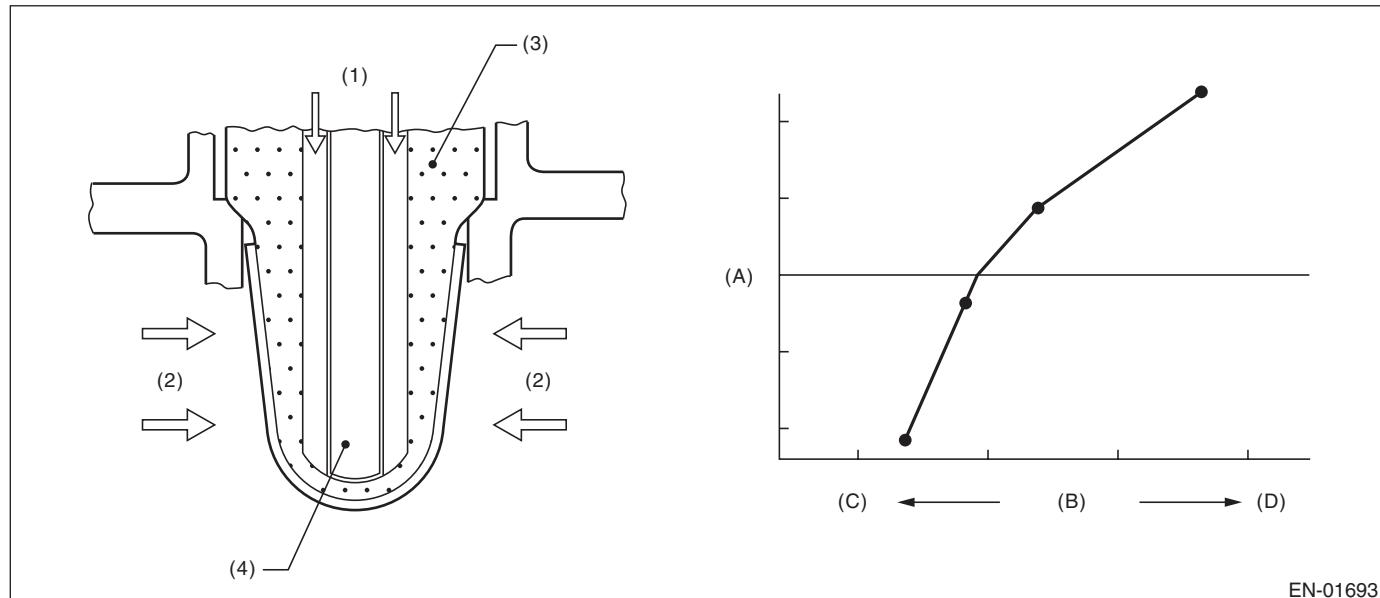
Judge as NG when lambda value is abnormal in accordance with  $\lambda$  value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

$\lambda$  value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$ : Lean

$\lambda < 1$ : Rich

#### 2. COMPONENT DESCRIPTION



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

EN-01693

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V ↔ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 8 g (0.28 oz)/s
Load change in 1/3 engine revolution.	≤ 0.02g (0.001 oz)/rev
Front oxygen (A/F) sensor impedance	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more
Targeted lambda value load compensation coefficient	–0.05 ↔ 0.05

### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant vehicle speed of 20 km/h (12 MPH) or more after 60 seconds have passed since the engine started.

### 5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

#### Judgment Value

Malfunction criteria	Threshold value
Output $\lambda$ value when rear oxygen sensor sub feedback compensation coefficient cannot be at minimum limit	≥ 1.15

**Time Needed for Diagnosis:** 10 seconds

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Rear oxygen sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

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

### **DH:DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P1152. <Ref. to GD(H6DO)-183, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **DI: DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)**

#### **1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P1153. <Ref. to GD(H6DO)-185, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

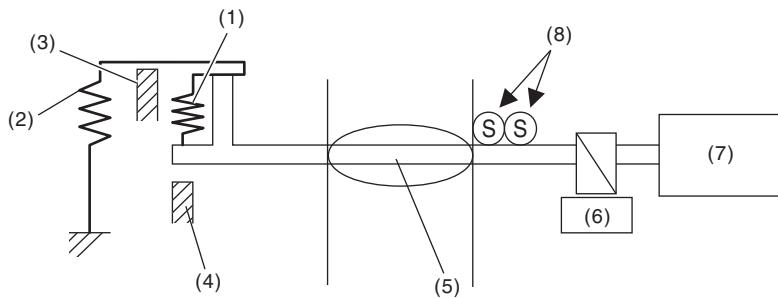
## GENERAL DESCRIPTION

### DJ:DTC P1160 RETURN SPRING FAILURE

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve is opened more than the default opening angle, but does not move to the close direction with the motor power stopped.

#### 2. COMPONENT DESCRIPTION



EN-04463

- |                          |                         |                                  |
|--------------------------|-------------------------|----------------------------------|
| (1) Opener spring        | (4) Full closed stopper | (7) DC motor                     |
| (2) Return spring        | (5) Throttle valve      | (8) Main and sub throttle sensor |
| (3) Intermediate stopper | (6) Gear                |                                  |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Motor continuity	OFF

#### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

#### 5. DIAGNOSTIC METHOD

##### Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1.88 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Opening variation after continuity is set to OFF	$\leq 2^\circ$

**Time Needed for Diagnosis:** 1880 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

## 8. FAIL SAFE

Throttle opening is fixed to 6°.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

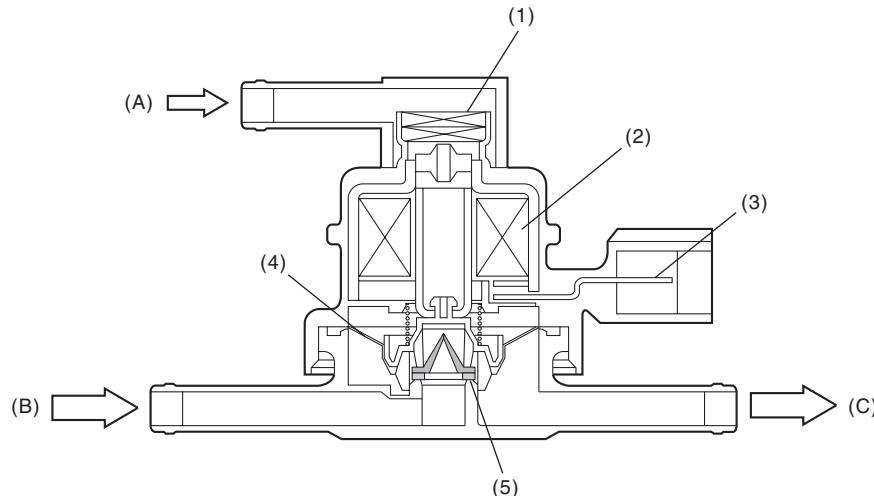
### DK:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.

Judge as NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



- |                        |               |                         |
|------------------------|---------------|-------------------------|
| (1) Filter             | (4) Diaphragm | (A) Barometric pressure |
| (2) Coil               | (5) Valve     | (B) Shut-off valve      |
| (3) Connector terminal |               | (C) To fuel tank        |

EN-01759

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

##### Judgment Value

Malfunction criteria	Threshold value
Terminal output voltage when ECM outputs OFF signal	Low

**Time Needed for Diagnosis:** 2.5 seconds

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

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

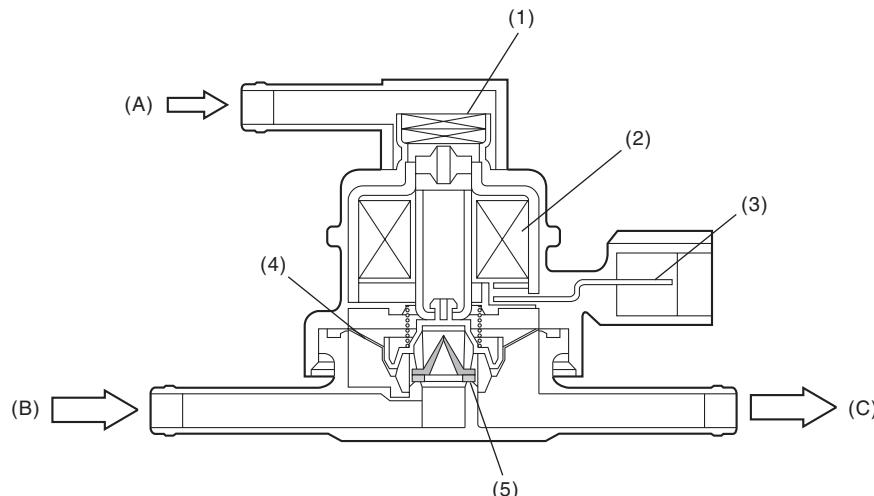
### DL:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.

Judge as NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



EN-01759

(1) Filter	(4) Diaphragm	(A) Barometric pressure
(2) Coil	(5) Valve	(B) Shut-off valve
(3) Connector terminal		(C) To fuel tank

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

##### Judgment Value

Malfunction criteria	Threshold value
Terminal output voltage when ECM outputs ON signal	High

**Time Needed for Diagnosis:** 2.5 seconds

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

#### 6. DTC CLEAR CONDITION

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

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

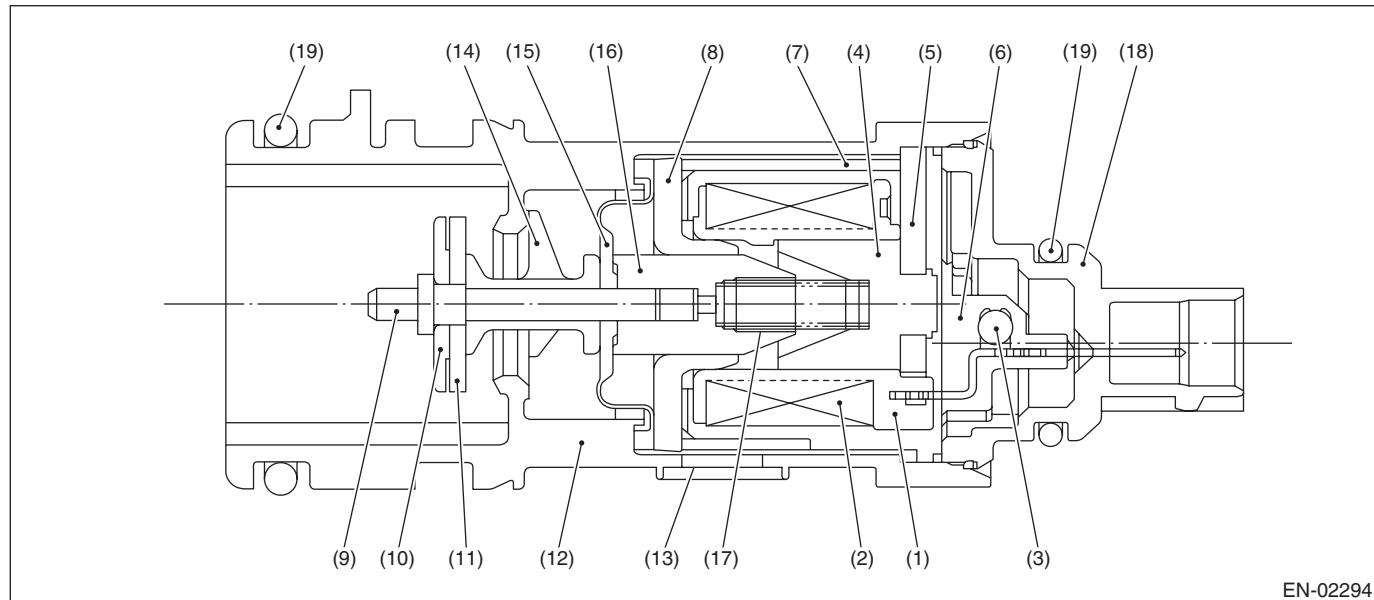
## DM:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

### 1. OUTLINE OF DIAGNOSIS

Detect the abnormal functioning (stuck closed) of drain valve.

Judge as NG when fuel tank pressure is low.

### 2. COMPONENT DESCRIPTION



- |                 |                    |                   |
|-----------------|--------------------|-------------------|
| (1) Bobbin      | (8) Magnetic plate | (14) Retainer     |
| (2) Coil        | (9) Shaft          | (15) Diaphragm    |
| (3) Diode       | (10) Plate         | (16) Movable core |
| (4) Stator core | (11) Valve         | (17) Spring       |
| (5) End plate   | (12) Housing       | (18) Cover        |
| (6) Body        | (13) Filter        | (19) O-ring       |
| (7) Yoke        |                    |                   |

### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V
Ignition switch	ON
Barometric pressure	$\geq 75.0$ kPa (563 mmHg, 22.17 inHg)
Tank pressure when starter is OFF → ON	$-0.43 \leftrightarrow 1.42$ kPa ( $-3.2 \leftrightarrow 10.7$ mmHg, $-0.13 \leftrightarrow 0.42$ inHg) Open
Drain valve	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 3 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	$\leq -4.0 \text{ kPa} (-30 \text{ mmHg, } -1.18 \text{ inHg})$

**Time Needed for Diagnosis:** 3 seconds

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

### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	$> -4.0 \text{ kPa} (-30 \text{ mmHg, } -1.18 \text{ inHg})$
Cumulative time when all the malfunction criteria below are met.	$\geq 30 \text{ seconds}$
Purge control solenoid valve duty	Not = 0
Fuel temperature	$-10 \leftrightarrow 55^\circ\text{C} (14 \leftrightarrow 131^\circ\text{F})$
Intake manifold relative pressure	$\leq -26.7 \text{ kPa} (-200 \text{ mmHg, } -7.87 \text{ inHg})$

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

## 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DN:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge as OFF NG when the engine starts without starter ON experience.

#### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as OFF NG when the malfunction criteria below are met.

##### Judgment Value

Malfunction criteria	Threshold value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed after engine speed of less than 500 rpm continues for 0.8 seconds or more.	≥ 500 rpm

**Time Needed for Diagnosis:** 800 milliseconds

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Starter ON	Experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

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

## DO:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

### 1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of back-up power supply circuit.  
Judge as NG when the backup power voltage is low.

### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Voltage of back-up power supply	Low
Battery voltage	$\geq 10.9$ V
Engine speed	> 500 rpm

**Time Needed for Diagnosis:** 2.5 seconds

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

#### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Voltage of back-up power supply	High
Battery voltage	$\geq 10.9$ V
Engine speed	> 500 rpm

### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### DP:DTC P1570 ANTENNA

#### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### DQ:DTC P1571 REFERENCE CODE INCOMPATIBILITY

#### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### DR:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

#### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### DS:DTC P1574 KEY COMMUNICATION FAILURE

#### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### DT:DTC P1576 EGI CONTROL MODULE EEPROM

#### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### DU:DTC P1577 IMM CONTROL MODULE EEPROM

#### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### DV:DTC P1578 METER FAILURE

#### 1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## DW:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

### 1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the catalyst advanced idling retard angle control.

Judge as NG when ECM is not controlling the angle properly during catalyst advanced idling retard angle control.

Judge as NG if there is exhaust gas temperature diagnosis and idle speed diagnosis and if either of them is NG.

- Exhaust gas temperature diagnosis

Judge as NG when the estimated exhausted gas temperature in 14 seconds after the cold start is below the specified value.

- Idle speed diagnosis

Judge as NG when actual engine speed is not close to target engine speed after terminating the retard angle control.

### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Cold start diagnosis	Incomplete
Engine	Starting
Vehicle speed	≤ 2 km/h (1 MPH)
Misfire within 200 engine revs.	< 7
Time after starting	= 14 seconds

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

### 4. DIAGNOSTIC METHOD

- Exhaust gas temperature diagnosis

#### Abnormality Judgment

Calculate the estimated exhaust gas temperature when the diagnostic enable condition is established. Judge as NG when the following conditions are established in 14 seconds after starting the engine.

#### Judgment Value

Malfunction criteria	Threshold value
Estimated exhaust gas temperature	< Value from Map 1

#### Map 1

Engine coolant temperature after starting the engine	-40°C (-40°F)	-30°C (-22°F)	-20°C (-4°F)	-10°C (14°F)	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	40°C (104°F)	50°C (122°F)
Threshold value	200°C (392°F)	180°C (356°F)	180°C (356°F)	170°C (338°F)	168°C (334°F)	153°C (307°F)				

**Time Needed for Diagnosis:** 14 seconds

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

#### Normality Judgment

Judge as OK when the following conditions are established after the specified amount of time has passed.

#### Judgment Value

Malfunction criteria	Threshold value
Estimated exhaust gas temperature	≥ Value from Map 1

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

- Idle speed diagnosis

Judge as NG when all of the following conditions are established, and judge as OK when the following conditions are met.

### Judgment Value

Malfunction criteria	Threshold value
Continuous time of (Target engine speed – Actual engine speed > 100 rpm)	≥ 5500 ms

**Time Needed for Diagnosis:** 14 seconds

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

## 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

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

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

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control solenoid valve.

Judge as NG when the current is small even though the duty signal is large.

### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Oil flow control solenoid valve control duty	$\geq 99.61\%$
Oil control solenoid valve control present current	$< 0.306$ A

**Time Needed for Diagnosis:** 2000 milliseconds

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

#### • Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Target current value of the oil flow control solenoid valve	$\geq 0.14$ A
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	$\geq 0.08$ A

### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value ( $0^\circ$  CA) to the compensation value of partial learning zone with IG OFF.
  - Enter the initial value ( $0^\circ$  CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
  - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
  - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

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

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

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control solenoid valve.

Judge as NG when the current is large even though the duty signal is small.

### 2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	$\geq 10.9$ V

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Oil flow control solenoid valve control duty	$< 0.39\%$
Oil control solenoid valve control present current	$\geq 0.306$ A

**Time Needed for Diagnosis:** 2000 milliseconds

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

#### • Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
$ Target\ current\ value\ of\ the\ oil\ flow\ control\ solenoid\ valve\ -\ Oil\ flow\ control\ sole-\\noid\ valve\ control\ current\ value $	$< 0.08$ A

### 5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
  - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
  - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

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

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

### 1. OUTLINE OF DIAGNOSIS

#### NOTE:

For the detection standard, refer to DTC P2088. <Ref. to GD(H6DO)-201, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

### 1. OUTLINE OF DIAGNOSIS

#### NOTE:

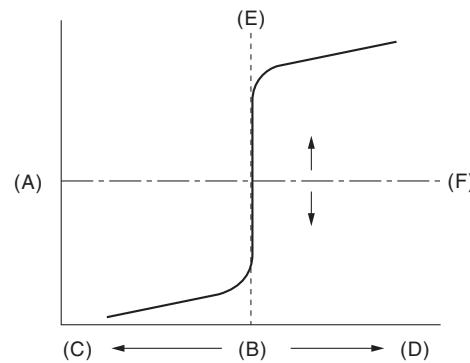
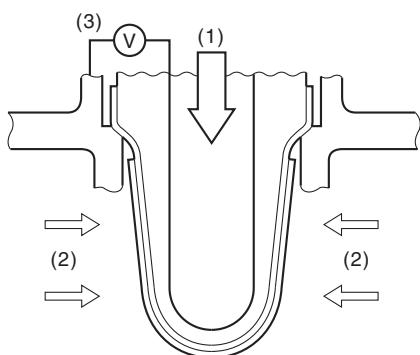
For the detection standard, refer to DTC P2089. <Ref. to GD(H6DO)-203, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value. Control the sub feedback learning and judge as NG when the learning value is in the lean zone.

#### 2. COMPONENT DESCRIPTION



EN-01696

- |                         |                         |                                |
|-------------------------|-------------------------|--------------------------------|
| (1) Atmosphere          | (A) Electromotive force | (D) Lean                       |
| (2) Exhaust gas         | (B) Air fuel ratio      | (E) Theoretical air fuel ratio |
| (3) Electromotive force | (C) Rich                | (F) Comparative voltage        |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Continuous time when all conditions are established.	$\geq 1$ second
Conditions for carrying out the sub feedback learning	Completed

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is 5 seconds or more.

Judge as OK and clear the NG when the continuous time of not meeting the following conditions is 5 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Sub feedback learning value	$< -0.035$

**Time Needed for Diagnosis:** 5 seconds  $\times$  1 time

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

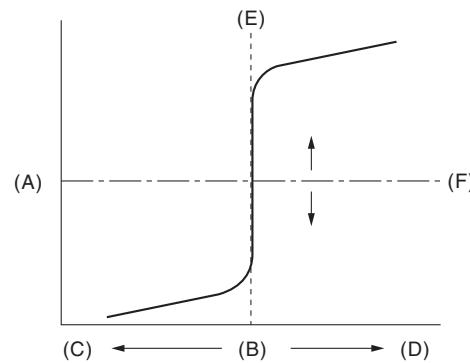
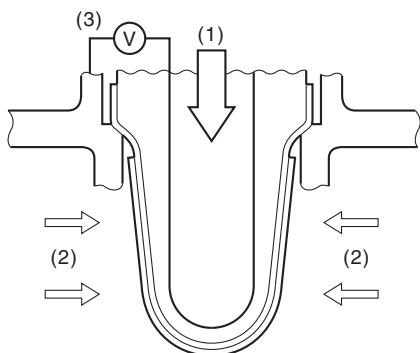
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value. Sub feedback learning is being performed. When the learning value goes to the rich side, judge as NG.

#### 2. COMPONENT DESCRIPTION



EN-01696

- |                         |                         |                                |
|-------------------------|-------------------------|--------------------------------|
| (1) Atmosphere          | (A) Electromotive force | (D) Lean                       |
| (2) Exhaust gas         | (B) Air fuel ratio      | (E) Theoretical air fuel ratio |
| (3) Electromotive force | (C) Rich                | (F) Comparative voltage        |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Continuous time when all conditions are established.	$\geq 1$ second
Conditions for carrying out the sub feedback learning	Completed

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

#### 5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is 5 seconds or more.

Judge as OK and clear the NG when the continuous time of not meeting the following conditions is 5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Sub feedback learning value	$\geq 0.035$

**Time Needed for Diagnosis:** 5 seconds  $\times$  1 time

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

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

## ED:DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2

### 1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P2096. <Ref. to GD(H6DO)-205, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## EE:DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2

### 1. OUTLINE OF DIAGNOSIS

NOTE:

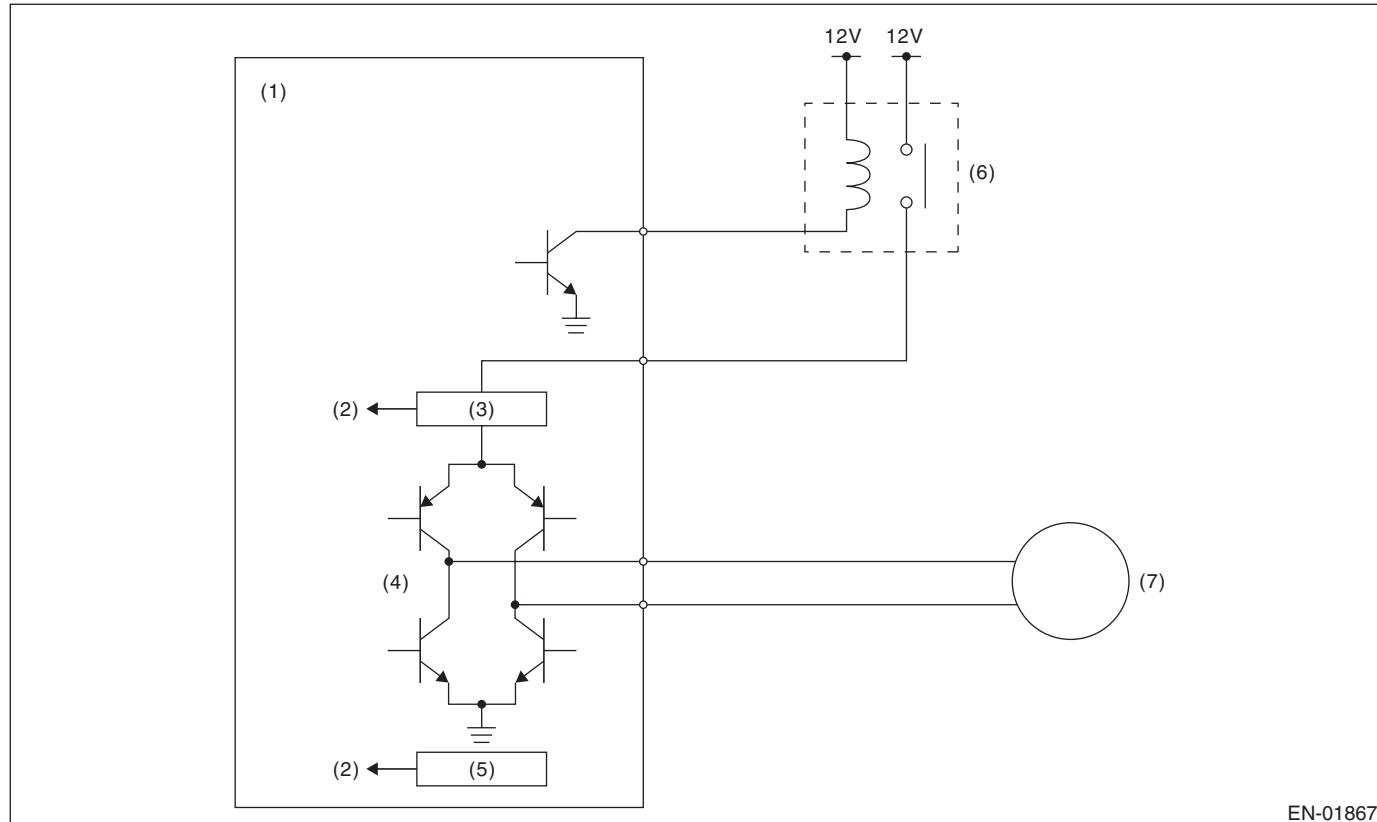
For the detection standard, refer to DTC P2097. <Ref. to GD(H6DO)-207, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### EF:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes large or drive circuit is heated.

#### 2. COMPONENT DESCRIPTION



- |                                   |                                   |                                       |
|-----------------------------------|-----------------------------------|---------------------------------------|
| (1) Engine control module (ECM)   | (4) Drive circuit                 | (6) Electronic throttle control relay |
| (2) Detecting circuit             | (5) Temperature detection circuit | (7) Motor                             |
| (3) Overcurrent detection circuit |                                   |                                       |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Under control of electronic throttle control	ON
CPU communication line sub → main normal judgment	Normal

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

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

#### Judgment Value

Malfunction criteria	Threshold value
Motor current	$\leq 8$ A
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ ( $347^{\circ}\text{F}$ )

#### Time Needed for Diagnosis:

- 500 milliseconds (For NG)
- 2000 milliseconds (For OK)

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

### 8. FAIL SAFE

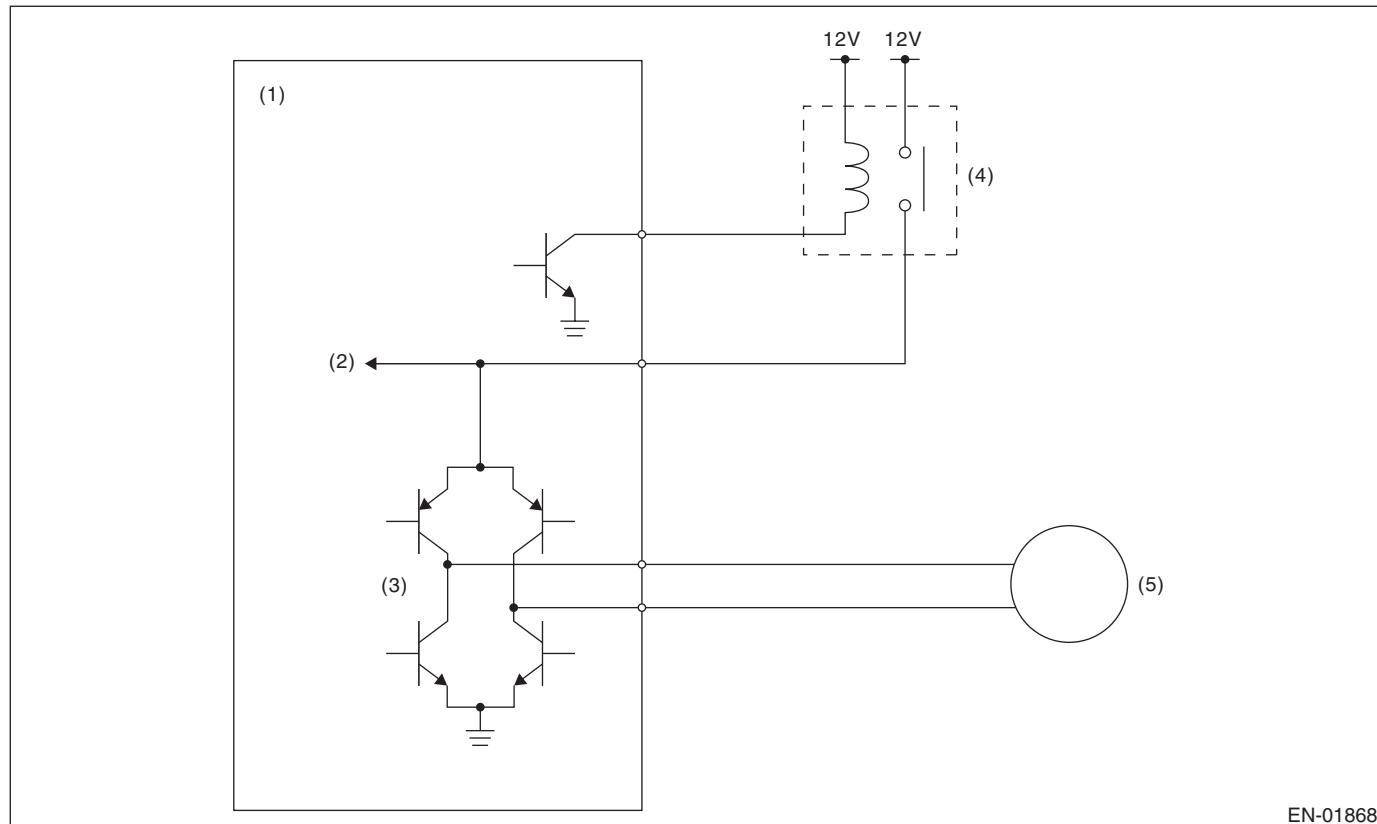
Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

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

**EG:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW****1. OUTLINE OF DIAGNOSIS**

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electronic throttle control relay to ON.

**2. COMPONENT DESCRIPTION**

(1) Engine control module (ECM)  
 (2) Voltage detection circuit

(3) Drive circuit  
 (4) Electronic throttle control relay

(5) Motor

**3. ENABLE CONDITION**

Secondary parameters	Enable conditions
Electronic throttle control relay output	ON

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

**5. DIAGNOSTIC METHOD**

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

**Judgment Value**

Malfunction criteria	Threshold value
Motor power voltage	$\geq 5$ V

**Time Needed for Diagnosis:**

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

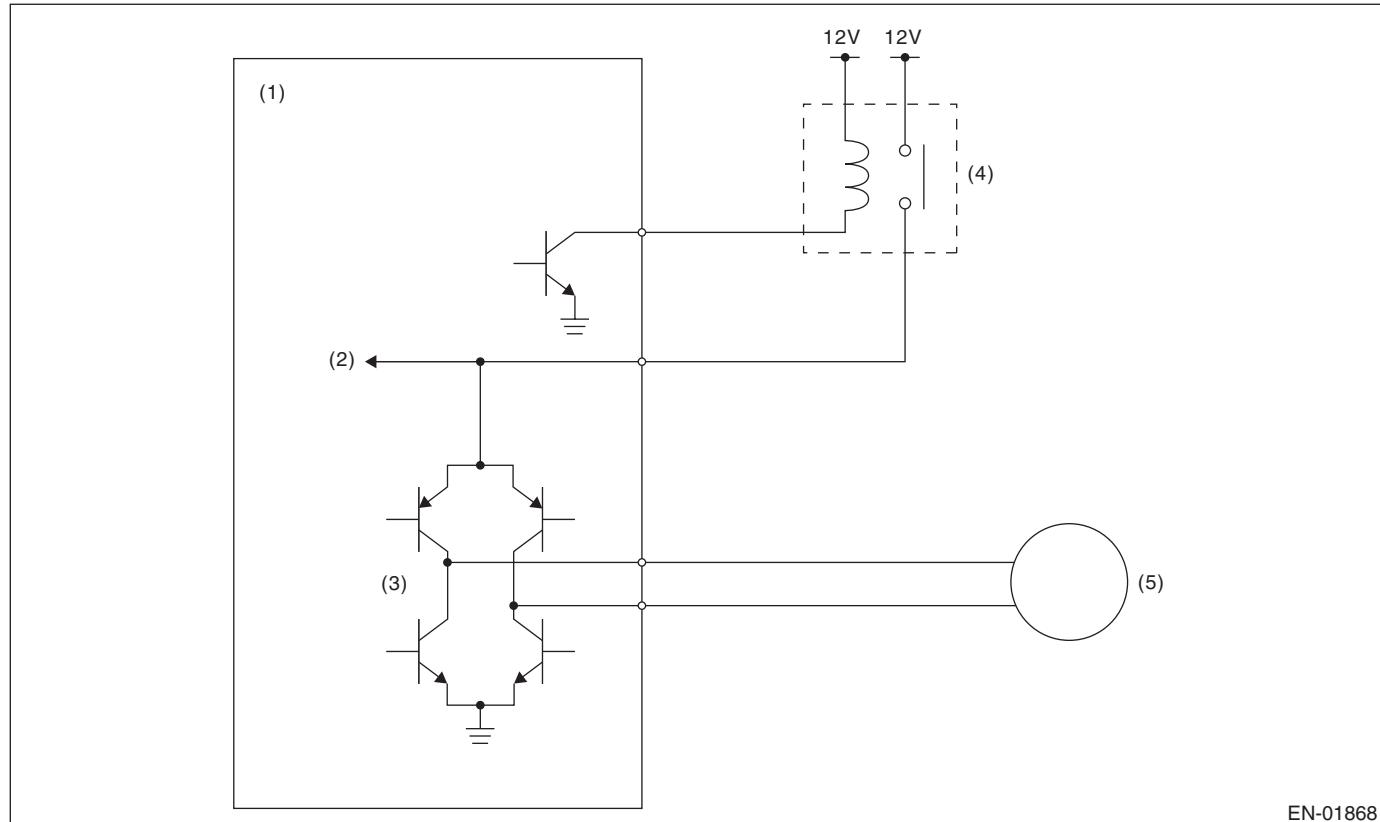
Memorize the freeze frame data. (For test mode \$02)

### EH:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electronic throttle control relay to OFF.

#### 2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)  
 (2) Voltage detection circuit

(3) Drive circuit  
 (4) Electronic throttle control relay

(5) Motor

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Electronic throttle control relay output	OFF

#### 4. GENERAL DRIVING CYCLE

- When ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

#### 5. DIAGNOSTIC METHOD

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

##### Judgment Value

Malfunction criteria	Threshold value
Motor power voltage	$\leq 5$ V

##### Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

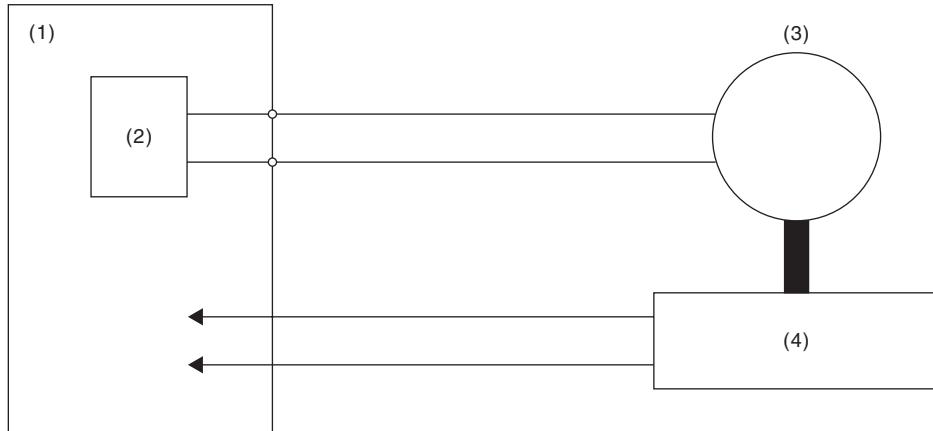
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when full close point learning cannot be conducted or an 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 (only after clear memory)	OFF → ON

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at full closed point learning.

#### 5. DIAGNOSTIC METHOD

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

##### Judgment Value

Malfunction criteria	Threshold value
Throttle sensor opening angle at full close point learning	10.127 deg — 19.872 deg

**Time Needed for Diagnosis:** 8 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

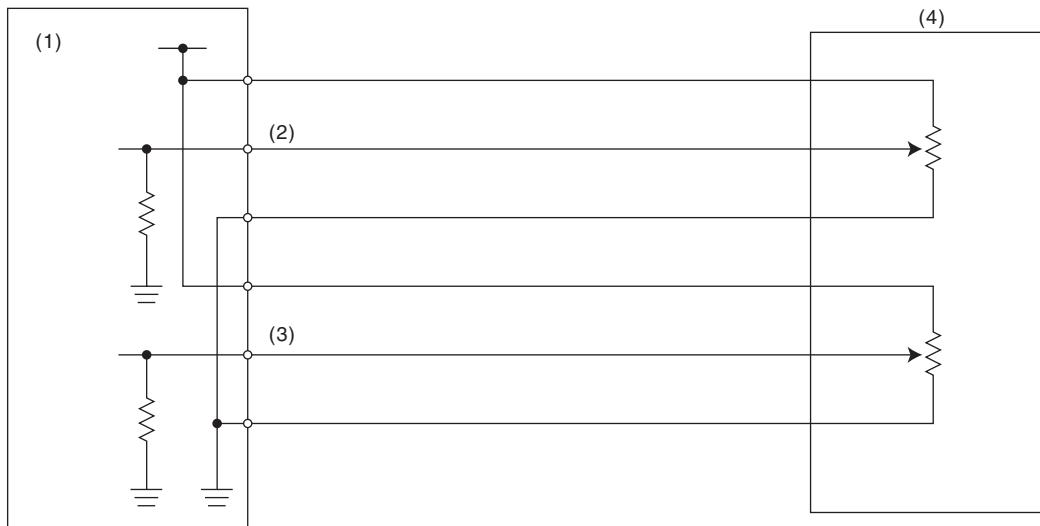
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01861

- |                                       |  |  |
|---------------------------------------|--|--|
| (1) Engine control module (ECM)       | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor 1 signal |
| (2) Accelerator pedal position sensor |  |  |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

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

##### Judgment Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	$\geq 0.308$ V

**Time Needed for Diagnosis:** 100 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

### 9. ECM OPERATION AT DTC SETTING

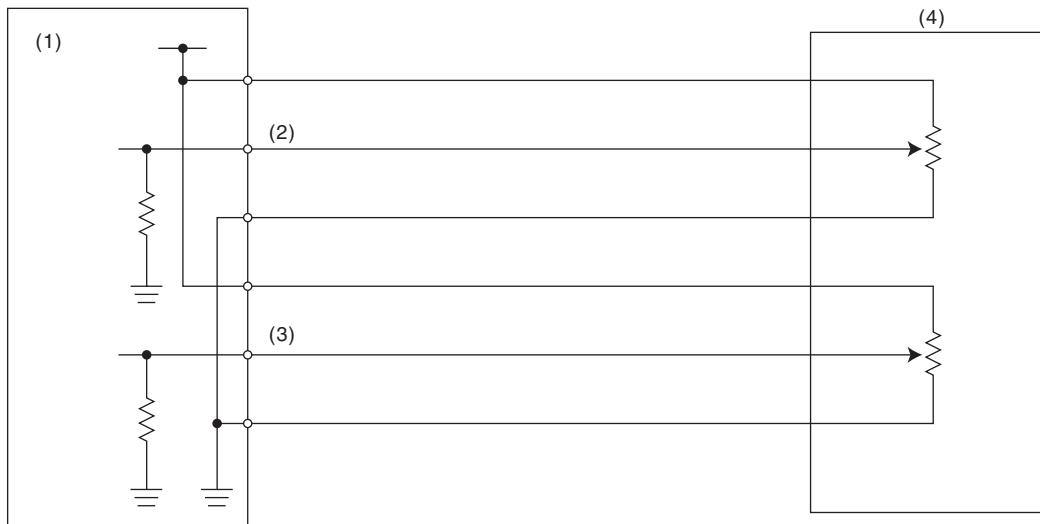
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |                                       |
|--|--|---------------------------------------|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor |
| (2) Accelerator pedal position sensor 1 signal |  |                                       |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

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

##### Judgment Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	$\leq 4.856$ V

**Time Needed for Diagnosis:** 32 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

### 9. ECM OPERATION AT DTC SETTING

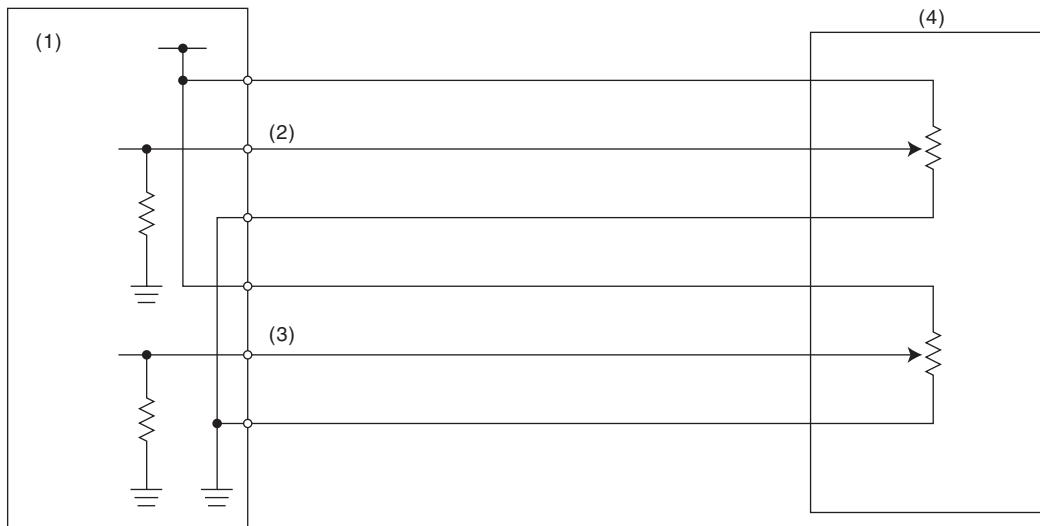
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01861

- |                                       |  |  |
|---------------------------------------|--|--|
| (1) Engine control module (ECM)       | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor 1 signal |
| (2) Accelerator pedal position sensor |  |  |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

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

##### Judgment Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$\geq 0.308$ V

**Time Needed for Diagnosis:** 100 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

### 9. ECM OPERATION AT DTC SETTING

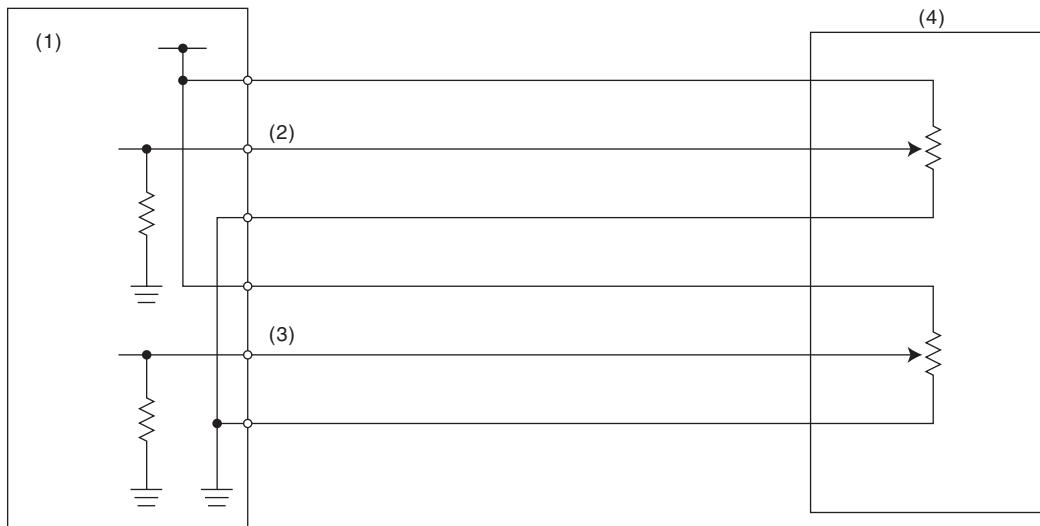
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION



EN-01861

- |                                       |  |  |
|---------------------------------------|--|--|
| (1) Engine control module (ECM)       | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor 1 signal |
| (2) Accelerator pedal position sensor |  |  |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

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

##### Judgment Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$\leq 4.865$ V

**Time Needed for Diagnosis:** 100 milliseconds

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

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

### 9. ECM OPERATION AT DTC SETTING

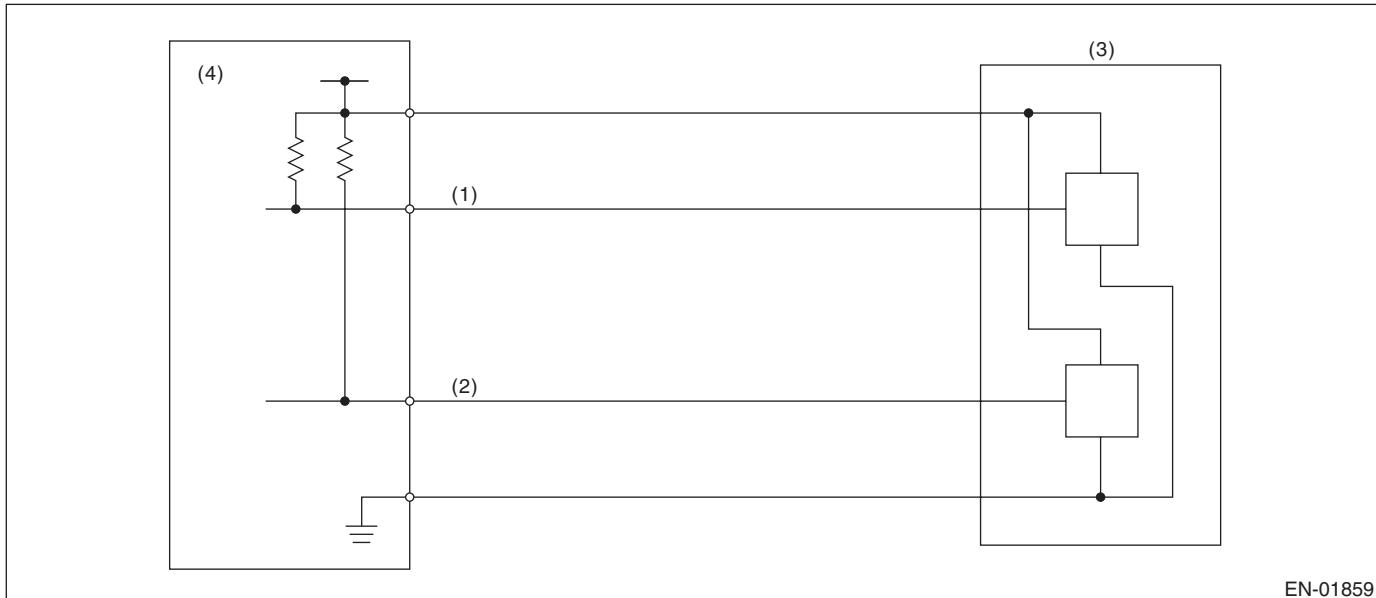
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

#### 2. COMPONENT DESCRIPTION



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.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

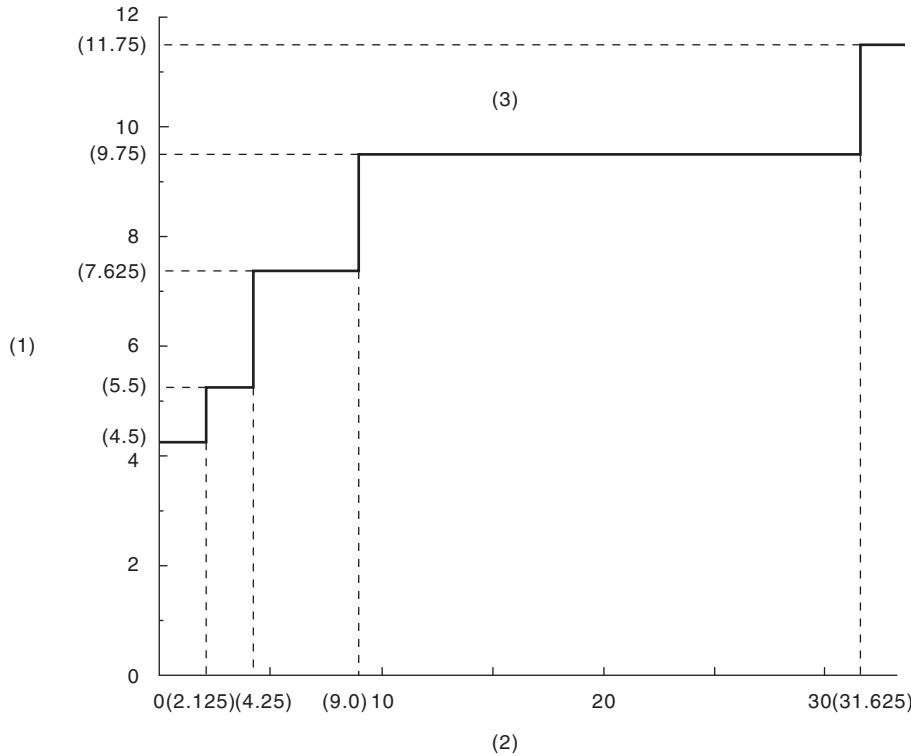
### 5. DIAGNOSTIC METHOD

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

#### Judgment Value

Malfunction criteria	Threshold value
Signal difference between two sensors	$\leq 4.5 \text{ deg}$

#### Details of Judgment Value



EN-05364

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

**Time Needed for Diagnosis:** 212 milliseconds (For NG), 24 milliseconds (For OK)

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

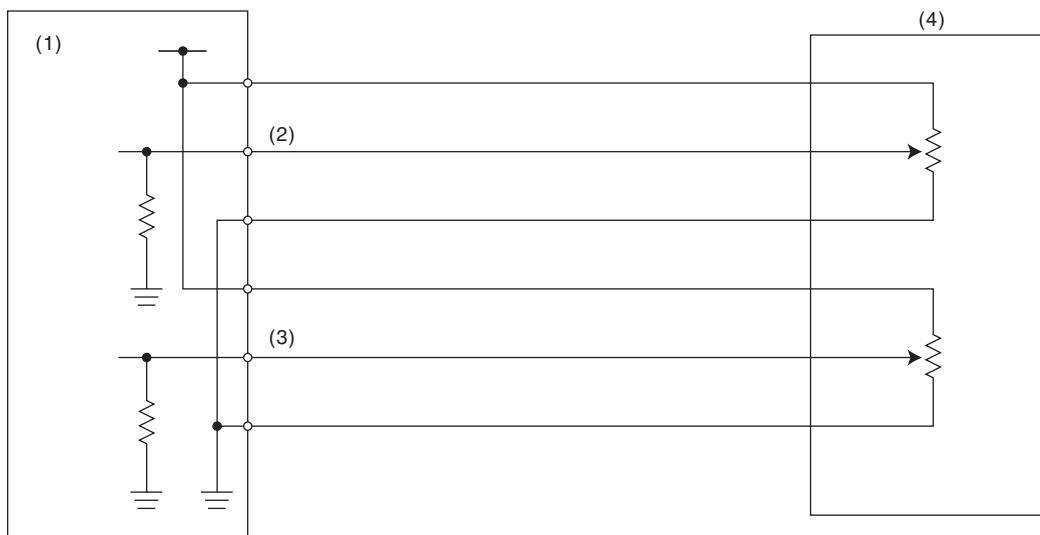
Memorize the freeze frame data. (For test mode \$02)

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

#### 1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

#### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |                                       |
|--|--|---------------------------------------|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor |
| (2) Accelerator pedal position sensor 1 signal |  |                                       |

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

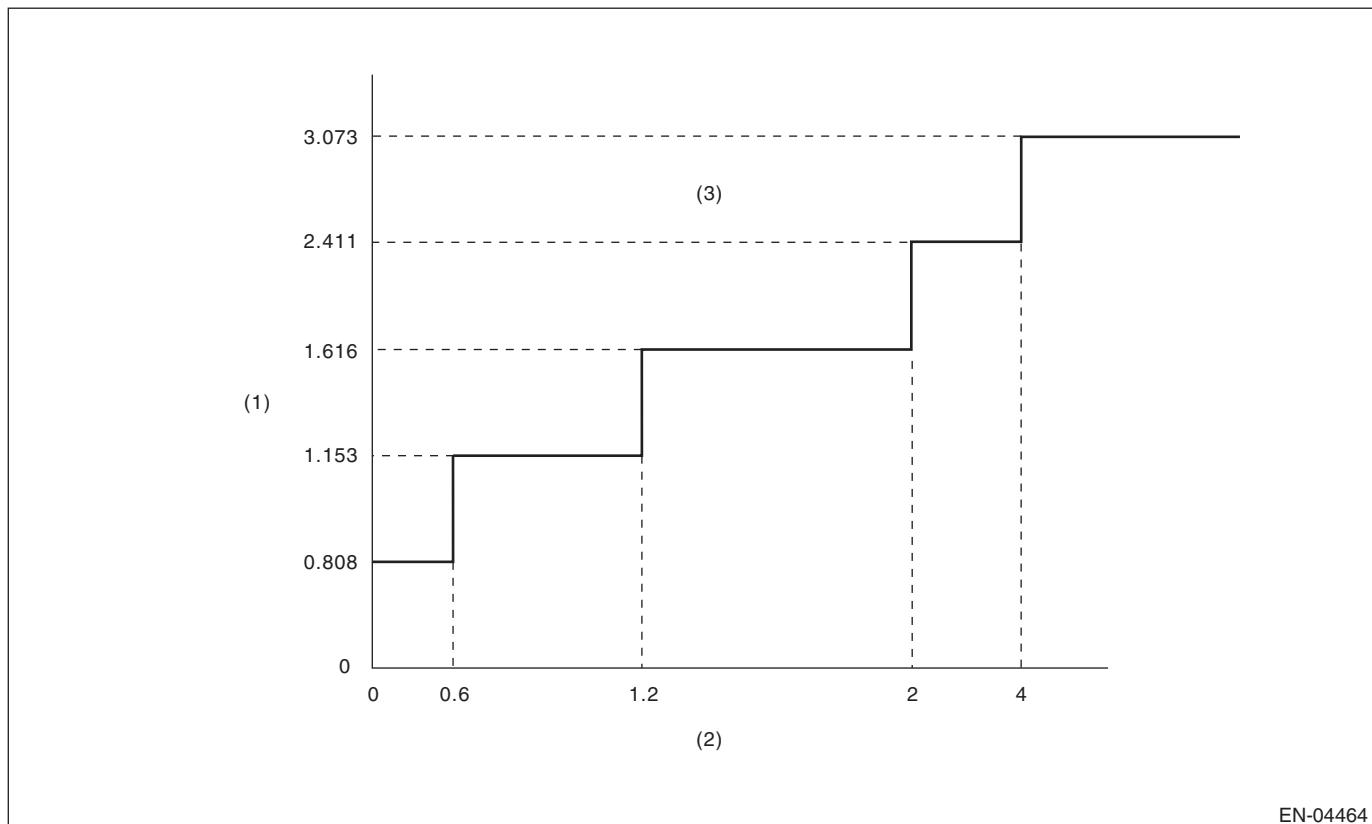
### 5. DIAGNOSTIC METHOD

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

#### Judgment Value

Malfunction criteria	Threshold value
Signal difference between two sensors	$\leq 0.808^\circ$

#### Details of Judgment Value



EN-04464

(1) Sensor output difference (°)

(2) Throttle position sensor 2 opening angle (°)

(3) NG area

#### Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 116 milliseconds (For OK)

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

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

Throttle opening is fixed to 6°.

### 9. ECM OPERATION AT DTC SETTING

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

## EP:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of barometric pressure sensor output property.

Judge as NG when the barometric pressure sensor output is largely different from the intake manifold pressure at engine start.

### 2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine speed at engine start	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)
Diagnosis for barometric pressure sensor property	Incomplete

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once at ignition switch ON.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.3 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
$ \text{Atmospheric pressure} - \text{Manifold pressure} $	$\geq 26.7 \text{ kPa (200 mmHg, 7.88 inHg)}$
$ \text{Intake manifold pressure at engine start} - \text{Manifold pressure} $	$< 1.33 \text{ kPa (10 mmHg, 2.95 inHg)}$

**Time Needed for Diagnosis:** 0.3 seconds

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

#### • Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes 0.262 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
$ \text{Atmospheric pressure} - \text{manifold pressure} $	$< 26.7 \text{ kPa (200 mmHg, 7.88 inHg)}$

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

Barometric pressure sensor process: Fix the barometric pressure to 101 kPa (760 mmHg, 29.8 inHg).

### 9. ECM OPERATION AT DTC SETTING

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

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### EQ:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the barometric pressure sensor.  
Judge as NG if out of specification.

#### 2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

#### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

##### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Output voltage	< 0.118 V

**Time Needed for Diagnosis:** 0.5 seconds

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

##### • Normality Judgment

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

##### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Output voltage	$\geq 0.118$ V

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

#### 8. FAIL SAFE

Barometric pressure sensor process: Fix the barometric 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)

## ER:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the barometric pressure sensor.  
Judge as NG if out of specification.

### 2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

### 3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Output voltage	$\geq 4.936$ V

**Time Needed for Diagnosis:** 0.5 seconds

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

#### • Normality Judgment

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

#### Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Output voltage	$< 4.936$ V

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

### 8. FAIL SAFE

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

### 9. ECM OPERATION AT DTC SETTING

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

# **Diagnostic Trouble Code (DTC) Detecting Criteria**

## **GENERAL DESCRIPTION**

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## TRANSMISSION SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

CONTROL SYSTEMS	CS
AUTOMATIC TRANSMISSION	4AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	4AT(diag)
AUTOMATIC TRANSMISSION	5AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	5AT(diag)
MANUAL TRANSMISSION AND DIFFERENTIAL	5MT
MANUAL TRANSMISSION AND DIFFERENTIAL	6MT
CLUTCH SYSTEM	CL



# CONTROL SYSTEMS

CS

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