

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC B1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

DTC	Item	OUTLINE OF DIAGNOSIS
B1570	Antenna	Faulty antenna
B1571	Reference Code Incompatibility	Reference code incompatibility between body integrated unit and ECM
B1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between body integrated unit and ECM
B1574	Key Communication Failure	The body integrated unit to confirm the key (transponder) ID code has malfunction, of the transponder is faulty.
B1575	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in body integrated unit)
B1576	EGI Control Module EEPROM	ECM malfunctioning
B1577	IMM Control Module EEPROM	Body integrated unit malfunctioning
B1578	Meter Failure	Reference code incompatibility between combination meter and body integrated unit

2. ENABLE CONDITIONS

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.

B: DTC B1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC B1570. <Ref. to GD(H4DO)-10, DTC B1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>

C: DTC B1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC B1570. <Ref. to GD(H4DO)-10, DTC B1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>

D: DTC B1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC B1570. <Ref. to GD(H4DO)-10, DTC B1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>

E: DTC B1575 INCORRECT IMMOBILIZER KEY

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC B1570. <Ref. to GD(H4DO)-10, DTC B1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>

F: DTC B1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC B1570. <Ref. to GD(H4DO)-10, DTC B1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>

G: DTC B1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC B1570. <Ref. to GD(H4DO)-10, DTC B1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>

H: DTC B1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC B1570. <Ref. to GD(H4DO)-10, DTC B1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

I: DTC P000A A CAMSHAFT POSITION SLOW RESPONSE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

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

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Engine oil temperature	≥ -40 °C (-40 °F)
AVCS control	Operation
Target timing advance change amount (per 64 ms)	< 3.2 °CA
AVCS target position	> 0 °CA

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the engine speed increases and AVCS operates.

4. DIAGNOSTIC METHOD

When the differences of target timing advance amount and actual timing advance amount is calculated during AVCS control, and the difference per predetermined time is the specified value or larger.

• Abnormality Judgment

Judge as NG when the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
$\Sigma(\text{Target position} - \text{Actual position})$	> 4000 °CA (Bank 1) > 4000 °CA (Bank 2)
or	
$\Sigma(\text{Target position} - \text{Actual position})$	< -4000 °CA (Bank 1) < -4000 °CA (Bank 2)

Time Needed for Diagnosis: 25000 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
$\Sigma(\text{Target position} - \text{Actual position})$	≤ 4000 °CA (Bank 1) ≤ 4000 °CA (Bank 2) and ≥ -4000 °CA (Bank 1) ≥ -4000 °CA (Bank 2)

Time Needed for Diagnosis: 25000 ms

J: DTC P000C A CAMSHAFT POSITION SLOW RESPONSE (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to P000A. <Ref. to GD(H4DO)-12, DTC P000A A CAMSHAFT POSITION SLOW RESPONSE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

K: DTC P0010 "A" CAMSHAFT POSITION ACTUATOR CIRCUIT/OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil control solenoid.

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

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. 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
Battery voltage	≥ 10.9 V
Oil control solenoid control duty	≥ 99.61 %
Oil control solenoid control present current	< 0.306 A

Time Needed for Diagnosis: 2000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Target current value of the oil control solenoid	≥ 0.14 A
Target current value of the oil control solenoid – oil control solenoid control current value	< 0.08 A

Time Needed for Diagnosis: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

Judge as NG when the conditions during which the differences of AVCS target timing advance amount and AVCS actual timing advance amount is large continues.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Engine oil temperature	≥ -40 °C (-40 °F)
AVCS control	Operation

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the engine speed increases and AVCS operates.

4. DIAGNOSTIC METHOD

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.

• Abnormality Judgment

Judge as NG when the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
(Target position – Actual position)	> 10 °CA or < -10 °CA

Time Needed for Diagnosis: 5000 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
(Target position – Actual position)	≤ 10 °CA and ≥ -10 °CA

Time Needed for Diagnosis: 5000 ms

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

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

Judge as NG when standard timing advance amount is far from learning angle.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm and < 1200 rpm
Engine coolant temperature	≥ 50 °C (122 °F)
AVCS control	Not in operation
Target timing advance	0°CA

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting engine and while AVCS is not operating.

4. DIAGNOSTIC METHOD

Judge as NG when the absolute value of the difference between cam signal input position and learning value is out of specification.

• 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
$ $ Crankshaft position when camshaft position sensor signal is input – Learning value $ $	> 10 °CA

Time Needed for Diagnosis: 5000 ms

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

NOTE:

Initial standard learning value is the value of crank angle initially input at the production plant. And then it will be updated every time normal judgment has been completed. Learning value will not be updated if NG judgment occurs because timing belt or chain derails suddenly in process or because wrong assembly occurs during servicing.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
$ $ Crankshaft position when camshaft position sensor signal is input – Learning value $ $	≤ 10 °CA

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0016. <Ref. to GD(H4DO)-15, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

O: DTC P0020 "A" CAMSHAFT POSITION ACTUATOR CIRCUIT/OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0010. <Ref. to GD(H4DO)-13, DTC P0010 "A" CAMSHAFT POSITION ACTUATOR CIRCUIT/OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0011. <Ref. to GD(H4DO)-14, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

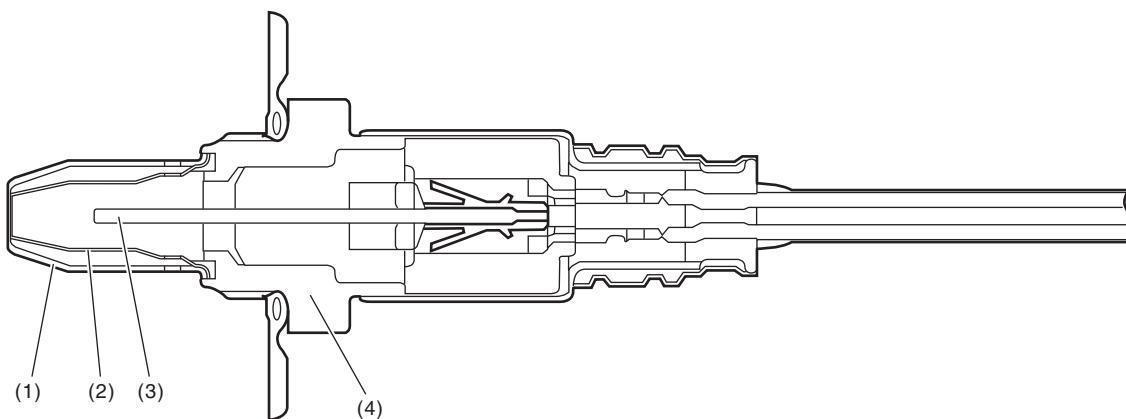
Q: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

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



EN-08982

(1) Element cover (outer)
(2) Element cover (inner)

(3) Sensor element

(4) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Condition established time	≥ 42000 ms
Battery voltage	≥ 10.9 V
Heater current	Permitted
A/F sensor heater final control	Main energization status
After fuel cut	≥ 20000 ms

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 42000 ms seconds or more have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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
Front oxygen (A/F) sensor impedance	$> 87 \Omega$

Time Needed for Diagnosis: 10000 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	$\leq 87 \Omega$

Time Needed for Diagnosis: 10000 ms

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

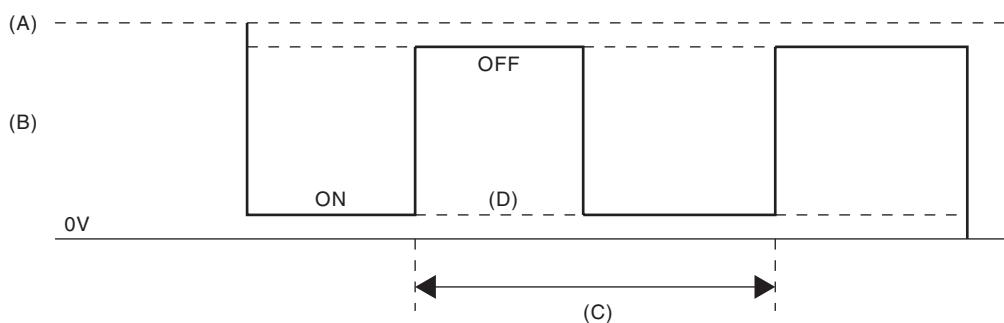
1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.

The front oxygen (A/F) 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

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

(C) 128 ms

(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

Time Needed for Diagnosis: 4 ms × 250 time(s)

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

Time Needed for Diagnosis: Less than 1 second

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

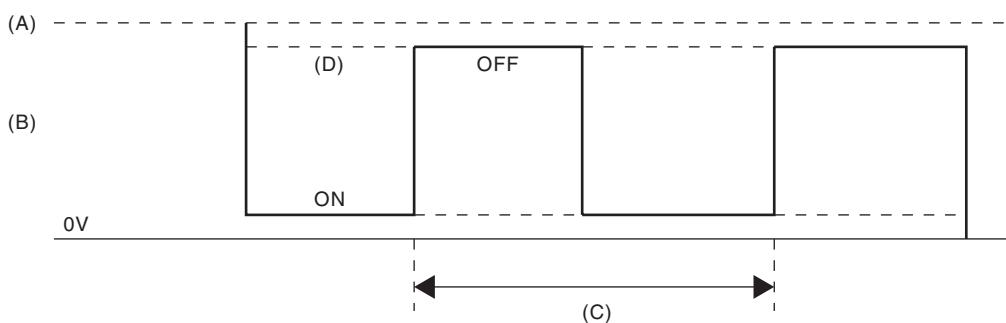
1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.

The front oxygen (A/F) 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

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

(C) 128 ms

(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

Time Needed for Diagnosis: 4 ms \times 500 time(s)

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

Time Needed for Diagnosis: Less than 1 second

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

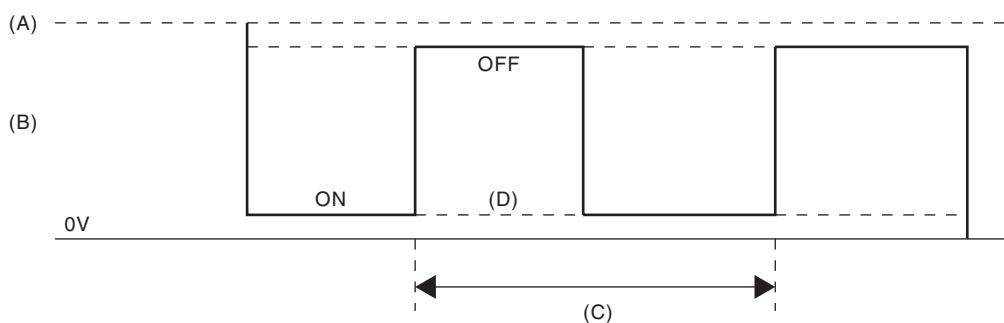
1. OUTLINE OF DIAGNOSIS

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

(B) Output voltage of the rear oxygen sensor heater

(C) 256 ms (cycle)

(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Engine speed	< 8000 rpm

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine is low speed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75 %

Time Needed for Diagnosis: 8 ms × 1250 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

Time Needed for Diagnosis: Less than 1 second

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

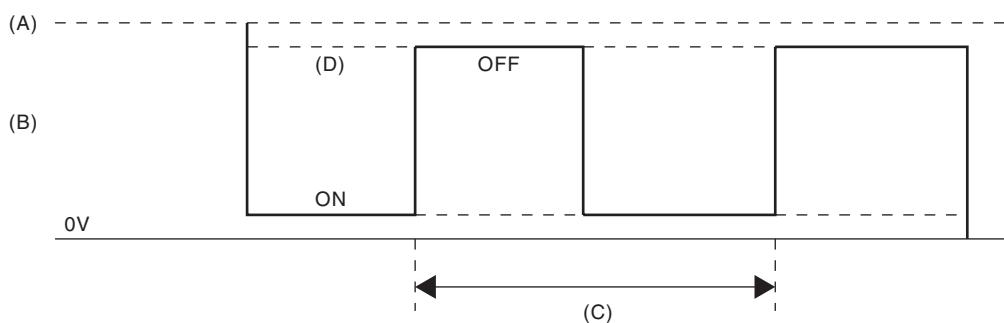
1. OUTLINE OF DIAGNOSIS

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

(B) Output voltage of the rear oxygen sensor heater

(C) 256 ms (cycle)

(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Engine speed	< 8000 rpm

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine is low speed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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
Output voltage level	High
Rear oxygen sensor heater control duty	$\geq 20\%$

Time Needed for Diagnosis: 8 ms \times 1250 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

Time Needed for Diagnosis: Less than 1 second

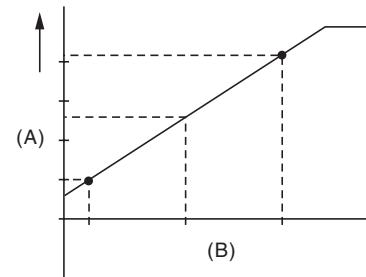
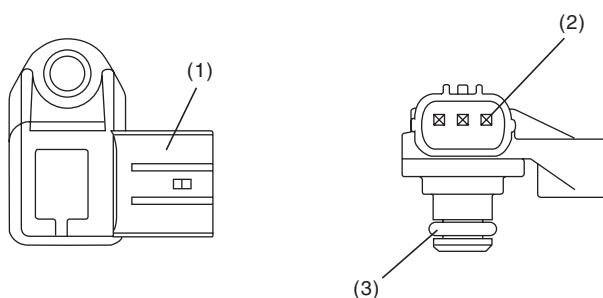
V: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

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-08984

(B) Absolute pressure

(1) Connector

(2) Terminals

(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 60^{\circ}\text{C}$ (140 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

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	
Engine speed	< 2500 rpm
Throttle position	≥ 12 °
Output voltage	< 1.46 V
Engine load	> 0.6 g/rev (0.02 oz/rev)
High	
Engine speed	525 rpm — 900 rpm
Throttle position	< 5.7 °
Output voltage	≥ 3.5 V
Engine load	< 0.44 g/rev (0.02 oz/rev)

Time Needed for Diagnosis:

Low side: 5000 ms

High side: 10000 ms

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.

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

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Engine speed	< 2500 rpm
Throttle position	≥ 12 °
Output voltage	≥ 1.46 V
Engine load	> 0.6 g/rev (0.02 oz/rev)
High	
Engine speed	525 rpm — 900 rpm
Throttle position	< 5.7 °
Output voltage	< 3.5 V
Engine load	< 0.44 g/rev (0.02 oz/rev)

Time Needed for Diagnosis:

Low side: Less than 1 second

High side: Less than 1 second

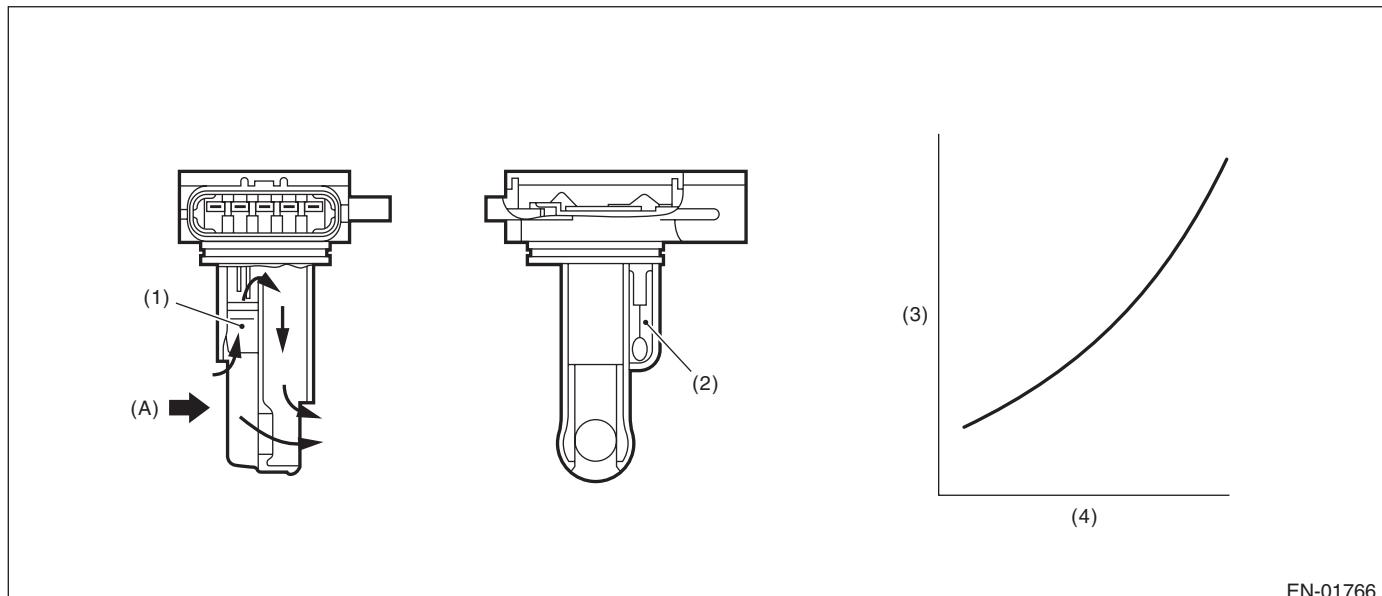
W: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

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



(A) Air

(1) Air flow sensor

(3) Voltage (V)

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

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 60^{\circ}\text{C}$ (140°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

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	
Output voltage	< 1.22 V
Engine speed	≥ 1500 rpm
Throttle opening angle	≥ 12 °
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
High (1)	
Output voltage	≥ 2.1 V
Engine speed	525 rpm — 900 rpm
Throttle opening angle	< 5.7 °
Intake manifold pressure	≥ 58.7 kPa (440 mmHg, 17.3 inHg)
High (2)	
Output voltage	≥ 2.1 V
Engine speed	525 rpm — 900 rpm
Throttle opening angle	< 5.7 °
Intake manifold pressure	≥ 58.7 kPa (440 mmHg, 17.3 inHg)
Fuel system diagnosis	Rich side malfunction

Time Needed for Diagnosis:

Low: 5000 ms

High: 10000 ms

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 and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Output voltage	≥ 1.22 V
Engine speed	≥ 1500 rpm
Throttle opening angle	≥ 12 °
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
High	
Output voltage	< 2.1 V
Engine speed	525 rpm — 900 rpm
Throttle opening angle	< 5.7 °
Intake manifold pressure	< 58.7 kPa (440 mmHg, 17.3 inHg)
Fuel system diagnosis	Rich side normal

Time Needed for Diagnosis:

Low: Less than 1 second

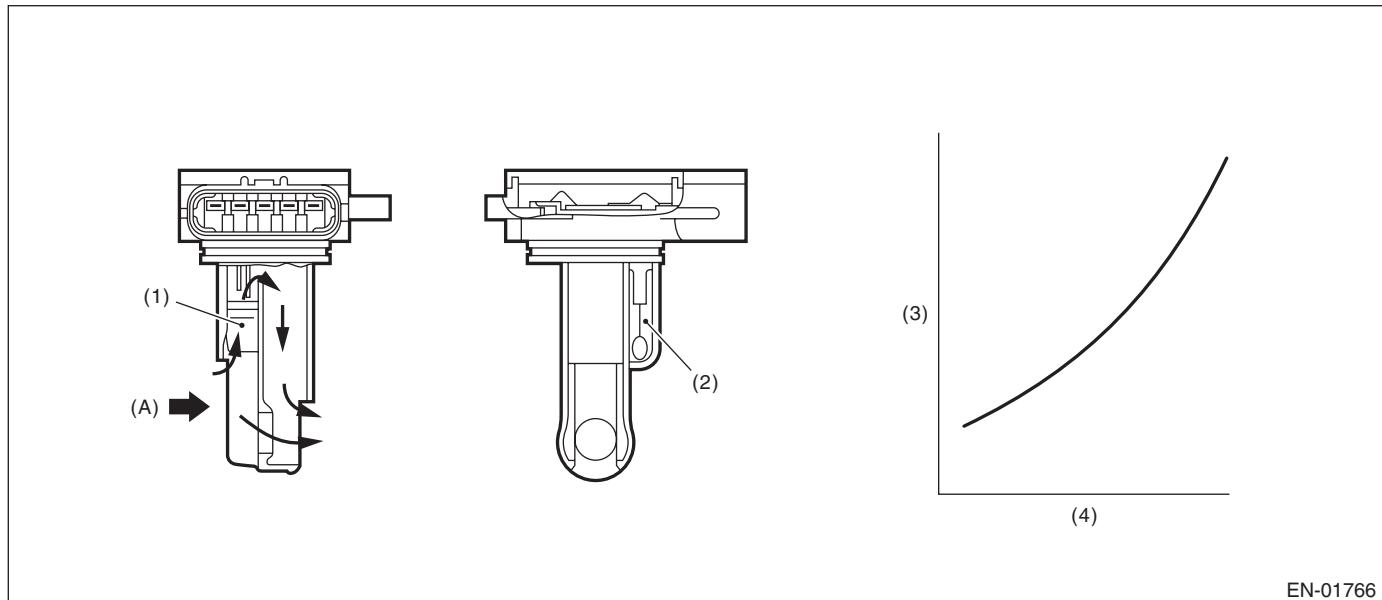
High: Less than 1 second

X: 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

(A) Air

(1) Air flow sensor

(3) Voltage (V)

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

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• 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
Output voltage	≤ 0.127 V

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.127 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

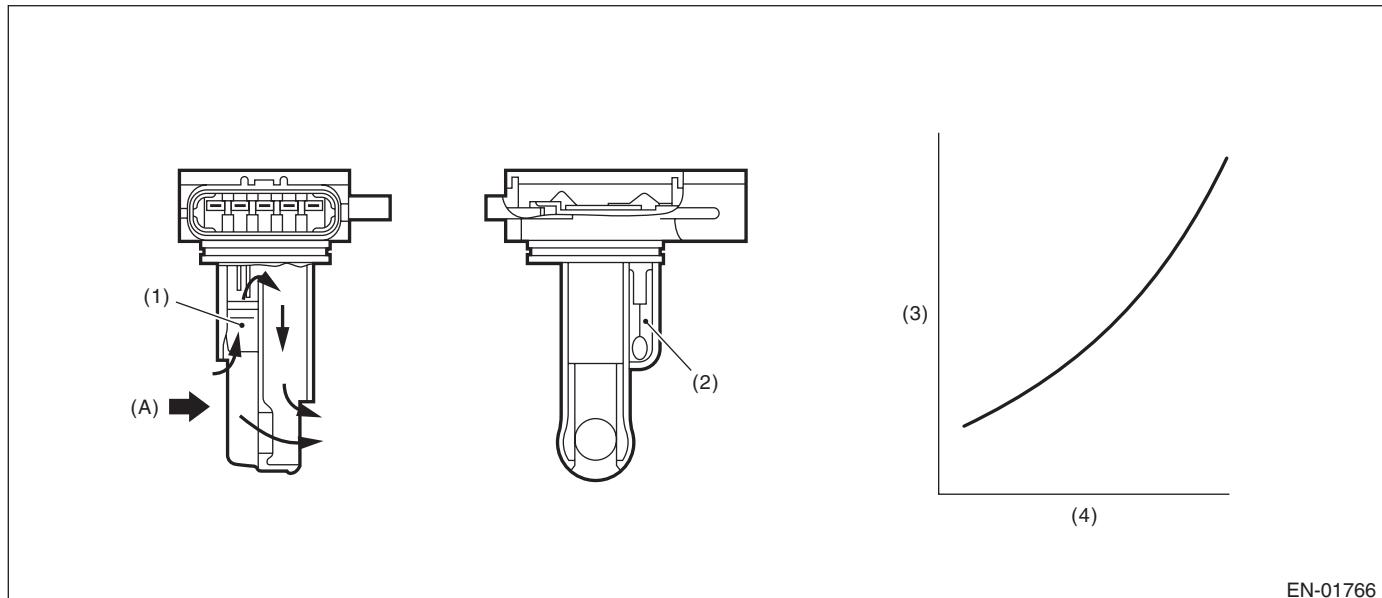
GENERAL DESCRIPTION

Y: 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

(A) Air

(1) Air flow sensor

(3) Voltage (V)

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

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• 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
Output voltage	≥ 4.43 V

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.43 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

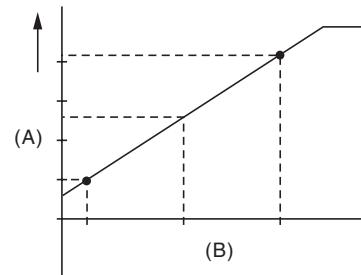
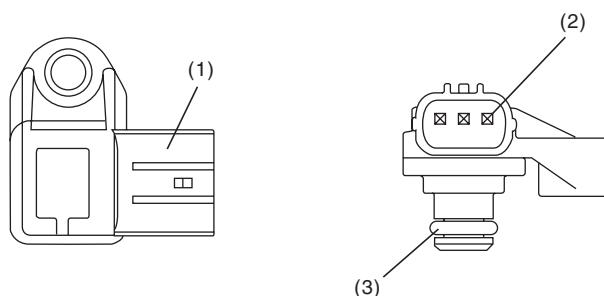
GENERAL DESCRIPTION

AA: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-08984

(A) Output voltage

(B) Absolute pressure

(1) Connector

(2) Terminals

(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	≥ 3.906 V

Time Needed for Diagnosis: 2000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 3.906 V

Time Needed for Diagnosis: Less than 1 second

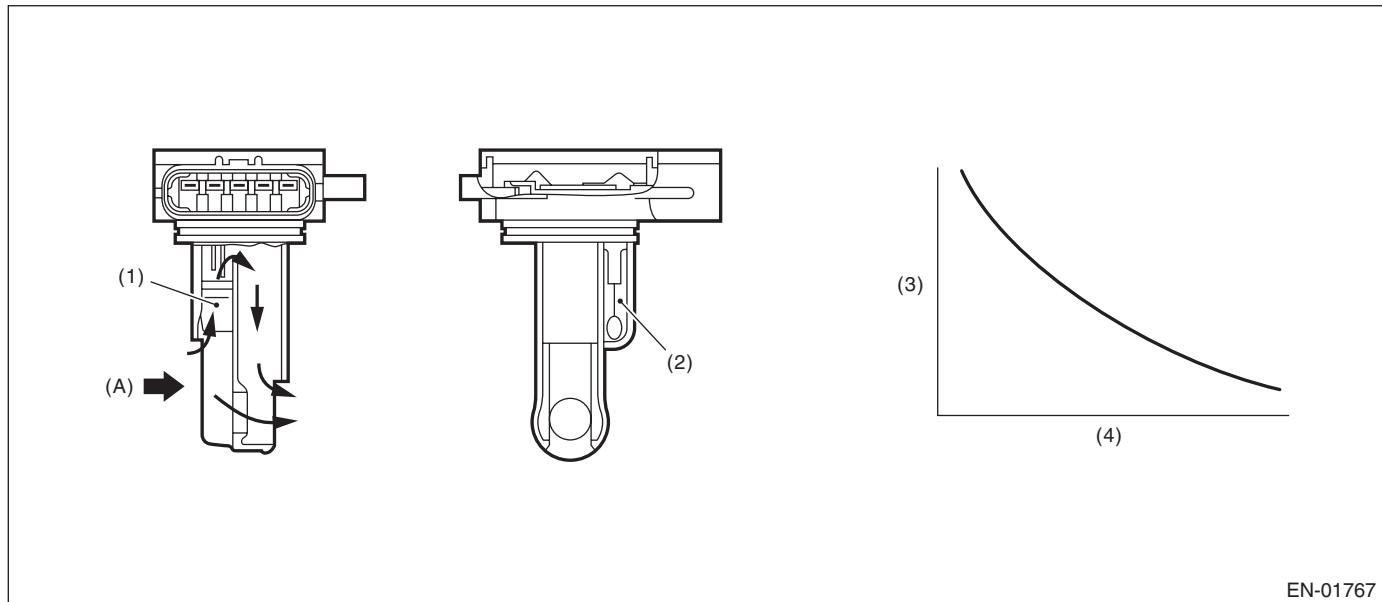
AB:DTC P0111 INTAKE AIR TEMPERATURE SENSOR RANGE/PERFORMANCE PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.

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

2. COMPONENT DESCRIPTION



EN-01767

(A) Air

(1) Air flow sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(2) Intake air temperature sensor

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature at engine starting	< 200 °C (392 °F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 200 km/h (124.3 MPH)	≥ 1 s
Engine coolant temperature	≥ 70 °C (158 °F)
Intake air amount sum value	≥ Value of Map 1
Number of experiences under conditions below	≥ 3 time(s)
• Continuous time when vehicle speed is less than 4 km/h (2.5 MPH)	≥ Value from Map 2
• Continuous time when vehicle speed is 40 km/h (24.9 MPH) or more and	≥ 15 s
Establishing time of 1, 2	≥ 15 s
1. Intake air amount	≥ 10 g/s (0.35 oz/s)
2. Vehicle speed	≥ 4 km/h (2.5 MPH)

Map 1

Engine coolant temperature °C (°F)	-30 (-22)	-10 (14)	0 (32)	10 (50)	25 (77)
Intake air amount sum value (g (oz))	30500 (1075.74)	24000 (846.48)	20500 (723.04)	15000 (529.05)	6800 (239.84)

Map 2

Engine coolant temperature °C (°F)	-30 (-22)	0 (32)	10 (50)	25 (77)
Continuous time (s) when vehicle speed is less than 4 km/h (2.5 MPH)	250	40	32	24

4. GENERAL DRIVING CYCLE

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

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 0.02 V(Equivalent to approximately 0.5°C (0.9°F) near 25°C)

Time Needed for Diagnosis: Less than 1 second

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 0.02 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

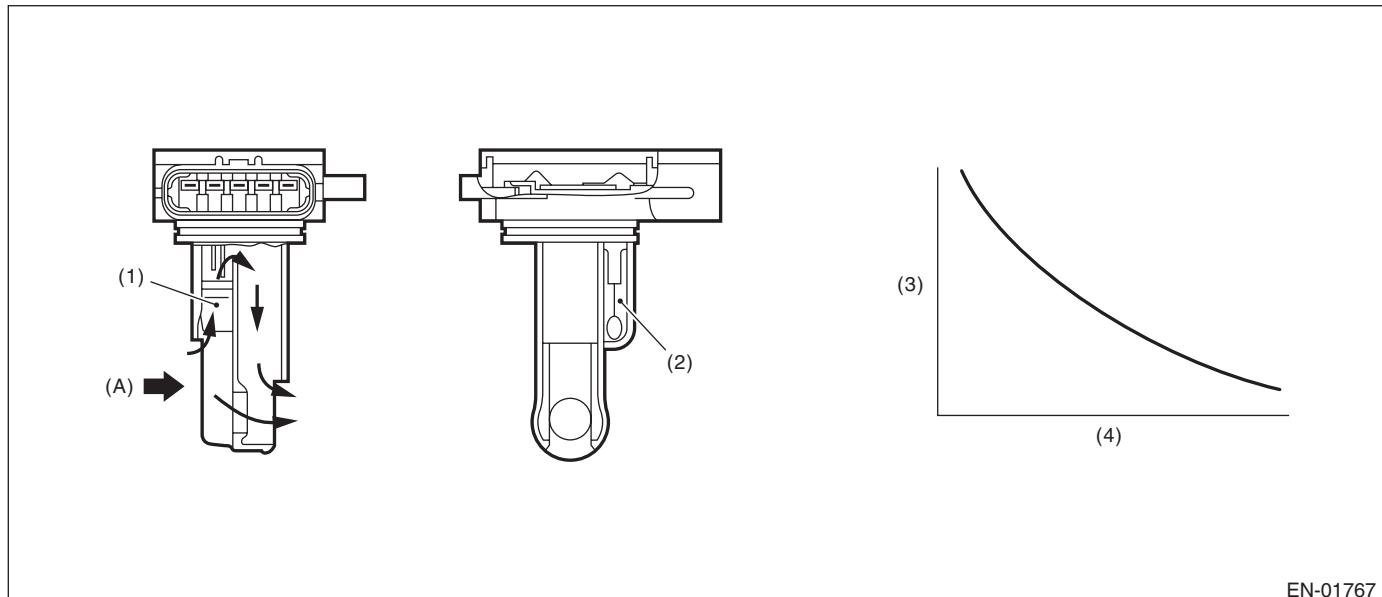
GENERAL DESCRIPTION

AC: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

(A) Air

(1) Air flow sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	< 0.4 V

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.4 V

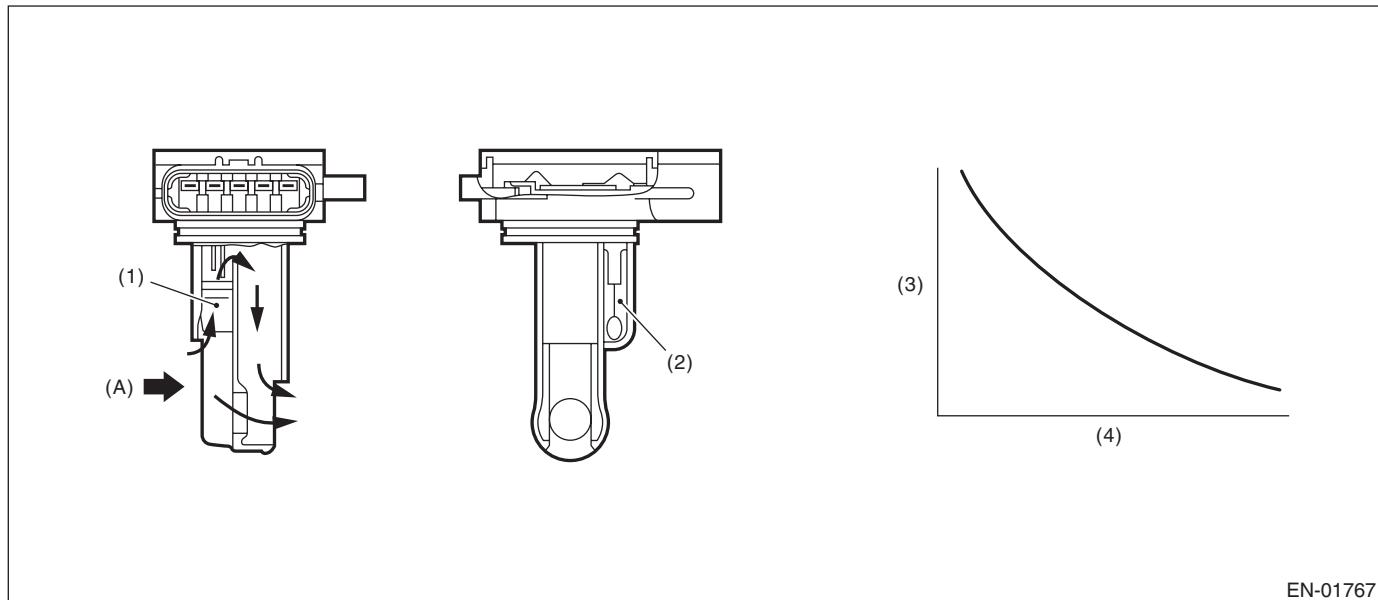
Time Needed for Diagnosis: Less than 1 second

AD: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

(A) Air

(1) Air flow sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	≥ 4.707 V

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.707 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

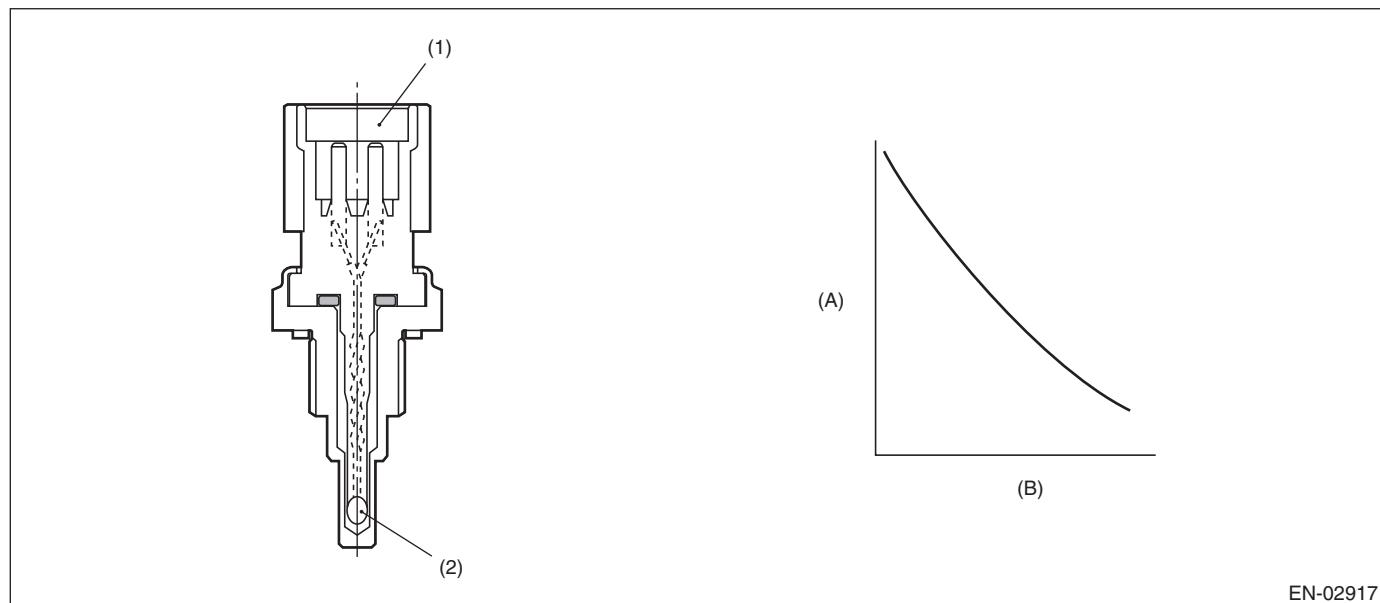
AE:DTC P0116 ENGINE COOLANT TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.

When the ignition is ON after the specified period of soaking time has elapsed, compare the engine coolant temperature with intake air temperature. Judge as NG if the difference between two temperatures is larger than the predetermined value and the engine coolant temperature becomes the specified value or more.

2. COMPONENT DESCRIPTION



EN-02917

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

(1) Connector (2) Thermistor element

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Soaking time	≥ 21600 s
Engine coolant temperature at the last engine stop	≥ Value from Map

Map

Estimate ambient temperature °C (°F)	-7 (19.4)	8 (46.4)	10 (50)	25 (77)
Engine coolant temperature at the last engine stop °C (°F)	62 (143.6)	62 (143.6)	62 (143.6)	62 (143.6)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

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
All of the following conditions are established.	
Engine coolant temperature – intake air temperature	> 15°C (27°F)
Engine coolant temperature	> 45 °C (113 °F)

Time Needed for Diagnosis: 512 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
When any one of the followings is established.	
Engine coolant temperature – intake air temperature	≤ 15°C (27°F)
Engine coolant temperature	≤ 45 °C (113 °F)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

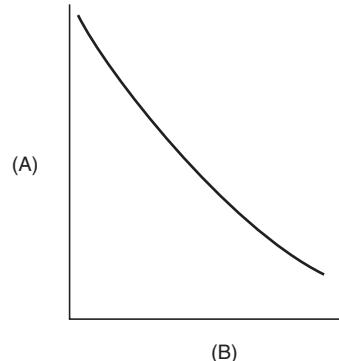
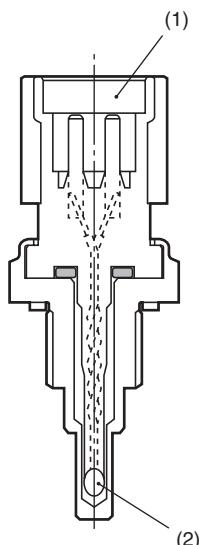
GENERAL DESCRIPTION

AF: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

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

(1) Connector (2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• 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
Output voltage	< 0.47 V

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.47 V

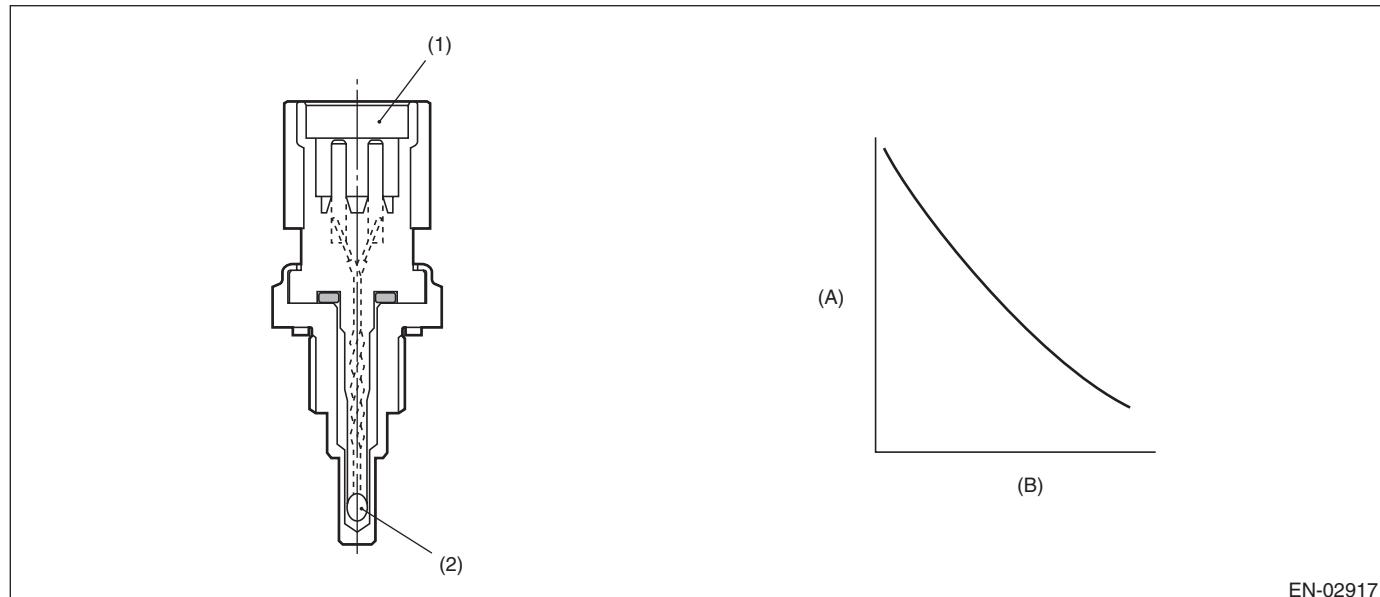
Time Needed for Diagnosis: Less than 1 second

AG: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

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

(1) Connector (2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• 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
Output voltage	≥ 4.698 V

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.698 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

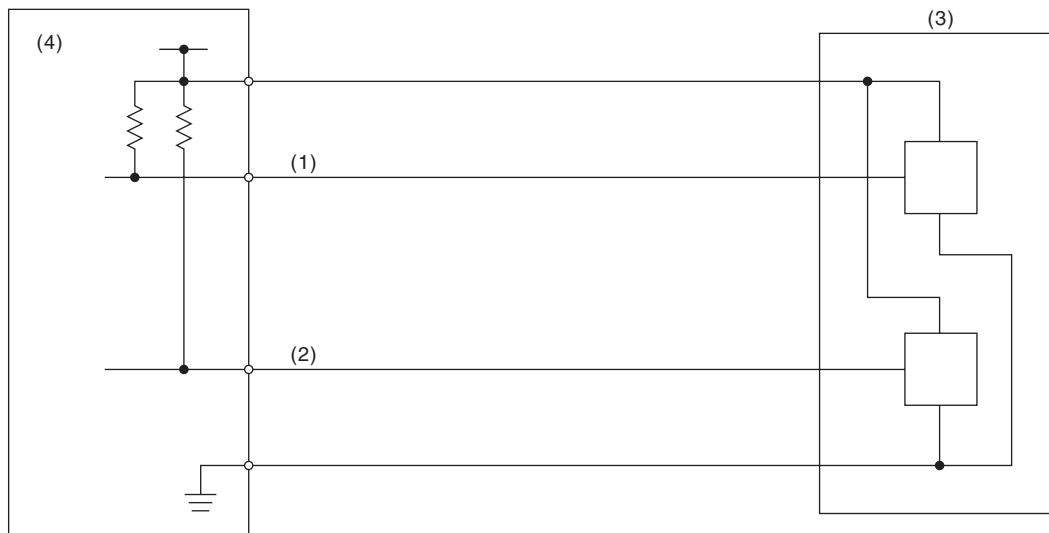
GENERAL DESCRIPTION

AH: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



(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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Sensor 1 input voltage	≤ 0.267 V

Time Needed for Diagnosis: 24 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.267 V

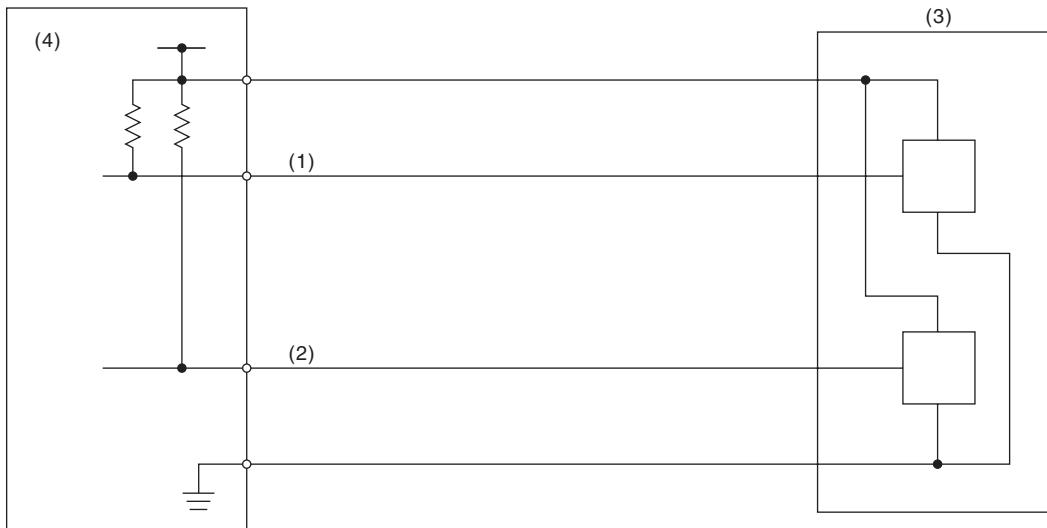
Time Needed for Diagnosis: 24 ms

AI: 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

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Sensor 1 input voltage	≥ 4.727 V

Time Needed for Diagnosis: 24 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.727 V

Time Needed for Diagnosis: 24 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

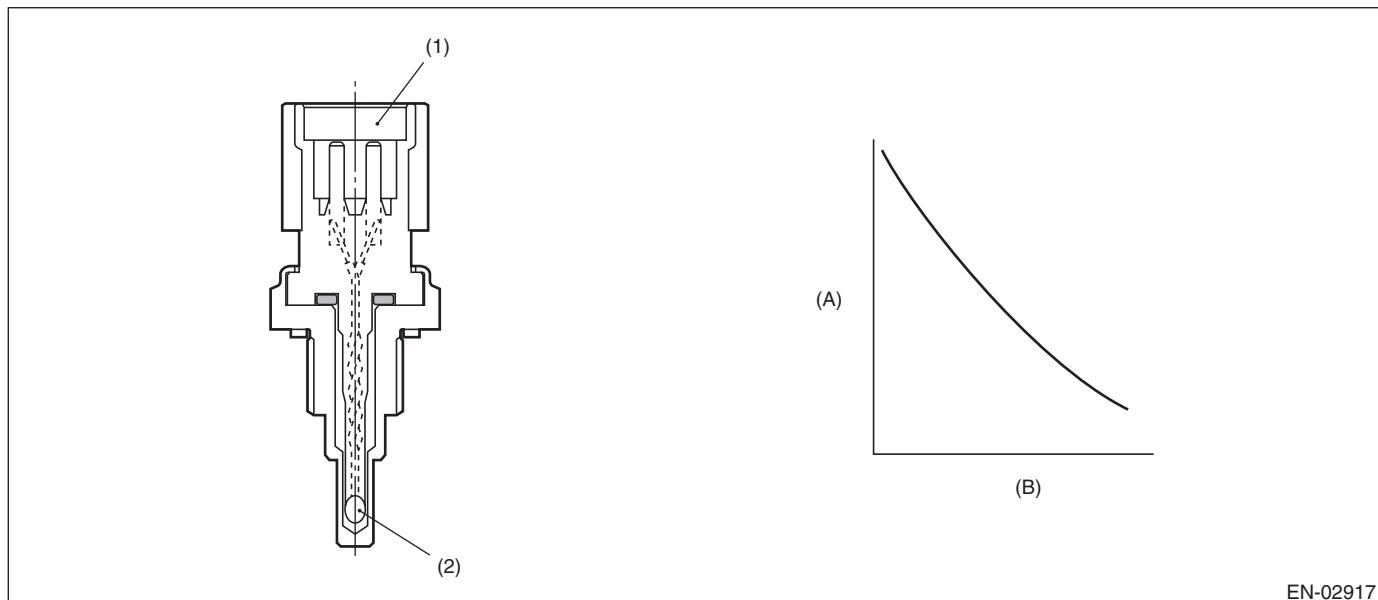
AJ:DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

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

(A) Resistance value (kΩ)

(B) Temperature °C (°F)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	\geq Value from Map
Battery voltage	≥ 10.9 V
Engine coolant temperature at engine starting	< -15 °C (5 °F)

Map

Engine coolant temperature °C (°F)	-40 (-40)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Engine speed rpm	500	500	500	500	500	500	500	500

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Engine speed rpm	500	500	500	500	500	500	500	500

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< -15 °C (5 °F)
Timer for diagnosis after engine start	≥ 299968 ms

Timer for diagnosis after engine start

64 ms + TWCNT ms (when at 64 ms)

TWCNT is shown in the following table.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
Lowest engine coolant temperature °C (°F)	-35 (-31)	0	0	0	0	0	0	0	0
	-23.5 (-10.3)	0	0	0	0	0	0	0	0
	-23.4 (-10.1)	96	96	96	96	96	96	96	96
	-15 (5)	96	96	96	96	96	96	96	96

Time Needed for Diagnosis: 120 or 300 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
Engine coolant temperature	≥ -15 °C (5 °F)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

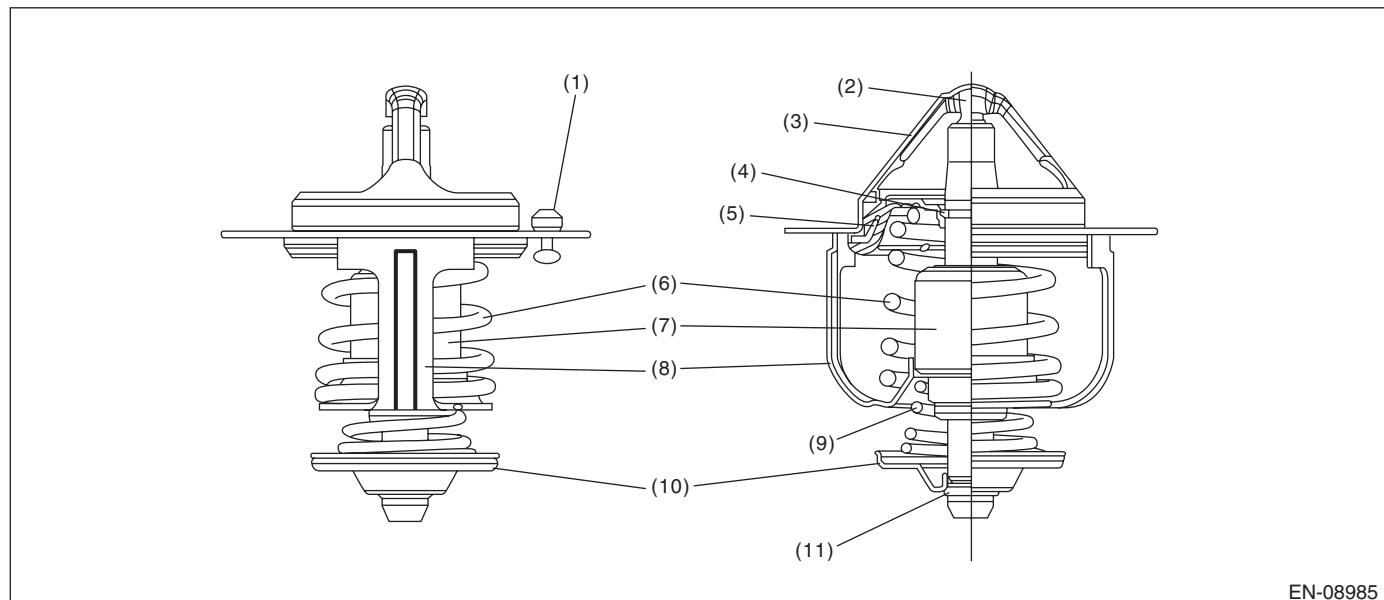
1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.

Judge as NG when any one of the following conditions is established.

- When the actual engine coolant temperature does not reach the maximum temperature necessary to perform other OBDII diagnosis and Σ (Estimated engine coolant temperature – actual engine coolant temperature) exceeded the predetermined value. (Judgment 1)
- When the actual engine coolant temperature does not reach the range within -11°C (-19.8°F) from the regulated temperature and Σ (Estimated engine coolant temperature – actual engine coolant temperature) exceeded the predetermined value. (Judgment 2)
- When the difference between the estimated coolant temperature and the actual engine coolant temperature exceeds the predetermined value, and Σ (Estimated engine coolant temperature – actual engine coolant temperature) exceeded the predetermined value. (Judgment 3)

2. COMPONENT DESCRIPTION



(1) Jiggle valve	(5) Dust seal	(9) Bypass spring
(2) Piston	(6) Main spring	(10) Bypass valve
(3) Flange	(7) Wax element	(11) Stop ring
(4) Stop ring	(8) Frame	

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
<Judgment 1>	
Battery voltage	$\geq 10.9 \text{ V}$
Estimate ambient temperature	$\geq -7 \text{ }^{\circ}\text{C} (19.4 \text{ }^{\circ}\text{F})$
Vehicle speed	$\geq 30 \text{ km/h (18.6 MPH)}$
Estimated coolant temperature	$\geq \text{Value of Map 1}$
<Judgment 2>	
Battery voltage	$\geq 10.9 \text{ V}$
Estimate ambient temperature	$\geq -7 \text{ }^{\circ}\text{C} (19.4 \text{ }^{\circ}\text{F})$
Vehicle speed	$\geq 30 \text{ km/h (18.6 MPH)}$
Estimated coolant temperature	$\geq \text{Value from Map 2}$
<Judgment 3>	
Battery voltage	$\geq 10.9 \text{ V}$
Estimate ambient temperature	$\geq -7 \text{ }^{\circ}\text{C} (19.4 \text{ }^{\circ}\text{F})$
Vehicle speed	$\geq 30 \text{ km/h (18.6 MPH)}$
Estimated coolant temperature	$\geq \text{Value from Map 3}$

Map 1

Engine coolant temperature at engine starting °C (°F)	-7 (19.4)	8 (46.4)	10 (50)	25 (77)
Estimated coolant temperature °C (°F)	70 (158)	70 (158)	70 (158)	70 (158)

Map 2

Engine coolant temperature at engine starting °C (°F)	-7 (19.4)	8 (46.4)	10 (50)	25 (77)
Estimated coolant temperature °C (°F)	71 (159.8)	80.2 (176.4)	80.2 (176.4)	80.2 (176.4)

Map 3

Engine coolant temperature at engine starting °C (°F)	-7 (19.4)	10 (50)	25 (77)	48 (118.4)
Estimated coolant temperature °C (°F)	45.1 (113.2)	55.9 (132.6)	65.5 (149.9)	80.2 (176.4)

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

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
When any one of the followings is established.	
<Judgment 1>	
Actual engine coolant temperature and Σ (Estimated engine coolant temperature – actual engine coolant temperature)	< Value of Map 4 > Value of Map 5
<Judgment 2>	
Actual engine coolant temperature and Σ (Estimated engine coolant temperature – actual engine coolant temperature)	< Regulated temperature – Value of Map 6 > Value of Map 7
<Judgment 3>	
Estimated engine coolant temperature – actual engine coolant temperature and Σ (Estimated engine coolant temperature – actual engine coolant temperature)	> Value of Map 8 > Value of Map 9

Map 4

Estimate ambient temperature °C (°F)	-7 (19.4)	8 (46.4)	10 (50)	25 (77)
Threshold Value °C (°F)	70 (158)	70 (158)	70 (158)	70 (158)

Map 5

Engine coolant temperature at engine starting °C (°F)	-7 (19.4)	0 (32)	8 (46.4)	10 (50)	30 (86)	40 (104)
Threshold Value °C (°F)	1731.6 (3116.9)	1731.6 (3116.9)	1731.6 (3116.9)	1731.6 (3116.9)	1731.6 (3116.9)	1200 (2160)

Map 6

Estimate ambient temperature °C (°F)	-7 (19.4)	8 (46.4)	10 (50)	25 (77)
Threshold Value °C (°F)	17.9 (32.2)	11.1 (20)	11.1 (20)	11.1 (20)

Map 7

Engine coolant temperature at engine starting °C (°F)	-7 (19.4)	0 (32)	8 (46.4)	10 (50)	30 (86)	35 (95)
Threshold Value °C (°F)	1731.6 (3116.9)	1731.6 (3116.9)	1731.6 (3116.9)	1731.6 (3116.9)	1731.6 (3116.9)	1500 (2700)

Map 8

Estimate ambient temperature °C (°F)	-7 (19.4)	8 (46.4)	10 (50)	25 (77)
Threshold Value °C (°F)	11.1 (20)	11.1 (20)	11.1 (20)	11.1 (20)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 9

Engine coolant temperature at engine starting °C (°F)	-7 (19.4)	8 (46.4)	10 (50)	25 (77)
Threshold Value °C (°F)	1731.6 (3116.9)	1731.6 (3116.9)	1731.6 (3116.9)	1731.6 (3116.9)

Time Needed for Diagnosis: 300 — 700 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
All of the following conditions are established.	
<Judgment 1>	
Actual engine coolant temperature and Σ (Estimated engine coolant temperature – actual engine coolant temperature)	\geq Value of Map 4 \leq Value of Map 5
<Judgment 2>	
Actual engine coolant temperature and Σ (Estimated engine coolant temperature – actual engine coolant temperature)	\geq Regulated temperature – Value of Map 6 \leq Value of Map 7
<Judgment 3>	
Estimated engine coolant temperature – actual engine coolant temperature and Σ (Estimated engine coolant temperature – actual engine coolant temperature) and Actual engine coolant temperature	\leq Value of Map 8 \leq Value of Map 9 \geq Regulated temperature – Value of Map 10

Map 10

Estimate ambient temperature °C (°F)	-7 (19.4)	8 (46.4)	10 (50)	25 (77)
Threshold Value °C (°F)	20.3 (36.54)	11.1 (20)	11.1 (20)	11.1 (20)

Time Needed for Diagnosis: 300 — 700 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

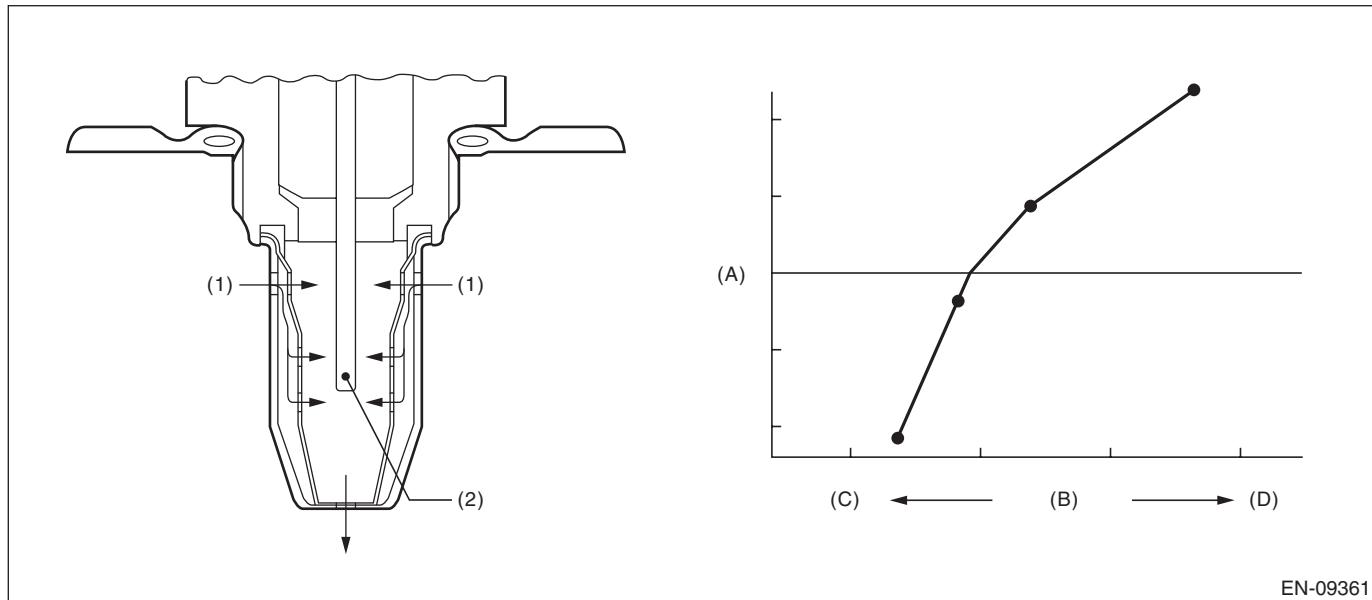
AL:DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG, when the element voltage is out of the specified range.

2. COMPONENT DESCRIPTION



EN-09361

(A) Electromotive force
(D) Rich

(B) Air fuel ratio
(2) ZrO_2

(C) Lean

(1) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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
Input voltage (+)	< 0.4 V
or	
Input voltage (-)	< 0.1 V
or	
$ Input\ voltage\ (+) - Input\ voltage\ (-) $	< 0.4 V

Time Needed for Diagnosis:

Input voltage (+): 1000 ms

Input voltage (-): 1000 ms

$|Input\ voltage\ (+) - Input\ voltage\ (-)|$: 1000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	$\geq 0.4\ V$
Input voltage (-)	$\geq 0.1\ V$
$ Input\ voltage\ (+) - Input\ voltage\ (-) $	$\geq 0.4\ V$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

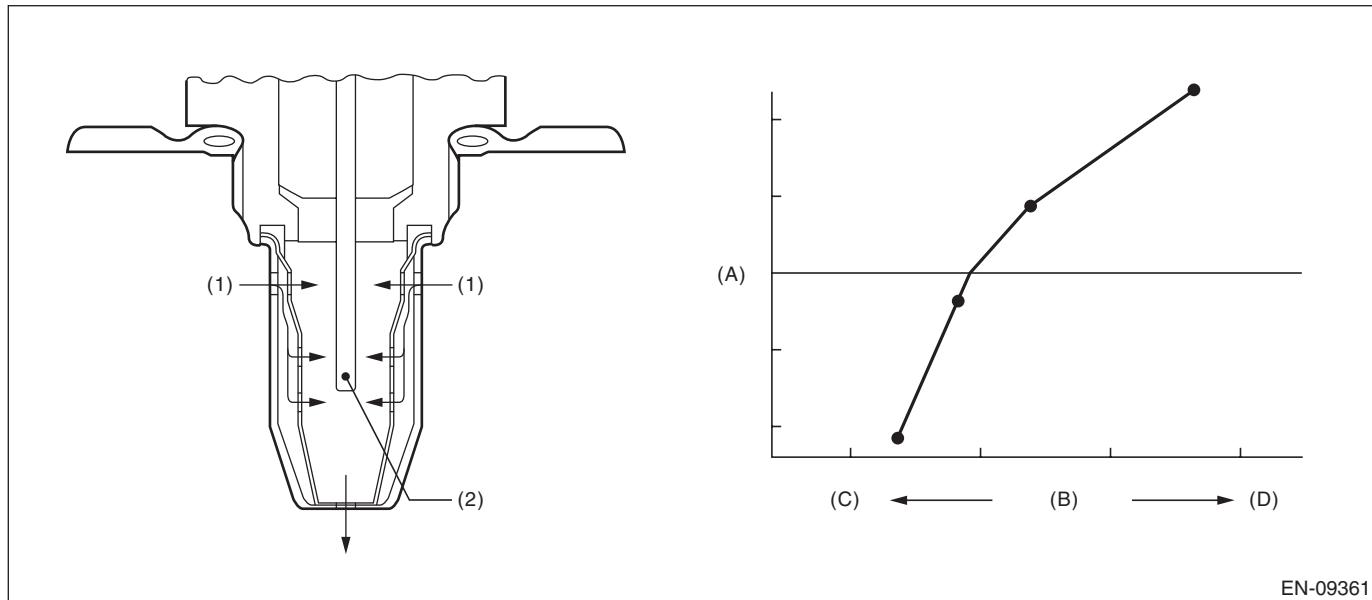
AM:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG, when the element voltage is out of the specified range.

2. COMPONENT DESCRIPTION



EN-09361

(A) Electromotive force
(D) Rich

(B) Air fuel ratio
(2) ZrO_2

(C) Lean

(1) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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
Input voltage (+)	> 4.7 V
or	
Input voltage (-)	> 4.7 V

Time Needed for Diagnosis:

Input voltage (+): 1000 ms

Input voltage (-): 1000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	\leq 4.7 V
Input voltage (-)	\leq 4.7 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

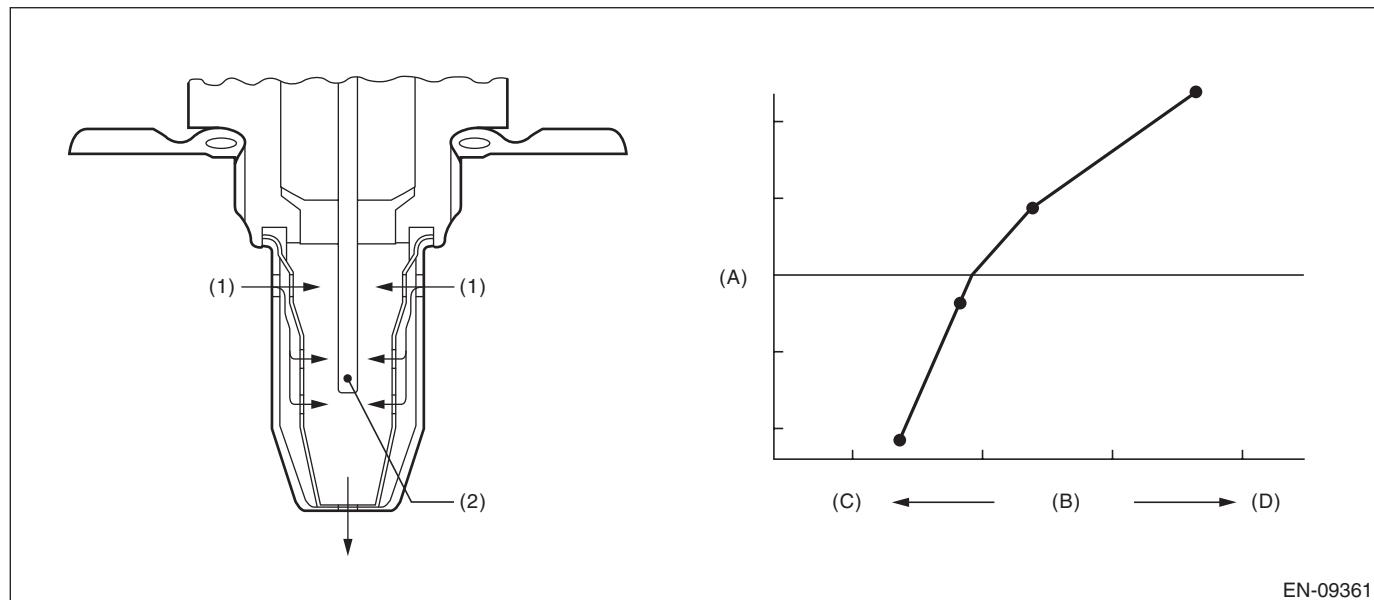
AN:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

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-09361

(A) Electromotive force
(D) Rich

(B) Air fuel ratio
(2) ZrO₂

(C) Lean

(1) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Battery voltage	$\geq 10.9 \text{ V}$
Time of heater control duty at 70 % or more	$\geq 36000 \text{ ms}$
Front oxygen (A/F) sensor impedance.	$> 450 \Omega$

Time Needed for Diagnosis: 5000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Front oxygen (A/F) sensor impedance.	$\leq 450 \Omega$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

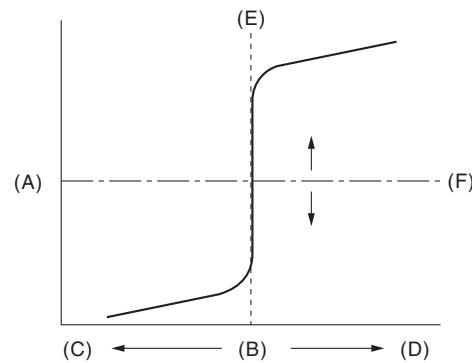
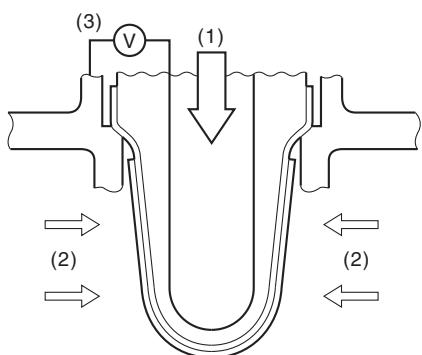
GENERAL DESCRIPTION

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	(B) Air fuel ratio	(C) Rich
(D) Lean	(E) Theoretical air fuel ratio	(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 Secondary air system Closed loop control at the oxygen sensor Misfire detection every 200 rotations Front oxygen (A/F) sensor compensation coefficient Battery voltage Engine coolant temperature	Not in operation In operation < 65535 time(s) Not in limit value ≥ 10.9 V ≥ 60 °C (140 °F)
Low (1) Secondary air system Closed loop control at the oxygen sensor Misfire detection every 200 rotations Front oxygen (A/F) sensor compensation coefficient Battery voltage Engine coolant temperature Amount of intake air	Not in operation In operation < 65535 time(s) Not in limit value ≥ 10.9 V ≥ 60 °C (140 °F) ≥ 10 g/s (0.35 oz/s)
Low (2) Secondary air system Closed loop control at the oxygen sensor Misfire detection every 200 rotations Front oxygen (A/F) sensor compensation coefficient Battery voltage Engine coolant temperature Amount of intake air Current continuation time of the rear oxygen sensor heater	Not in operation In operation < 65535 time(s) Not in limit value ≥ 10.9 V ≥ 60 °C (140 °F) < 10 g/s (0.35 oz/s) ≥ 30000 ms
Low (3) Secondary air system Closed loop control at the oxygen sensor Misfire detection every 200 rotations Front oxygen (A/F) sensor compensation coefficient Battery voltage Engine coolant temperature Amount of intake air Current continuation time of the rear oxygen sensor heater Fuel cut	Not in operation In operation < 65535 time(s) Not in limit value ≥ 10.9 V ≥ 60 °C (140 °F) < 10 g/s (0.35 oz/s) ≥ 30000 ms Experienced

Used for normality judgment

Secondary Parameters	Enable Conditions
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 65535 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 60 °C (140 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 30000 ms
Fuel cut	Experienced

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

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	DTC
High Sensor output voltage	> 1.2 V	P0138
Low Sensor output voltage	< 0.03 V	P0137

Time Needed for Diagnosis:

High: 2500 ms

Low (1): 20000 ms

Low (2): 40000 ms

Low (3): Value from Map

Map

Fuel cut time (ms)	0	2000	10000
Time Needed for Diagnosis (ms)	40000	40000	60000

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High Sensor output voltage	$\leq 1.2 \text{ V}$	P0138
Low Sensor output voltage	$\geq 0.03 \text{ V}$	P0137

Time Needed for Diagnosis:

High: Less than 1 second

Low (1): Less than 1 second

Low (2): Less than 1 second

Low (3): Less than 1 second

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

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0137. <Ref. to GD(H4DO)-58, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AQ:DTC P013A O2 SENSOR SLOW RESPONSE - RICH TO LEAN (BANK 1 SENSOR 2)

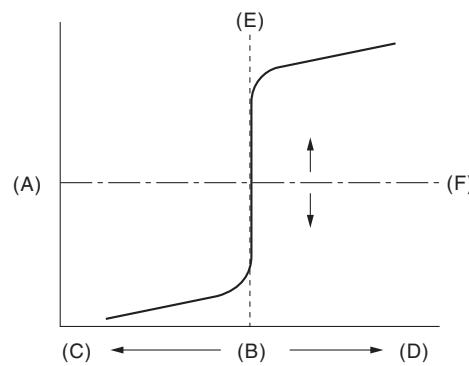
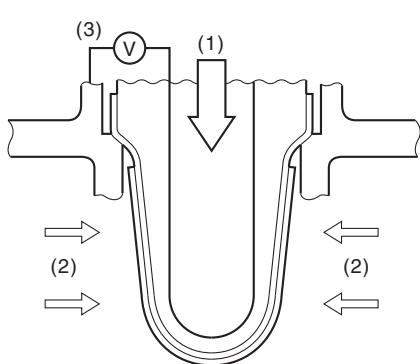
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rich → lean for rear oxygen sensor output.

When the deceleration fuel cut has occurred, detect the trouble by calculating the time when the rear oxygen sensor output passes through the predetermined range of voltages.

Judge as NG when the response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

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

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Rear oxygen sensor closed loop control	Operation
Current calculation time of the rear oxygen sensor heater after starting	≥ 180000 ms
Engine speed when fuel cut starts	≥ 1000 rpm
Rear oxygen sensor voltage when fuel cut starts	≥ 0.55 V
Fuel cut time	≥ 5000 ms
Engine coolant temperature when fuel cut starts	≥ -40 °C (-40 °F)
Estimated temperature of rear oxygen sensor element when fuel cut starts	≥ 500 °C (932 °F)

4. GENERAL DRIVING CYCLE

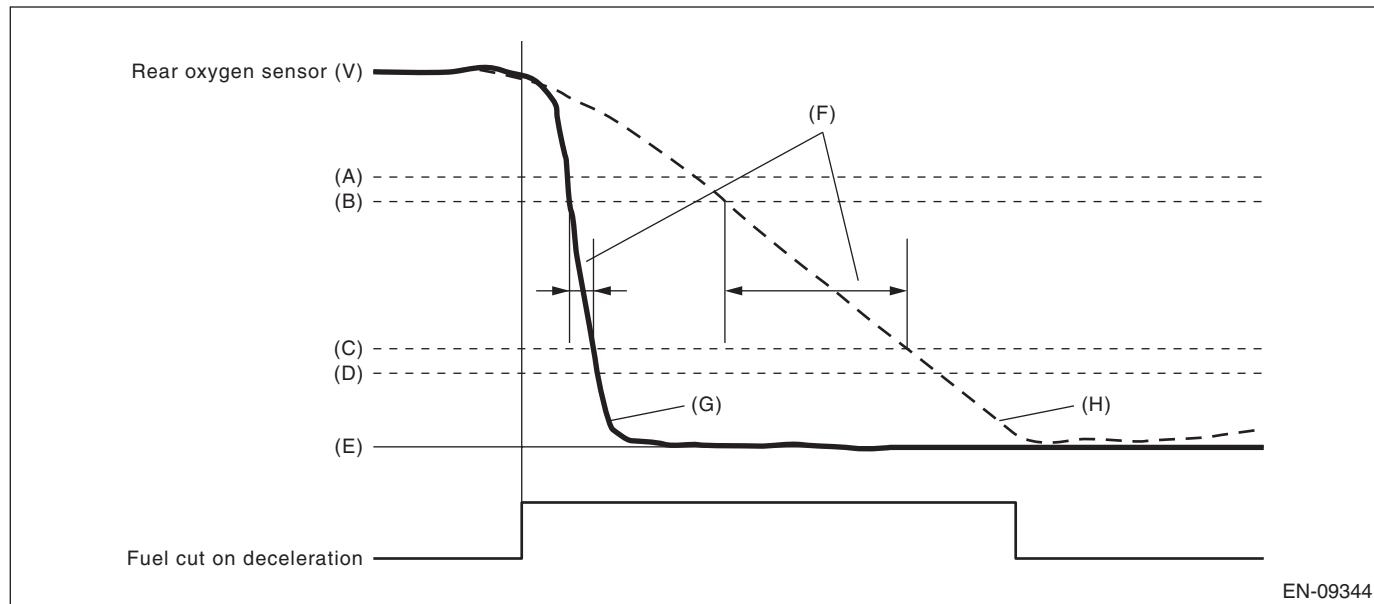
Perform diagnosis once during deceleration fuel cut from a constant and high speed driving, when rear oxygen sensor is warmed up sufficiently.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Detect the trouble by calculating the response time of the rear oxygen sensor during fuel cut.



EN-09344

(A) 0.55 V	(B) 0.50 V	(C) 0.20 V
(D) 0.15 V	(E) 0 V	(F) Diagnostic parameter
(G) Normal	(H) Malfunction	

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Time when rear oxygen sensor voltage changed from 0.5 V to 0.2 V.	> 491 ms

Time Needed for Diagnosis: 10 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Time when rear oxygen sensor voltage changed from 0.5 V to 0.2 V.	≤ 491 ms

Time Needed for Diagnosis: 10 seconds

AR:DTC P013B O2 SENSOR SLOW RESPONSE - LEAN TO RICH (BANK 1 SENSOR 2)

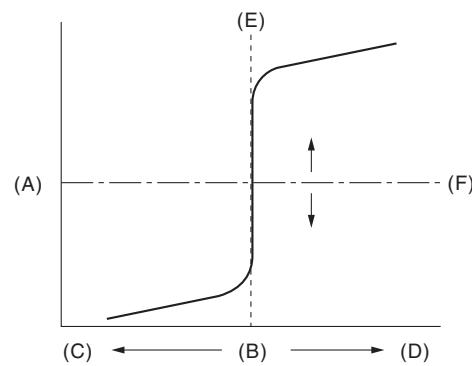
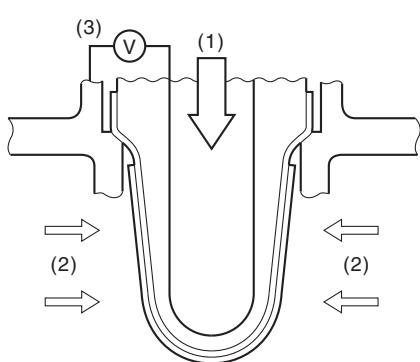
1. OUTLINE OF DIAGNOSIS

Detect the slow response of lean → rich for rear oxygen sensor output.

After the deceleration fuel cut has occurred, detect the trouble by calculating the time when the rear oxygen sensor output passes through the predetermined range of voltages.

Judge as NG when the response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

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

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Rear oxygen sensor closed loop control	Operation
Fuel cut time	≥ 5000 ms

4. GENERAL DRIVING CYCLE

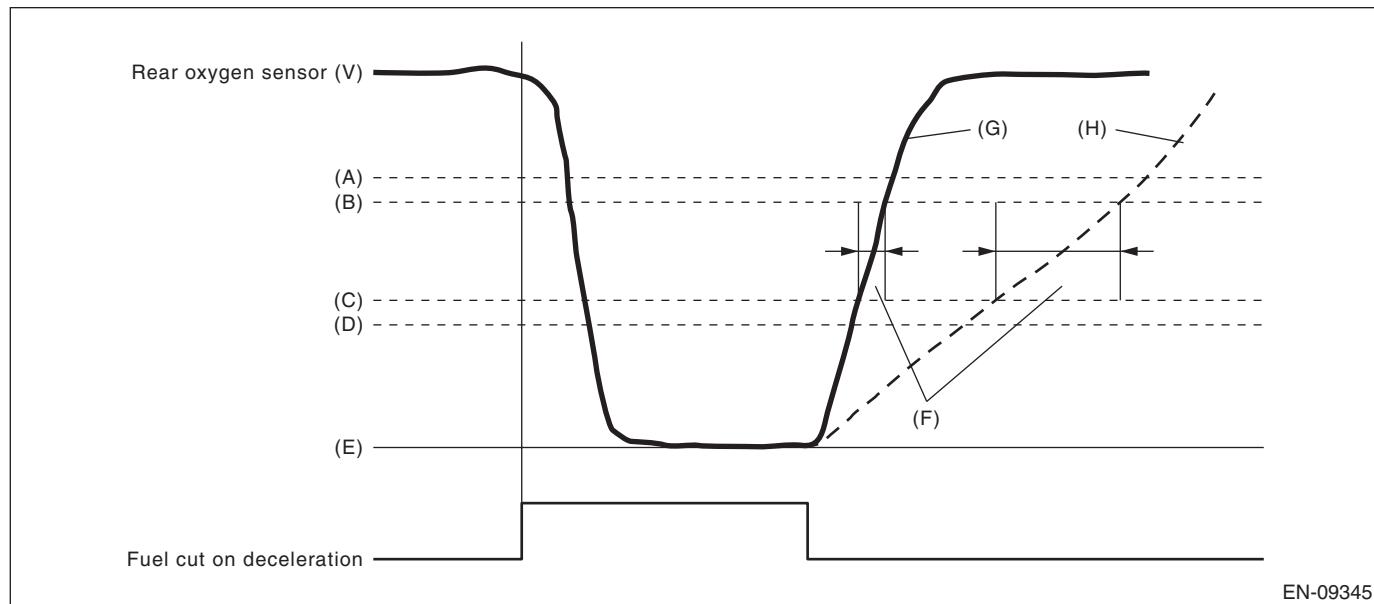
Perform diagnosis only once after recovering from a deceleration fuel cut continued for more than predetermined time.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Detect the trouble by calculating the response time of the rear oxygen sensor after fuel cut.



EN-09345

(A) 0.55 V	(B) 0.50 V	(C) 0.30 V
(D) 0.25 V	(E) 0 V	(F) Diagnostic parameter
(G) Normal	(H) Malfunction	

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Time when rear oxygen sensor voltage changed from 0.3 V to 0.5 V.	> 4000 ms

Time Needed for Diagnosis: 10 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Time when rear oxygen sensor voltage changed from 0.3 V to 0.5 V.	≤ 4000 ms

Time Needed for Diagnosis: 10 seconds

AS:DTC P013E O2 SENSOR DELAYED RESPONSE - RICH TO LEAN (BANK 1 SENSOR 2)

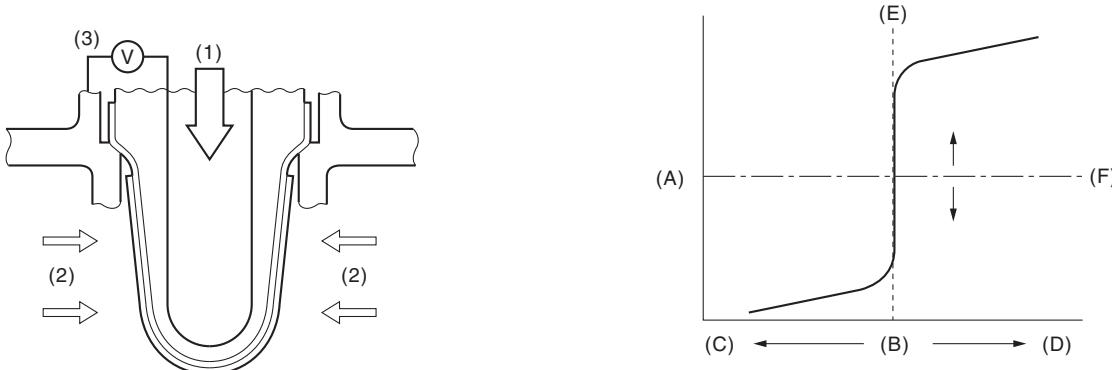
1. OUTLINE OF DIAGNOSIS

Detect the delayed response of rear oxygen sensor output for rich → lean.

After the deceleration fuel cut has started, detect the trouble by calculating the time when the rear oxygen sensor output decreases to the predetermined voltages.

Judge as NG when the response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

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

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Rear oxygen sensor closed loop control	Operation
Engine speed when fuel cut starts	≥ 1000 rpm
Rear oxygen sensor voltage when fuel cut starts	≥ 0.55 V
Fuel cut time	≥ 5000 ms
Engine coolant temperature when fuel cut starts	≥ -40 °C (-40 °F)
Estimated temperature of rear oxygen sensor element when fuel cut starts	≥ 500 °C (932 °F)

4. GENERAL DRIVING CYCLE

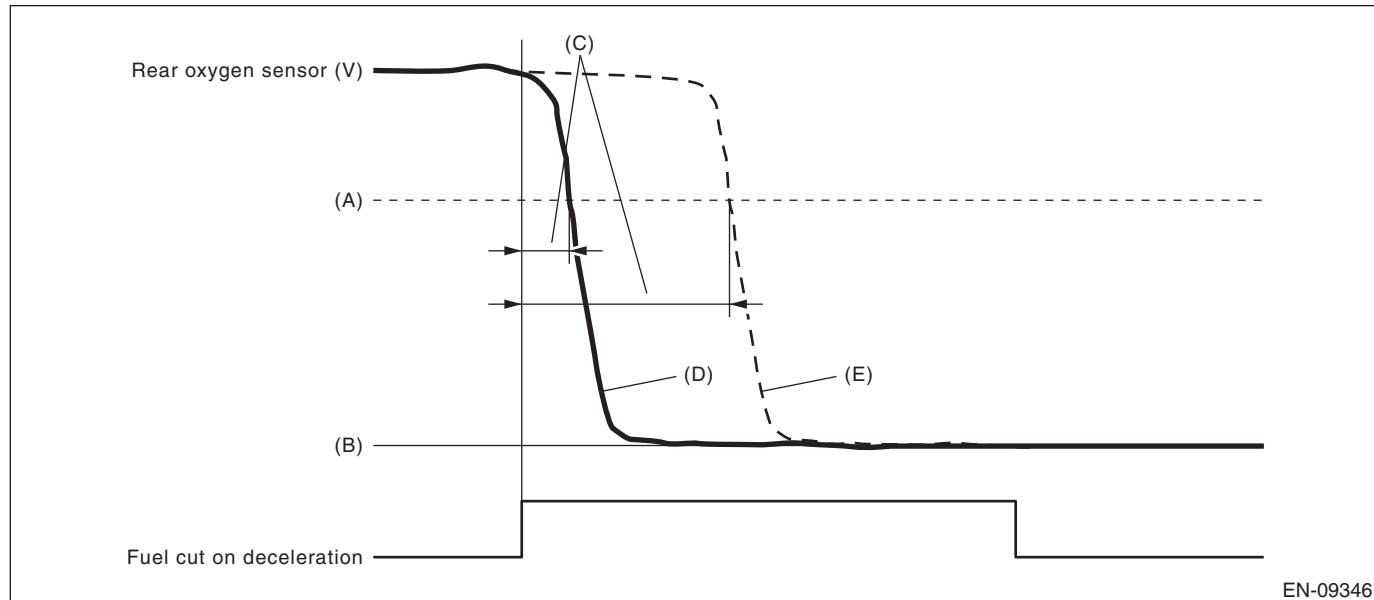
Perform diagnosis once during deceleration fuel cut from a constant and high speed driving, when rear oxygen sensor is warmed up sufficiently.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Detect the trouble by calculating the time from the beginning of the fuel cut to the beginning of the rear oxygen sensor voltage starting to drop.



(A) 0.5 V

(D) Normal

(B) 0 V

(E) Malfunction

(C) Diagnostic parameter

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Time when rear oxygen sensor voltage changed to 0.5 V after the fuel cut started.	> 4000 ms

Time Needed for Diagnosis: 10 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Time when rear oxygen sensor voltage changed to 0.5 V after the fuel cut started.	≤ 4000 ms

Time Needed for Diagnosis: 10 seconds

AT:DTC P013F O2 SENSOR DELAYED RESPONSE - LEAN TO RICH (BANK 1 SENSOR 2)

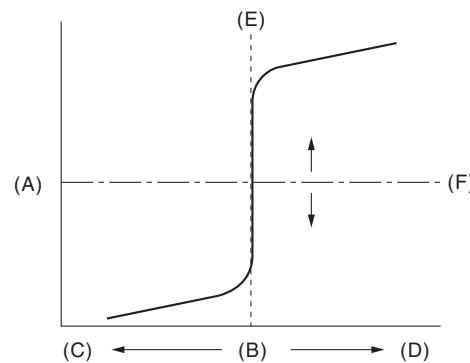
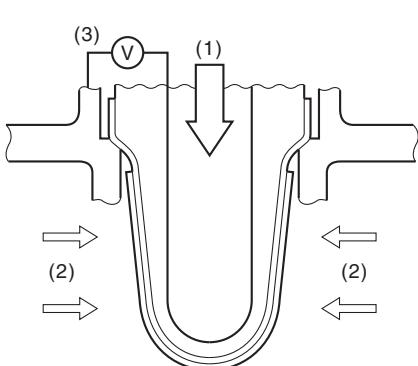
1. OUTLINE OF DIAGNOSIS

Detect the delayed response of rear oxygen sensor output for lean → rich.

After the deceleration fuel cut has completed, detect the trouble by calculating the time when the rear oxygen sensor output increases to the predetermined voltages.

Judge as NG when the response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

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

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Rear oxygen sensor closed loop control	Operation
Engine speed	≥ 500 rpm
Rear oxygen sensor voltage when fuel cut has completed	< 0.15 V
Fuel cut time	≥ 5000 ms
Engine coolant temperature when fuel cut has completed	≥ -40 °C (-40 °F)
Estimated element temperature of rear oxygen sensor when fuel cut has completed	≥ 500 °C (932 °F)

4. GENERAL DRIVING CYCLE

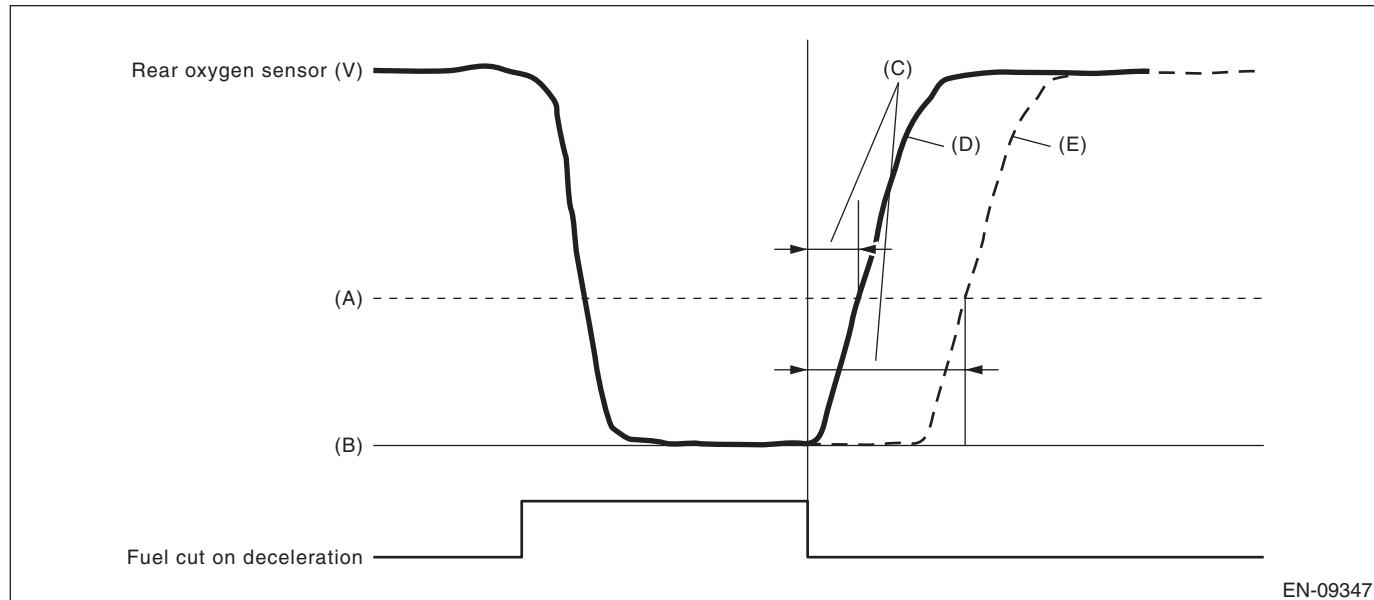
Perform diagnosis only once when recovering from the deceleration fuel cut continued for more than predetermined time with the rear oxygen sensor warmed up sufficiently.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Detect the trouble by calculating the time from the completion of the fuel cut to the beginning of the rear oxygen sensor voltage starting to rise.



(A) 0.3 V

(D) Normal

(B) 0 V

(E) Malfunction

(C) Diagnostic parameter

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
The number of times that the rear oxygen sensor voltage changed to 0.3 V after the fuel cut has completed (time counter)	> 3750 time(s)

Time Needed for Diagnosis: 10 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
The number of times that the rear oxygen sensor voltage changed to 0.3 V after the fuel cut has completed (time counter)	≤ 3750 time(s)

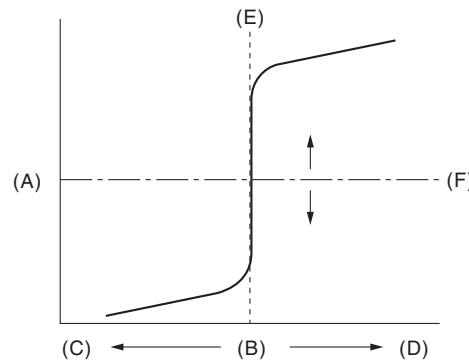
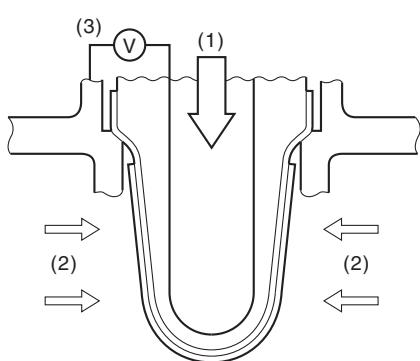
Time Needed for Diagnosis: 10 seconds

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

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



EN-01696

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

3. ENABLE CONDITION (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	$\geq 0.55 \text{ V} + 0.05 \text{ V}$
Amount of intake air	$\geq 10 \text{ g/s} (0.35 \text{ oz/s})$
Engine coolant temperature	$\geq -40^\circ\text{C} (-40^\circ\text{F})$
Misfire detection every 200 rotations	$< 65535 \text{ time(s)}$
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	$\geq 10.9 \text{ V}$
Deceleration fuel cut of 5000 ms or more.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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
Minimum output voltage or Maximum output voltage	> 0.15 V < 0.55 V

Time Needed for Diagnosis: 90000 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnosis of the rear oxygen sensor voltage low side	Incomplete
Minimum output voltage	≤ 0.15 V
Maximum output voltage	≥ 0.55 V

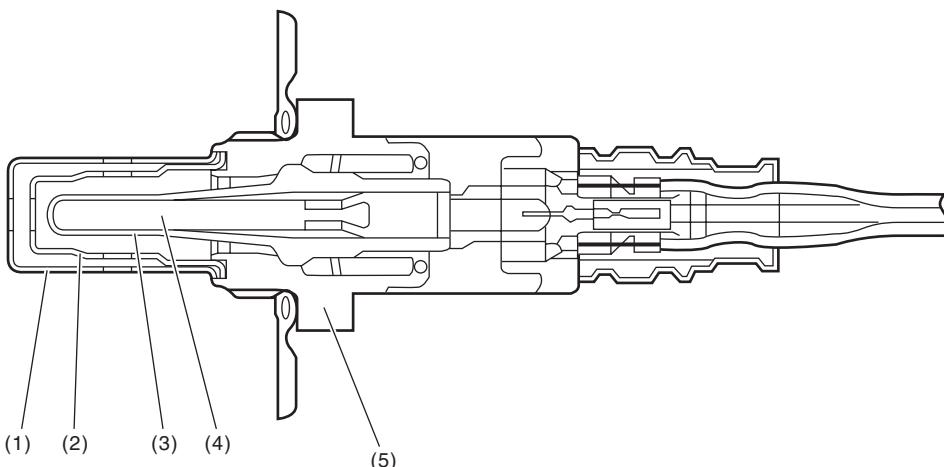
AV:DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor heater.

While observing the engine condition, judge as NG if the rear oxygen sensor impedance is great.

2. COMPONENT DESCRIPTION



EN-08983

(1) Element cover (outer)	(3) Sensor element	(5) Sensor housing
(2) Element cover (inner)	(4) Ceramic heater	

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1000 \text{ ms}$
Engine coolant temperature	$\geq 60 \text{ }^{\circ}\text{C}$ (140 $^{\circ}\text{F}$)
A/F sensor element impedance	$\leq 87 \text{ } \Omega$
A/F sensor heater control duty	$\leq 75 \text{ \%}$
Rear oxygen sensor heater control duty	$< 70 \text{ \%}$

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 1000 ms seconds or more have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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
Output terminal for heater characteristics failure detection	Low

Time Needed for Diagnosis: 4 ms × 2500 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output terminal for heater characteristics failure detection	High

Time Needed for Diagnosis: 4 ms × 2500 time(s)

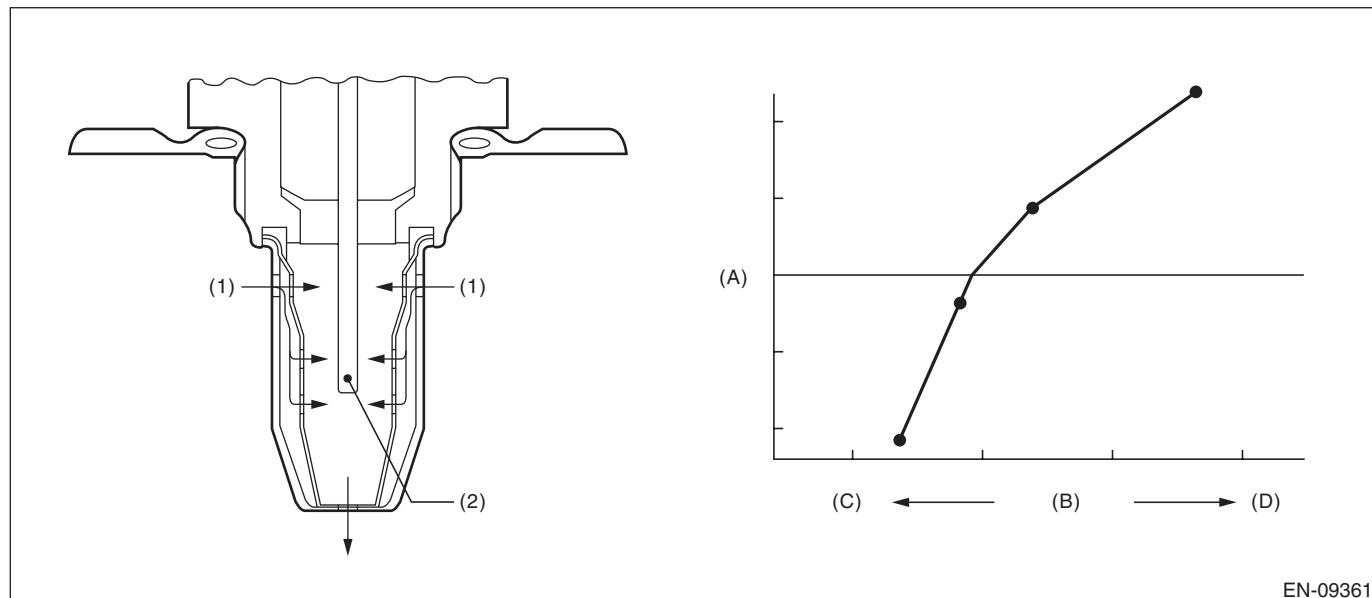
AW:DTC P014C O2 SENSOR SLOW RESPONSE - RICH TO LEAN (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

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

For diagnosis, detect the trouble by processing the λ waveform in normal driving without forcibly changing the target air fuel ratio.

2. COMPONENT DESCRIPTION



EN-09361

(A) Electromotive force
(D) Rich

(B) Air fuel ratio

(C) Lean

(1) Exhaust gas

(2) ZrO_2

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	$\geq 0 \Omega$ and $< 87 \Omega$
Elapsed time after starting the engine	$\geq 0 \text{ ms}$
Engine coolant temperature	$\geq -40^\circ\text{C} (-40^\circ\text{F})$
Engine speed	$\geq 1000 \text{ rpm}$
Amount of intake air	$\geq 10 \text{ g/s} (0.35 \text{ oz/s})$
After fuel cut	$\geq 3000 \text{ ms}$
Idle switch	OFF

4. GENERAL DRIVING CYCLE

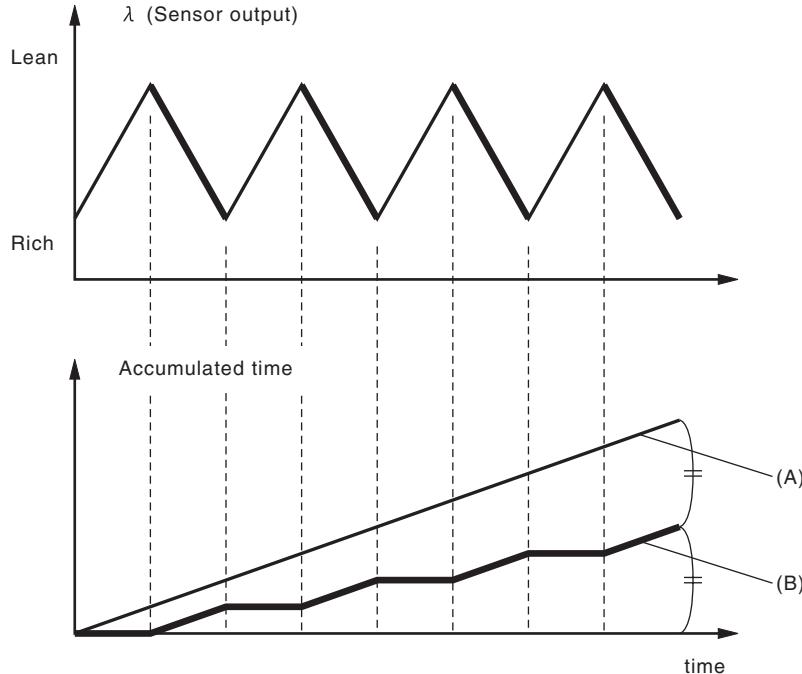
Perform diagnosis only once in a city driving including normal acceleration and deceleration.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD 1

Detect the malfunction by checking “Cumulative value of time when λ changes from lean → rich” in comparison to “Time during which diagnosis is in progress”.



EN-09340

(A) Time during which diagnosis is in progress (B) Cumulative value of time when λ changes from lean → rich

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Cumulative value of time when λ changes from lean → rich) / (Time during which diagnosis is in progress)	< 0.35 (CVT model) < 0.39 (MT model)	P014C
	> 0.65 (CVT model) > 0.59 (MT model)	P014D

Time Needed for Diagnosis: 90 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Cumulative value of time when λ changes from lean → rich) / (Time during which diagnosis is in progress)	≥ 0.35 (CVT model) ≥ 0.39 (MT model)	P014C
	≤ 0.65 (CVT model) ≤ 0.59 (MT model)	P014D

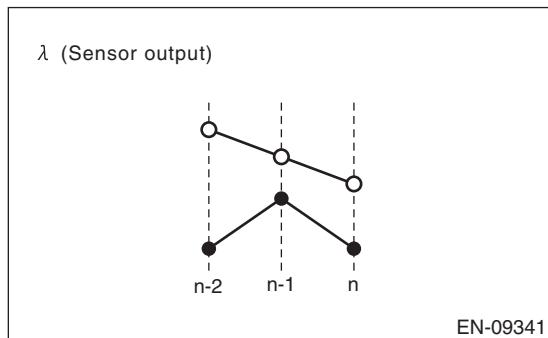
Time Needed for Diagnosis: 90 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DIAGNOSTIC METHOD 2

Detect the malfunction by the cumulative value obtained from the amount of variation in λ change.



• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Cumulative value obtained from the amount of variation in λ change $\Sigma (\lambda(n) - \lambda(n-1)) - (\lambda(n-1) - \lambda(n-2)) $	< Value from Map	P014C and P014D

Map (CVT model except for PZEV)

Cumulative value obtained from the amount of variation in λ $\Sigma \lambda(n) - \lambda(n-1) $	0.00	5.00
Cumulative value obtained from the amount of variation in λ change	0.00	3.00

Map (MT model except for PZEV)

Cumulative value obtained from the amount of variation in λ $\Sigma \lambda(n) - \lambda(n-1) $	0.00	3.00
Cumulative value obtained from the amount of variation in λ change	0.00	9.00

Map (PZEV CVT model)

Cumulative value obtained from the amount of variation in λ $\Sigma \lambda(n) - \lambda(n-1) $	0.00	3.50
Cumulative value obtained from the amount of variation in λ change	0.00	3.50

Map (PZEV MT model)

Cumulative value obtained from the amount of variation in λ $\Sigma \lambda(n) - \lambda(n-1) $	0.00	2.00	4.00
Cumulative value obtained from the amount of variation in λ change	0.00	7.00	9.00

Time Needed for Diagnosis: 90 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Cumulative value obtained from the amount of variation in λ change $\Sigma (\lambda(n) - \lambda(n-1)) - (\lambda(n-1) - \lambda(n-2)) $	\geq Value from Map	P014C and P014D

Time Needed for Diagnosis: 90 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AX:DTC P014D O2 SENSOR SLOW RESPONSE - LEAN TO RICH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P014C. <Ref. to GD(H4DO)-73, DTC P014C O2 SENSOR SLOW RESPONSE - RICH TO LEAN (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

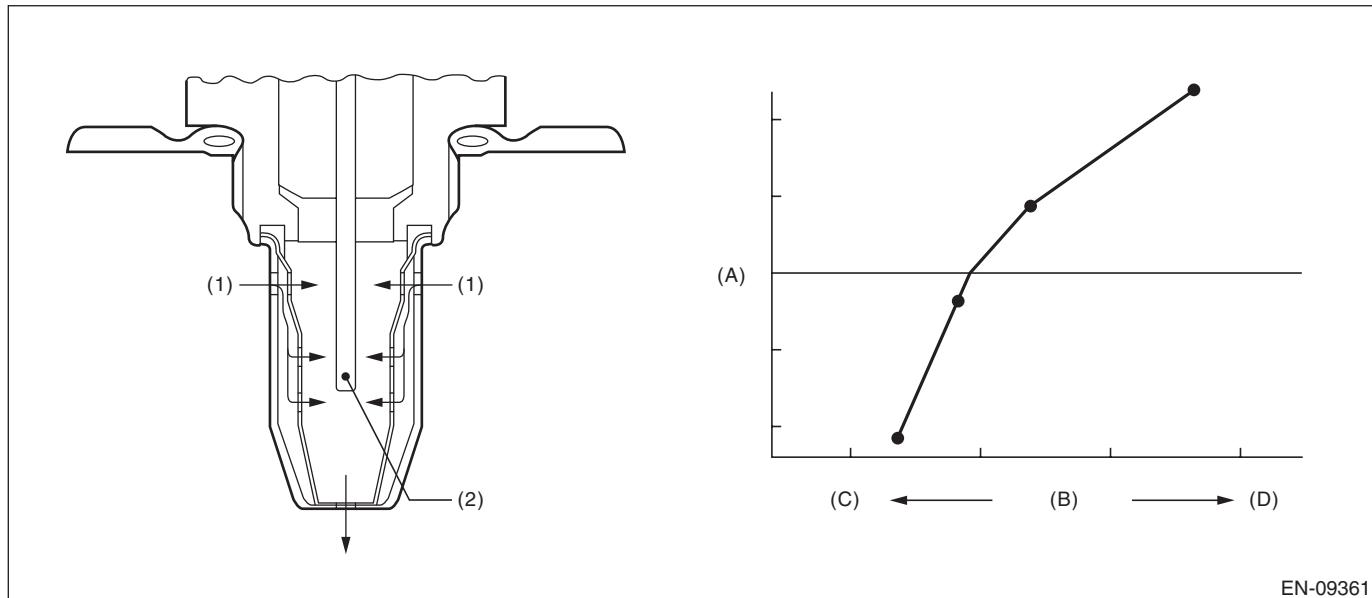
AY:DTC P015A O2 SENSOR DELAYED RESPONSE - RICH TO LEAN (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

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

For diagnosis, detect the trouble by processing the λ waveform in normal driving without forcibly changing the target air fuel ratio.

2. COMPONENT DESCRIPTION



EN-09361

(A) Electromotive force
(D) Rich

(B) Air fuel ratio

(C) Lean

(1) Exhaust gas

(2) ZrO_2

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITIONS

Diagnostic method 1

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	$\geq 0 \Omega$ and $< 87 \Omega$
Elapsed time after starting the engine	$\geq 0 \text{ ms}$
Engine coolant temperature	$\geq -40^\circ\text{C} (-40^\circ\text{F})$
Engine speed	$\geq 1000 \text{ rpm}$
Amount of intake air	$\geq 10 \text{ g/s (0.35 oz/s)}$
After fuel cut	$\geq 3000 \text{ ms}$
Idle switch	OFF

Diagnostic method 2

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	$\geq 0 \Omega$ and $< 87 \Omega$
Elapsed time after starting the engine	$\geq 0 \text{ ms}$
Engine coolant temperature	$\geq -40^\circ\text{C} (-40^\circ\text{F})$
Engine speed	$\geq 1000 \text{ rpm}$
Amount of intake air	$\geq 10 \text{ g/s (0.35 oz/s)}$
After fuel cut	$\geq 3000 \text{ ms}$
Learning value of EVAP conc. during purge	< 1
Total time of operating canister purge	$\geq 0 \text{ s}$
Engine load change	$< 255 \text{ g/rev (8.99 oz/rev)}$
Idle switch	OFF

DIAGNOSIS METHOD 3 (MT MODEL ONLY)

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	$\geq 0 \Omega$ and $< 87 \Omega$
Elapsed time after starting the engine	$\geq 120000 \text{ ms}$
Engine coolant temperature	$\geq 60^\circ\text{C} (140^\circ\text{F})$
Vehicle speed	$\geq 40 \text{ km/h (24.9 MPH)}$
Engine speed	$\geq 1000 \text{ rpm}$ and $< 4000 \text{ rpm}$
Amount of intake air	$\geq 7.5 \text{ g/s (0.26 oz/s)}$ and $< 40 \text{ g/s (1.41 oz/s)}$
Learning value of EVAP conc. during purge	< 1
Catalyst depletion diagnosis	Not under diagnosis

Diagnostic Trouble Code (DTC) Detecting Criteria

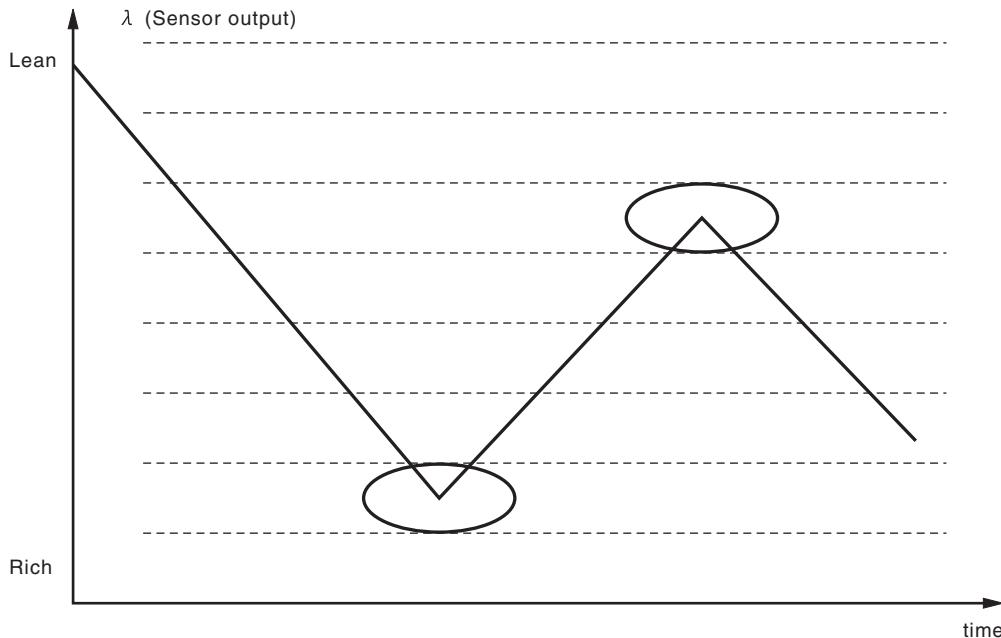
GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform diagnosis only once in a city driving including normal acceleration and deceleration.

5. DIAGNOSTIC METHOD 1

Detect the malfunction depending on the average value of time necessary for λ to inverse the air fuel ratio from "Lean \rightarrow Rich \rightarrow Lean" to "Rich \rightarrow Lean \rightarrow Rich".



EN-09342

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Average value of time necessary for λ to inverse the air fuel ratio to Lean \rightarrow Rich \rightarrow Lean	> 150 ms (CVT model except for PZEV) > 130 ms (MT model except for PZEV) > 150 ms (PZEV CVT model) > 170 ms (PZEV MT model)	P015A
Average value of time necessary for λ to inverse the air fuel ratio to Rich \rightarrow Lean \rightarrow Rich	> 350 ms (CVT model except for PZEV) > 170 ms (MT model except for PZEV) > 200 ms (PZEV CVT model) > 150 ms (PZEV MT model)	P015B

Time Needed for Diagnosis: 50 times of inversion

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 and clear the NG if the following conditions are established.

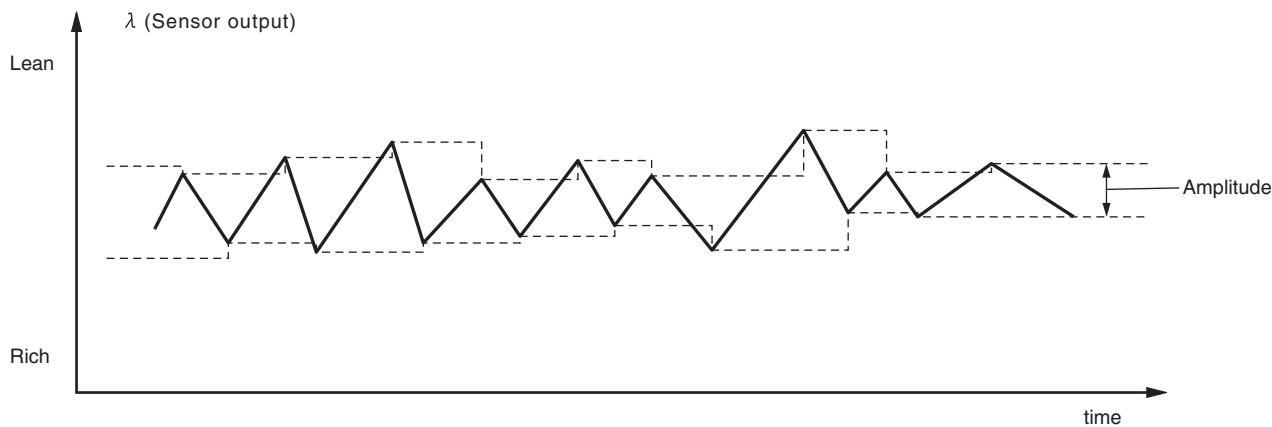
Judgment Value

Malfunction Criteria	Threshold Value	DTC
Average value of time necessary for λ to inverse the air fuel ratio to Lean \rightarrow Rich \rightarrow Lean	≤ 150 ms (CVT model except for PZEV) ≤ 130 ms (MT model except for PZEV) ≤ 150 ms (PZEV CVT model) ≤ 170 ms (PZEV MT model)	P015A
Average value of time necessary for λ to inverse the air fuel ratio to Rich \rightarrow Lean \rightarrow Rich	≤ 350 ms (CVT model except for PZEV) ≤ 170 ms (MT model except for PZEV) ≤ 200 ms (PZEV CVT model) ≤ 150 ms (PZEV MT model)	P015B

Time Needed for Diagnosis: 50 times of inversion

6. DIAGNOSTIC METHOD 2

Detect the malfunction by calculating the average amplitude of λ .



EN-09343

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Average value for λ amplitude	> 0.07 (CVT model) > 0.1 (MT model)	P015A and P015B

Time Needed for Diagnosis: 11250 time(s) \times 8 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

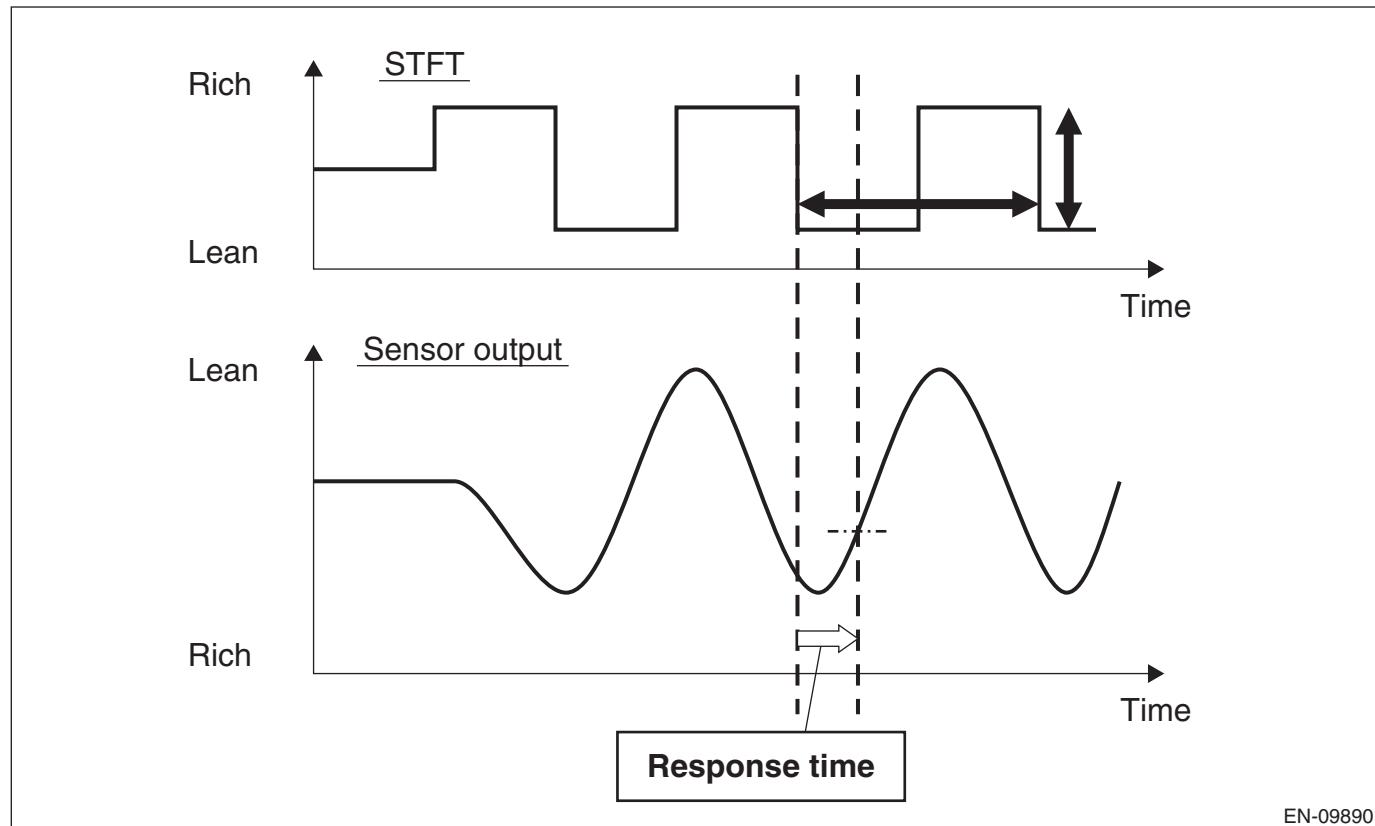
Judgment Value

Malfunction Criteria	Threshold Value	DTC
Average value for λ amplitude	≤ 0.07 (CVT model) ≤ 0.1 (MT model)	P015A and P015B

Time Needed for Diagnosis: 11250 time(s) \times 8 ms

7. DIAGNOSIS METHOD 3 (MT MODEL ONLY)

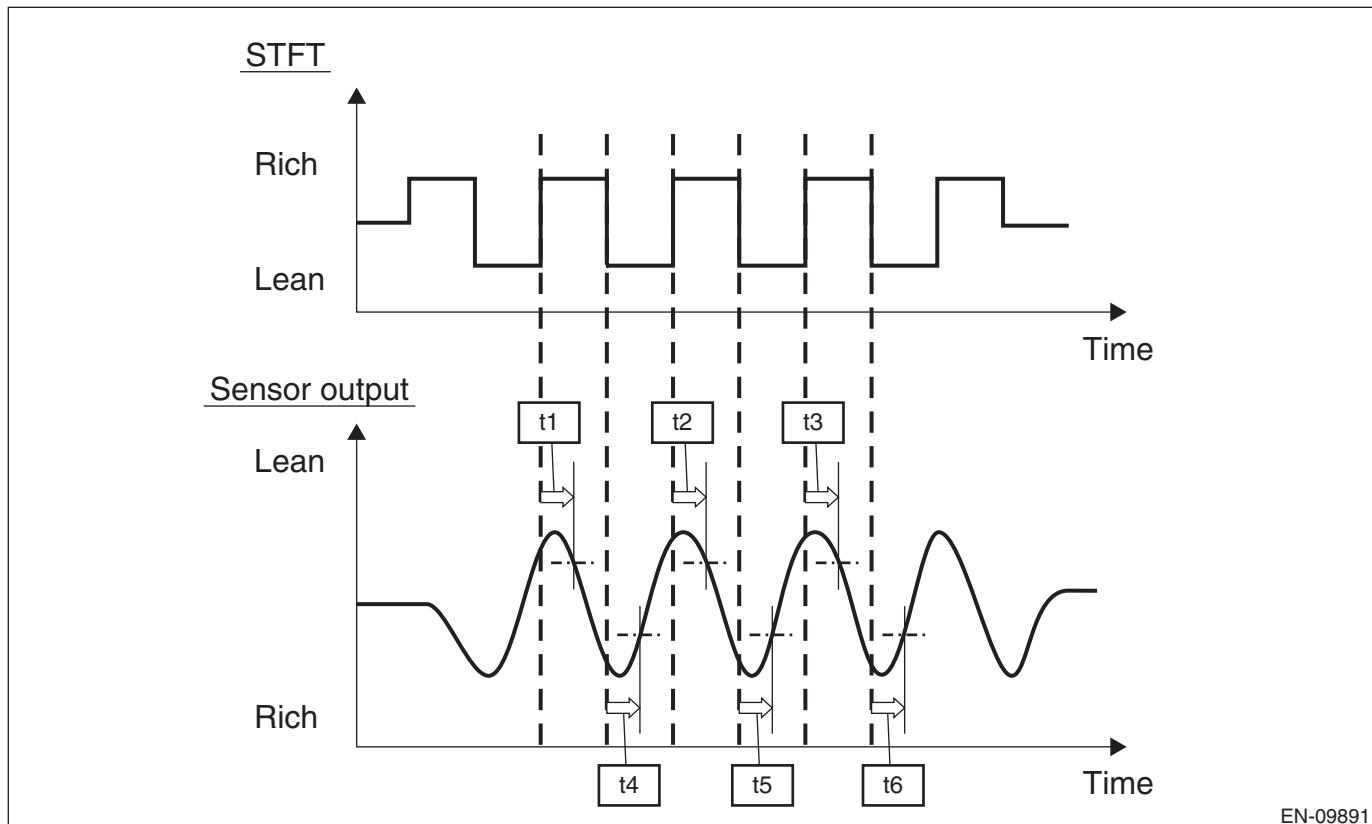
Change STFT (A/F compensation value) by interruption, and measure the reaction time of λ value. When A/F sensor malfunctions, the reaction time takes longer than at normal condition. In this case, judge as abnormal.



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Measure reaction time (t_1, t_2, t_3) and reaction time (t_4, t_5, t_6). Use the average value of the reaction time to obtain the diagnostic value.



• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
$(t_1 + t_2 + t_3)/3$ and $(t_4 + t_5 + t_6)/3$	> 820 ms (except for PZEV model) > 800 ms (PZEV model) > 820 ms (except for PZEV model) > 800 ms (PZEV model)	P015A and P015B

Time Needed for Diagnosis: $1000 \text{ ms} \times [1 \text{ time(s)}/2] + 1000 \text{ ms} \times 3 \text{ time(s)} + 500 \text{ ms}$

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
$(t_1 + t_2 + t_3)/3$ or $(t_4 + t_5 + t_6)/3$	≤ 820 ms (except for PZEV model) ≤ 800 ms (PZEV model) ≤ 820 ms (except for PZEV model) ≤ 800 ms (PZEV model)	P015A and P015B

Time Needed for Diagnosis: $1000 \text{ ms} \times [1 \text{ time(s)}/2] + 1000 \text{ ms} \times 3 \text{ time(s)} + 500 \text{ ms}$

AZ:DTC P015B O2 SENSOR DELAYED RESPONSE - LEAN TO RICH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P015A. <Ref. to GD(H4DO)-77, DTC P015A O2 SENSOR DELAYED RESPONSE - RICH TO LEAN (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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	$\geq 60^{\circ}\text{C}$ (140°F)
Engine load change	$< 0.02 \text{ g/rev}$ (0 oz/rev)
Engine load	\geq Value of Map 1

Map 1 (CVT model)

Engine speed (rpm)	Idling	670	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/rev)	na	0.154 (0.01)	0.158 (0.01)	0.154 (0.01)	0.163 (0.01)	0.176 (0.01)	0.19 (0.01)	0.218 (0.01)	0.229 (0.01)	0.25 (0.01)

Map 1 (MT model)

Engine speed (rpm)	Idling	650	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/rev)	na	0.15 (0.01)	0.16116 (9 (0.01))	0.15800 (7 (0.01))	0.14349 (9 (0.01))	0.15624 (0.01)	0.16358 (7 (0.01))	0.18637 (2 (0.01))	0.19539 (3 (0.01))	0.21975 (9 (0.01))

3. GENERAL DRIVING CYCLE

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Compare the diagnostic value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for 10 s × 3 time(s) 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	≥ Value from Map 2

Map 2

Amount of air (g (oz)/s)	0 (0)	3.2 (0.11)	6.4 (0.23)	9.6 (0.34)	12.8 (0.45)	16 (0.56)	19.2 (0.68)
fsobdL1 (%)	1.4	1.4	1.332	1.25	1.25	1.25	1.25

Time Needed for Diagnosis: 10 s × 3 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	< 1.15

Time Needed for Diagnosis: 10 s

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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	$\geq 60^{\circ}\text{C}$ (140°F)
Engine load change	$\leq 0.02 \text{ g/rev}$ (0 oz/rev)
Learning value of EVAP conc.	< 1
Cumulative time of canister purge after engine start	$\geq 0 \text{ s}$
Continuous period after canister purge starting	$\geq 5000 \text{ ms}$
Engine load	$\geq \text{Value of Map 1}$

Map 1 (CVT model)

Engine speed (rpm)	Idling	670	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/rev)	na	0.154 (0.01)	0.158 (0.01)	0.154 (0.01)	0.163 (0.01)	0.176 (0.01)	0.19 (0.01)	0.218 (0.01)	0.229 (0.01)	0.25 (0.01)

Map 1 (MT model)

Engine speed (rpm)	Idling	650	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/rev)	na	0.15 (0.01)	0.16116 9 (0.01)	0.15800 7 (0.01)	0.14349 9 (0.01)	0.15624 (0.01)	0.16358 7 (0.01)	0.18637 2 (0.01)	0.19539 3 (0.01)	0.21975 9 (0.01)

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 diagnostic value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for $10\text{ s} \times 3$ time(s) 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	< Value of Map 2

Map 2

Amount of air (g (oz)/s)	0 (0)	3.2 (0.11)	6.4 (0.23)	9.6 (0.34)	12.8 (0.45)	16 (0.56)	19.2 (0.68)
fsobdL1 (%)	0.6	0.6	0.668	0.735	0.735	0.735	0.735

Time Needed for Diagnosis: $10\text{ s} \times 3$ time(s)

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

• Normality Judgment

Judge as OK if the status that the criteria below are met continues for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) +faf + flaf$	≥ 0.85

Time Needed for Diagnosis: 10 s

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

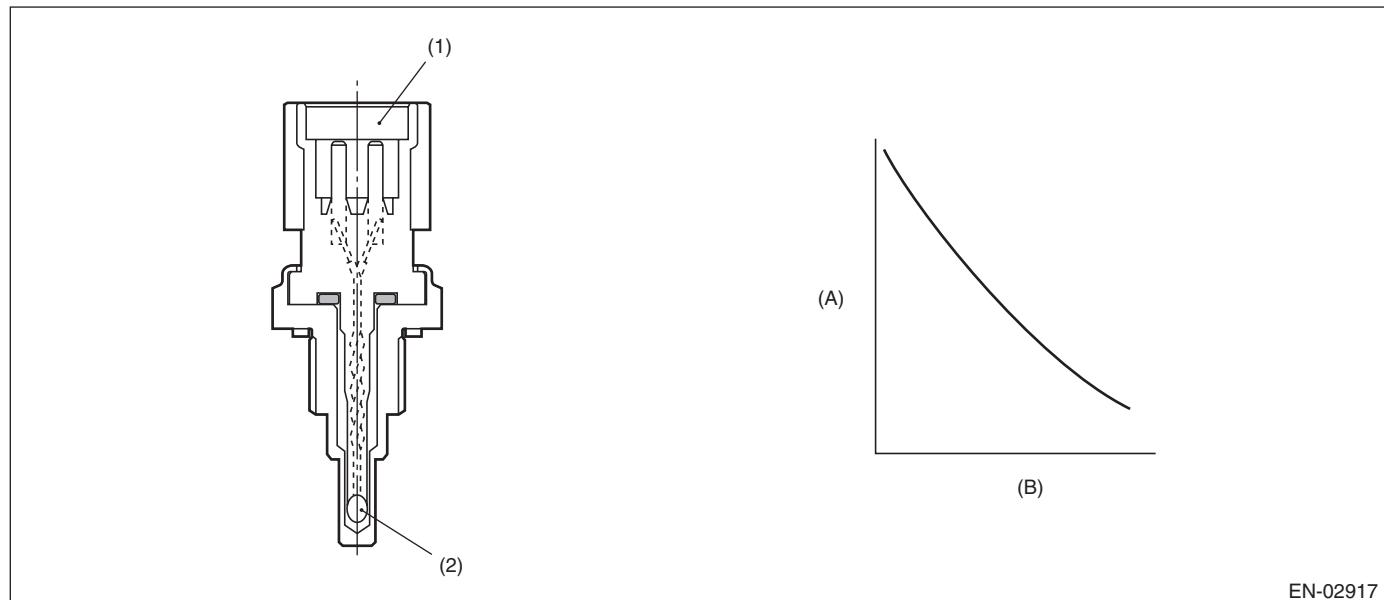
BC:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/ PERFORMANCE

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. COMPONENT DESCRIPTION



EN-02917

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

(1) Connector (2) Thermistor element

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine oil temperature at engine starting	< 40 °C (104 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Engine oil temperature	< 40 °C (104 °F)
After engine start oil temperature sensor characteristic diagnosis timer	≥ 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 ms + TOILCNT ms (when at 64 ms)

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 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
Lowest engine oil temperature °C (°F)	-20 (-4)	0	26.546	32.525	39.359	57.696	81.469	107.490	129.459
	-10 (14)	0	23.945	29.753	36.390	52.766	75.211	97.658	118.256
	0 (32)	0	21.564	27.215	33.673	47.872	67.555	87.207	105.833
	10 (50)	0	17.464	22.844	28.992	40.993	55.379	71.445	85.303
	30 (86)	0	3.840	8.320	13.440	19.840	28.160	37.760	46.720

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

$$t = 1631442 - 46424 \times Ti \quad (t \geq 238722)$$

Ti = The lowest engine oil temperature after starting the engine

Time Needed for Diagnosis: Less than 1 second

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Engine oil temperature	≥ 40 °C (104 °F)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

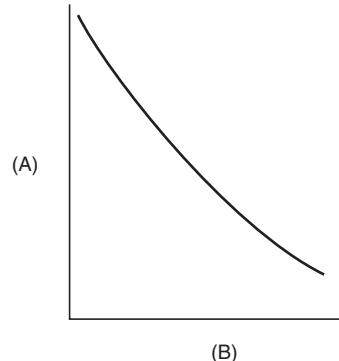
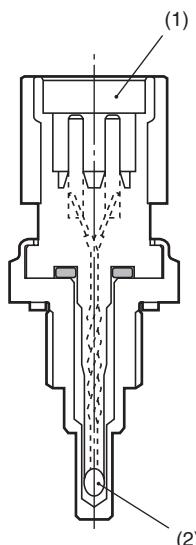
GENERAL DESCRIPTION

BD: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 outside of the judgment value.

2. COMPONENT DESCRIPTION



EN-02917

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

(1) Connector (2) Thermistor element

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	< 0.203 V

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.203 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

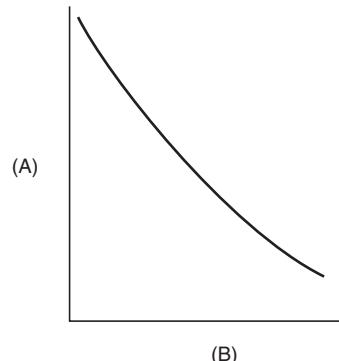
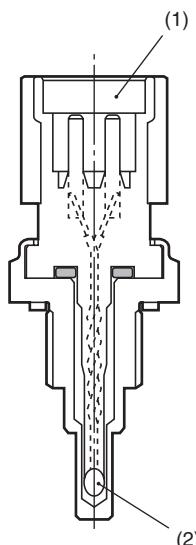
GENERAL DESCRIPTION

BE: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. COMPONENT DESCRIPTION



EN-02917

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

(1) Connector (2) Thermistor element

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	≥ 4.698 V

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.698 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BF:DTC P0201 INJECTOR #1

1. OUTLINE OF DIAGNOSIS

Based on the self-diagnostic result of the injector driving IC, judge the injector driving circuit as normal or abnormal.

Injector driving IC detects the status of “fuel remains injected” or “fuel is not injected” as a malfunction.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	> 1 s
Engine speed	> 500 rpm
Injection time	$\geq 1000 \mu\text{s}$ and $< 120000000/\text{engine speed} - 1000 \mu\text{s}$
Injection status	Not during fuel cut and Not during asynchronous injection controlled by crankshaft position sensor

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Injector driving IC information	Malfunction

Time Needed for Diagnosis: 2500 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Injector driving IC information	Normal

Time Needed for Diagnosis: Less than 1 second

BG:DTC P0202 INJECTOR #2

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0201. <Ref. to GD(H4DO)-94, DTC P0201 INJECTOR #1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BH:DTC P0203 INJECTOR #3

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0201. <Ref. to GD(H4DO)-94, DTC P0201 INJECTOR #1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BI: DTC P0204 INJECTOR #4

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0201. <Ref. to GD(H4DO)-94, DTC P0201 INJECTOR #1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

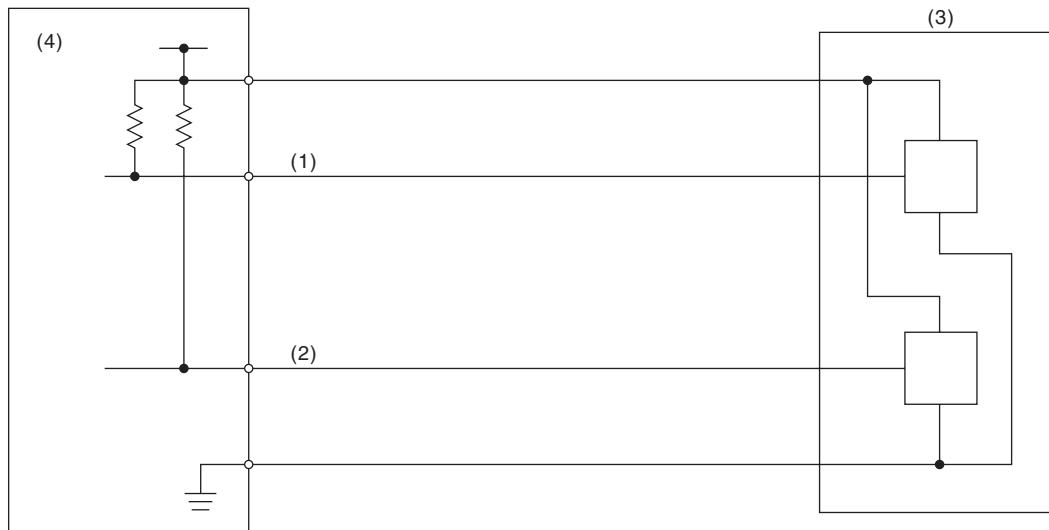
GENERAL DESCRIPTION

BJ: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



(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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Sensor 2 input voltage	$\leq 1.133 \text{ V}$

Time Needed for Diagnosis: 24 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	$> 1.133 \text{ V}$

Time Needed for Diagnosis: 24 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

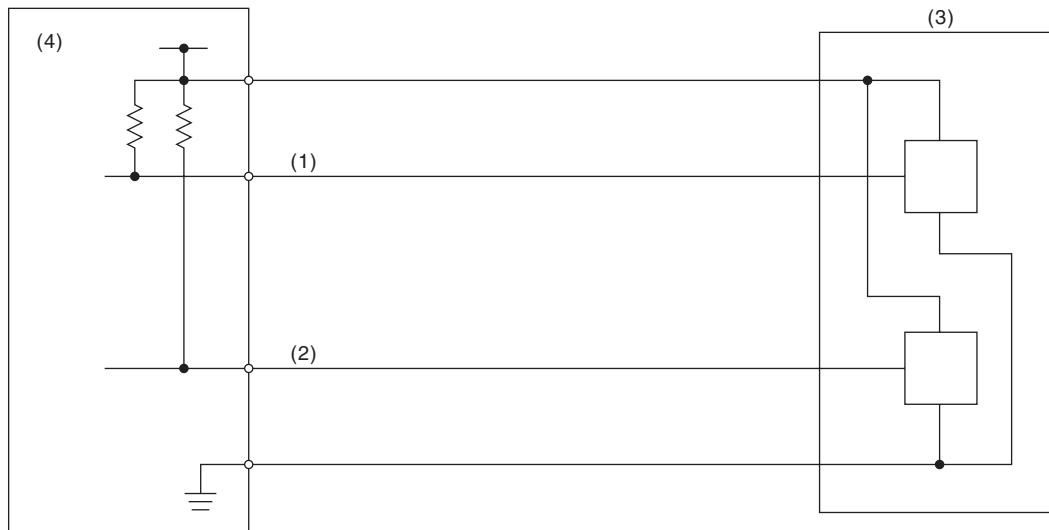
GENERAL DESCRIPTION

BK: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



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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Sensor 2 input voltage	$\geq 4.772 \text{ V}$

Time Needed for Diagnosis: 24 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	$< 4.772 \text{ V}$

Time Needed for Diagnosis: 24 ms

BL:DTC P0300 RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H4DO)-100, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BM: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 two patterns below:

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

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; CVT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or more)

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

- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	≥ 1024 ms
Intake manifold pressure change at 180°CA	$<$ Value of Map 1
Throttle position change during 16 milliseconds	$< 21^\circ$
Fuel shut-off function	Not in operation
Fuel level	≥ 9 l (2.38 US gal, 1.98 Imp gal)
Vehicle dynamic control or AT torque control	Not in operation
Evaporative system leak check	Not in operation
Engine speed	475 rpm — 6100 rpm (CVT model) 500 rpm — 6500 rpm (MT model)
Intake manifold pressure	\geq Value from Map 2
Battery voltage	≥ 8 V
Fuel parameter determination	Not extremely low volatility
Elapsed time after starting the engine	≥ 0 ms
Engine speed change during 32 milliseconds	< 1000 rpm

Map 1

- CVT model

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	26.7 (200, 7.9)												

- MT model

rpm	650	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	26.7 (200, 7.9)												

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 2 (CVT model)

- Normal ignition

		Barometric pressure (kPa (mmHg, inHg))						
		66 (495, 19.5)	74.2 (557, 21.9)	79.7 (598, 23.5)	83.8 (629, 24.8)	87 (653, 25.7)	91.7 (688, 27.1)	100.1 (751, 29.6)
Engine speed (rpm)	675	19.1 (142.9, 5.6)	20.3 (152.4, 6)	23.8 (178.8, 7)	25.1 (188.0, 7.4)	25.6 (192.1, 7.6)	26.9 (202.1, 8)	28.3 (212.2, 8.4)
	1000	17.5 (131.2, 5.2)	18.4 (138.1, 5.4)	21 (157.5, 6.2)	21.9 (164.4, 6.5)	22.3 (167.1, 6.6)	23.8 (178.2, 7)	25 (187.2, 7.4)
	1200	16.6 (124.3, 4.9)	17.7 (132.5, 5.2)	19.8 (148.8, 5.9)	20.9 (156.7, 6.2)	21.3 (159.9, 6.3)	22.7 (170.5, 6.7)	23.1 (173.6, 6.8)
	1600	16.1 (120.9, 4.8)	17.4 (130.6, 5.1)	19.6 (146.7, 5.8)	20.3 (152.3, 6)	20.5 (153.6, 6)	21.6 (162.3, 6.4)	22.5 (168.7, 6.6)
	2000	18 (134.9, 5.3)	19 (142.5, 5.6)	21.1 (158.3, 6.2)	22 (165.3, 6.5)	22.3 (167.1, 6.6)	23.5 (176.0, 6.9)	24.2 (181.5, 7.1)
	2400	18 (135.4, 5.3)	19.1 (143.0, 5.6)	20.8 (156.2, 6.2)	21.8 (163.2, 6.4)	22.2 (166.2, 6.5)	23 (172.8, 6.8)	23.9 (179.3, 7.1)
	2800	18.5 (138.9, 5.5)	19.4 (145.2, 5.7)	21.5 (161.1, 6.3)	22.1 (166.1, 6.5)	22.4 (168.3, 6.6)	23.4 (175.7, 6.9)	24.2 (181.6, 7.1)
	3000	18.7 (140.4, 5.5)	19.6 (147.1, 5.8)	22 (165.0, 6.5)	22.3 (167.6, 6.6)	22.6 (169.6, 6.7)	23.8 (178.3, 7)	24.3 (182.4, 7.2)
	3200	22 (164.7, 6.5)	22.7 (170.4, 6.7)	25.8 (193.5, 7.6)	26.4 (197.8, 7.8)	26.6 (199.2, 7.8)	27.6 (206.7, 8.1)	28.5 (213.6, 8.4)
	3600	22.7 (170.7, 6.7)	23.4 (175.9, 6.9)	26.5 (198.6, 7.8)	26.8 (200.9, 7.9)	27 (202.9, 8)	28.1 (210.6, 8.3)	28.6 (214.5, 8.4)
	4000	24 (179.9, 7.1)	24 (180.4, 7.1)	27.2 (204.0, 8)	27.3 (205.1, 8.1)	27.7 (207.7, 8.2)	28.7 (215.3, 8.5)	29 (217.7, 8.6)
	4400	25.6 (191.7, 7.5)	25.6 (192.1, 7.6)	28.8 (215.7, 8.5)	28.9 (216.9, 8.5)	29.3 (219.5, 8.6)	30.3 (227.1, 8.9)	30.6 (229.5, 9)
	4800	27.1 (203.5, 8)	27.2 (203.9, 8)	30.3 (227.5, 9)	30.5 (228.7, 9)	30.8 (231.3, 9.1)	31.8 (238.8, 9.4)	32.2 (241.3, 9.5)
	5200	28.7 (215.2, 8.5)	28.7 (215.7, 8.5)	31.9 (239.3, 9.4)	32 (240.4, 9.5)	32.4 (243.0, 9.6)	33.4 (250.6, 9.9)	33.7 (253.0, 10)
	5600	30.3 (227.0, 8.9)	30.3 (227.4, 9)	33.5 (251.0, 9.9)	33.6 (252.2, 9.9)	34 (254.8, 10)	35 (262.4, 10.3)	35.3 (264.8, 10.4)
	6000	31.8 (238.7, 9.4)	31.9 (239.2, 9.4)	35 (262.8, 10.3)	35.2 (263.9, 10.4)	35.5 (266.5, 10.5)	36.5 (274.1, 10.8)	36.9 (276.6, 10.9)
	6400	33.4 (250.5, 9.9)	33.5 (251.0, 9.9)	36.6 (274.6, 10.8)	36.8 (275.7, 10.9)	37.1 (278.3, 11)	38.1 (285.9, 11.3)	38.4 (288.3, 11.4)
kPa (mmHg, inHg)								

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- Idling ignition

		Barometric pressure (kPa (mmHg, inHg))						
		66 (495, 19.5)	74.2 (557, 21.9)	79.7 (598, 23.5)	83.8 (629, 24.8)	87 (653, 25.7)	91.7 (688, 27.1)	100.1 (751, 29.6)
Engine speed (rpm)	675	19.3 (144.9, 5.7)	20.7 (155.4, 6.1)	24.1 (180.8, 7.1)	25.7 (192.8, 7.6)	25.7 (192.8, 7.6)	27.2 (203.7, 8)	29.3 (220.1, 8.7)
	1000	18.9 (141.7, 5.6)	20.5 (153.8, 6.1)	24 (179.7, 7.1)	25 (187.7, 7.4)	25.4 (190.3, 7.5)	26.8 (201.1, 7.9)	28.2 (211.7, 8.3)
	1200	18.6 (139.3, 5.5)	20.2 (151.2, 6)	23.4 (175.7, 6.9)	24.6 (184.3, 7.3)	24.6 (184.3, 7.3)	26.1 (195.5, 7.7)	27.1 (203.1, 8)
	1600	18 (135.3, 5.3)	19.6 (147.0, 5.8)	22 (165.1, 6.5)	23.5 (176.0, 6.9)	23.5 (176.0, 6.9)	24.9 (186.9, 7.4)	25.9 (194.7, 7.7)
	2000	18.6 (139.5, 5.5)	19.6 (147.0, 5.8)	22.2 (166.2, 6.5)	23.3 (174.7, 6.9)	23.3 (174.7, 6.9)	24.4 (183.0, 7.2)	25.9 (194.0, 7.6)
	2400	18.2 (136.6, 5.4)	19.7 (147.5, 5.8)	21.7 (162.7, 6.4)	22.8 (171.1, 6.7)	22.8 (171.1, 6.7)	24 (179.7, 7.1)	24.9 (186.5, 7.3)
	2800	18.5 (138.9, 5.5)	19.6 (147.3, 5.8)	21.5 (161.1, 6.3)	22.7 (170.4, 6.7)	22.8 (170.9, 6.7)	23.4 (175.7, 6.9)	25 (187.3, 7.4)
	3000	18.7 (140.4, 5.5)	19.8 (148.6, 5.9)	22 (165.0, 6.5)	22.8 (171.0, 6.7)	22.8 (171.0, 6.7)	23.8 (178.6, 7)	24.9 (187.1, 7.4)
	3200	22.8 (170.7, 6.7)	23.9 (179.2, 7.1)	26.5 (198.7, 7.8)	27.4 (205.8, 8.1)	27.4 (205.8, 8.1)	28.7 (215.4, 8.5)	29.8 (223.3, 8.8)
	3600	23.3 (174.6, 6.9)	24.1 (180.9, 7.1)	26.5 (198.6, 7.8)	27.6 (207.4, 8.2)	27.6 (207.4, 8.2)	28.6 (214.7, 8.5)	29.7 (222.6, 8.8)
	4000	24 (179.9, 7.1)	24.6 (184.4, 7.3)	27.2 (204.0, 8)	28 (210.0, 8.3)	28 (210.0, 8.3)	28.8 (216.4, 8.5)	29.9 (224.0, 8.8)
	4400	25.6 (191.7, 7.5)	26.2 (196.2, 7.7)	28.8 (215.7, 8.5)	29.6 (221.8, 8.7)	29.6 (221.8, 8.7)	30.4 (228.2, 9)	31.4 (235.7, 9.3)
	4800	27.1 (203.5, 8)	27.7 (208.0, 8.2)	30.3 (227.5, 9)	31.1 (233.5, 9.2)	31.1 (233.5, 9.2)	32 (239.9, 9.4)	33 (247.5, 9.7)
	5200	28.7 (215.2, 8.5)	29.3 (219.7, 8.7)	31.9 (239.3, 9.4)	32.7 (245.3, 9.7)	32.7 (245.3, 9.7)	33.5 (251.7, 9.9)	34.6 (259.3, 10.2)
	5600	30.3 (227.0, 8.9)	30.9 (231.5, 9.1)	33.5 (251.0, 9.9)	34.3 (257.1, 10.1)	34.3 (257.1, 10.1)	35.1 (263.5, 10.4)	36.1 (271.0, 10.7)
	6000	31.8 (238.7, 9.4)	32.4 (243.2, 9.6)	35 (262.8, 10.3)	35.8 (268.8, 10.6)	35.8 (268.8, 10.6)	36.7 (275.2, 10.8)	37.7 (282.8, 11.1)
	6400	33.4 (250.5, 9.9)	34 (255.0, 10)	36.6 (274.6, 10.8)	37.4 (280.6, 11)	37.4 (280.6, 11)	38.3 (287.0, 11.3)	39.3 (294.6, 11.6)

kPa (mmHg, inHg)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 2 (MT model)

- Normal ignition

		Barometric pressure (kPa (mmHg, inHg))						
		65.5 (491, 19.3)	73.4 (551, 21.7)	80 (600, 23.6)	84.1 (631, 24.8)	86.9 (652, 25.7)	92.1 (691, 27.2)	100.5 (754, 29.7)
Engine speed (rpm)	700	20.6 (154.3, 6.1)	21.8 (163.3, 6.4)	23.2 (174.0, 6.9)	24.4 (183.0, 7.2)	24.9 (187.0, 7.4)	26.3 (197.0, 7.8)	27.1 (203.7, 8)
	1000	18 (135.3, 5.3)	19.2 (144.3, 5.7)	20 (150.0, 5.9)	21.1 (158.0, 6.2)	21.5 (161.0, 6.3)	22.8 (171.0, 6.7)	24 (179.9, 7.1)
	1200	17 (127.3, 5)	18.2 (136.3, 5.4)	19.3 (145.0, 5.7)	20.1 (151.0, 5.9)	20.3 (152.0, 6)	21.2 (159.0, 6.3)	22.6 (169.7, 6.7)
	1600	16.6 (124.3, 4.9)	17.8 (133.3, 5.2)	18.3 (137.0, 5.4)	19.1 (143.0, 5.6)	19.9 (149.0, 5.9)	20.5 (154.0, 6.1)	21.9 (164.2, 6.5)
	2000	16.7 (125.3, 4.9)	17.9 (134.3, 5.3)	18.9 (142.0, 5.6)	19.6 (147.0, 5.8)	20.1 (151.0, 5.9)	21.3 (160.0, 6.3)	22.2 (166.2, 6.5)
	2400	16.3 (122.3, 4.8)	17.5 (131.3, 5.2)	18.4 (138.0, 5.4)	19.1 (143.0, 5.6)	19.6 (147.0, 5.8)	20.3 (152.0, 6)	21.4 (160.6, 6.3)
	2800	16.6 (124.3, 4.9)	17.8 (133.3, 5.2)	18.8 (141.0, 5.6)	19.5 (146.0, 5.7)	19.5 (146.0, 5.7)	20.8 (156.0, 6.1)	21.8 (163.2, 6.4)
	3000	16.8 (126.3, 5)	18 (135.3, 5.3)	18.9 (142.0, 5.6)	19.5 (146.0, 5.7)	19.9 (149.0, 5.9)	21.2 (159.0, 6.3)	22 (164.8, 6.5)
	3200	20.4 (153.1, 6)	21 (157.9, 6.2)	21 (157.9, 6.2)	22.2 (166.9, 6.6)	22.2 (166.9, 6.6)	23.4 (175.9, 6.9)	24.2 (181.7, 7.2)
	3600	21.3 (159.9, 6.3)	22.5 (168.9, 6.6)	23.5 (176.6, 7)	24.5 (183.6, 7.2)	24.5 (183.6, 7.2)	25.8 (193.6, 7.6)	26.4 (198.3, 7.8)
	4000	21.9 (164.7, 6.5)	23.1 (173.7, 6.8)	24.2 (181.4, 7.1)	24.8 (186.4, 7.3)	24.8 (186.4, 7.3)	26.4 (198.4, 7.8)	26.5 (199.0, 7.8)
	4400	22.7 (170.4, 6.7)	23.9 (179.4, 7.1)	24.8 (186.2, 7.3)	25.6 (192.2, 7.6)	25.6 (192.2, 7.6)	26.8 (201.2, 7.9)	27.8 (208.3, 8.2)
	4800	25.2 (189.2, 7.4)	26.4 (198.2, 7.8)	27.6 (206.9, 8.1)	28.1 (210.9, 8.3)	28.1 (210.9, 8.3)	29.6 (221.9, 8.7)	30.2 (226.6, 8.9)
	5200	27.7 (208.0, 8.2)	28.9 (217.0, 8.5)	29.7 (222.7, 8.8)	30.1 (225.7, 8.9)	30.1 (225.7, 8.9)	31.7 (237.7, 9.4)	32.4 (242.8, 9.6)
	5600	30.2 (226.7, 8.9)	31.4 (235.7, 9.3)	31.8 (238.5, 9.4)	32.3 (242.5, 9.5)	32.3 (242.5, 9.5)	34.2 (256.5, 10.1)	34.6 (259.2, 10.2)
	6000	32.5 (243.5, 9.6)	33.7 (252.5, 9.9)	35.1 (263.2, 10.4)	35.2 (264.2, 10.4)	35.2 (264.2, 10.4)	37 (277.2, 10.9)	38.3 (287.5, 11.3)
	6400	34 (255.3, 10)	35.2 (264.3, 10.4)	38.1 (286.0, 11.3)	38.9 (292.0, 11.5)	38.9 (292.0, 11.5)	40.8 (306.0, 12)	42.7 (320.5, 12.6)

kPa (mmHg, inHg)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- Idling ignition

		Barometric pressure (kPa (mmHg, inHg))						
		65.5 (491, 19.3)	73.4 (551, 21.7)	80 (600, 23.6)	84.1 (631, 24.8)	86.9 (652, 25.7)	92.1 (691, 27.2)	100.5 (754, 29.7)
Engine speed (rpm)	700	20.7 (155.3, 6.1)	21.9 (164.3, 6.5)	23.2 (174.0, 6.9)	24.4 (183.0, 7.2)	24.9 (187.0, 7.4)	26.3 (197.0, 7.8)	27.1 (203.7, 8)
	1000	20.3 (152.3, 6)	21.5 (161.3, 6.3)	22.4 (168.0, 6.6)	23.5 (176.0, 6.9)	24.3 (182.0, 7.2)	25.6 (192.0, 7.6)	26.5 (198.5, 7.8)
	1200	19.9 (149.3, 5.9)	21.1 (158.3, 6.2)	22.1 (166.0, 6.5)	23.2 (174.0, 6.9)	23.9 (179.0, 7)	25.2 (189.0, 7.4)	25.9 (194.4, 7.7)
	1600	19.5 (146.3, 5.8)	20.7 (155.3, 6.1)	22.1 (166.0, 6.5)	22.8 (171.0, 6.7)	23.9 (179.0, 7)	25.1 (188.0, 7.4)	25.9 (194.3, 7.6)
	2000	19.2 (144.3, 5.7)	20.4 (153.3, 6)	21.6 (162.0, 6.4)	22.8 (171.0, 6.7)	23.3 (175.0, 6.9)	24.9 (187.0, 7.4)	25.4 (190.8, 7.5)
	2400	19 (142.3, 5.6)	20.2 (151.3, 6)	21.6 (162.0, 6.4)	22.7 (170.0, 6.7)	22.8 (171.0, 6.7)	24.5 (184.0, 7.2)	25.2 (189.3, 7.5)
	2800	19.2 (144.3, 5.7)	20.4 (153.3, 6)	21.5 (161.0, 6.3)	22.1 (166.0, 6.5)	22.8 (171.0, 6.7)	24.1 (181.0, 7.1)	25 (187.8, 7.4)
	3000	19.1 (143.3, 5.6)	20.3 (152.3, 6)	21.2 (159.0, 6.3)	22.1 (166.0, 6.5)	22.7 (170.0, 6.7)	24 (180.0, 7.1)	24.8 (186.0, 7.3)
	3200	26.5 (199.1, 7.8)	27.7 (208.1, 8.2)	29.3 (219.9, 8.7)	30.9 (231.9, 9.1)	31.3 (234.9, 9.2)	32.1 (240.9, 9.5)	32.1 (240.9, 9.5)
	3600	25.3 (189.9, 7.5)	26.5 (198.9, 7.8)	28.1 (210.6, 8.3)	29.3 (219.6, 8.6)	29.8 (223.6, 8.8)	30.5 (228.7, 9)	30.5 (228.7, 9)
	4000	24.7 (185.7, 7.3)	25.9 (194.7, 7.7)	26.8 (201.4, 7.9)	28.4 (213.4, 8.4)	28.4 (213.4, 8.4)	29.2 (219.3, 8.6)	29.2 (219.3, 8.6)
	4400	24.9 (186.4, 7.3)	26.1 (195.4, 7.7)	27.1 (203.2, 8)	28 (210.2, 8.3)	28.5 (214.2, 8.4)	29.2 (219.2, 8.6)	30.1 (226.1, 8.9)
	4800	27.6 (207.2, 8.2)	28.8 (216.2, 8.5)	30 (224.9, 8.9)	31.3 (234.9, 9.2)	31.6 (236.9, 9.3)	32.7 (244.9, 9.6)	32.7 (245.1, 9.7)
	5200	29.3 (220.0, 8.7)	30.5 (229.0, 9)	30.9 (231.7, 9.1)	32.1 (240.7, 9.5)	32.6 (244.7, 9.6)	33.7 (252.6, 9.9)	33.7 (252.6, 9.9)
	5600	30.4 (227.7, 9)	31.6 (236.7, 9.3)	31.8 (238.5, 9.4)	32.7 (245.5, 9.7)	33.3 (249.5, 9.8)	34.6 (259.5, 10.2)	34.6 (259.7, 10.2)
	6000	32.5 (243.5, 9.6)	33.7 (252.5, 9.9)	35.1 (263.2, 10.4)	35.4 (265.2, 10.4)	36 (270.2, 10.6)	37 (277.2, 10.9)	38.3 (287.5, 11.3)
	6400	34 (255.3, 10)	35.2 (264.3, 10.4)	38.1 (286.0, 11.3)	38.9 (292.0, 11.5)	39.6 (297.0, 11.7)	40.8 (306.0, 12)	42.7 (320.5, 12.6)

kPa (mmHg, inHg)

3. GENERAL DRIVING CYCLE

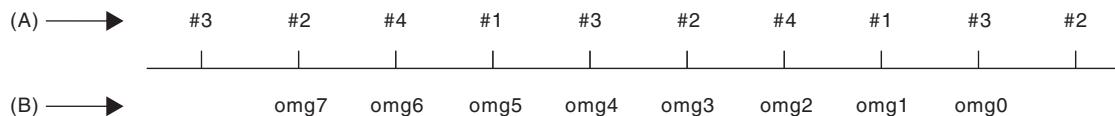
- If conditions are met, it is possible to detect the misfires from idling to high engine speed. However, to avoid excessive load or harm to the engine, perform diagnosis at idle.
- Perform the diagnosis continuously.

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. Count 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 value)
	<ul style="list-style-type: none">• 180° Interval Difference Method• 360° Interval Difference Method• 720° Interval Difference Method	<ul style="list-style-type: none">• FTP 1.5 times misfire NG judgment• Catalyst damage misfire NG judgment

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



EN-01774

(A) Ignition order

(B) Crankshaft position speed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

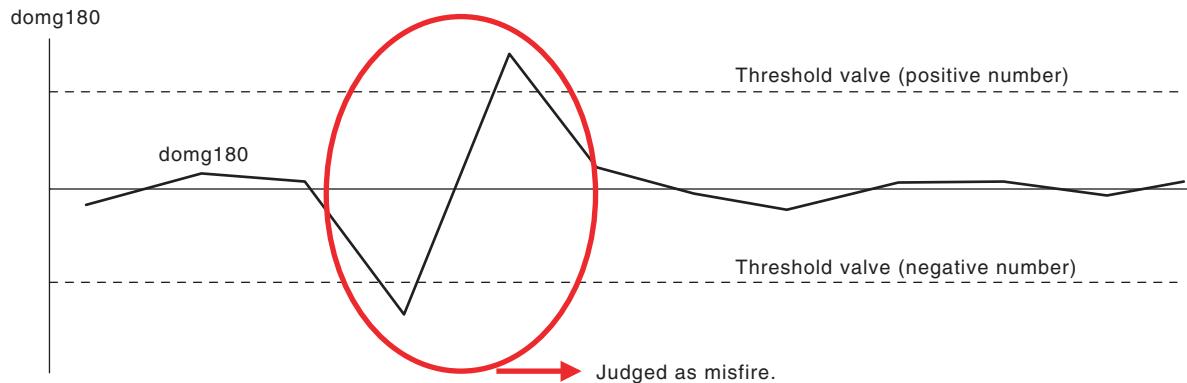
180° Interval Difference Method

Diagnostic value	$domg\ 180 = (omg\ 1 - omg\ 0) - (omg\ 5 - omg\ 1)/4$
------------------	---

Judge as a misfire in the following cases.

- $domg\ 180 > \text{judgment value of positive side}$
- $domg\ 180 \leq \text{judgment value of negative side}$

(Diagnostic value before 180° CA)

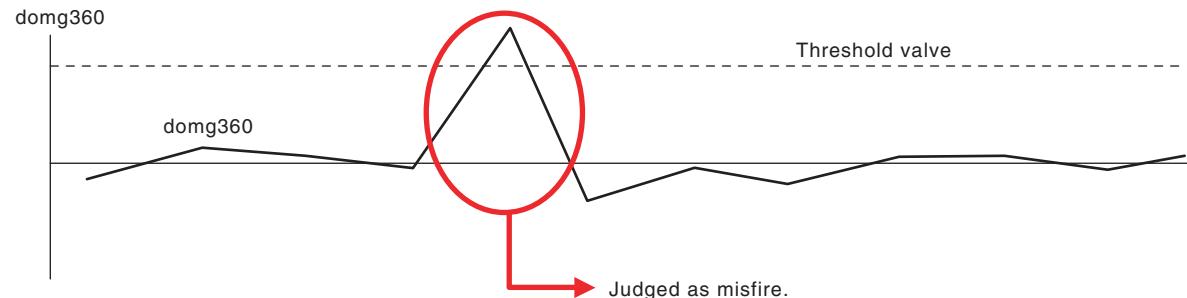


EN-02877

360° Interval Difference Method

Diagnostic value	$domg\ 360 = (omg\ 1 - omg\ 0) - (omg\ 3 - omg\ 2)$
------------------	---

Misfire judgment	$domg\ 360 > \text{Judgment value} \rightarrow \text{Judge as misfire}$
------------------	---



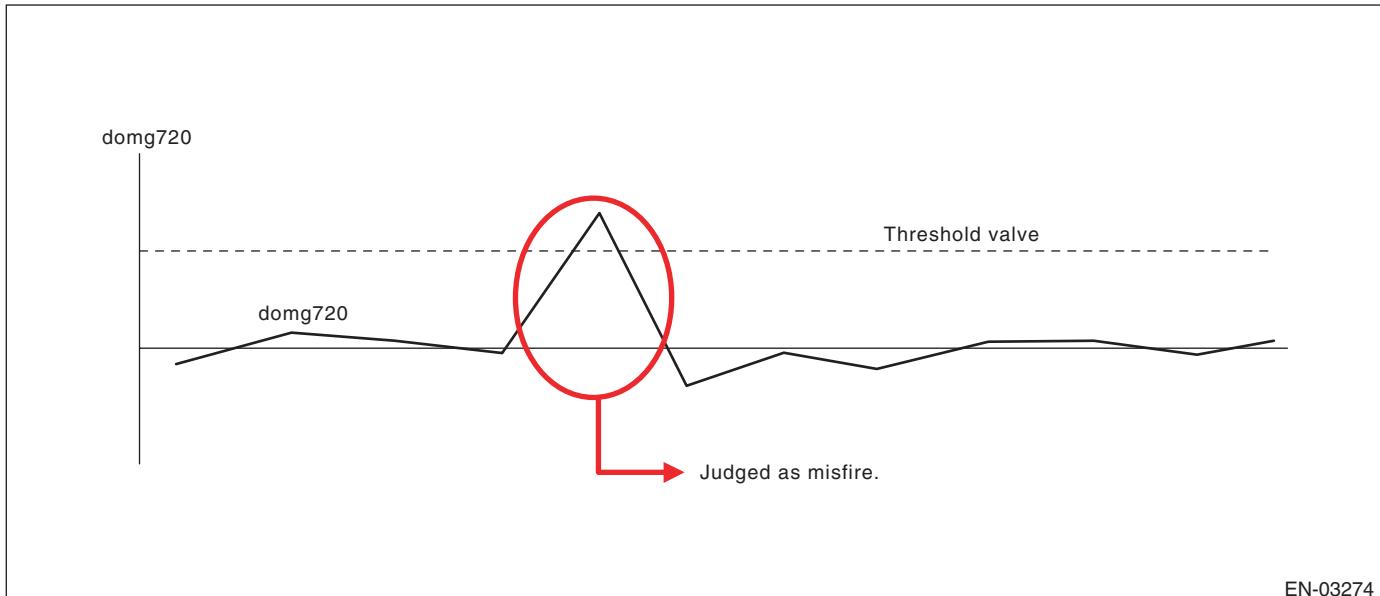
EN-03273

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

720° Interval Difference Method

Diagnostic value	$domg\ 720 = (omg\ 1 - omg\ 0) - (omg\ 5 - omg\ 4)$
Misfire judgment	$domg\ 720 > Judgment\ value \rightarrow \text{Judge as misfire}$



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

- **Abnormality Judgment**

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

Malfunction Criteria	Threshold Value
FTP emission diagnostic value	$\geq 47 \times 100/2000\% \text{ in 1000 revs. (except for PZEV model)}$
	$\geq 17 \times 100/2000\% \text{ in 1000 revs. (PZEV model)}$

Time Needed for Diagnosis: 1000 engine revs.

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

- **Normality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
FTP emission diagnostic value	$< 47 \times 100/2000\% \text{ in 1000 revs. (except for PZEV model)}$ $< 17 \times 100/2000\% \text{ in 1000 revs. (PZEV model)}$

Time Needed for Diagnosis: 1000 engine revs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- **Catalyst damage misfire (Misfire occurrence level damaging catalyst)**
- **Abnormality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire diagnostic value	\geq Value from Map 3

Map 3

		Intake air (g/oz)/rev)							
		0.2 (0.01)	0.3 (0.01)	0.4 (0.01)	0.5 (0.02)	0.6 (0.02)	0.8 (0.03)	0.9 (0.03)	1.1 (0.04)
Engine speed (rpm)	650	100	100	100	100	100	80	64	48
	1000	100	100	100	80	80	80	52	24
	1500	100	100	80	80	80	57	36	26
	2000	80	80	80	80	80	44	26	26
	2500	68	68	68	58	58	35	26	26
	3000	57	57	57	36	36	26	26	26
	3500	55	46	42	30	28	20	20	20
	4000	55	36	26	20	20	20	20	20
	4500	50	28	20	20	20	20	20	20
	5000	50	20	20	20	20	20	20	20
	5500	40	20	20	20	20	20	20	20
	6000	40	20	20	20	20	20	20	20
	6400	40	20	20	20	20	20	20	20

Time Needed for Diagnosis: 200 engine revs.

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

- **Normality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire diagnostic value	< Value of Map 3

Time Needed for Diagnosis: 200 engine revs.

BN:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H4DO)-100, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BO:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H4DO)-100, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BP:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H4DO)-100, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

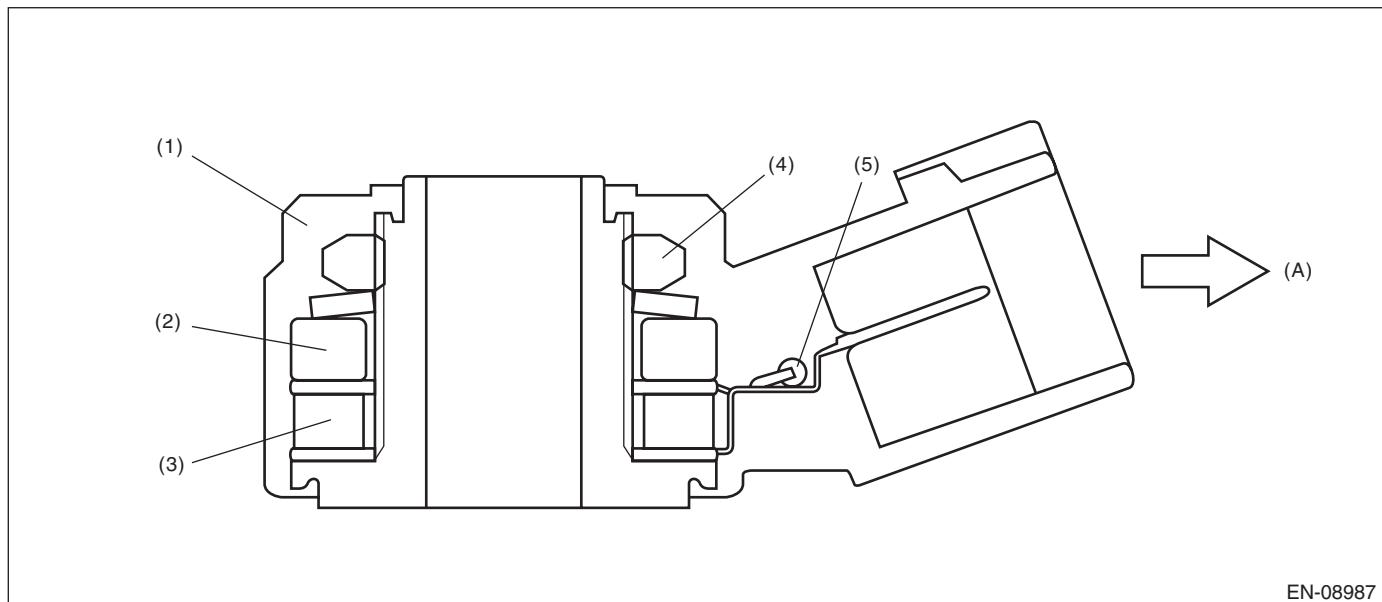
GENERAL DESCRIPTION

BQ: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



(A) To knock sensor harness

(1) Case	(3) Piezoelectric element	(5) Resistance
(2) Weight	(4) Nut	

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	< 0.154 V

Time Needed for Diagnosis: 1000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.154 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

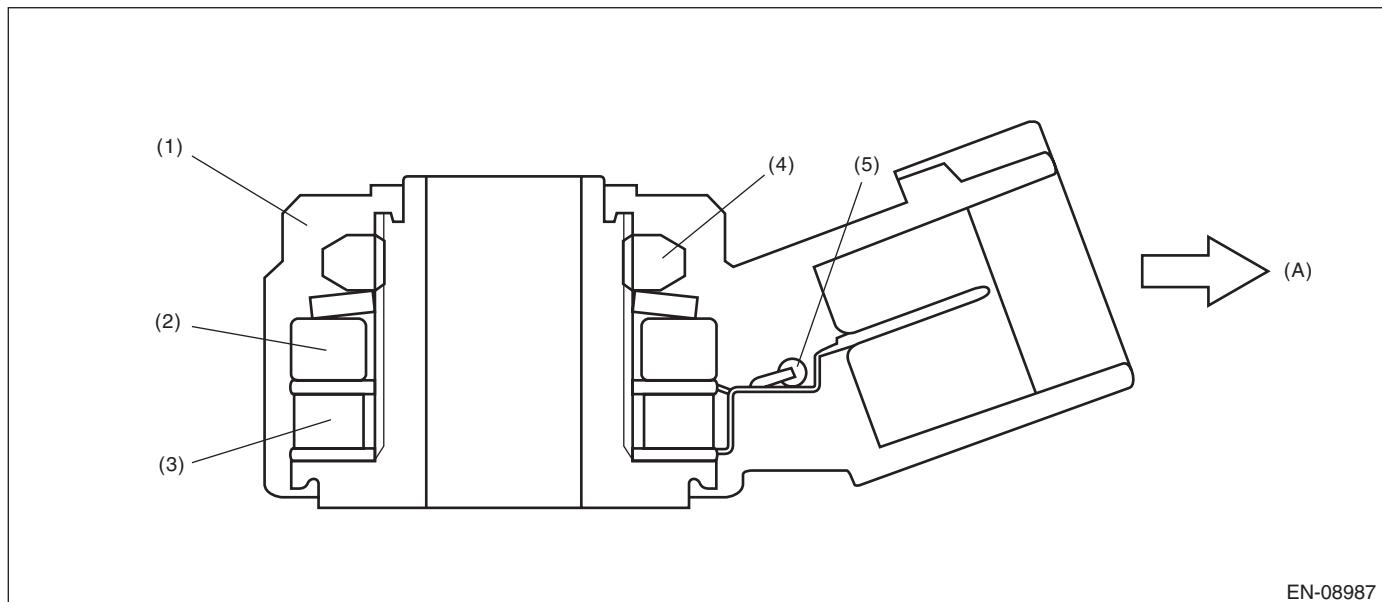
GENERAL DESCRIPTION

BR: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



(A) To knock sensor harness

(1) Case	(3) Piezoelectric element	(5) Resistance
(2) Weight	(4) Nut	

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	$\geq 4.838 \text{ V}$

Time Needed for Diagnosis: 1000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.838 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

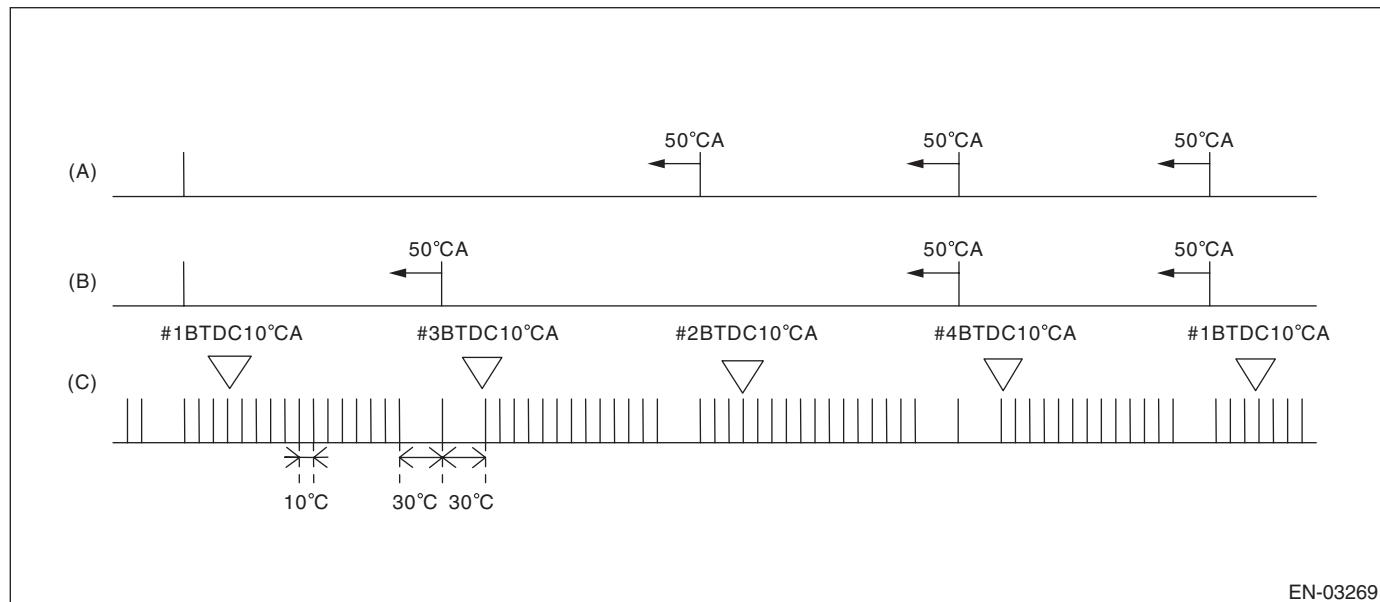
BS:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

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.

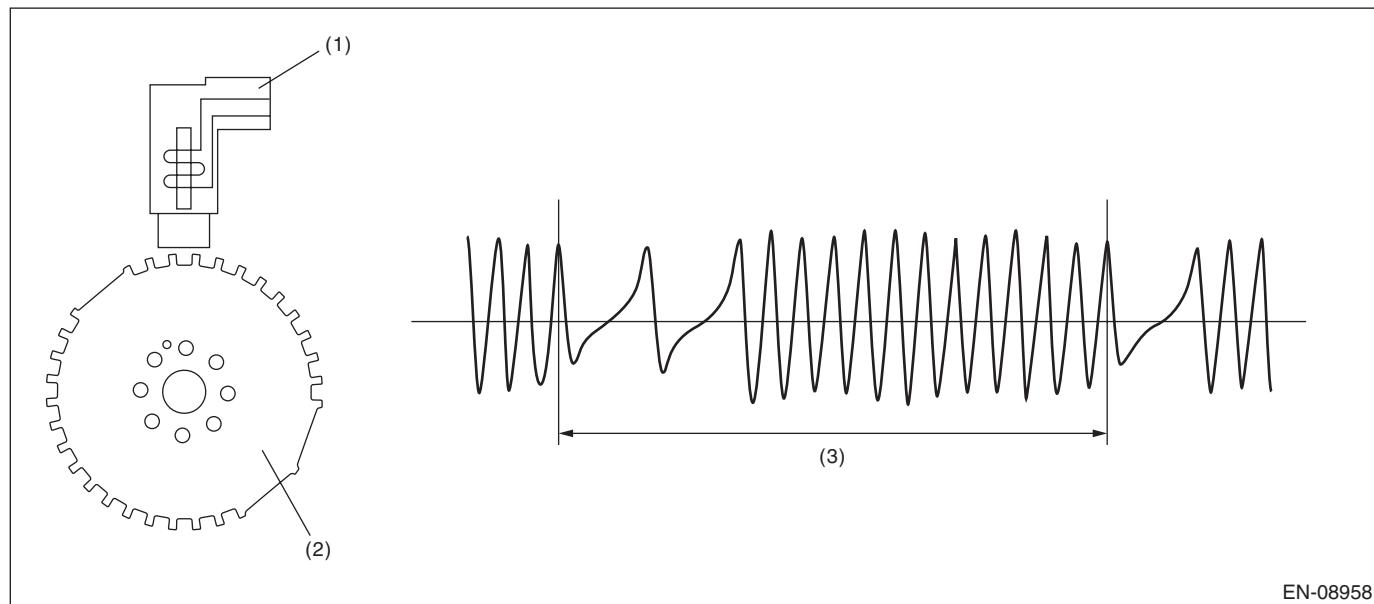
2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal



(1) Crankshaft position sensor

(2) Crankshaft position sensor plate

(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

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
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

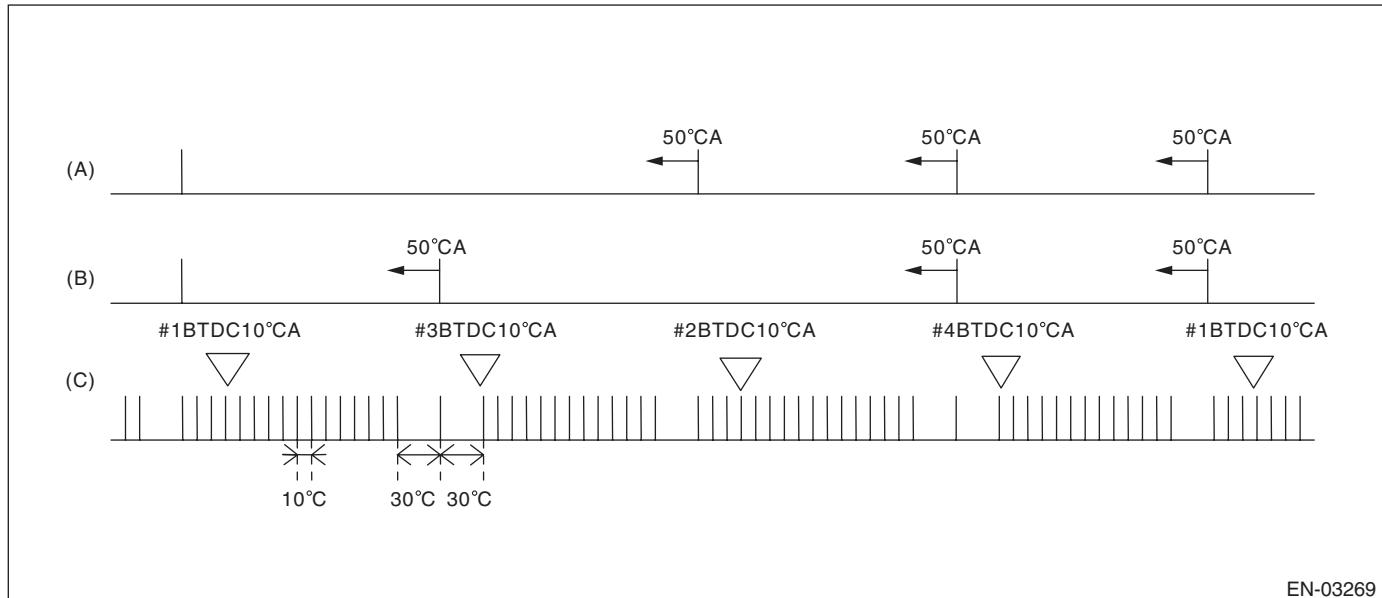
BT:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE

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 of crankshaft.

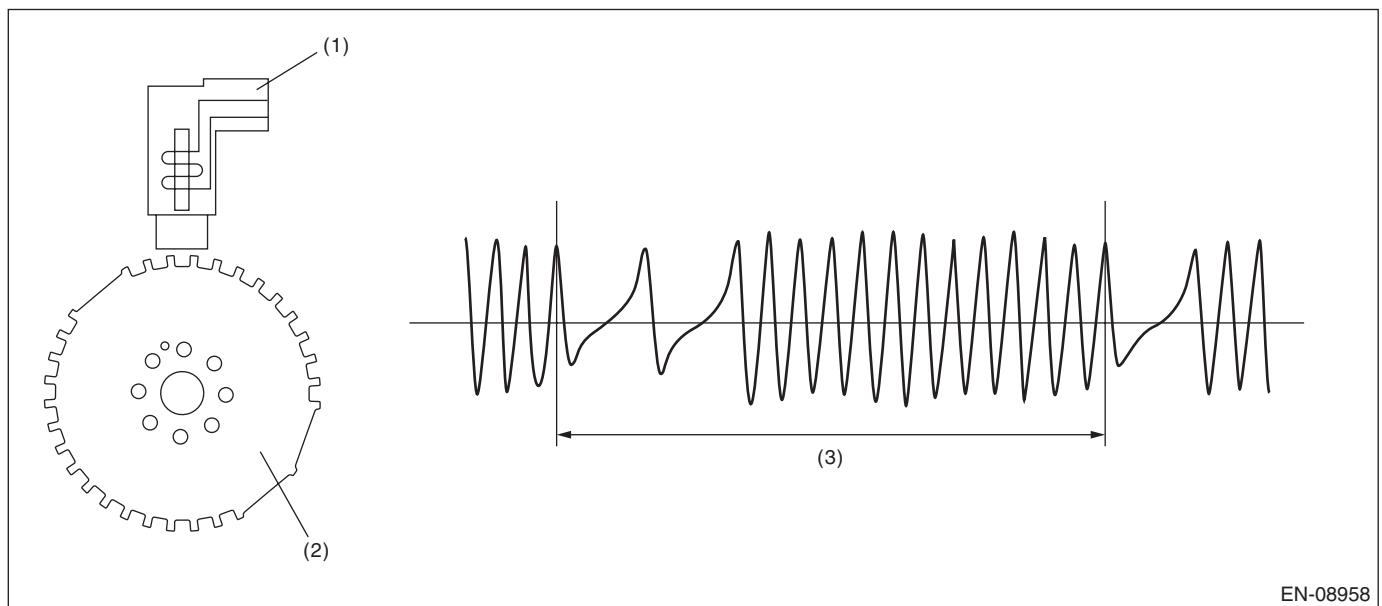
2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 4000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev of crankshaft.	Not = 30

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

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev of crankshaft.	= 30

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

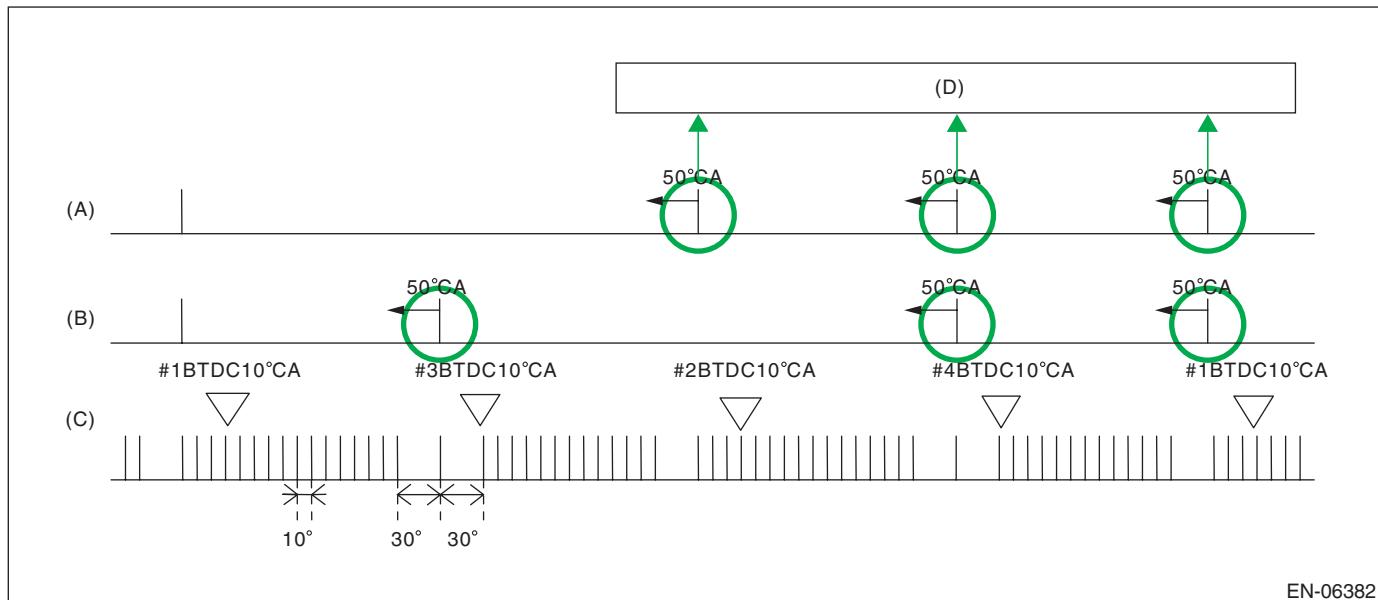
BU:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

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

When there is no camshaft position signal input continuously, judge as NG.

2. COMPONENT DESCRIPTION



EN-06382

(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal

(D) Camshaft position signal: When normal, there will be 3 camshaft position signals for every 2 crankshaft revolutions.

3. ENABLE CONDITION

Diagnosis 1

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Elapsed time after starting the engine	≥ 200 ms

Diagnosis 2

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Starter	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Diagnosis 1

Judge as NG when no input of camshaft position sensor signal in TDC remains for 10 time(s).

Judgment Value

Malfunction Criteria	Threshold Value
No camshaft position sensor signal input in TDC	≥ 10 time(s)

Time Needed for Diagnosis: $TDC \times 10$ time(s)

Diagnosis 2

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
Camshaft position sensor signal	No input

Time Needed for Diagnosis: 3000 ms

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

• Normality Judgment

Diagnosis 1

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

Judgment Value

Malfunction Criteria	Threshold Value
No camshaft position sensor signal input in TDC	$= 0$ time(s)

Time Needed for Diagnosis: $TDC \times 10$ time(s)

Diagnosis 2

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	Input exists

Time Needed for Diagnosis: 32 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

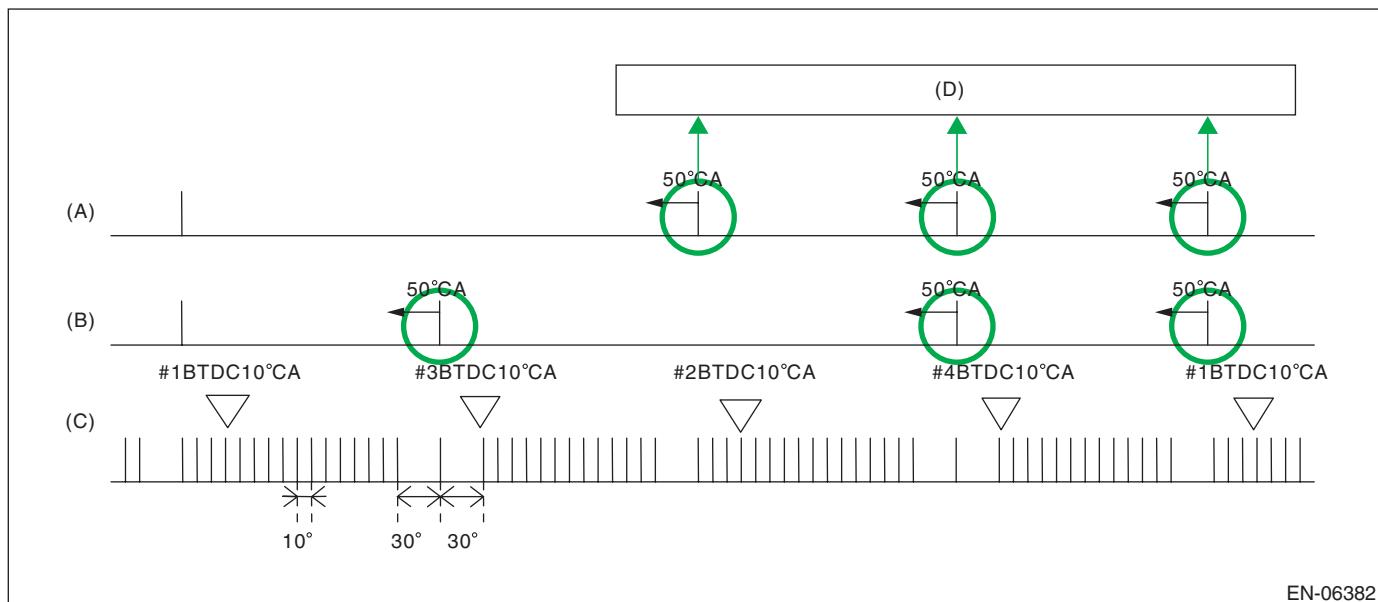
BV:DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/ PERFORMANCE (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of camshaft position sensor property.

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

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal

(D) Camshaft position signal: When normal, there will be 3 camshaft position signals for every 2 crankshaft revolutions.

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Elapsed time after starting the engine	≥ 200 ms

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the status where the number of camshaft position sensor signal in two crankshaft revolutions is other than 3 time(s).

Judgment Value

Malfunction Criteria	Threshold Value
Amount of camshaft sensor signal during 2 revs of crankshaft.	≠ 3 time(s)

Time Needed for Diagnosis: Engine two revolutions × 4 time(s)

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
Camshaft position sensor signal	= 3 time(s)

Time Needed for Diagnosis: Engine two revolutions

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BW: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(H4DO)-118, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BX:DTC P0346 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0341. <Ref. to GD(H4DO)-120, DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BY:DTC P0351 IGNITION COIL A PRIMARY/SECONDARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

Based on the self-diagnostic result of the ignition coil driving IC, judge the ignition coil driving circuit as normal or abnormal.

The ignition coil driving IC detects “no ignition” status as a malfunction.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	> 1 s
Engine speed	> 500 rpm
Ignition energization time	> 2000 μ s
Ignition status	Not during ignition cut

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition driving IC information	Malfunction

Time Needed for Diagnosis: 2500 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition driving IC information	Normal

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BZ:DTC P0352 IGNITION COIL B PRIMARY/SECONDARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0351. <Ref. to GD(H4DO)-123, DTC P0351 IGNITION COIL A PRIMARY/SECONDARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CA:DTC P0353 IGNITION COIL C PRIMARY/SECONDARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0351. <Ref. to GD(H4DO)-123, DTC P0351 IGNITION COIL A PRIMARY/SECONDARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CB:DTC P0354 IGNITION COIL D PRIMARY/SECONDARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0351. <Ref. to GD(H4DO)-123, DTC P0351 IGNITION COIL A PRIMARY/SECONDARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

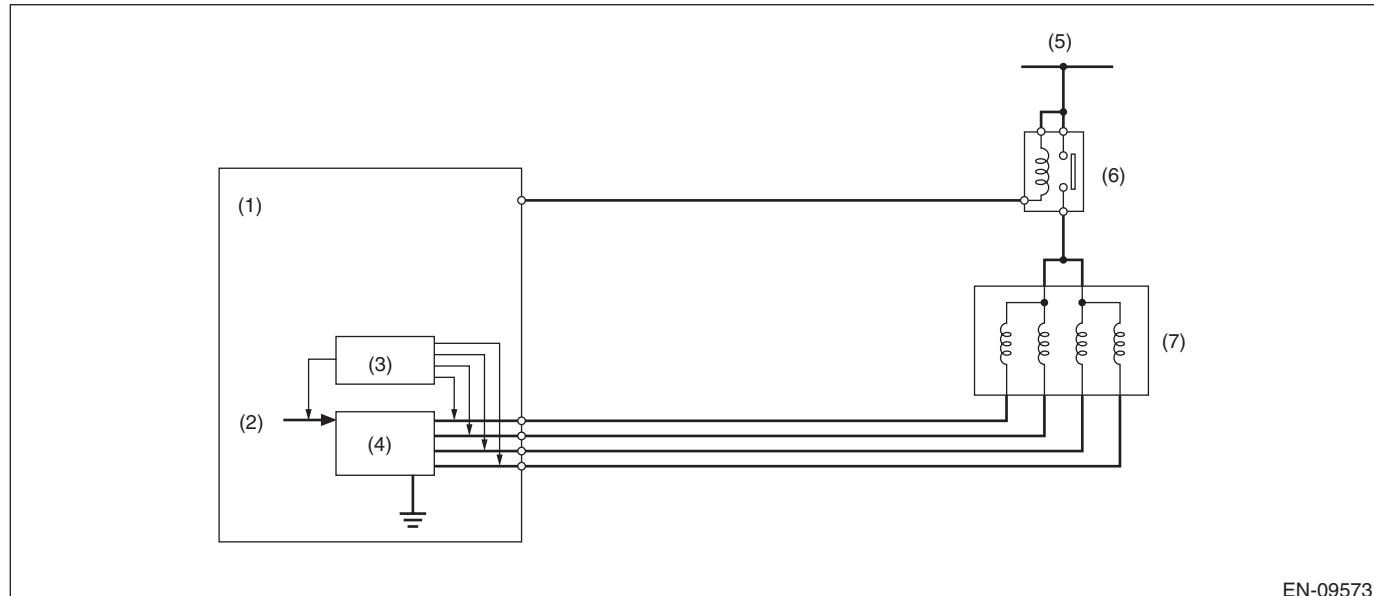
CC:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

1. OUTLINE OF DIAGNOSIS

Detect EGR system malfunction.

Intake manifold pressure (negative pressure) is constant because the throttle valve is fully closed during deceleration fuel cut. At this time, when the EGR valve is opened/closed, the intake manifold pressure will change. EGR System OK/NG is judged by the range of this change.

2. COMPONENT DESCRIPTION



(1) ECM	(4) CPU	(6) Main relay
(2) Detecting circuit	(5) EGR valve	(7) Battery power supply
(3) Switching circuit		

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 0 s
Engine coolant temperature	≥ -40 °C (-40 °F)
Engine speed	1300 rpm — 5000 rpm (CVT model) 1400 rpm — 5000 rpm (MT model)
Intake manifold pressure (absolute pressure)	< 64 kPa (480 mmHg, 18.9 inHg)
Ambient air temperature	≥ 5 °C (41 °F)
Throttle position	< 0.25 °
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Vehicle speed	≥ 40 km/h (24.9 MPH)
Fuel shut-off function	In operation
Neutral switch	OFF
Elapsed time after neutral switch ON/OFF change	\geq Value from Map
No load change (A/C, power steering, lighting, rear defogger, heater fan and radiator fan)	≥ 5000 ms

Map

Engine coolant temperature °C (°F)	-40 (-40)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Elapsed time after neutral switch change msec	0	0	0	0	0	0	0	0

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Elapsed time after neutral switch change msec	650	650	650	650	600	600	600	600

4. GENERAL DRIVING CYCLE

During deceleration fuel cut from 53 km/h (approx. 33 MPH) or more, perform diagnosis once. Be careful of vehicle speed and engine speed. (Diagnosis will not be completed if the vehicle speed and engine speed conditions become out of specification due to deceleration.)

5. DIAGNOSTIC METHOD

Measure the pressure values when the enable conditions are established, and perform diagnosis by calculating those results.

1. Label the intake manifold pressure value as PMOF1, which is observed when enable conditions are established, and set the EGR target step to 45 step(s) (nearly full open).
2. Label the intake manifold pressure value as PMON, which is observed after 1000 ms has passed since EGR target step was set to 45 step(s) (when the enable conditions were established), and set the EGR target step to 0.
3. Label the intake manifold pressure as PMOF2, which is observed after 1000 ms has passed since EGR target step was set to 0 (after (1000 ms + 1000 ms) have passed since the enable conditions were established).

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

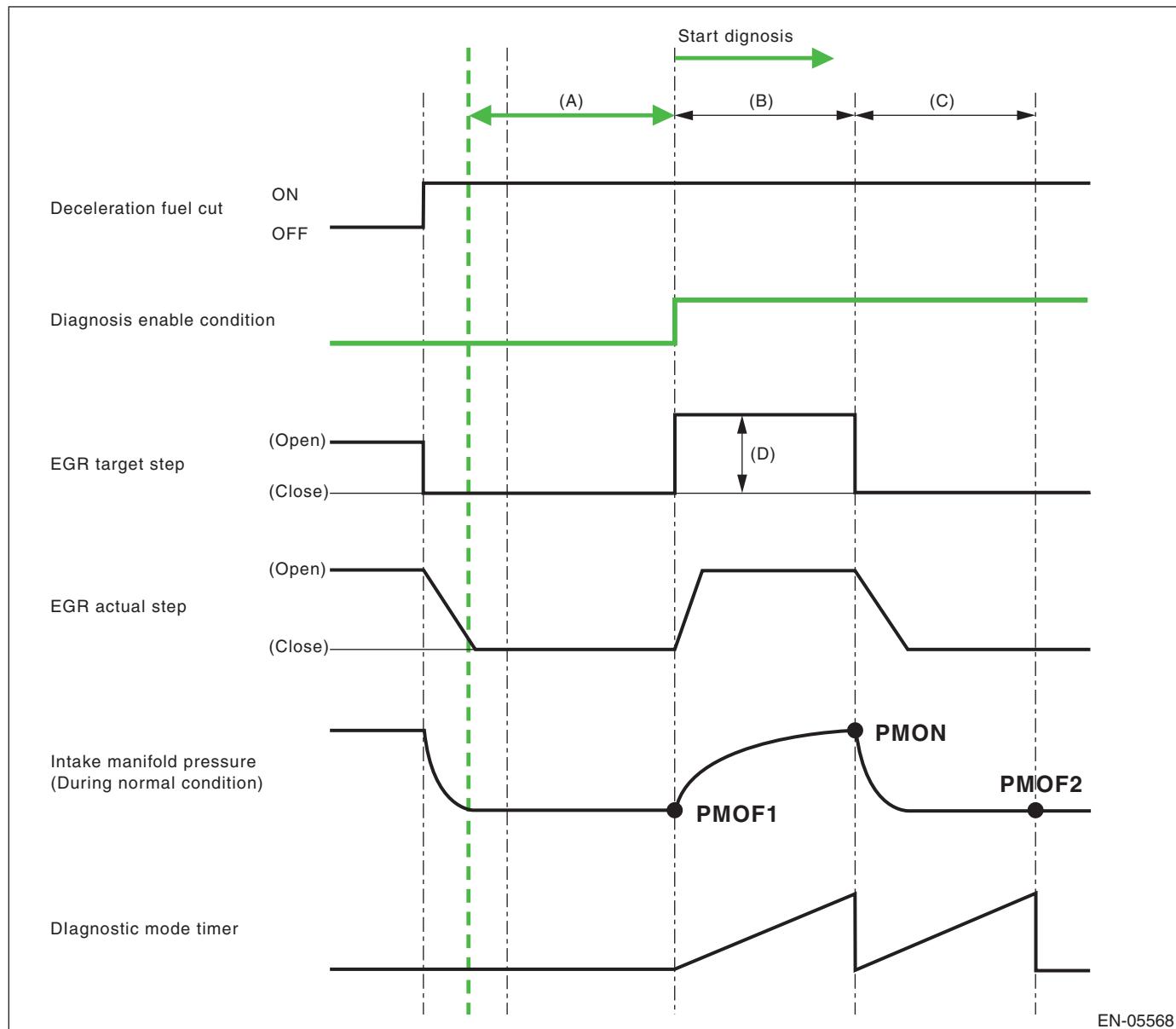
Malfunction Criteria	Threshold Value
PMON – (PMOF1 + PMOF2)/2	< 2.5 kPa (18.63 mmHg, 0.7 inHg)

Time Needed for Diagnosis: 1 time

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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



(A) 3000 ms

(D) 45 step(s)

(B) 1000 ms

(C) 1000 ms

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
PMON – (PMOF1 + PMOF2)/2	$\geq 2.5 \text{ kPa (18.63 mmHg, 0.7 inHg)}$

Time Needed for Diagnosis: 1 time

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

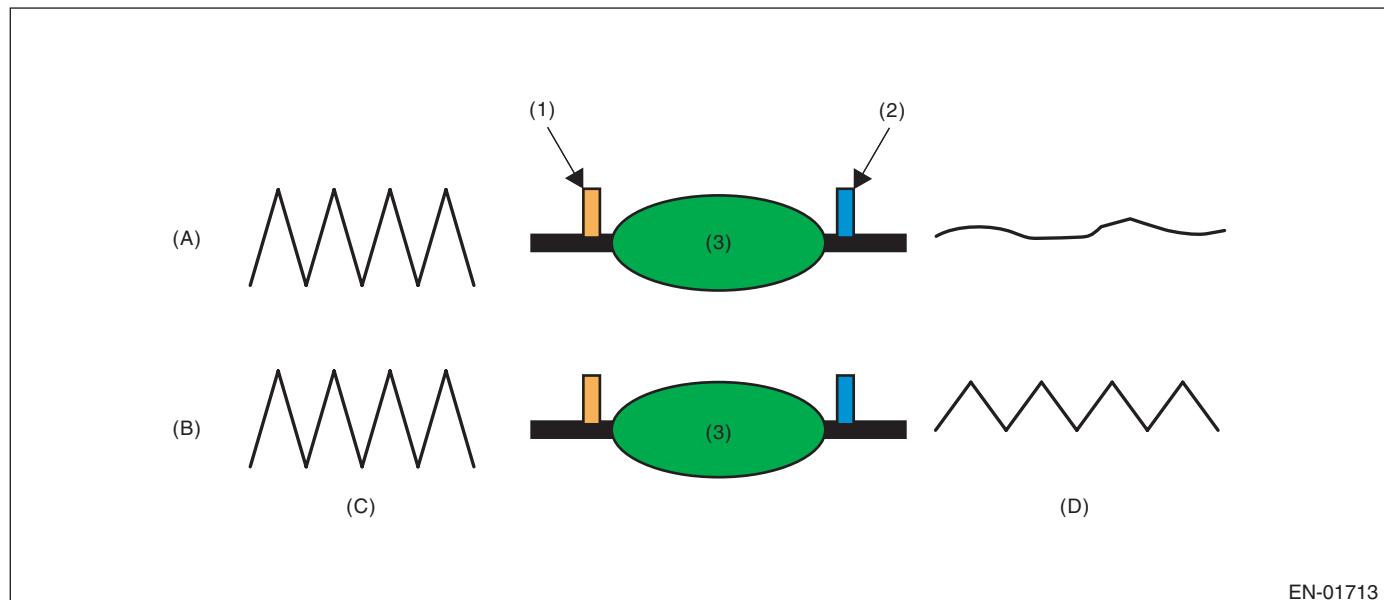
1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst function.

Though the front 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 front oxygen sensor output and comparing it with the front oxygen (A/F) sensor output.

2. COMPONENT DESCRIPTION



EN-01713

(A) Normal

(B) Deterioration

(C) Output waveform from the front oxygen (A/F) sensor

(D) Output waveform from the front oxygen sensor

(1) Front oxygen (A/F) sensor

(2) Front oxygen sensor

(3) Catalytic converter

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 60 °C (140 °F)
Estimated catalyst temperature	≥ 535 °C (995 °F) (CVT model) ≥ 535 °C (995 °F) (MT model)
Misfire detection every 200 rotations	< 65535 time(s)
Learning value of evaporation gas density	< 1
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual lambda and target lambda	≥ 0 ms
Vehicle speed	> 40 km/h (24.9 MPH)
Amount of intake air	≥ 8 g/s (0.28 oz/s) and < 45 g/s (1.59 oz/s)
Engine load change every 0.5 engine revs.	< 255 g/rev (8.99 oz/rev)
Rear oxygen output change from 660 mV or less to 660 mV or more	Experienced after fuel cut
Elapsed time after starting the engine	≥ 0 s
Purge execution calculated time	≥ 0 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant 40 km/h (24.9 MPH) or higher.

5. DIAGNOSTIC METHOD

After the enable conditions have been established, calculate the front oxygen (A/F) sensor lambda value deviation sum value ($\sum |(sglmd_n - sglmd_{n-1})|$), and rear oxygen sensor output voltage deviation sum value ($\sum |(ro2sad_n - ro2sad_{n-1})|$) in every 32 ms \times 4 times. If the front oxygen (A/F) sensor lambda value deviation sum value ($\sum |(sglmd_n - sglmd_{n-1})|$) is the predetermined value or more, calculate the diagnostic value.

• Abnormality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
$\sum (ro2sad_n - ro2sad_{n-1}) / \sum (sglmd_n - sglmd_{n-1}) $	> 10 (except for PZEV model) > 8 (PZEV model)

Time Needed for Diagnosis: 30 — 55 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
$\sum (ro2sad_n - ro2sad_{n-1}) / \sum (sglmd_n - sglmd_{n-1}) $	≤ 10 (except for PZEV model) ≤ 8 (PZEV model)

Time Needed for Diagnosis: 30 — 55 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CE:DTC P0441 EVAPORATIVE EMISSION CONT. SYS. INCORRECT PURGE FLOW

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of purge flow by the change of ELCM pressure sensor output value before/after purge introduction.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
<Common conditions>	
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75 kPa (563 mmHg, 22.2 inHg)
<First diagnosis>	
Learning value of EVAP conc. during purge	< 1
Total time of canister purge operation	≥ 120 s
<Second diagnosis>	
Time after cancel of second diagnosis	≥ 60000 ms
Total time of canister purge operation	≥ 120 s
Intake manifold pressure (absolute pressure)	> 13.3 kPa (100 mmHg, 3.9 inHg)
Engine speed	≥ 0 rpm
Intake manifold pressure (relative pressure)	< 6.7 kPa (50 mmHg, 2 inHg)
Vehicle speed	≥ 30 km/h (18.6 MPH)
Closed air/fuel ratio control	In operation
Air fuel ratio	> 0 and < 2
Main feedback compensation coefficient	> 0
Learning value of EVAP conc. during purge	< 1

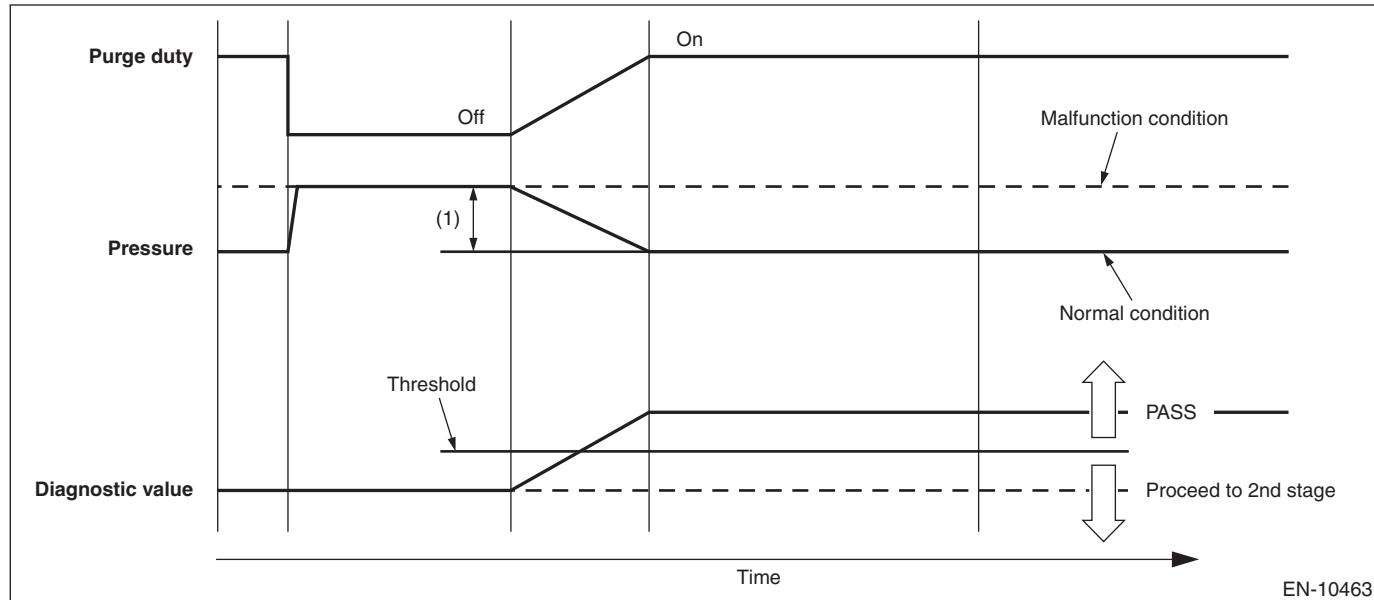
3. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

4. DIAGNOSTIC METHOD

First diagnosis

Pressure decreases when the purge is introduced compared with when the purge is not performed. By using this, judge if the purge is correctly performed. If there is no pressure decrease, go to the second diagnosis.



(1) 0.004 V

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output voltage when purge is not performed – ELCM pressure sensor output voltage when purge is performed	> 0.004 V

Time Needed for Diagnosis: 26 seconds

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output voltage when purge is not performed – ELCM pressure sensor output voltage when purge is performed	> 0.004 V

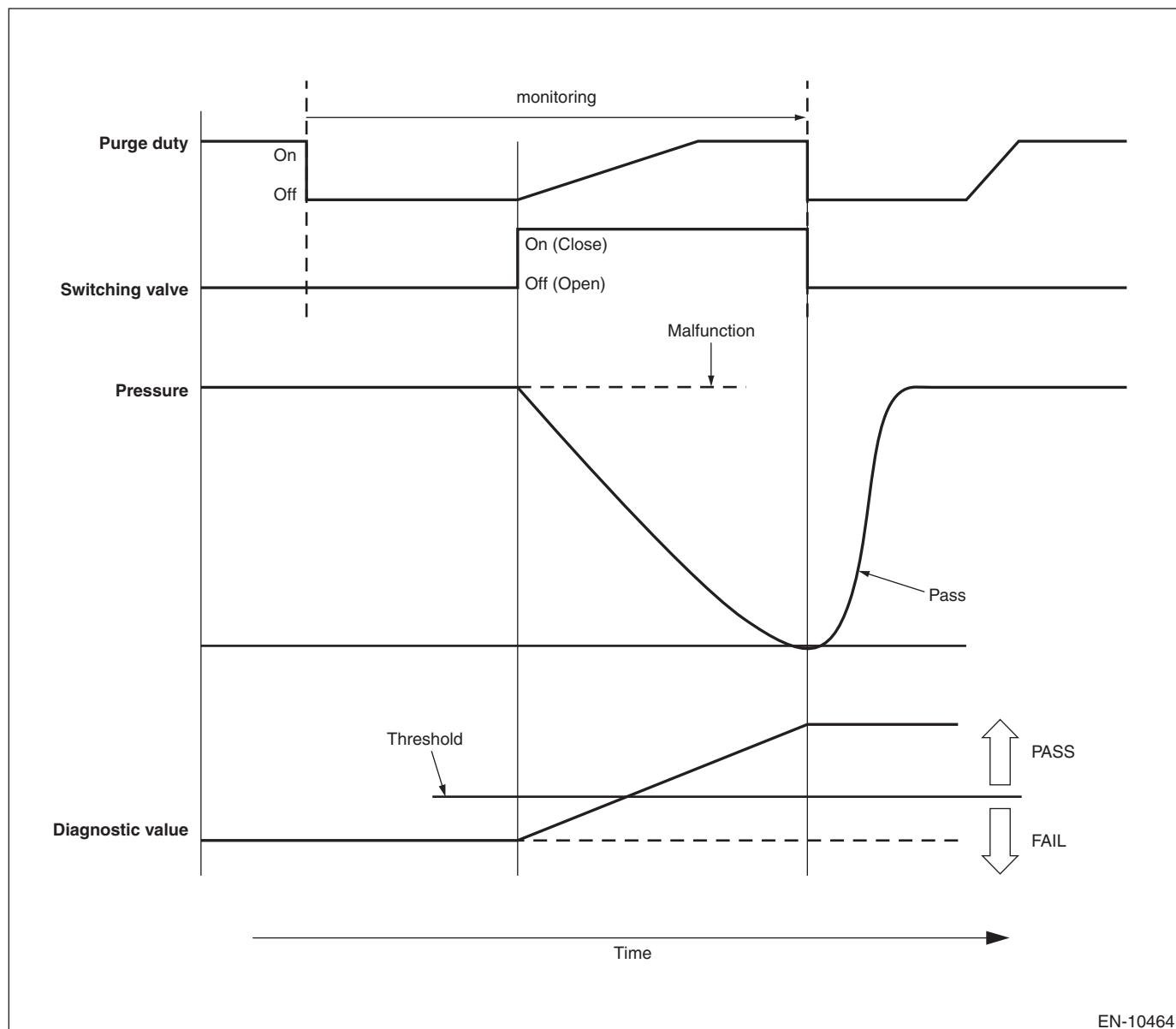
Time Needed for Diagnosis: 26 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Second diagnosis

Close the ELCM switching valve, and close the fuel tank completely, and perform the forced purging. If pressure change amount is 0.7 kPa (5 mmHg, 0.2 inHg) or less, judge as malfunction of purge flow.



• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output value when purge is not performed – ELCM pressure sensor output value when purge is performed	< 666.5 Pa (5 mmHg, 0.2 inHg)

Time Needed for Diagnosis: 21 seconds

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 and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output value when purge is not performed – ELCM pressure sensor output value when purge is performed	≥ 666.5 Pa (5 mmHg, 0.2 inHg)

Time Needed for Diagnosis: Less than 21 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

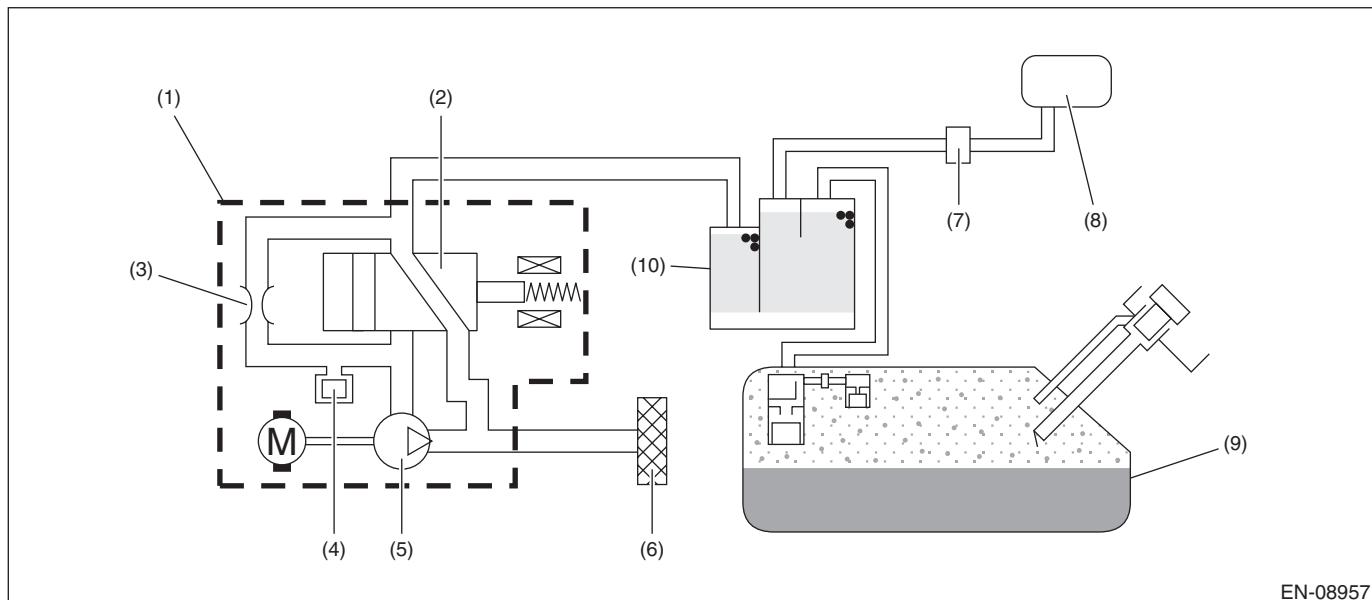
CF:DTC P0451 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/ SWITCH RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of ELCM pressure sensor output properties.

Judge as NG when the ELCM pressure sensor output value is largely different from the intake manifold pressure when the ignition switch is ON.

2. COMPONENT DESCRIPTION



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Ignition switch	ON
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.621 MPH)
Soaking time	≥ 60 s
Variation value of intake manifold pressure (absolute pressure) since ignition switch is turned to ON	< 1.332 kPa (9.99 mmHg, 0.39 inHg)
ELCM vacuum pump	Not in operation
ELCM switching valve	Open
Purge control	Not in operation

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at ignition ON.

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
ELCM pressure sensor output value – intake manifold pressure (absolute pressure) when ignition switch is ON	> 4.226 kPa (31.7 mmHg, 1.25 inHg)

Time Needed for Diagnosis: 328 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output value – intake manifold pressure (absolute pressure) when ignition switch is ON	≤ 4.226 kPa (31.7 mmHg, 1.25 inHg)

Time Needed for Diagnosis: 262 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

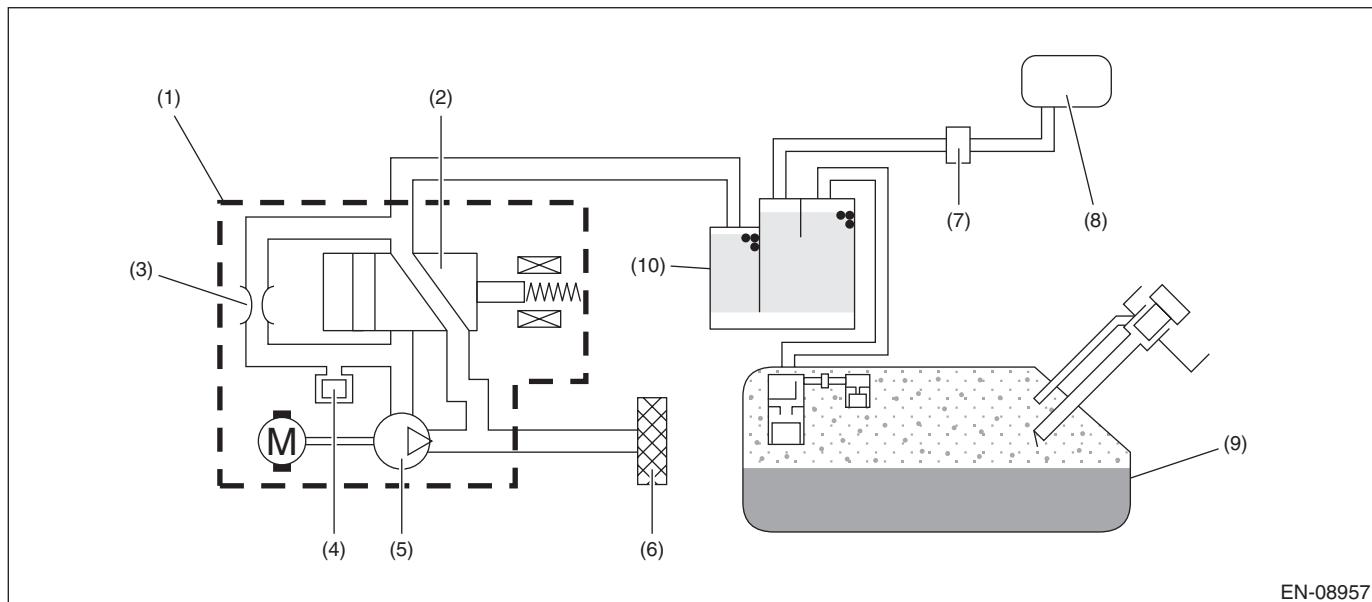
GENERAL DESCRIPTION

**CG:DTC P0452 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/
SWITCH LOW**

1. OUTLINE OF DIAGNOSIS

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

2. COMPONENT DESCRIPTION



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	< 0.973 V

Time Needed for Diagnosis: 1000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.973 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

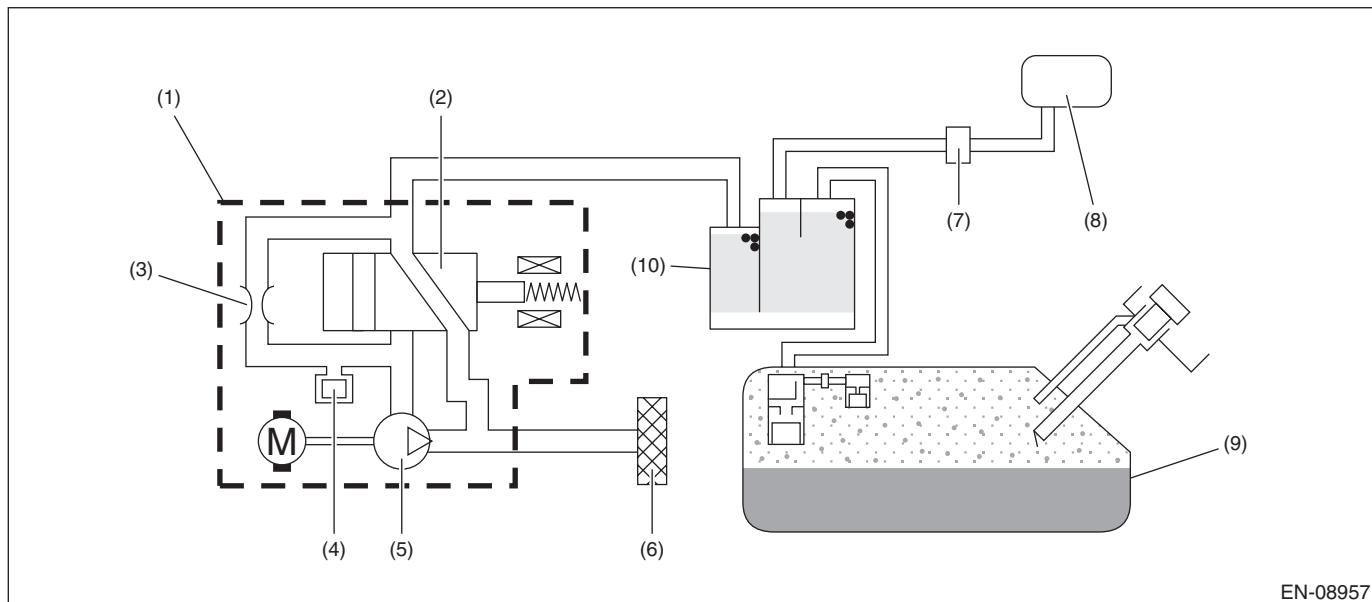
GENERAL DESCRIPTION

**CH:DTC P0453 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/
SWITCH HIGH**

1. OUTLINE OF DIAGNOSIS

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

2. COMPONENT DESCRIPTION



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	$\geq 4.095 \text{ V}$

Time Needed for Diagnosis: 1000 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.095 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CI: DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK)

1. OUTLINE OF DIAGNOSIS

This diagnosis judges whether the ELCM operation is normal or not, and whether the evaporative emission system has leak and clogging or not.

To purge the canister, after driving, perform the five hours soaking after ignition switch OFF in order to stabilize the evaporative gas status. * After 5, 7 or 9.5 hours passed, ECM is activated by soaking timer, and the leak check is started.

Judges whether the ELCM operation is normal or not, by measuring the reference pressure status via reference orifice (0.02 inch orifice). Judge as malfunction if the reference pressure is out of specified range. Then, judge whether there is a leak or not, by comparing the pressure (leak pressure) when the reference pressure and the evaporative emission system are in negative pressure condition. Judge as system leak in the evaporative emission system if the leak pressure is higher than reference pressure. Judge as clogging of pipe if the leak pressure becomes lower than the reference pressure within the specified amount of time.

0.02 inch leak and 0.04 inch leak can be distinguished by measuring the leak pressure.

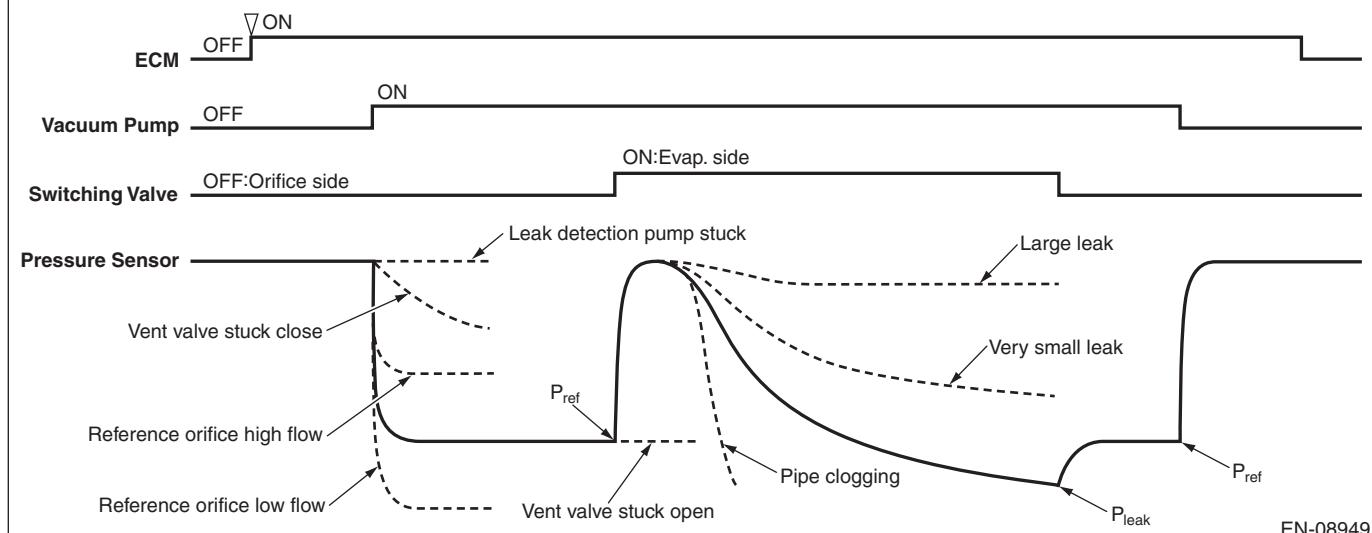
The diagnosis results are stored inside ECM until the engine is started again.

*: When the test conditions are not met in 5 hours, perform diagnosis at elapsed time of 7 hours. When the test conditions are not met in 7 hours, perform diagnosis at elapsed time of 9.5 hours.

Diagnostic item	
ELCM system (ELCM body)	Vacuum pump stuck Switching valve stuck to open Switching valve stuck to close Reference orifice flow large Reference orifice flow small
Leak check	Large leak <ul style="list-style-type: none">• 0.04 inch leak• Fuel cap loose• Fuel cap off• System malfunction Very small leak <ul style="list-style-type: none">• 0.02 inch leak
Clogging of pipe	—

OUTLINE OF DIAGNOSIS

5 hours after ignition switch turned off.

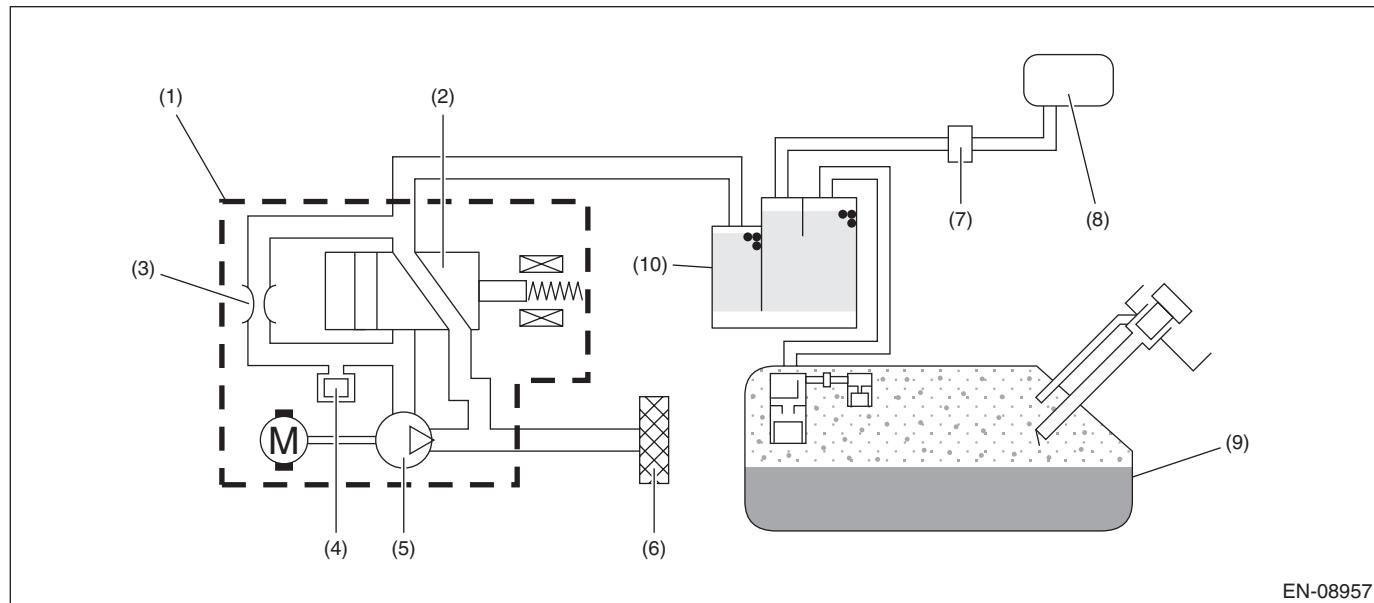


Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION

ELCM consists of the pressure sensor, the reference orifice (diameter of 0.02 inch), the vacuum pump which introduces the negative pressure into evaporative emission system, and the switching valve which switches the passage to introduce the negative pressure.



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Activation of soaking timer	Completed
Battery voltage	$\geq 10.9 \text{ V}$
Ignition switch	OFF
Engine coolant temperature	$\geq 4.4 \text{ }^{\circ}\text{C}$ ($39.9 \text{ }^{\circ}\text{F}$) and $< 45 \text{ }^{\circ}\text{C}$ ($113 \text{ }^{\circ}\text{F}$)
Atmospheric pressure	$\geq 75 \text{ kPa}$ (563 mmHg, 22.2 inHg) and $< 110 \text{ kPa}$ (825 mmHg, 32.5 inHg)
EVAP conc. learning during previous driving cycle	Done
Learning value of EVAP conc. during previous driving cycle	≤ 1
Accumulated purge amount during previous driving cycle	\geq Value of Map 1

Map 1

Engine coolant temperature °C (°F)	0 (32)	30 (86)	35 (95)	40 (104)	45 (113)
Accumulated purge amount during previous driving cycle g (oz)	4000 (141.08)	4000 (141.08)	11500 (405.61)	19000 (670.13)	26500 (934.66)

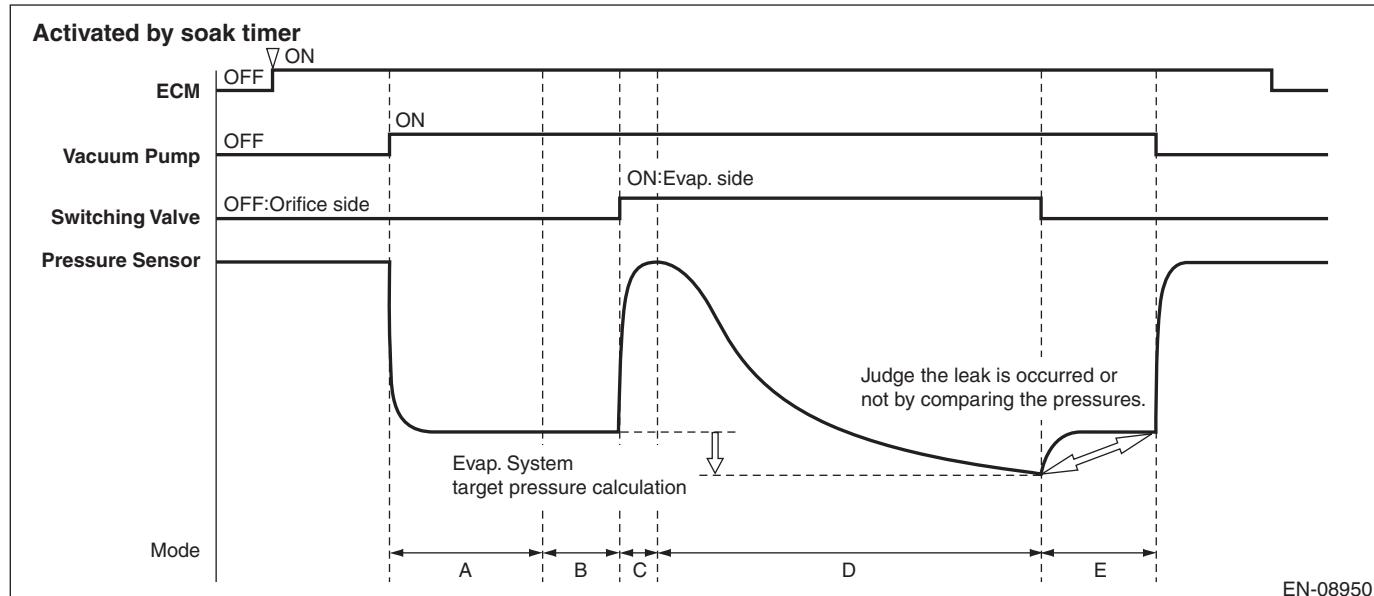
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

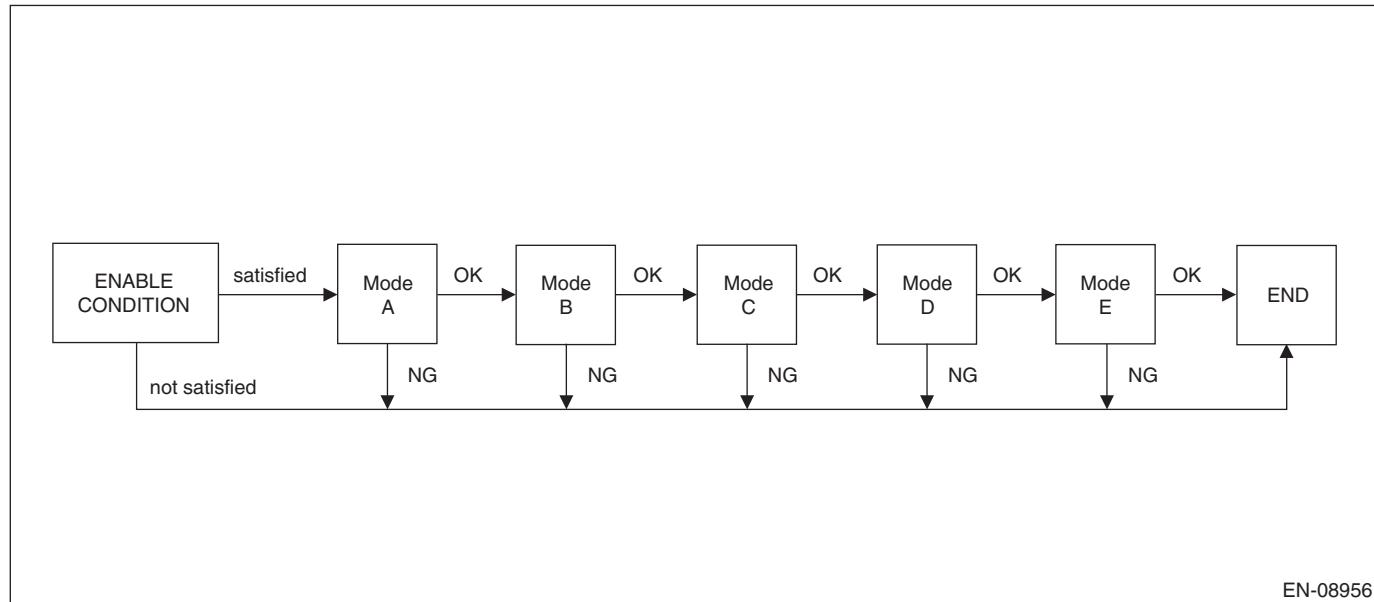
4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when 5, 7 or 9.5 hours has passed after ignition switch is OFF. For more detail, refer to "OUTLINE OF DIAGNOSIS". <Ref. to GD(H4DO)-140, OUTLINE OF DIAGNOSIS, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

5. DIAGNOSTIC METHOD



Mode	Explanation of Mode	Diagnosis Period
A	Vacuum pump operation confirmation and characteristics stability	7 s or less & 300 s
B	Measurement of reference pressure for setting the target negative pressure	40 s or less
C	Switching valve operation confirmation	12 s or less
D	Clogging of pipe diagnosis and leak pressure measurement	900 s or less
E	Reference pressure measurement for judgment	40 s or less



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode A (Vacuum pump operation confirmation and characteristics stability)

Purpose: Detect the vacuum pump operation trouble.

Judge as NG when the following conditions are established.

Judge as OK if the following conditions are not established, and warm up for five minutes to stabilize the vacuum pump characteristics.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pressure sensor output value	> -0.2 kPa (-1.68 mmHg, -0.1 inHg)	P2404

Mode B (Measurement of reference pressure for setting the target negative pressure)

1. Purpose: Judge the reference pressure stability.

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pressure sensor maximum output value – Pressure sensor minimum output value	> 0.3 kPa (2.355 mmHg, 0.1 inHg)	P2404

2. Purpose: Judge whether the reference pressure is within the normal range, and detect the vacuum pump and orifice malfunctions.

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Reference pressure for setting the target negative pressure	< Value of Map 2 or > Value of Map 3	P2404

Map 2

Atmospheric pressure kPa (mmHg, inHg)	70 (525, 20.7)	80 (600, 23.6)	90 (675, 26.6)	100 (750, 29.5)
Reference pressure for setting the target negative pressure kPa (mmHg, inHg)	-4 (-29.79, -1.2)	-4.1 (-30.593, -1.2)	-4.2 (-31.395, -1.2)	-4.3 (-32.19, -1.3)

Map 3

Atmospheric pressure kPa (mmHg, inHg)	70 (525, 20.7)	80 (600, 23.6)	90 (675, 26.6)	100 (750, 29.5)
Reference pressure for setting the target negative pressure kPa (mmHg, inHg)	-0.9 (-7.065, -0.3)	-1 (-7.86, -0.3)	-1.2 (-8.663, -0.3)	-1.3 (-9.465, -0.4)

Mode C (Switching valve operation confirmation)

Purpose: Measure the pressure increase when switching valve is changed from open to close, and detect the stuck to open/close malfunctions of the switching valve.

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pressure sensor output value – Reference pressure for setting the target negative pressure	< 0.2 kPa (1.68 mmHg, 0.1 inHg)	P2404

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode D (Clogging of pipe diagnosis and leak pressure measurement)

1. Clogging of pipe

Purpose: Measure the time required for the evaporative emission system to reach the target negative pressure by the vacuum pump, and detect the clogging of pipe trouble.

Judge as clogging of pipe malfunction if the evaporative emission system reaches to the target negative pressure within the specified time.

Judgment Value

Malfunction Criteria												Threshold Value	DTC
Time required to reach to the target negative pressure For target vacuum, use one of the followings. • Reference pressure for target vacuum setting – value of Map 4 • $-5 \text{ kPa} (-37.298 \text{ mmHg}, -1.5 \text{ inHg})$												$\leq 34000 \text{ ms}$	P1451

Map 4

Time of negative pressure introduction ms	0	100000	200000	300000	400000	500000	600000	700000	800000	900000	1000000	1100000	1200000
Reference pressure for setting the target negative pressure – Pressure sensor output value kPa (mmHg, inHg)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)

2. Leak pressure measurement

Purpose: Measure the pressure (leak pressure) when the evaporative emission system becomes the negative pressure by the vacuum pump.

Store the pressure as a leak pressure while the following conditions are met.

Judgment Value

Conditions for storing the leak pressure	Threshold Value
When any one of the followings is established. • Reference pressure for setting the target negative pressure – Pressure sensor output value • Pressure sensor output value • Time of negative pressure introduction	\geq Value of Map 4 $< -5 \text{ kPa} (-37.298 \text{ mmHg}, -1.5 \text{ inHg})$ $\geq 900000 \text{ ms}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode E (Measurement of reference pressure for judgment)

1. Purpose: Judge the reference pressure stability.

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pressure sensor maximum output value – Pressure sensor minimum output value	> 0.3 kPa (2.355 mmHg, 0.1 inHg)	P2404

2. Purpose: Judge whether the reference pressure is within the normal range, and detect the vacuum pump and orifice malfunctions. Judge the vacuum pump performance stability.

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Reference pressure for judgment	< Value of Map 5 or > Value of Map 6	P2404

Map 5

Atmospheric pressure kPa (mmHg, inHg)	70 (525, 20.7)	80 (600, 23.6)	90 (675, 26.6)	100 (750, 29.5)
Reference pressure for judgment kPa (mmHg, inHg)	-4.5 (-34.02, -1.3)	-4.6 (-34.815, -1.4)	-4.7 (-35.618, -1.4)	-4.9 (-36.42, -1.4)

Map 6

Atmospheric pressure kPa (mmHg, inHg)	70 (525, 20.7)	80 (600, 23.6)	90 (675, 26.6)	100 (750, 29.5)
Reference pressure for judgment kPa (mmHg, inHg)	-0.8 (-6.18, -0.2)	-0.9 (-6.983, -0.3)	-1 (-7.785, -0.3)	-1.1 (-8.58, -0.3)

3. Purpose: Judge the presence of evaporative emission system leak.

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
<Large leak (0.04 inch)> Leak pressure $\text{Ileakjdg} = (\text{Reference pressure for judgment}) \times 0.377 - (-45.5 \text{ Pa})$	$\geq \text{Ileakjdg} (\text{Pa})$	P0455
<Very small leak (0.02 inch)> Leak pressure	$< \text{Ileakjdg} (\text{Pa})$	P0456

Time Needed for Diagnosis: Approx. 23 min

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgment

At next engine start, confirm whether the enable conditions are satisfied even though refueling has been done during soaking, and determine the malfunction.

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

• Normality Judgment

At next engine start, confirm whether the enable conditions are satisfied even though refueling has been done during soaking, then, if the following conditions are established, judge as OK and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
NG flag	Not set	P0455 P0456 P1451 P2404

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

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0455. <Ref. to GD(H4DO)-140, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

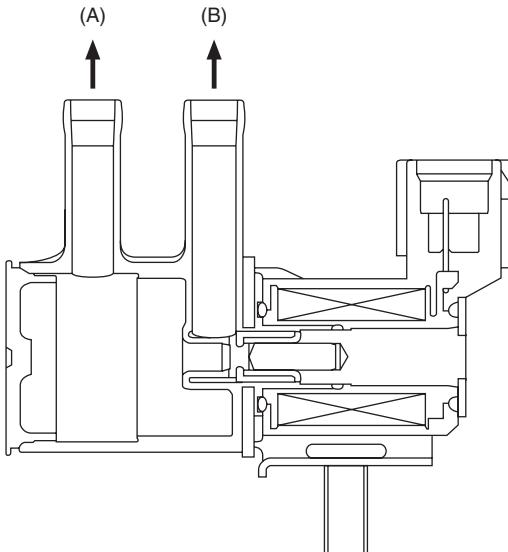
CK:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

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



EN-08988

(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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
Duty ratio of "ON"	< 0.75
Terminal output voltage	Low

Time Needed for Diagnosis: 2500 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

Time Needed for Diagnosis: Less than 1 second

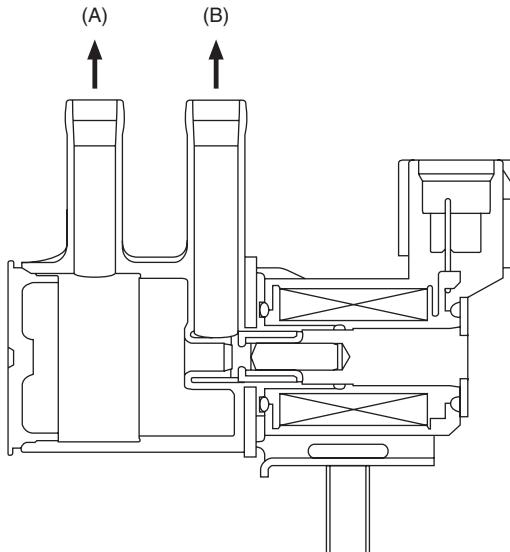
CL:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

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



EN-08988

(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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
Duty ratio of "ON"	≥ 0.25
Terminal output voltage	High

Time Needed for Diagnosis: 2500 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

Time Needed for Diagnosis: Less than 1 second

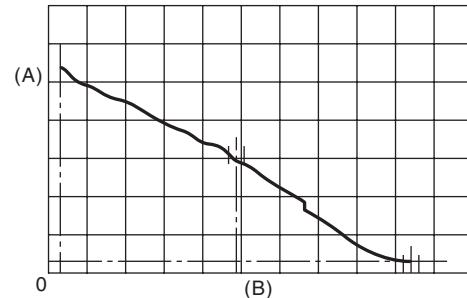
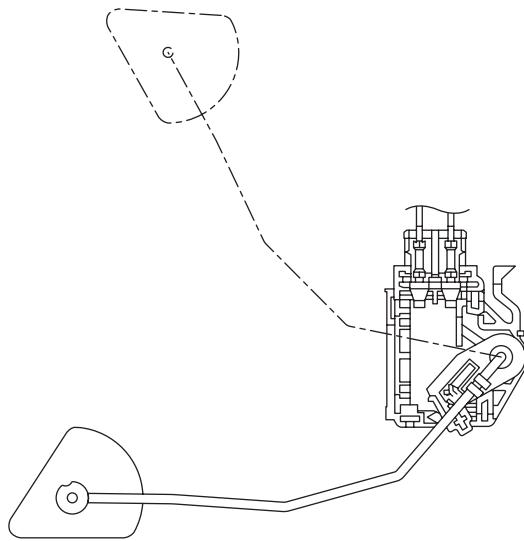
CM:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

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-10515

(A) Fuel level

(B) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 165375 g (5832.78 oz)
Max. – min. values of fuel level output	< 2.6 l (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 10000 rpm
Elapsed time after starting the engine	≥ 5000 ms

Time Needed for Diagnosis: Less than 1 second

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 165375 g (5832.78 oz)
Max. – min. values of fuel level output	≥ 2.6 l (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 10000 rpm
Elapsed time after starting the engine	≥ 5000 ms

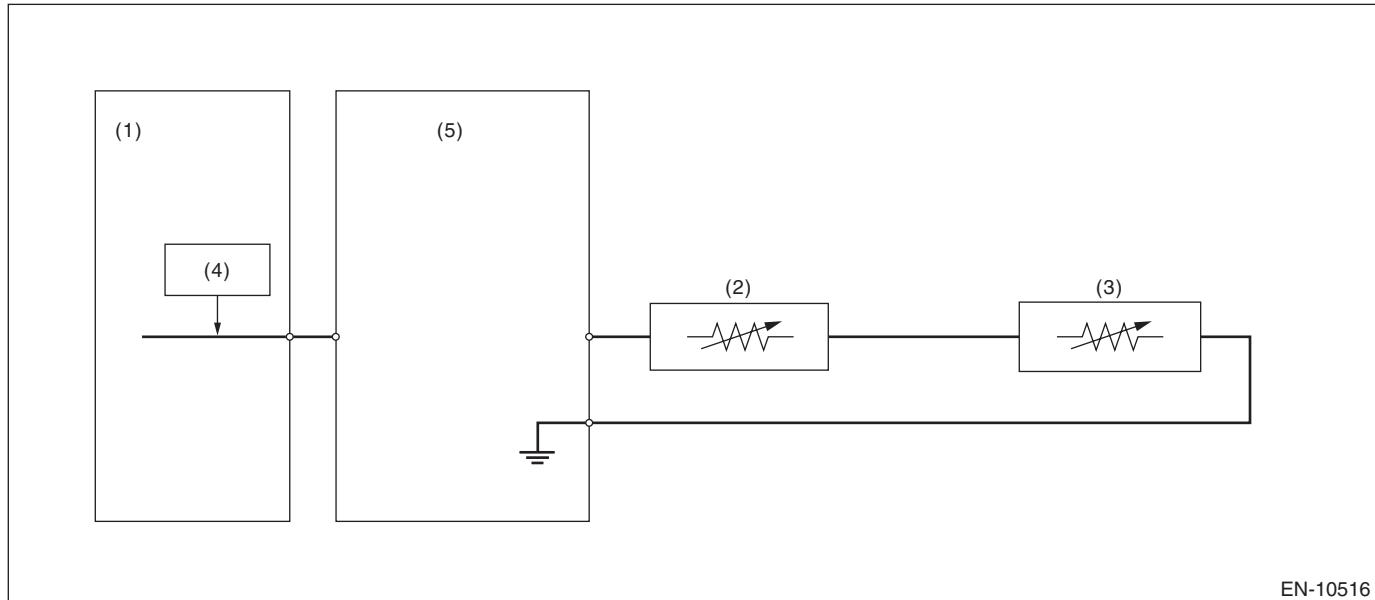
Time Needed for Diagnosis: Less than 1 second

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



(1) Engine control module (ECM)

(2) Fuel level sensor

(3) Fuel sub level sensor

(5) Combination meter

(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 3000 \text{ ms}$
Output voltage	$< 2.211 \text{ V}$

Time Needed for Diagnosis: 2500 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 3000 \text{ ms}$
Output voltage	$\geq 2.211 \text{ V}$

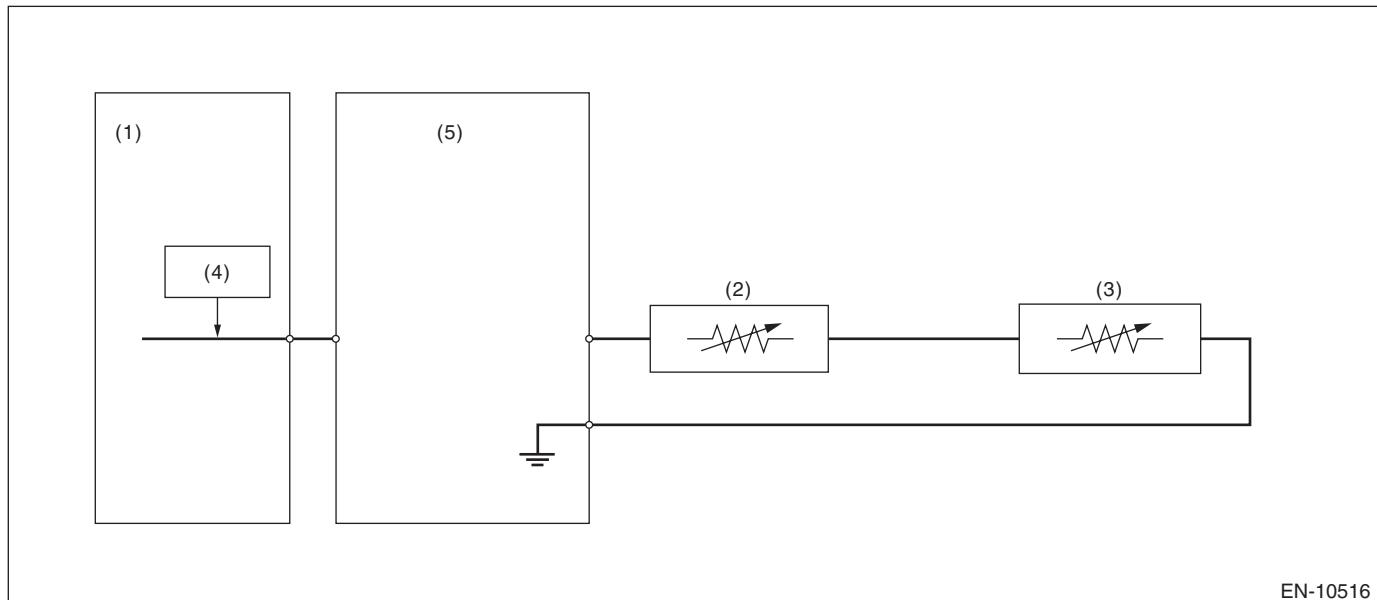
Time Needed for Diagnosis: Less than 1 second

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



(1) Engine control module (ECM)

(2) Fuel level sensor

(3) Fuel sub level sensor

(5) Combination meter

(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	≥ 12 V

Time Needed for Diagnosis: 1000 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	< 12 V

Time Needed for Diagnosis: Less than 1 second

CP:DTC P0500 VEHICLE SPEED SENSOR “A”

1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the judgment value.

Judge NG when the received data from VDCCM&H/U is abnormal vehicle speed, and the vehicle speed data is impossible.

2. COMPONENT DESCRIPTION

Vehicle speed signals are taken in to the VDC control module and hydraulic control unit, and normal/erroneous data of the ABS wheel speed sensor is received by CAN communication from the VDC control module and hydraulic control unit.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 2000 ms

4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2000 ms after starting the engine.

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
Front ABS wheel speed sensor status	Malfunction
Either of the following is established	
Front left wheel speed	≥ 300 km/h (186.4 MPH)
Front right wheel speed	≥ 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 2500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Front left wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)
Front right wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 2500 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CQ: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	$\geq 60^{\circ}\text{C}$ (140°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$\geq 75\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9\text{ l}$ (2.38 US gal, 1.98 Imp gal)
Elapsed time after starting the engine	$\geq 10.49\text{ s}$
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.81 and < 1.1
After switching air conditioner to ON/OFF	$\geq 5.1\text{ s}$
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	$> 5.1\text{ s}$
Elapsed time after switching neutral position switch to ON/OFF	$> 5.1\text{ s}$
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

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
Actual engine speed – Target engine speed	$< -100\text{ rpm}$
Feedback compensation for ISC	Max.

Time Needed for Diagnosis: 15 s \times 1 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Target engine speed	$\geq -100\text{ rpm}$

Time Needed for Diagnosis: 15 s

CR: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	$\geq 60^{\circ}\text{C}$ (140 $^{\circ}\text{F}$)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$\geq 75\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9\text{ l}$ (2.38 US gal, 1.98 Imp gal)
Elapsed time after starting the engine	$\geq 10.49\text{ s}$
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.81 and < 1.1
After switching air conditioner to ON/OFF	$\geq 5.1\text{ s}$
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	$> 5.1\text{ s}$
Elapsed time after switching neutral position switch to ON/OFF	$> 5.1\text{ s}$
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

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
Actual engine speed – Target engine speed	$\geq 200\text{ rpm}$
Feedback compensation for ISC	Min.

Time Needed for Diagnosis: 15 s \times 1 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Target engine speed	$< 200\text{ rpm}$

Time Needed for Diagnosis: 15 s

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CS:DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

• When cold, the abnormality in the control of target engine speed increase is detected. (P050A)

Judge as NG if the exhaust gas temperature diagnosis or idle speed diagnosis 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 at cold start.

• Detect malfunctions of the catalyst advanced idling retard angle control. (P050B)

Judge as NG when ECM is not controlling the angle properly during catalyst advanced idling retard angle control.

- Final ignition timing diagnosis

Judge as NG when actual retard amount is under the specified value at cold start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
<Exhaust gas temperature diagnosis>	
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Engine condition	In operation
Vehicle speed	≤ 2 km/h (1.2 MPH)
Elapsed time after gear position change (P ↔ D or N ↔ D)	≥ 3000 ms
ISC feedback	In operation
Throttle opening angle	< 0.37 °
Fuel property	Not extremely low volatility
Target retard amount	≥ 11 °CA (CVT model) ≥ 11 °CA (MT model)
<Idle speed diagnosis>	
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Engine condition	In operation
Vehicle speed	≤ 2 km/h (1.2 MPH)
Engine coolant temperature	≤ 60 °C (140 °F)
Intake air amount sum value	≤ Value of Map 1
Elapsed time after gear position change (P ↔ D or N ↔ D)	≥ 3000 ms
Throttle opening angle	< 0.37 °
Fuel property	Not extremely low volatility
Elapsed time after starting the engine	≥ 2000 ms
<Final ignition timing diagnosis>	
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Engine condition	In operation
Vehicle speed	≤ 2 km/h (1.2 MPH)
Engine coolant temperature	≤ 60 °C (140 °F)
Intake air amount sum value	≤ Value of Map 2
Elapsed time after gear position change (P ↔ D or N ↔ D)	≥ 3000 ms
Throttle opening angle	< 0.37 °
Fuel property	Not extremely low volatility
Target retard amount	≥ Value from Map 3

Map 1

Engine coolant temperature at engine starting °C (°F)	-40 (-40)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Intake air amount sum value g (oz)	770 (27.16)	690 (24.34)	620 (21.87)	560 (19.75)	510 (17.99)	450 (15.87)	390 (13.76)	320 (11.29)

Engine coolant temperature at engine starting °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Intake air amount sum value g (oz)	260 (9.17)	210 (7.41)	180 (6.35)	180 (6.35)	180 (6.35)	180 (6.35)	180 (6.35)	180 (6.35)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 2

Engine coolant temperature at engine starting °C (°F)	-40 (-40)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Intake air amount sum value g (oz)	770 (27.16)	690 (24.34)	620 (21.87)	560 (19.75)	510 (17.99)	450 (15.87)	390 (13.76)	320 (11.29)

Engine coolant temperature at engine starting °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Intake air amount sum value g (oz)	260 (9.17)	210 (7.41)	180 (6.35)	180 (6.35)	180 (6.35)	180 (6.35)	180 (6.35)	180 (6.35)

Map 3

Engine coolant temperature	-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)	60 °C (140 °F)
Target retard amount (CVT model)	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA
Target retard amount (MT model)	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA	11 °CA

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.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	< Value of Map 4

Map 4

Engine coolant temperature at engine starting	-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)	60 °C (140 °F)
Threshold value (CVT model)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)
Threshold value (MT model)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °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 and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	≥ Value of Map 4

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Idle speed diagnosis

Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Target engine speed	< -300 — -125 rpm (CVT model) < -300 rpm (MT model)

Time Needed for Diagnosis: 7000 ms

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

Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Target engine speed	≥ -300 — -125 rpm (CVT model) ≥ -300 rpm (MT model)

Time Needed for Diagnosis: 7000 ms

• Final ignition timing diagnosis

Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Final ignition timing – ignition timing during CSERS* *: Ignition timing during CSERS (Cold Start Emission Reduction Strategy) = Base ignition timing – retard amount	> Value of Map 5

Map 5

Engine coolant temperature at engine starting	-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)	60 °C (140 °F)
Threshold value (CVT model)	6 °CA	6 °CA	6 °CA	6 °CA	6 °CA	6 °CA	6 °CA	6 °CA	6 °CA	6 °CA	6 °CA
Threshold value (MT model)	7 °CA	7 °CA	7 °CA	7 °CA	7 °CA	7 °CA	7 °CA	7 °CA	7 °CA	7 °CA	7 °CA

Time Needed for Diagnosis: 7000 ms

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

Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Final ignition timing – ignition timing during CSERS* *: Ignition timing during CSERS (Cold Start Emission Reduction Strategy) = Base ignition timing – retard amount	≤ Value of Map 5

Time Needed for Diagnosis: 7000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CT:DTC P050B COLD START IGNITION TIMING PERFORMANCE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P050A. <Ref. to GD(H4DO)-160, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CU:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect abnormal continuity in the starter SW1.

Judge as ON NG when the starter SW 1 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

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
Battery voltage	≥ 8 V
Engine condition	After engine starting
Starter SW 1 signal	ON

Time Needed for Diagnosis: 30000 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Starter SW 1 signal	OFF

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

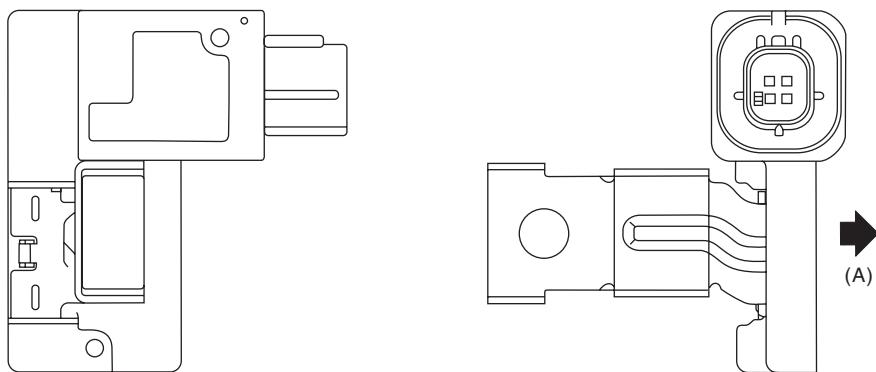
GENERAL DESCRIPTION

CV:DTC P0516 BATTERY TEMPERATURE SENSOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

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

2. COMPONENT DESCRIPTION



EN-10449

(A) Positive direction of measured current

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	> 1000 ms
Engine speed	> 500 rpm
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	< 0.1294 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Does not illuminate even when malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.1294 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

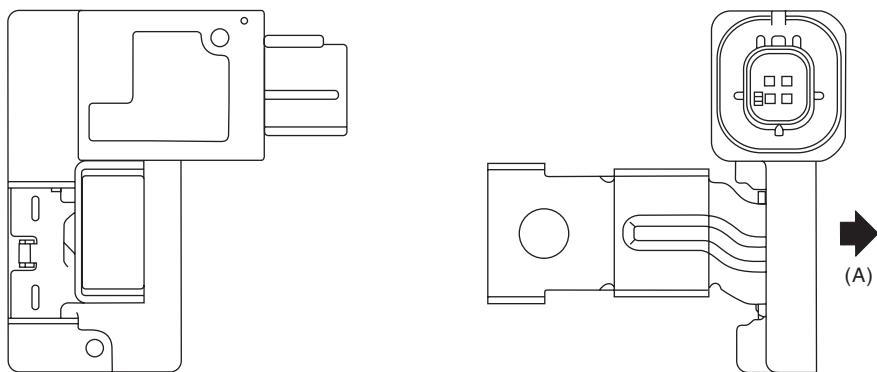
GENERAL DESCRIPTION

CW:DTC P0517 BATTERY TEMPERATURE SENSOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

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

2. COMPONENT DESCRIPTION



EN-10449

(A) Positive direction of measured current

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	> 1000 ms
Engine speed	> 500 rpm
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Output voltage	$\geq 4.787 \text{ V}$

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Does not illuminate even when malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.787 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CX:DTC P0560 SYSTEM VOLTAGE

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 CONDITIONS

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. 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
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: 2500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: Less than 1 second

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 CPU normal RAM, judge as NG.

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 when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Write the specified value to RAM and then read.	The written value cannot be read.

Time Needed for Diagnosis: Less than 1 second

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Write the specified value to RAM and then read.	The written value can be read.

Time Needed for Diagnosis: Less than 1 second

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.

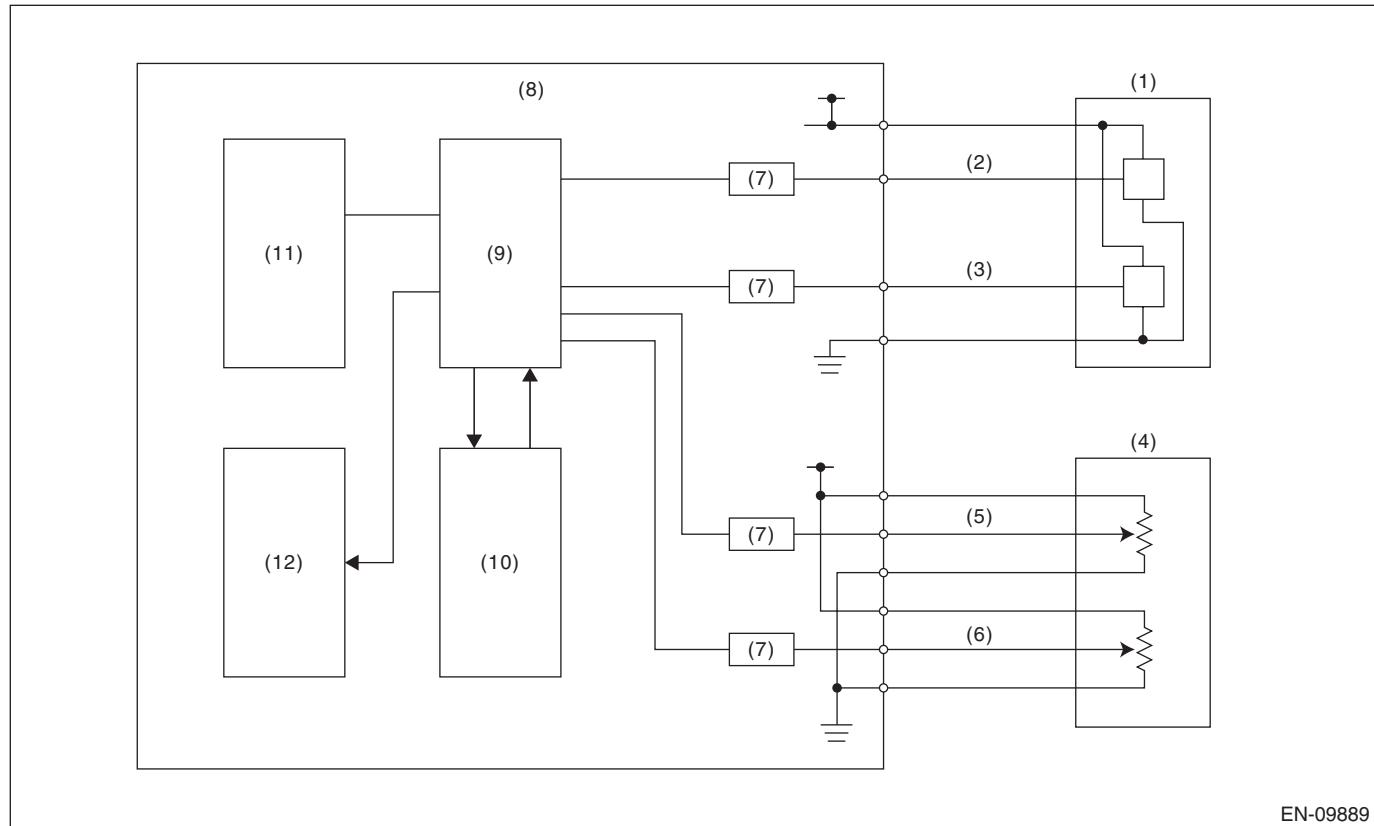
DA:DTC P0606 CONTROL MODULE PROCESSOR

1. OUTLINE OF DIAGNOSIS

Judge as NG when the CPU operation is abnormal.

- (1) Instruction check initial
- (2) Instruction check base
- (3) Software flow check
- (4) Software monitor check
- (5) CAN register check
- (6) If the output IC operation is abnormal

2. COMPONENT DESCRIPTION



EN-09889

(1) Throttle position sensor	(5) Accelerator pedal position sensor 1	(9) CPU
(2) Throttle position sensor 1	(6) Accelerator pedal position sensor 2	(10) Monitoring IC
(3) Throttle position sensor 2	(7) I/F circuit	(11) EEPROM
(4) Accelerator pedal position sensor	(8) Engine control module (ECM)	(12) Output IC

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
(1) Ignition switch	Change from OFF to ON
(2) Battery voltage	≥ 6.2 V
(2) Electronic throttle control relay	ON
(3) None	
(4) Battery voltage	≥ 6.2 V
(4) Electronic throttle control relay	ON
(5) None	
(6) None	

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Main CPU calculation result	The result and expected value do not match.
(2) Main CPU calculation result	The result and expected value do not match.
(3) Process flow result	The result and expected value do not match.
(4) High integrated IC motor continuity cut demand	None
(5) Writing value to CAN register	≠ Read out value
(6) Communication between output driver ICs	Not possible to communicate

Time Needed for Diagnosis:

- (1): 2 time(s)
- (2): 512 ms
- (3): 504 ms
- (4): 48 ms
- (5): None
- (6): 2500 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Main CPU calculation result	The result and expected value match.
(2) Main CPU calculation result	The result and expected value match.
(3) Process flow result	The result and expected value match.
(4) High integrated IC motor continuity cut demand	Exist
(5) Writing value to CAN register	= Read out value
(6) Communication between output driver ICs	Possible to communicate

Time Needed for Diagnosis:

- (1): None
- (2): 2000 ms
- (3): 2000 ms
- (4): 2000 ms
- (5): None
- (6): None

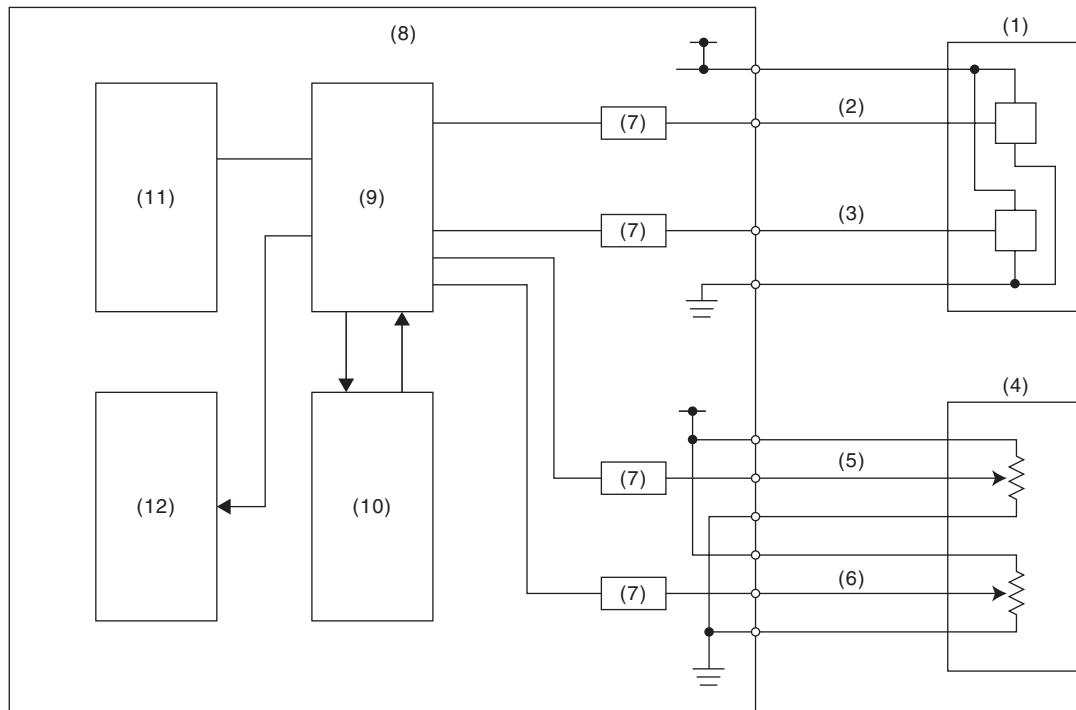
DB:DTC P060A INTERNAL CONTROL MODULE MONITORING PROCESSOR PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the monitoring IC operation is abnormal.

- (1) Monitoring IC Disable (motor continuity cut demand) diagnosis
- (2) Monitoring IC function diagnosis
- (3) Monitoring IC register diagnosis

2. COMPONENT DESCRIPTION



EN-09889

(1) Throttle position sensor	(5) Accelerator pedal position sensor 1	(9) CPU
(2) Throttle position sensor 1	(6) Accelerator pedal position sensor 2	(10) Monitoring IC
(3) Throttle position sensor 2	(7) I/F circuit	(11) EEPROM
(4) Accelerator pedal position sensor	(8) Engine control module (ECM)	(12) Output IC

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
(1) Battery voltage	≥ 6.2 V
(1) Main throttle sensor continuity diagnosis result	Normal
(1) Sub throttle sensor continuity diagnosis result	Normal
(1) Main throttle sensor property diagnosis result	Normal
(1) Monitoring IC Disable status	ON
(1) Micro computer Disable status	OFF
(2) Battery voltage	≥ 6.2 V
(2) Micro computer Disable status	ON
(3) Battery voltage	≥ 6.2 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when one of the following conditions is established.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Main throttle opening angle – Main throttle opening angle at monitoring start	$\geq 2^\circ$
(2) Monitoring IC Disable status	OFF
(3) Monitoring IC register writing value	\neq Reading value

Time Needed for Diagnosis:

- (1): 24 ms
- (2): $0.08 \text{ s} \times 2$ time(s)
- (3): 200 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Main throttle opening angle – Main throttle opening angle at monitoring start	$< 2^\circ$
(2) Monitoring IC Disable status	ON
(3) Monitoring IC register writing value	$=$ Reading value

Time Needed for Diagnosis:

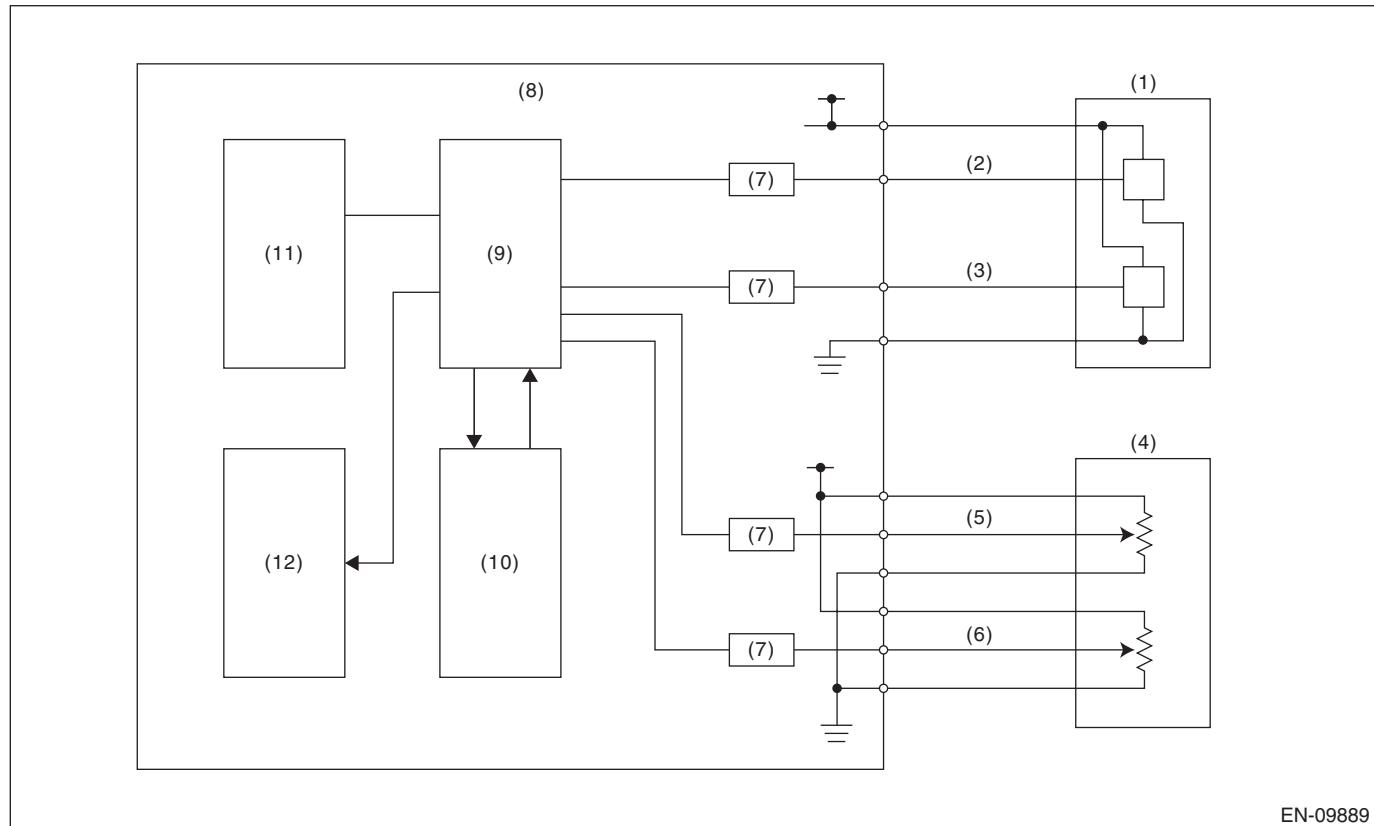
- (1): 80 ms
- (2): None
- (3): 2000 ms

DC:DTC P060B INTERNAL CONTROL MODULE A/D PROCESSING PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the AD converter operation is abnormal.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor	(5) Accelerator pedal position sensor 1	(9) CPU
(2) Throttle position sensor 1	(6) Accelerator pedal position sensor 2	(10) Monitoring IC
(3) Throttle position sensor 2	(7) I/F circuit	(11) EEPROM
(4) Accelerator pedal position sensor	(8) Engine control module (ECM)	(12) Output IC

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 6.2 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when one of the following conditions is established.

Judgment Value

Malfunction Criteria	Threshold Value
Target voltage and Actual voltage or Actual voltage	= 0 V < 0 V > 0.01953125 V
Target voltage and Actual voltage or Actual voltage	= 5 V < 4.979248047 V > 5 V

Time Needed for Diagnosis: 200 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Target voltage and Actual voltage and Actual voltage	= 0 V \geq 0 V \leq 0.01953125 V
Target voltage and Actual voltage and Actual voltage	= 5 V \geq 4.979248047 V \leq 5 V

Time Needed for Diagnosis: 2000 ms

DD:DTC P0616 STARTER RELAY CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

- Model without push button start

Detect abnormal continuity in the starter SW1.

Judge as OFF NG when the starter SW 1 signal remains OFF.

- Model with push button start

Detect abnormal continuity in the starter SW 2.

Judge as OFF NG when the starter SW 2 signal remains OFF.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- Abnormality Judgment

Judge as OFF NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Vehicle speed	< 1 km/h (0.6 MPH)
Engine condition	Change from pre-start to post-start
Starter SW 1 signal (model without push button start)	No ON experience
Starter SW 2 signal (model with push button start)	

Time Needed for Diagnosis: Less than 1 second

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

- Normality Judgment

Judge as OFF OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Vehicle speed	< 1 km/h (0.6 MPH)
Engine condition	Change from pre-start to post-start
Starter SW 1 signal (model without push button start)	ON Experience exists
Starter SW 2 signal (model with push button start)	

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DE:DTC P0617 STARTER RELAY CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

- Model without push button start

Detect abnormal continuity in the starter SW1.

Judge as ON NG when the starter SW 1 signal remains ON.

- Model with push button start

Detect abnormal continuity in the starter SW 2.

Judge as ON NG when the starter SW 2 signal remains ON.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. 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
Battery voltage	≥ 8 V
Engine condition	After engine starting
Starter relay (model with push button start)	OFF
Starter SW 1 signal (model without push button start)	ON
Starter SW 2 signal (model with push button start)	

Time Needed for Diagnosis:

- Model without push button start: 30000 ms
- Model with push button start: 2000 ms

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

- **Normality Judgment**

Judge as OFF OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Starter SW 1 signal (model without push button start)	OFF
Starter SW 2 signal (model with push button start)	

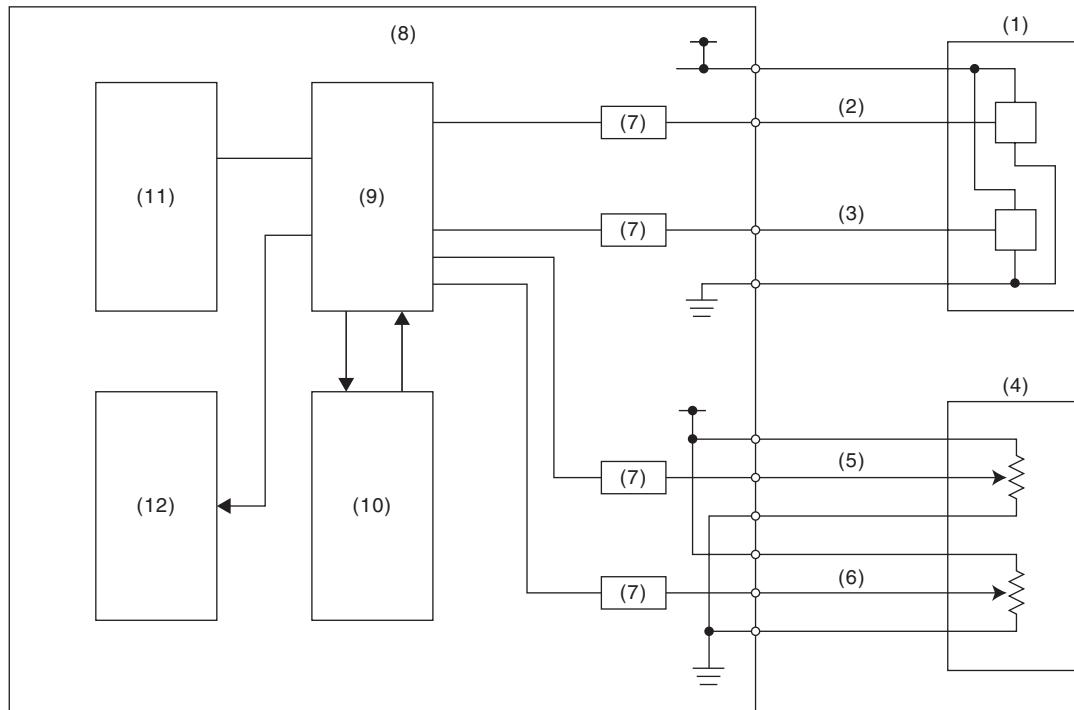
Time Needed for Diagnosis: Less than 1 second

DF:DTC P062F INTERNAL CONTROL MODULE EEPROM ERROR

1. OUTLINE OF DIAGNOSIS

Judge as NG when the EEPROM operation is abnormal.

2. COMPONENT DESCRIPTION



EN-09889

(1) Throttle position sensor	(5) Accelerator pedal position sensor 1	(9) CPU
(2) Throttle position sensor 1	(6) Accelerator pedal position sensor 2	(10) Monitoring IC
(3) Throttle position sensor 2	(7) I/F circuit	(11) EEPROM
(4) Accelerator pedal position sensor	(8) Engine control module (ECM)	(12) Output IC

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis during self shut.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Writing result to EEPROM	Malfunction

Time Needed for Diagnosis: 2 times

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Writing result to EEPROM	Normal

Time Needed for Diagnosis: None

DG:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

Judge as NG when there is CAN communication with the TCM and there is a MIL lighting request.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. 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
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	Yes

Time Needed for Diagnosis: 2500 ms

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

• Normality 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
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	None

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DH:DTC P081A STARTER DISABLE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect abnormal continuity in the starter cut relay.
Judge as NG when the starter cut relay output line is open.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Vehicle speed	< 1 km/h (0.6 MPH)
Engine condition	Change from pre-start to post-start
Starter cut relay terminal level	No High level experience

Time Needed for Diagnosis: Less than 1 second

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Vehicle speed	< 1 km/h (0.6 MPH)
Engine condition	Change from pre-start to post-start
Starter cut relay terminal level	High level experience exists

Time Needed for Diagnosis: Less than 1 second

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.

Judge as NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

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

4. 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
Neutral switch signal in ECM when "P"/"N" range in TCM are "OFF" and when the other switches are "ON"	LOW (ON)

Time Needed for Diagnosis: 64 ms × 100 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when "P"/"N" range in TCM are "OFF" and when the other switches are "ON"	HIGH (OFF)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

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

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed determined times or more after the neutral SW change.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below) Driving condition change a) Engine speed 550 rpm — 900 rpm & Vehicle speed = 0 km/h (0 MPH) b) Engine speed 1500 rpm — 2150 rpm & Vehicle speed ≥ 64 km/h (39.8 MPH)	LOW (ON) continues. From a) to b)

Time Needed for Diagnosis: 3 time(s)

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

• Normality Judgment

Judge as OK and clear NG when there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below) Driving condition change a) Engine speed 550 rpm — 900 rpm & Vehicle speed = 0 km/h (0 MPH) b) Engine speed 1500 rpm — 2150 rpm & Vehicle speed ≥ 64 km/h (39.8 MPH)	Changes to HIGH (OFF). From a) to b)

Time Needed for Diagnosis: Less than 1 second

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.

Judge as NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

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

4. 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
Neutral switch signal in ECM when "P"/"N" range in TCM are "ON" and when the other switches are "OFF"	HIGH (OFF)

Time Needed for Diagnosis: 64 ms × 100 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when "P"/"N" range in TCM are "ON" and when the other switches are "OFF"	LOW (ON)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

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

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed determined times or more after the neutral SW change.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below) Driving condition change a) Engine speed 550 rpm — 900 rpm & Vehicle speed = 0 km/h (0 MPH) b) Engine speed 1500 rpm — 2150 rpm & Vehicle speed ≥ 64 km/h (39.8 MPH)	HIGH (OFF) continues. From a) to b)

Time Needed for Diagnosis: 3 time(s)

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

• Normality Judgment

Judge as OK and clear NG when there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below) Driving condition change a) Engine speed 550 rpm — 900 rpm & Vehicle speed = 0 km/h (0 MPH) b) Engine speed 1500 rpm — 2150 rpm & Vehicle speed ≥ 64 km/h (39.8 MPH)	Changes to LOW (ON). From a) to b)

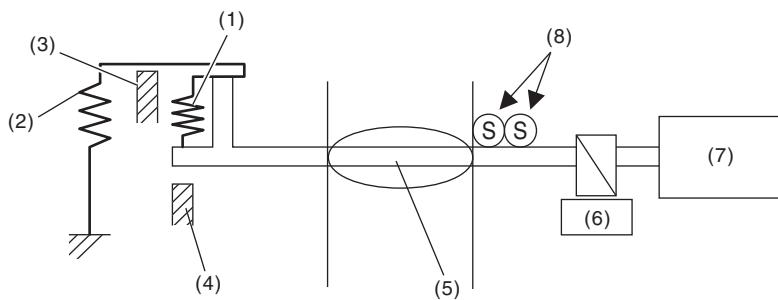
Time Needed for Diagnosis: Less than 1 second

DM: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 position sensor
(3) Intermediate stopper	(6) Gear	

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 6 V
Throttle position sensor	Normal

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2 °

Time Needed for Diagnosis: 24 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	≥ 2 °

Time Needed for Diagnosis: 3400 ms

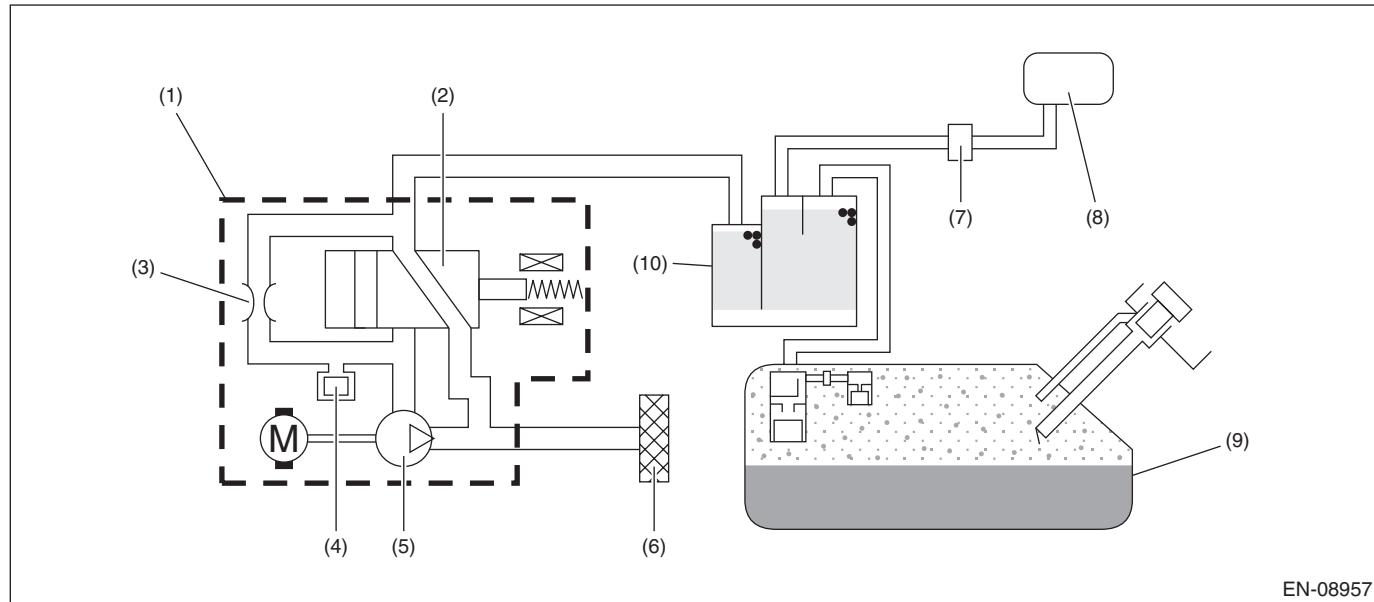
DN:DTC P1449 EVAPORATIVE EMISSION CONT. SYS. AIR FILTER CLOG

1. OUTLINE OF DIAGNOSIS

Detect the drain filter clogging by the pressure change during purge introduction.

Judge as drain filter clogging malfunction if the pressure in the evaporative emission system piping suddenly decreases by the purging.

2. COMPONENT DESCRIPTION



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 20000 ms
Continuous time of $ $ Pressure sensor output value – Pressure sensor output value 64 ms ago $ \leq 0.7$ kPa (5 mmHg, 0.2 inHg)	≥ 5120 ms + 13000 ms
Establishing time for following conditions	≥ 10000 ms
• ELCM vacuum pump	Not in operation
• ELCM switching valve	Open

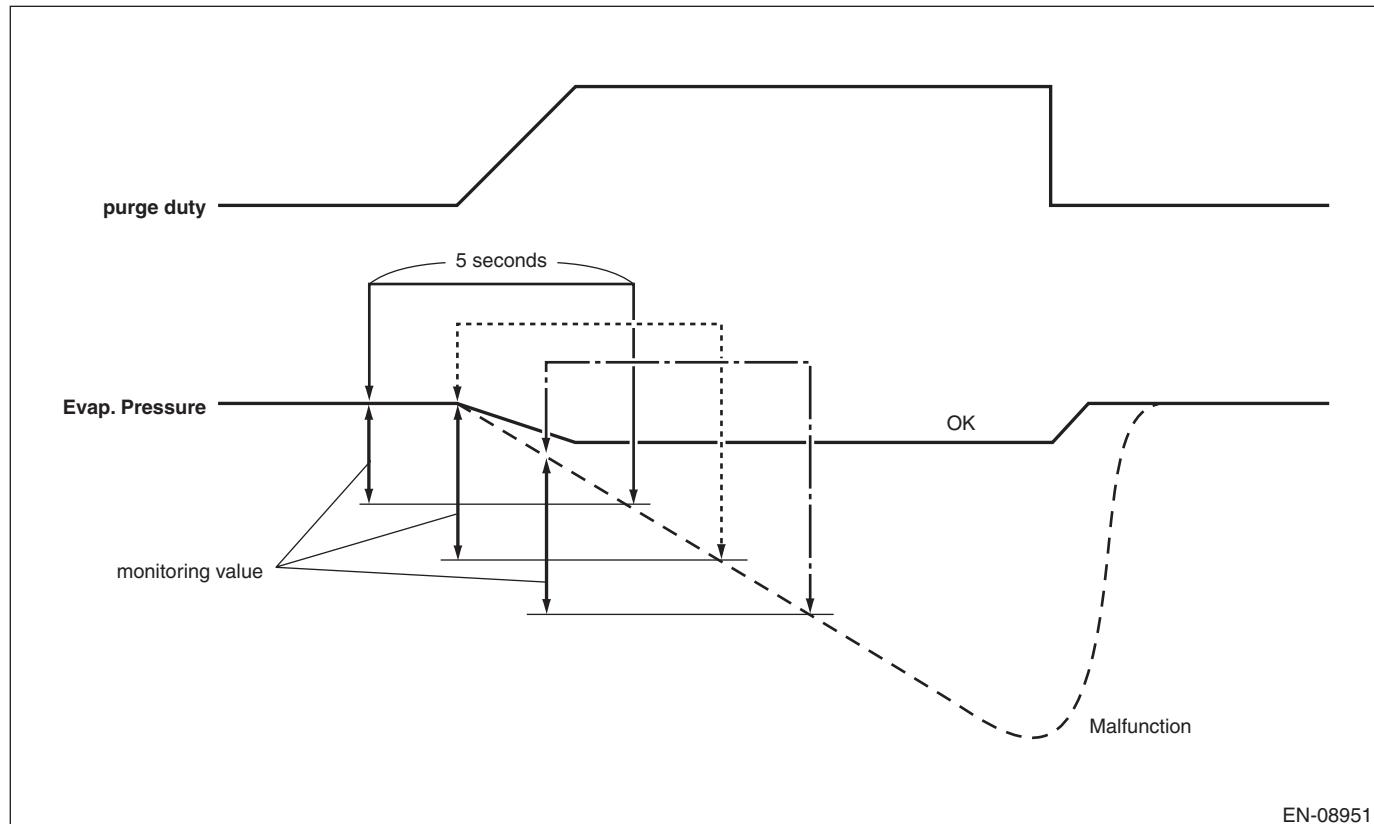
4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging is performed after 20000 ms have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD



Calculate the difference between the ELCM pressure sensor output value as of 5 seconds ago and the current one, and if the value is greater than judgment value, detect and judge as filter clogging trouble.

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria		Threshold Value
Pressure sensor output value as of 5 seconds ago – Current pressure sensor output value		> Value from Map
Number of above conditions established		> 2 time(s)

Map

Vehicle speed km/h (MPH)	0 (0)	20 (12.4)	40 (24.9)	60 (37.3)	80 (49.7)	100 (62.1)	120 (74.6)	300 (186.4)
Pressure sensor output value as of 5 seconds ago – Current pressure sensor output value kPa (mmHg, inHg)	1.1 (8.5314, 0.3)	2.2 (16.4664, 0.6)						

Time Needed for Diagnosis: Approx. 5 seconds

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria		Threshold Value
Pressure sensor output value as of 5 seconds ago – Current pressure sensor output value		\leq Value from Map

DO:DTC P1451 EVAPORATIVE EMISSION CONT. SYS.

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0455. <Ref. to GD(H4DO)-140, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

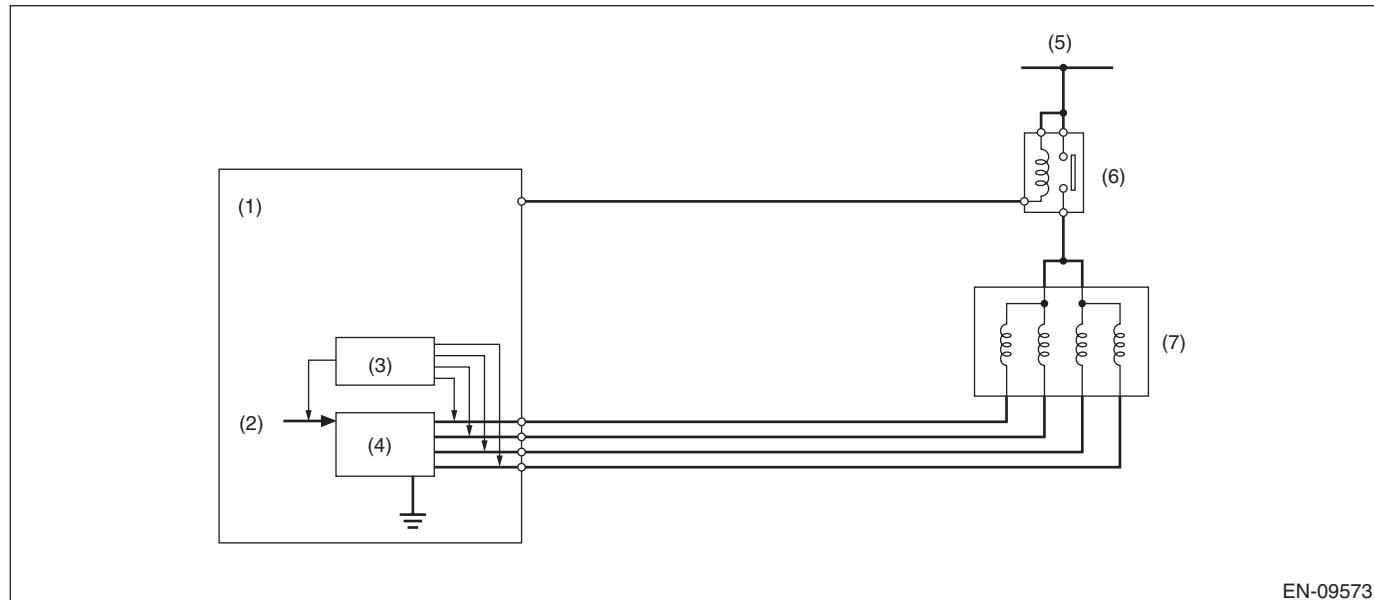
GENERAL DESCRIPTION

DP:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detects open or short circuit of EGR.
- Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-09573

(1) Engine control module (ECM)
(2) Computer unit (CPU)

(3) Detecting circuit
(4) Switch circuit

(5) Battery voltage
(6) Main relay

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 1 s
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously during EGR operation.

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
Terminal voltage level when ECM outputs OFF signal or Terminal voltage level when EGR operates	Low level
	Low level

Time Needed for Diagnosis: 2500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level
Terminal voltage level when EGR operates	High level

Time Needed for Diagnosis: 256 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

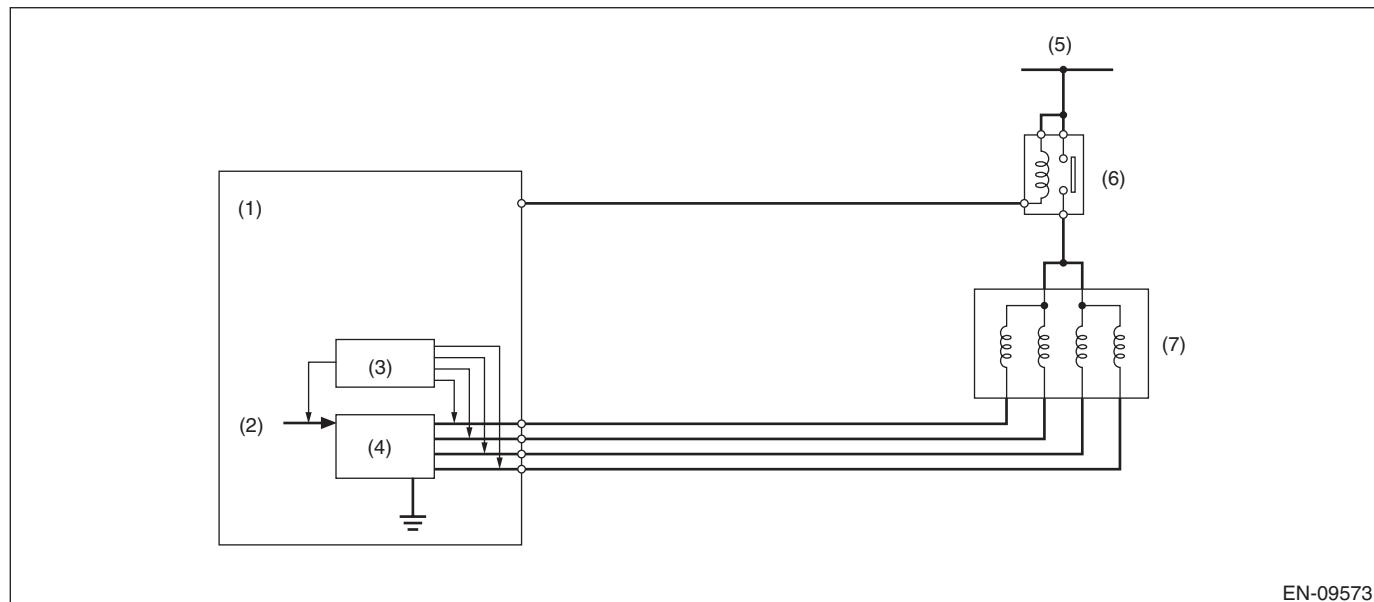
GENERAL DESCRIPTION

DQ:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detects open or short circuit of EGR.
- Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-09573

(1) Engine control module (ECM)
(2) Computer unit (CPU)

(3) Detecting circuit
(4) Switch circuit

(5) Battery voltage
(6) Main relay

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 1 s
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Terminal voltage level when ECM outputs ON signal or	High level
Terminal voltage level when EGR operates	High level

Time Needed for Diagnosis: 2500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level
Terminal voltage level when EGR operates	Low level

Time Needed for Diagnosis: 256 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DR:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1492. <Ref. to GD(H4DO)-194, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DS:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1493. <Ref. to GD(H4DO)-196, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DT:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1492. <Ref. to GD(H4DO)-194, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DU:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1493. <Ref. to GD(H4DO)-196, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DV:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1492. <Ref. to GD(H4DO)-194, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DW:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

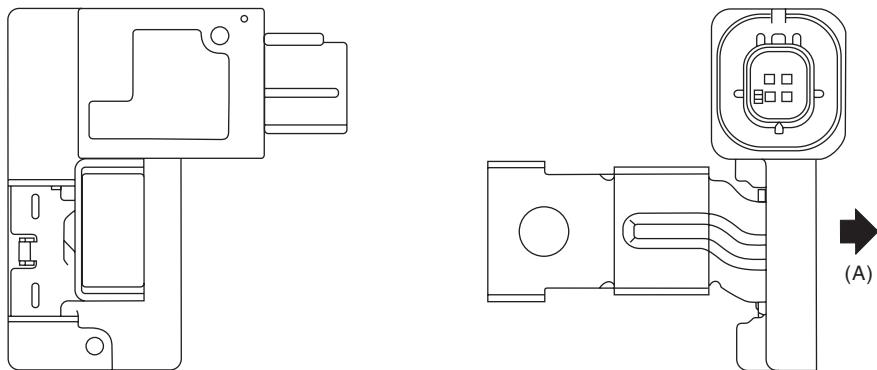
For the detection standard, refer to DTC P1493. <Ref. to GD(H4DO)-196, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DX:DTC P1530 BATTERY CURRENT SENSOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of battery current sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-10449

(A) Positive direction of measured current

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	> 1000 ms
Engine speed	> 500 rpm
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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
Output voltage	< 0.2148 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Does not illuminate even when malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.2148 V

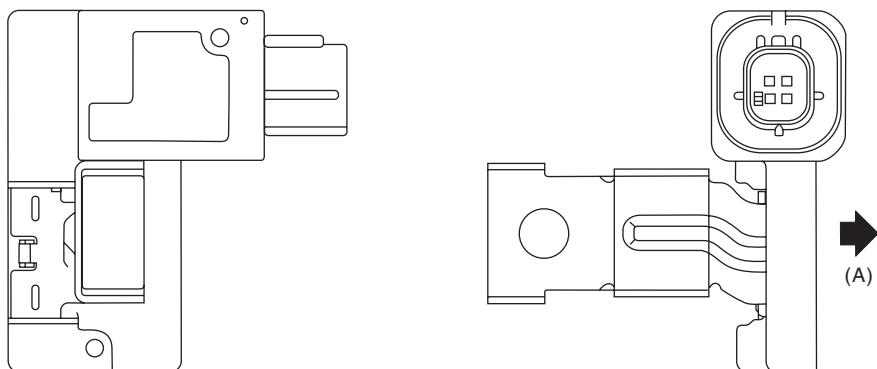
Time Needed for Diagnosis: Less than 1 second

DY:DTC P1531 BATTERY CURRENT SENSOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of battery current sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-10449

(A) Positive direction of measured current

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	> 1000 ms
Engine speed	> 500 rpm
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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
Output voltage	$\geq 4.832 \text{ V}$

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Does not illuminate even when malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.832 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

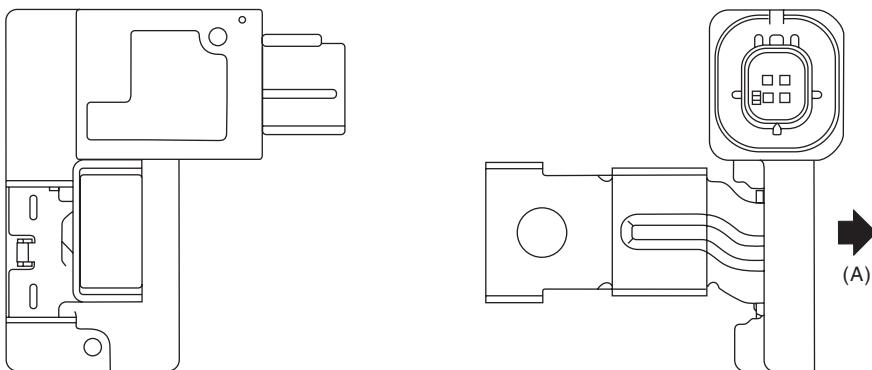
DZ:DTC P1532 BATTERY CHARGING SYSTEM

1. OUTLINE OF DIAGNOSIS

Detect the output property and malfunction of battery current sensor.

Judge as NG when there is no variation (stuck) under a condition where the battery current sensor output should have changed or when difference between output and battery current value is larger than expected (characteristics malfunction).

2. COMPONENT DESCRIPTION



EN-10449

(A) Positive direction of measured current

3. ENABLE CONDITIONS

- Stuck

Secondary Parameters	Enable Conditions
Ignition switch During switchover of regulating voltage	ON High condition judgment*1 \longleftrightarrow Low condition judgment*2 However, the generator target duty has not experienced the following during switchover. $40\% \leq \text{Generator target duty} < 60\%$
<p>*1 High condition judgment</p> <p>Continuous time during which all the conditions listed below are met</p> <ul style="list-style-type: none">• Battery voltage $\geq 5000\text{ ms}$• Generator final output duty $\geq 13.7\text{ V}$• Engine speed $\geq 60\%$• Engine speed $\geq 600\text{ rpm}$	
<p>*2 Low condition judgment</p> <p>Continuous time during which all the conditions listed below are met</p> <ul style="list-style-type: none">• Battery voltage $\geq 5000\text{ ms}$• Generator final output duty $< 13.2\text{ V}$• Engine speed $< 40\%$• Engine speed $< 600\text{ rpm}$	

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- Characteristics malfunction

Secondary Parameters	Enable Conditions
Ignition switch During switchover of regulating voltage	ON High condition judgment is established. Target duty $\geq 60\%$ \rightarrow target duty $< 40\%$ or Low condition judgment is established. Target duty $< 40\%$ \rightarrow target duty $\geq 60\%$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- Abnormality Judgment

- Stuck

Judge as NG when the following conditions are repeated 10 time(s) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Difference between maximum value and minimum value in output voltage	$< 0.07\text{ V}$

Time Needed for Diagnosis: Less than 1 second

Malfunction Indicator Light Illumination: Does not illuminate even when malfunction occurs.

- Characteristics malfunction (Charge side)

Within 30000 ms from “enable condition not met” to “enable condition met”, judge as NG when the time required for meeting the following conditions exceeds the predetermined time.

(When NG judgment is performed, NG status is retained during that driving cycle.)

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage and Battery voltage	$0\text{ V} \leq \text{Output voltage} < 2.4\text{ V}$ $< 13.2\text{ V}$

Time Needed for Diagnosis: 26000 ms

Malfunction Indicator Light Illumination: Does not illuminate even when malfunction occurs.

- Characteristics malfunction (Discharge side)

Within 30000 ms from “enable condition not met” to “enable condition met”, judge as NG when the time required for meeting the following conditions exceeds the predetermined time.

(Within 30000 ms from “enable condition not met” to “enable condition met”, the target duty $\geq 60\%$ has not been experienced.)

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage and Battery voltage	$2.6\text{ V} \leq \text{Output voltage} < 5\text{ V}$ $\geq 13.7\text{ V}$

Time Needed for Diagnosis: 26000 ms

Malfunction Indicator Light Illumination: Does not illuminate even when malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- **Normality Judgment**

- **Stuck**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Difference between maximum value and minimum value in output voltage	$\geq 0.07 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

- **Characteristics malfunction (Charge side)**

Within 30000 ms from “enable condition not met” to “enable condition met”, judge as OK and clear the NG when the time required for meeting the following conditions does not reach the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage and Battery voltage	$0 \text{ V} \leq \text{Output voltage} < 2.4 \text{ V}$ $< 13.2 \text{ V}$

Time Needed for Diagnosis: 26000 ms

- **Characteristics malfunction (Discharge side)**

Within 30000 ms from “enable condition not met” to “enable condition met”, judge as OK and clear the NG when the time required for meeting the following conditions does not reach the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage and Battery voltage	$2.6 \text{ V} \leq \text{Output voltage} < 5 \text{ V}$ $\geq 13.7 \text{ V}$

Time Needed for Diagnosis: 26000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. 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
Tumble generator valve opening switch	= High
Tumble generator valve “close” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 4600 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= Low
Tumble generator valve “close” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 1600 ms

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. 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
Tumble generator valve opening switch	= High
Tumble generator valve “close” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 4600 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= Low
Tumble generator valve “close” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 1600 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. 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
Tumble generator valve opening switch	= Low
Tumble generator valve “open” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 4600 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= High
Tumble generator valve “open” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 1600 ms

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. 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
Tumble generator valve opening switch	= Low
Tumble generator valve “open” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 4600 ms

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= High
Tumble generator valve “open” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 1600 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

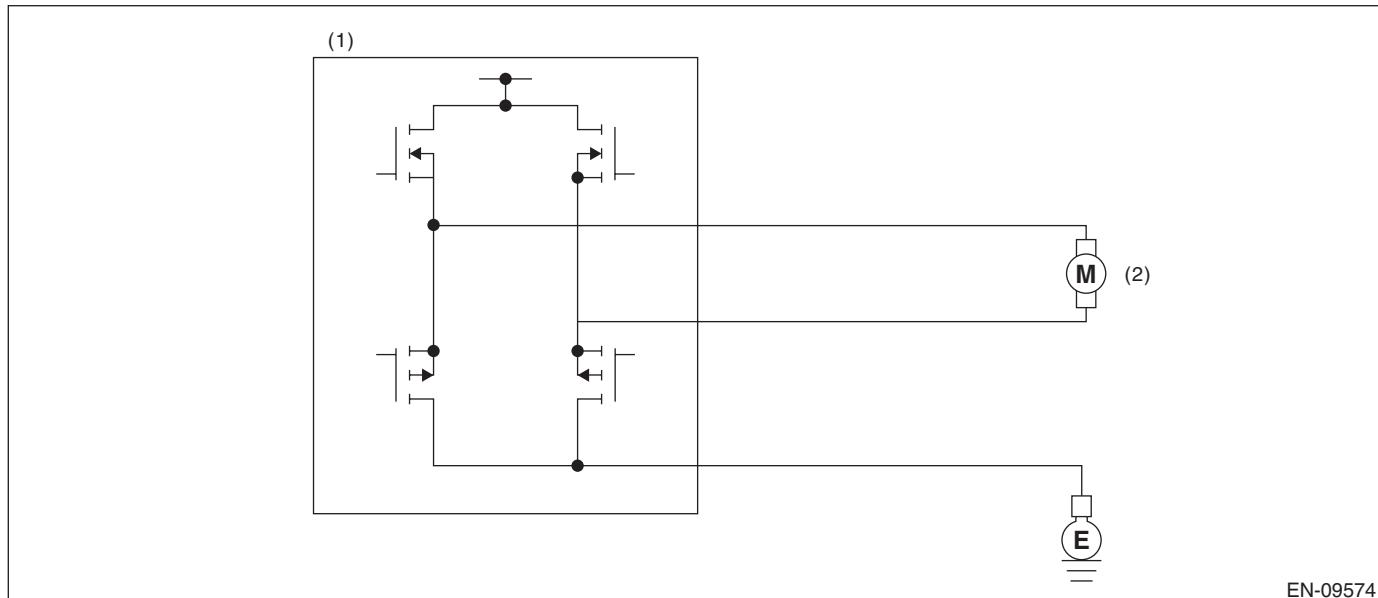
EE:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge open NG when the open NG signal is sent $96\text{ ms} \times 10$ time(s) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	Low

Time Needed for Diagnosis: $96\text{ ms} \times 10$ time(s)

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

• Normality Judgment

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	High

Time Needed for Diagnosis: Less than 1 second

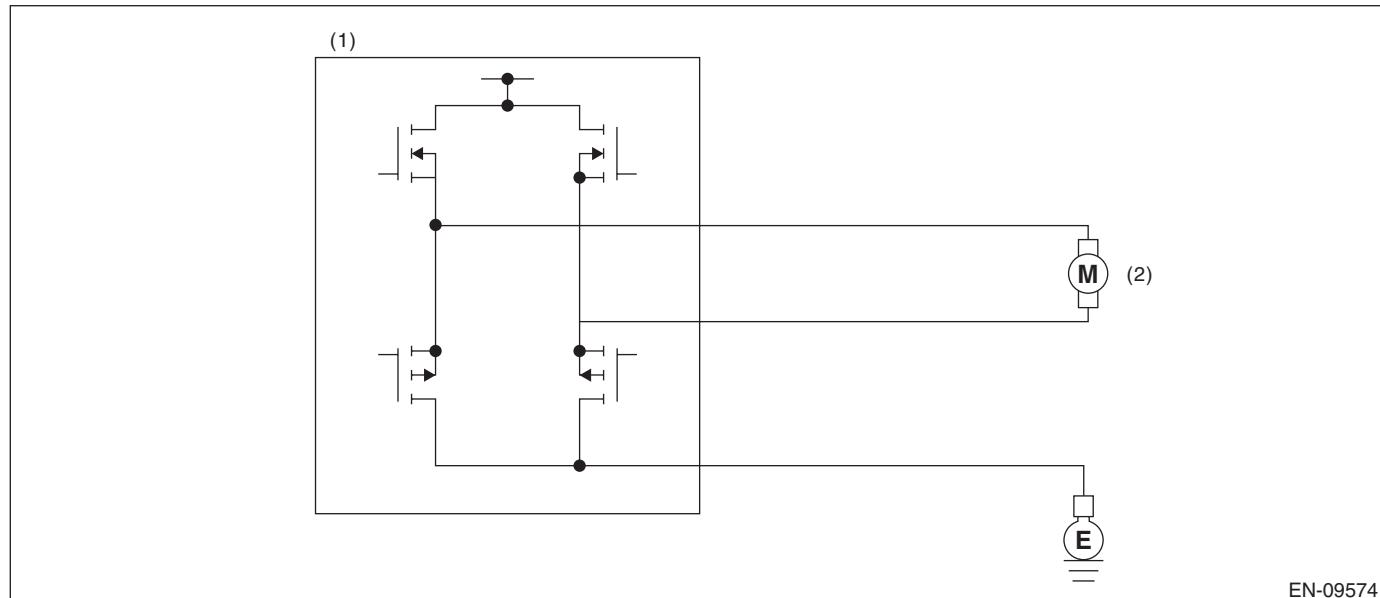
EF:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge open NG when the open NG signal is sent $96\text{ ms} \times 10$ time(s) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	Low

Time Needed for Diagnosis: $96\text{ ms} \times 10$ time(s)

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

• Normality Judgment

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	High

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

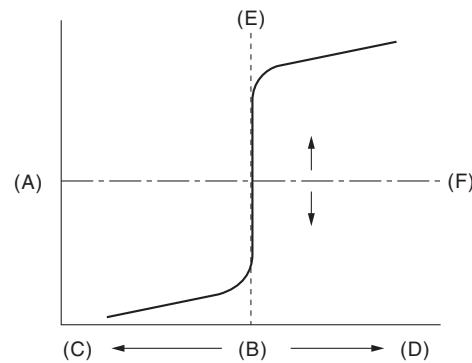
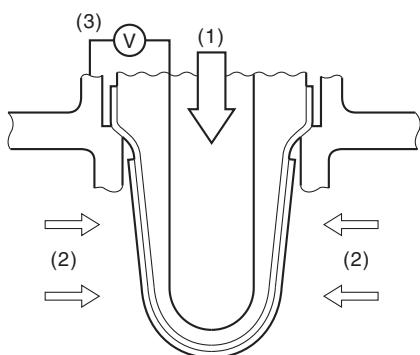
GENERAL DESCRIPTION

EG: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

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

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning Continuous time when all conditions are established.	Complete ≥ 1 s

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

• 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
Sub feedback learning value	< -0.042 (CVT model except for PZEV) < -0.044 (MT model except for PZEV) < -0.035 (PZEV CVT model) < -0.037 (PZEV MT model)

Time Needed for Diagnosis: 1 s × 1 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ -0.042 + 0 (CVT model except for PZEV) ≥ -0.044 + 0 (MT model except for PZEV) ≥ -0.035 + 0 (PZEV CVT model) ≥ -0.037 + 0 (PZEV MT model)

Time Needed for Diagnosis: 1 s

Diagnostic Trouble Code (DTC) Detecting Criteria

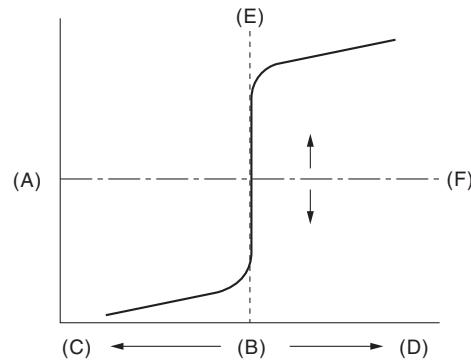
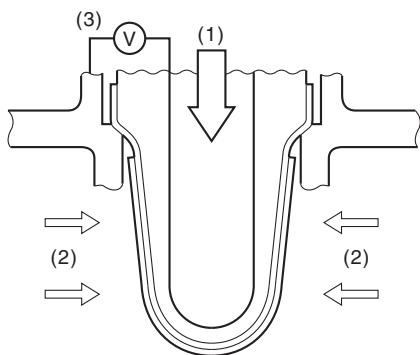
GENERAL DESCRIPTION

EH: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

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

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Complete
Continuous time when all conditions are established.	≥ 1 s

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

• 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
Sub feedback learning value	≥ 0.013 (CVT model except for PZEV) ≥ 0.017 (MT model except for PZEV) ≥ 0.024 (PZEV CVT model) ≥ 0.023 (PZEV MT model)

Time Needed for Diagnosis: 1 s \times 1 time(s)

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	$< 0.013 + 0$ (CVT model except for PZEV) $< 0.017 + 0$ (MT model except for PZEV) $< 0.024 + 0$ (PZEV CVT model) $< 0.023 + 0$ (PZEV MT model)

Time Needed for Diagnosis: 1 s

Diagnostic Trouble Code (DTC) Detecting Criteria

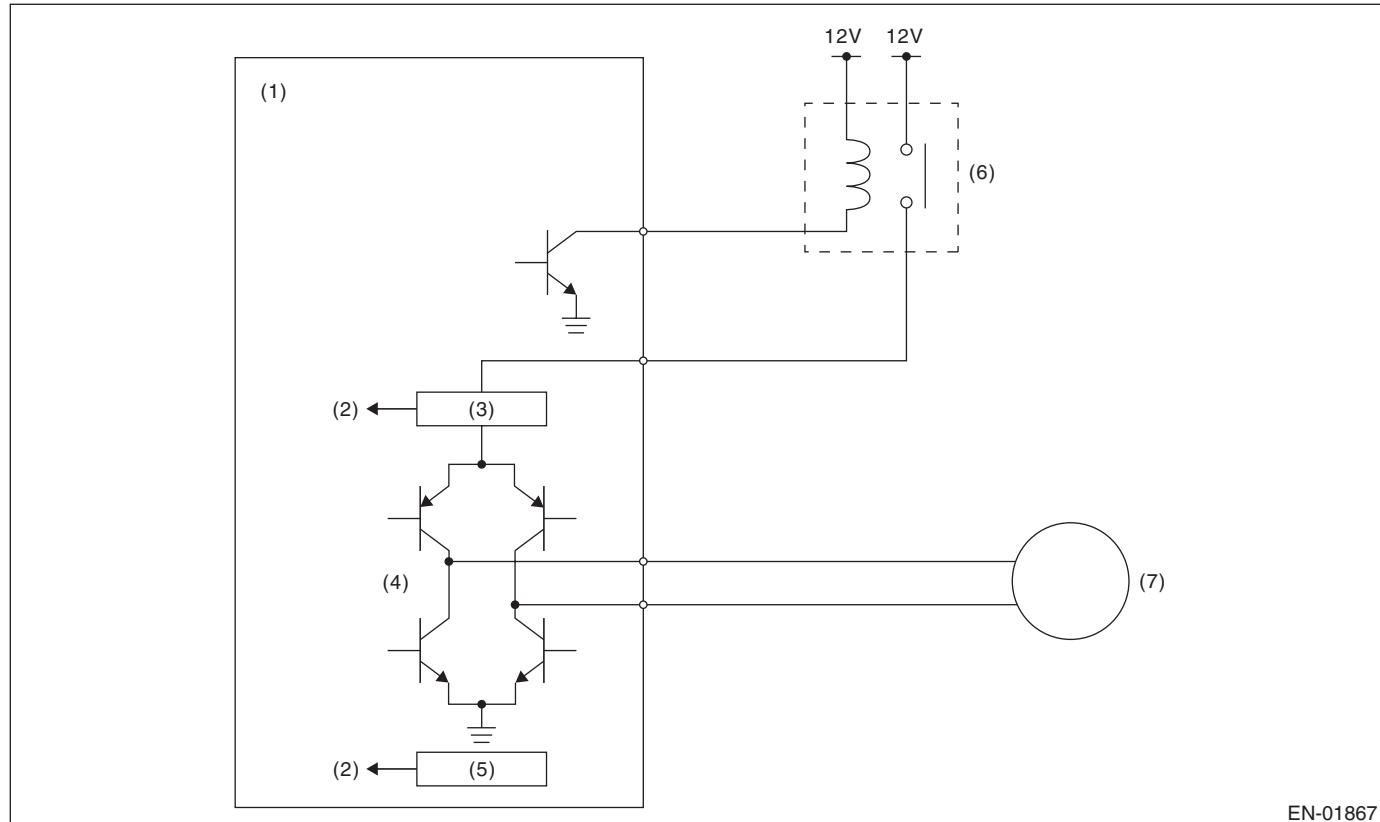
GENERAL DESCRIPTION

EI: 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 CPU communication line sub → main normal judgment	ON Normal

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Motor current	> 8 A
or	
Drive circuit inner temperature	> 175°C (347°F)

Time Needed for Diagnosis: 512 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

Time Needed for Diagnosis: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

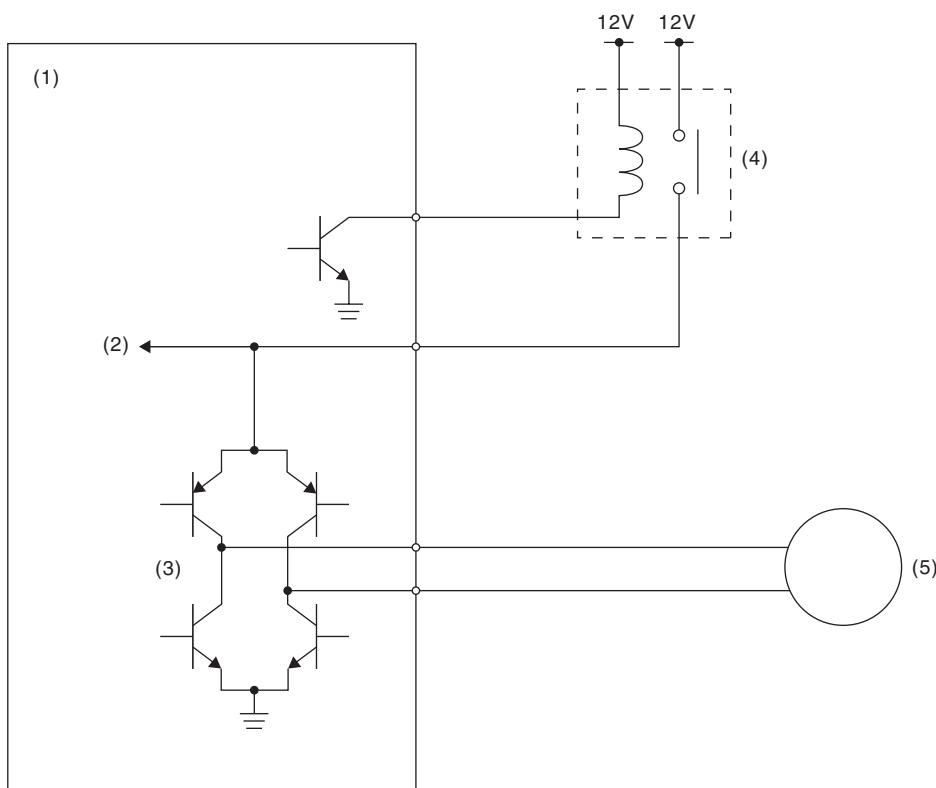
GENERAL DESCRIPTION

EJ:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electronic throttle control relay to ON.

2. COMPONENT DESCRIPTION



EN-01868

(1) Engine control module (ECM)

(2) Voltage detection circuit

(3) Drive circuit

(4) Electronic throttle control relay

(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 11 V
Electronic throttle control relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Motor power voltage	≤ 5 V

Time Needed for Diagnosis: 352 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	> 5 V

Time Needed for Diagnosis: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

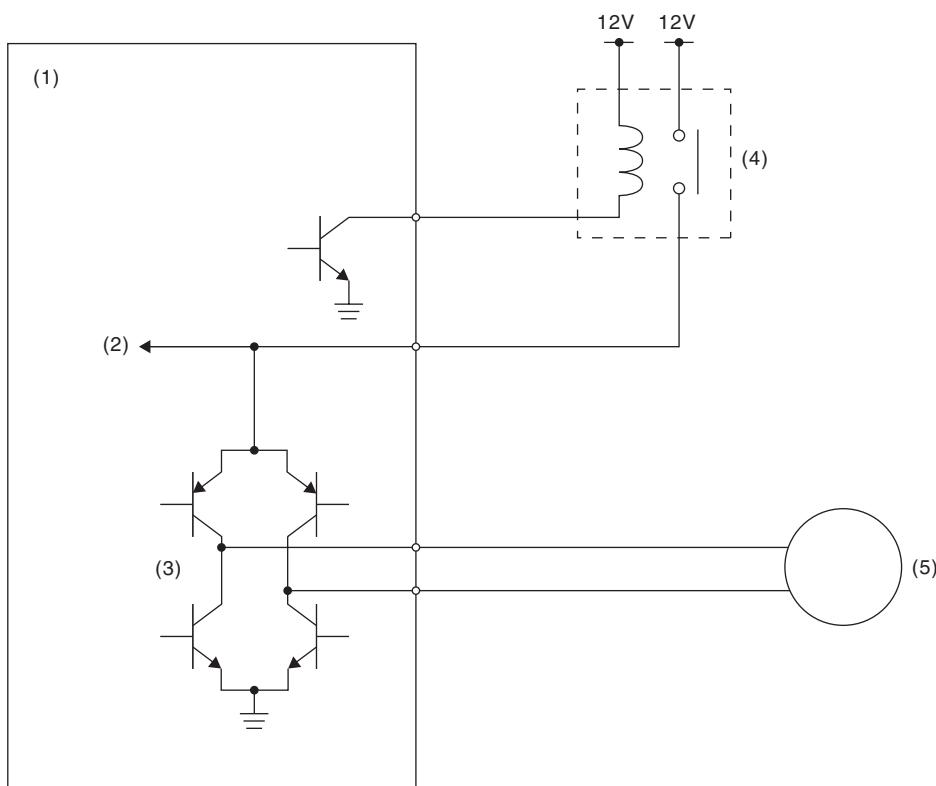
GENERAL DESCRIPTION

EK:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electronic throttle control relay to OFF.

2. COMPONENT DESCRIPTION



EN-01868

(1) Engine control module (ECM)
(2) Voltage detection circuit

(3) Drive circuit
(4) Electronic throttle control relay

(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 6 V
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

• 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
Motor power voltage	≥ 5 V

Time Needed for Diagnosis: 600 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	< 5 V

Time Needed for Diagnosis: 400 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

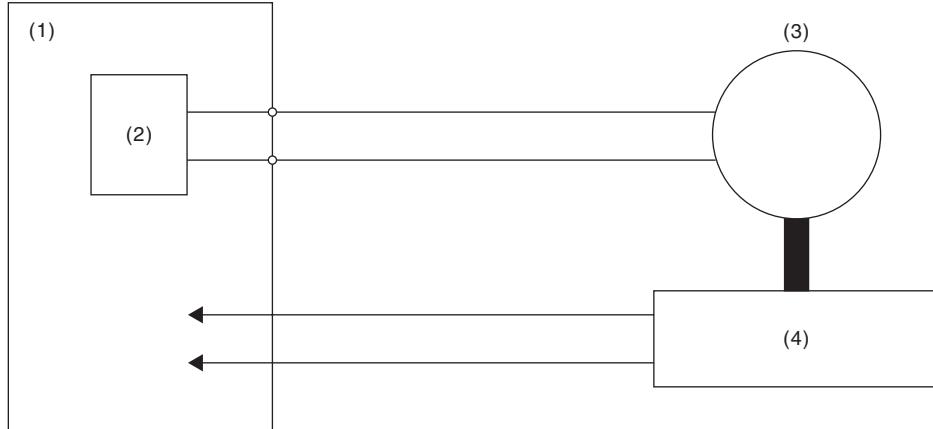
GENERAL DESCRIPTION

EL: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 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

• 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
Throttle sensor opening angle at full close point learning or Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	< 9.975 ° or > 20.025 ° < 1.162 °

Time Needed for Diagnosis: 8 ms — 80 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at full close point learning	$\geq 9.975 ^\circ$ and $\leq 20.025 ^\circ$
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	$\geq 1.162 ^\circ$

Time Needed for Diagnosis: 8 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

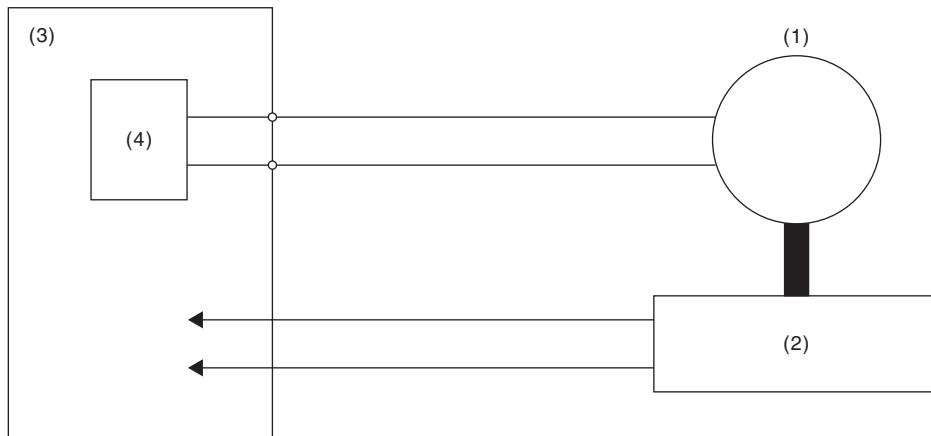
GENERAL DESCRIPTION

EM:DTC P2119 THROTTLE ACTUATOR CONTROL THROTTLE BODY RANGE/ PERFORMANCE

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 CONDITIONS

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	Within OK range of Details of Judgment value
Output duty to drive circuit	< 95 %

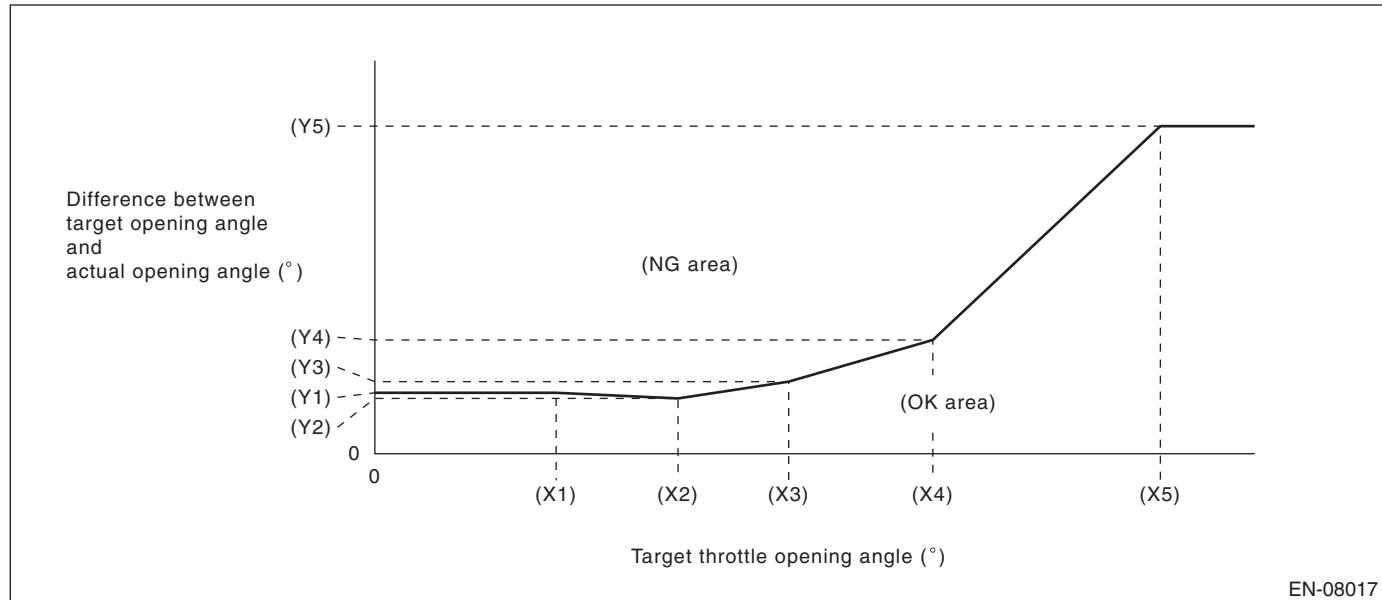
Time Needed for Diagnosis:

- Difference between target opening angle and actual opening angle:
 - NG judgment: See **Details of Judgment time**
 - OK judgment: 2000 ms
- Output duty to driving circuit: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment Value



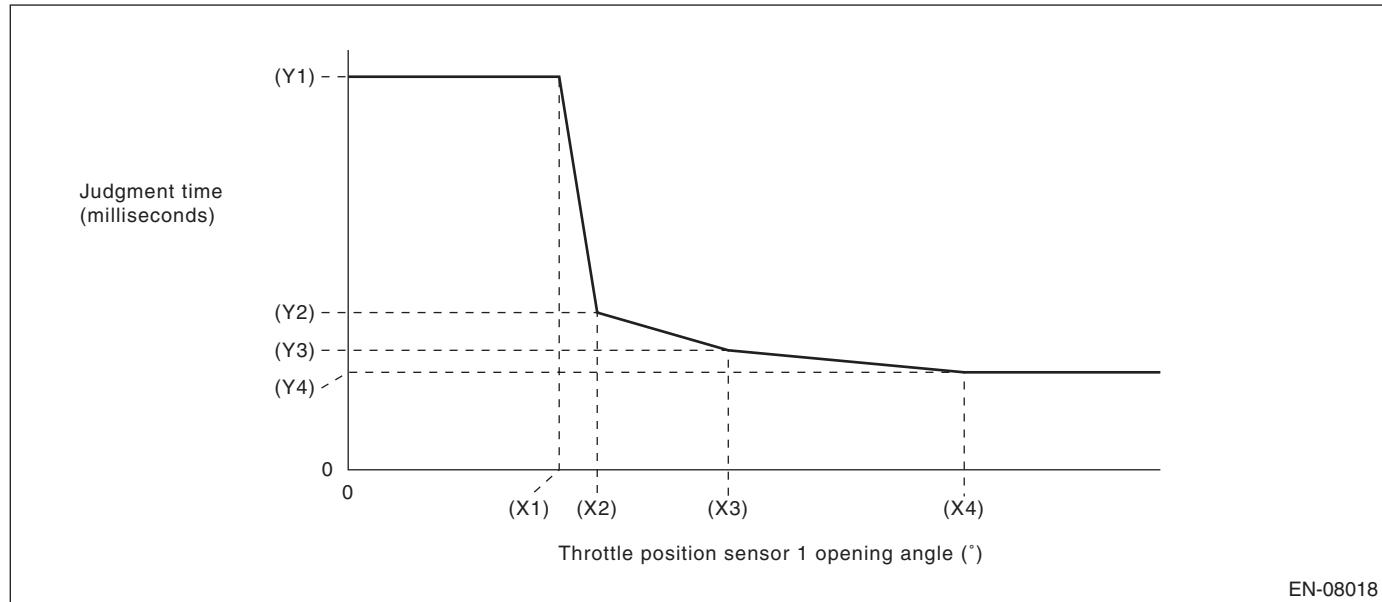
(X1) 6.915 ° (X2) 11.565 ° (X3) 15.785 °

(X4) 21.285 ° (X5) 29.965 °

(Y1) 4.65 ° (Y2) 4.22 ° (Y3) 5.5 °

(Y4) 8.68 ° (Y5) 25 °

Details of Judgment time



(X1) 8.049999237 ° (X2) 9.5 ° (X3) 14.5 °

(X4) 23.5 °

(Y1) 1000 ms (Y2) 400 ms (Y3) 304 ms

(Y4) 248 ms

NOTE:

Judgment time when actual opening angle \leq target opening angle is always 1000 milliseconds.

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

Diagnostic Trouble Code (DTC) Detecting Criteria

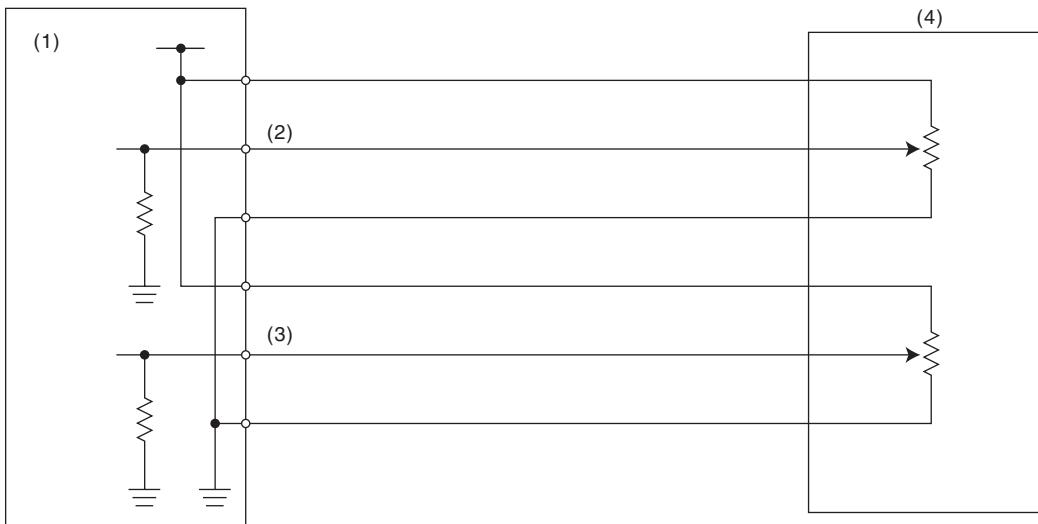
GENERAL DESCRIPTION

EN: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

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Sensor 1 input voltage	< 0.298 V

Time Needed for Diagnosis: 100 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.298 V

Time Needed for Diagnosis: 100 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

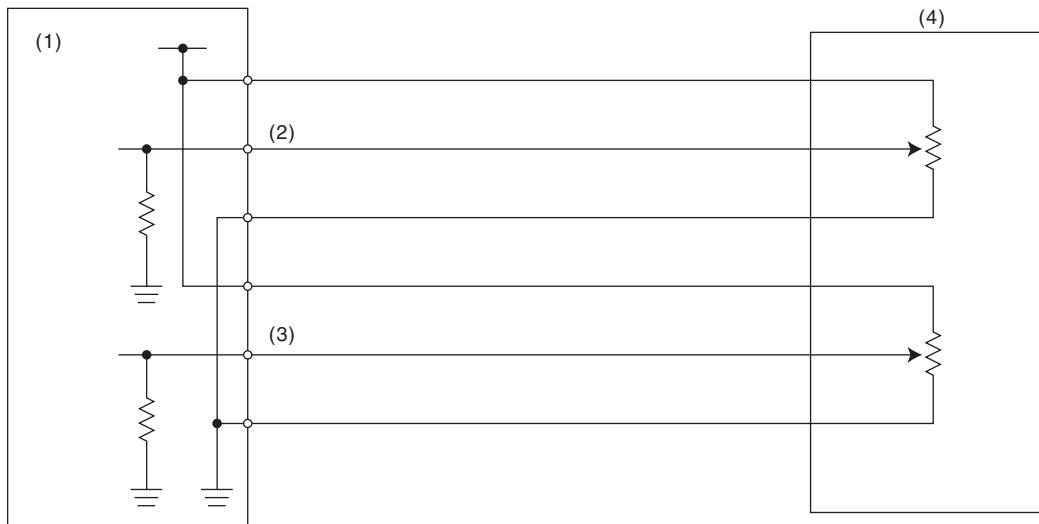
GENERAL DESCRIPTION

EO: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 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Sensor 1 input voltage	$\geq 4.737 \text{ V}$

Time Needed for Diagnosis: 32 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$< 4.737 \text{ V}$

Time Needed for Diagnosis: 32 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

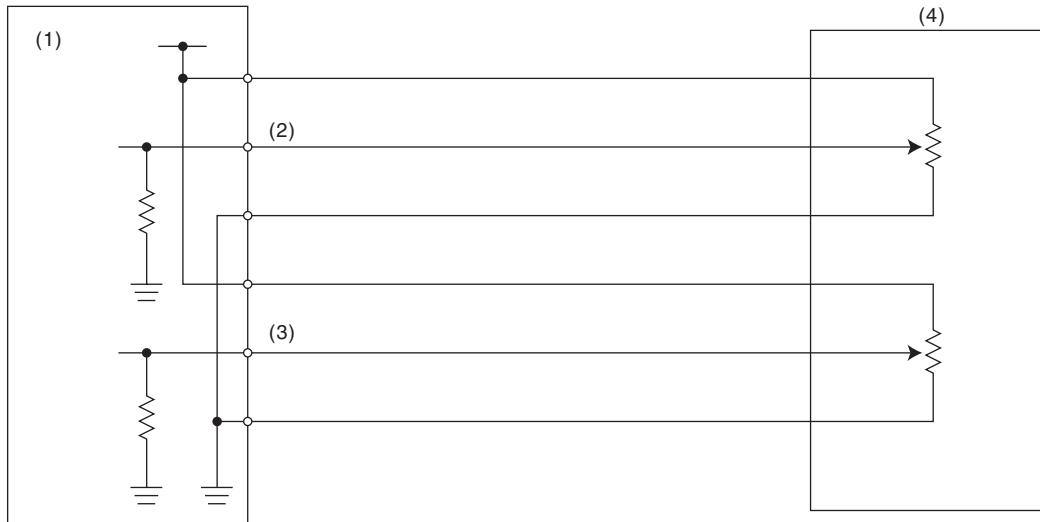
GENERAL DESCRIPTION

EP: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

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Sensor 2 input voltage	< 0.298 V

Time Needed for Diagnosis: 100 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.298 V

Time Needed for Diagnosis: 100 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

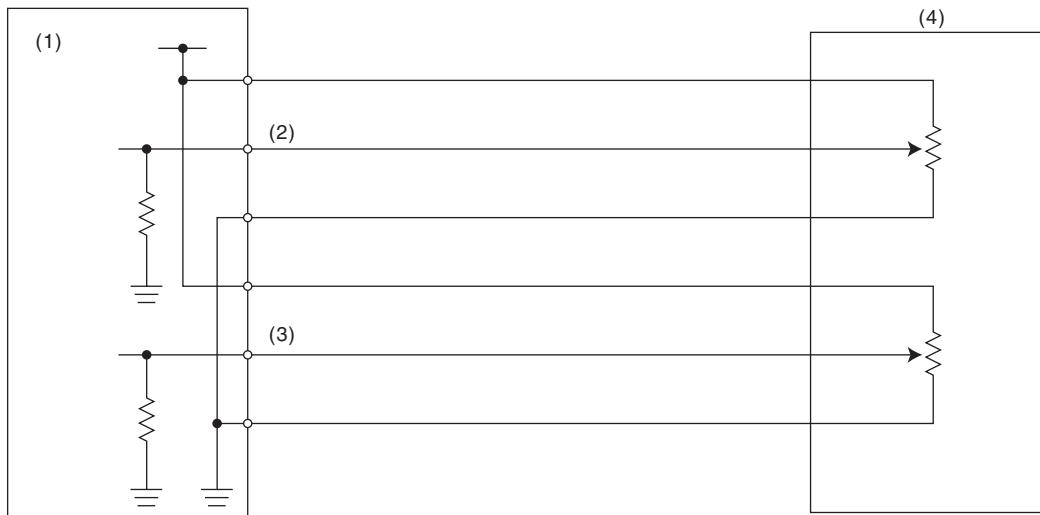
GENERAL DESCRIPTION

EQ: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
(2) Accelerator pedal position sensor
1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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
Sensor 2 input voltage	$\geq 4.737 \text{ V}$

Time Needed for Diagnosis: 100 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	$< 4.737 \text{ V}$

Time Needed for Diagnosis: 100 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

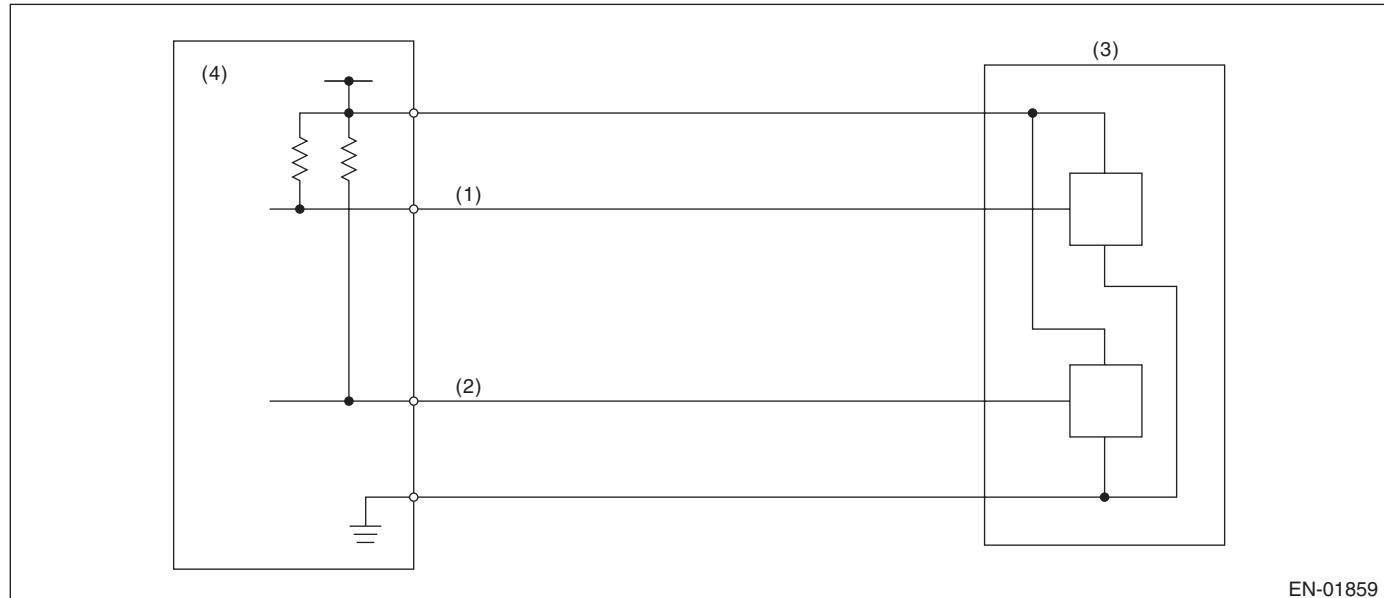
GENERAL DESCRIPTION

ER: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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

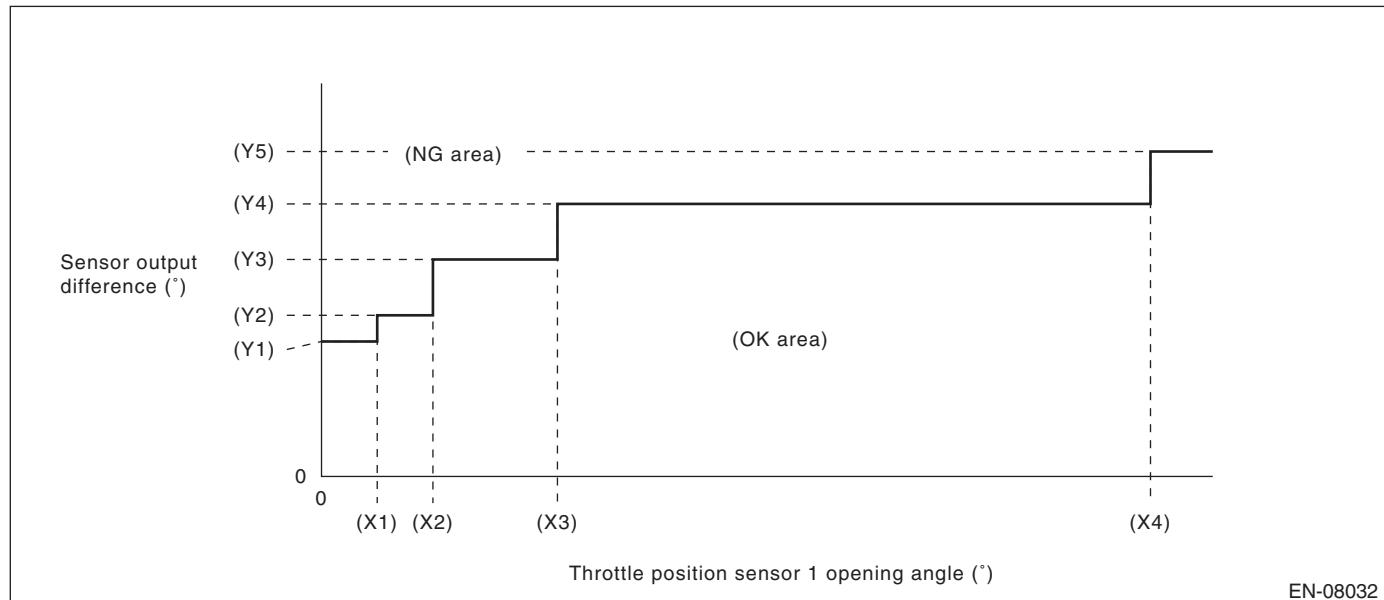
• Abnormality Judgment

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
Signal difference between two sensors	Within the NG range of judgment value detail

Details of Judgment Value



EN-08032

(X1) 2.125 ° (X2) 4.25 ° (X3) 9 °
(X4) 31.625 °

(Y1) 4.736 ° (Y2) 5.736 ° (Y3) 7.861 °
(Y4) 9.986 ° (Y5) 11.986 °

Time Needed for Diagnosis: 212 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within the OK range of judgment value detail

Time Needed for Diagnosis: 24 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

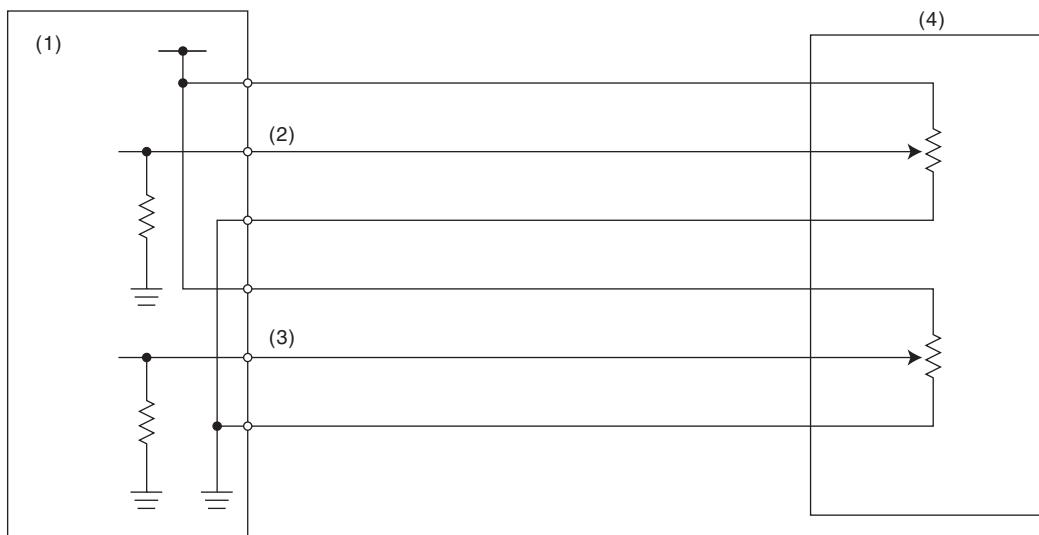
GENERAL DESCRIPTION

ES: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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

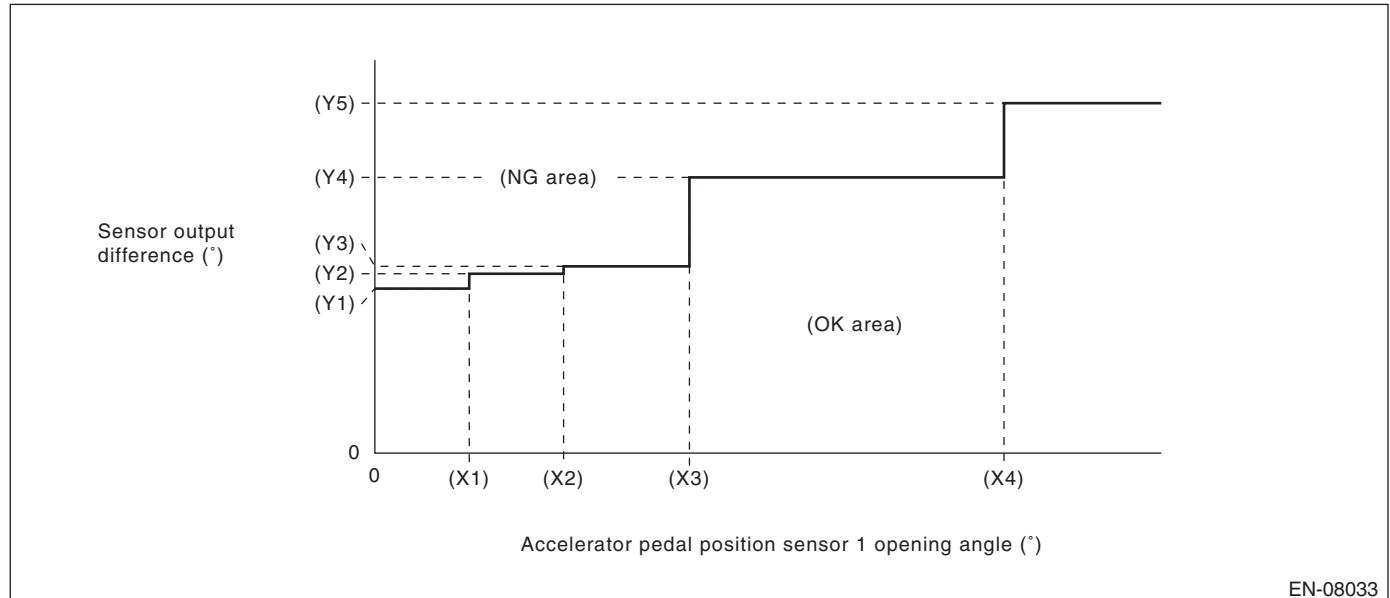
• Abnormality Judgment

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
Signal difference between two sensors	Within the NG range of judgment value detail

Details of Judgment Value



EN-08033

(X1) 0.6 °
(X4) 4 °

(X2) 1.2 °

(X3) 2 °

(Y1) 1.465 °
(Y4) 2.455 °

(Y2) 1.597 °
(Y5) 3.116 °

(Y3) 1.663 °

Time Needed for Diagnosis: 116 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within the OK range of judgment value detail

Time Needed for Diagnosis: 116 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ET:DTC P2195 O2 SENSOR SIGNAL BIASED/STUCK LEAN (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains low.

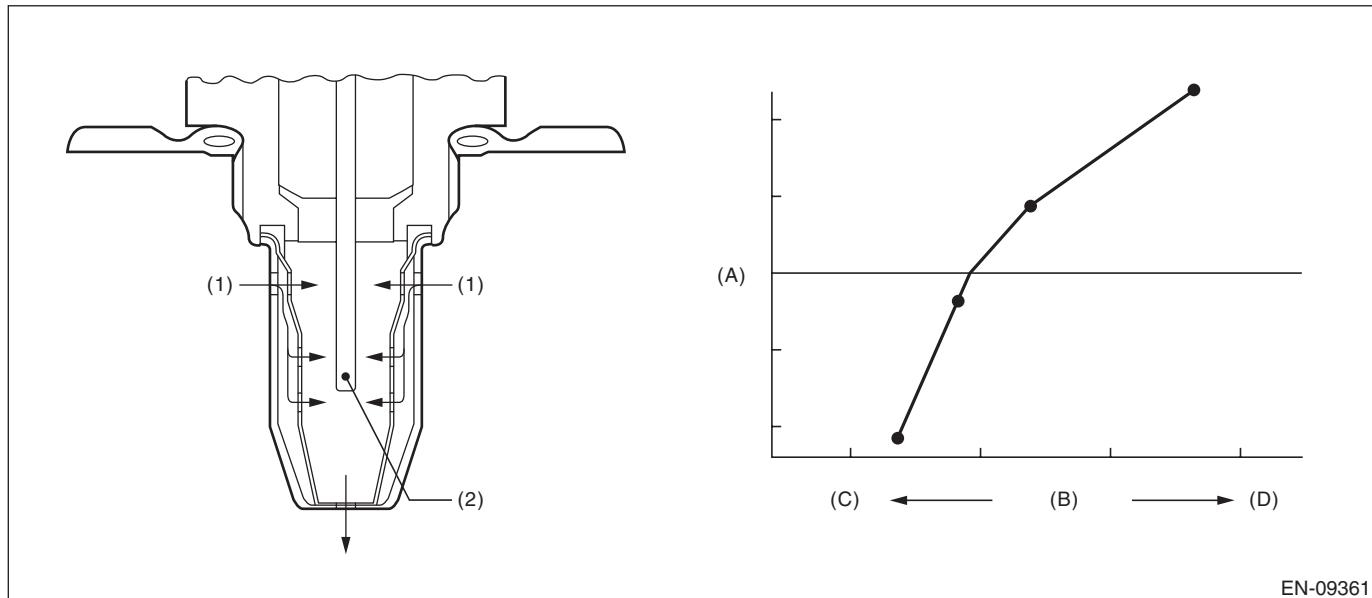
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



EN-09361

(A) Electromotive force
(D) Rich

(B) Air fuel ratio

(C) Lean

(1) Exhaust gas

(2) ZrO_2

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 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.
Elapsed time after starting the engine	≥ 0 ms
Engine coolant temperature	≥ -40 °C (-40 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s (0.21 oz/s)
Load change at 180°C	< 255 g/rev (8.99 oz/rev)
Front oxygen (A/F) sensor impedance	0Ω — 87Ω
Learning value of evaporation gas density	< 1
Total time of operating canister purge	≥ 0 s
Targeted lambda value load compensation coefficient	-1 — 1.000

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 0 ms have passed since the engine started.

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
λ value	< 0.85

Time Needed for Diagnosis: 10000 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	≥ 0.85

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EU:DTC P2196 O2 SENSOR SIGNAL BIASED/STUCK RICH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains high.

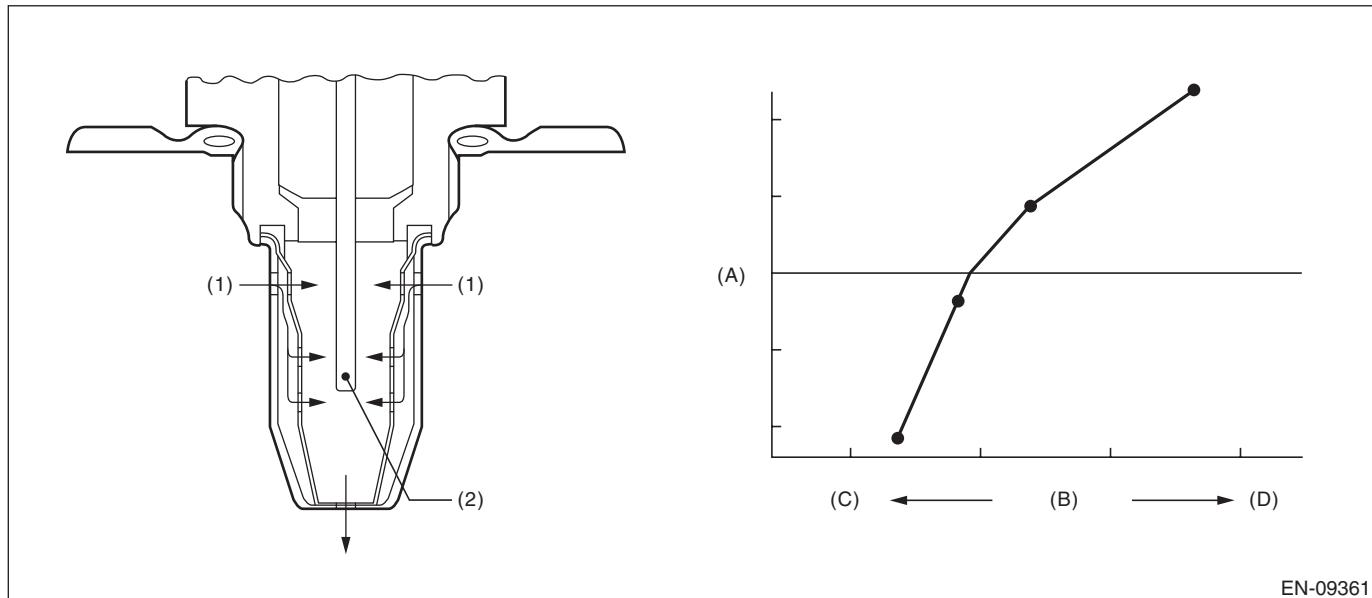
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



EN-09361

(A) Electromotive force
(D) Rich

(B) Air fuel ratio

(C) Lean

(1) Exhaust gas

(2) ZrO_2

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 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.
Elapsed time after starting the engine	≥ 0 ms
Engine coolant temperature	≥ -40 °C (-40 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s (0.21 oz/s)
Load change at 180°C	< 255 g/rev (8.99 oz/rev)
Front oxygen (A/F) sensor impedance	0Ω — 87Ω
Learning value of evaporation gas density	< 1
Total time of operating canister purge	≥ 0 s
Targeted lambda value load compensation coefficient	-1 — 1.000

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 0 ms have passed since the engine started.

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
λ value	> 1.15

Time Needed for Diagnosis: 10000 ms

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

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	≤ 1.15

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EV:DTC P219A BANK 1 AIR-FUEL RATIO IMBALANCE

1. OUTLINE OF DIAGNOSIS

This diagnostic monitor performs a functional check of the fuel system to determine an air-fuel ratio cylinder imbalance.

This diagnosis is composed of two monitors.

The outline of “monitor A1” is as follows. When an air-fuel ratio cylinder imbalance occurs, the primary oxygen sensor output signal will oscillate with increased amplitude. This monitor utilizes this behavior to make a diagnosis. The monitor integrates the difference between the amplification value and the mean value of the first oxygen sensor output signal and compares it to a threshold to make a judgment.

The outline of “monitor B1” is as follows. Similarly, when an imbalance occurs, the engine speed also fluctuates with increased amplitude. This monitor utilizes this behavior to make a diagnosis. For reference, it should be noted that this imbalance monitor method is actually similar to the current misfire diagnostic monitor, and the parameter “domg360” (units: degrees CA) is shared between the imbalance and misfire monitors. The imbalance monitor is performed during idle condition when the engine is warm. The monitor integrates the count of “domg360” which exceeds a threshold in 1000 revolution.

When both the “monitor A1” value and the “monitor B1” value exceed a predetermined threshold, this monitor determines a malfunction and stores a fault code.

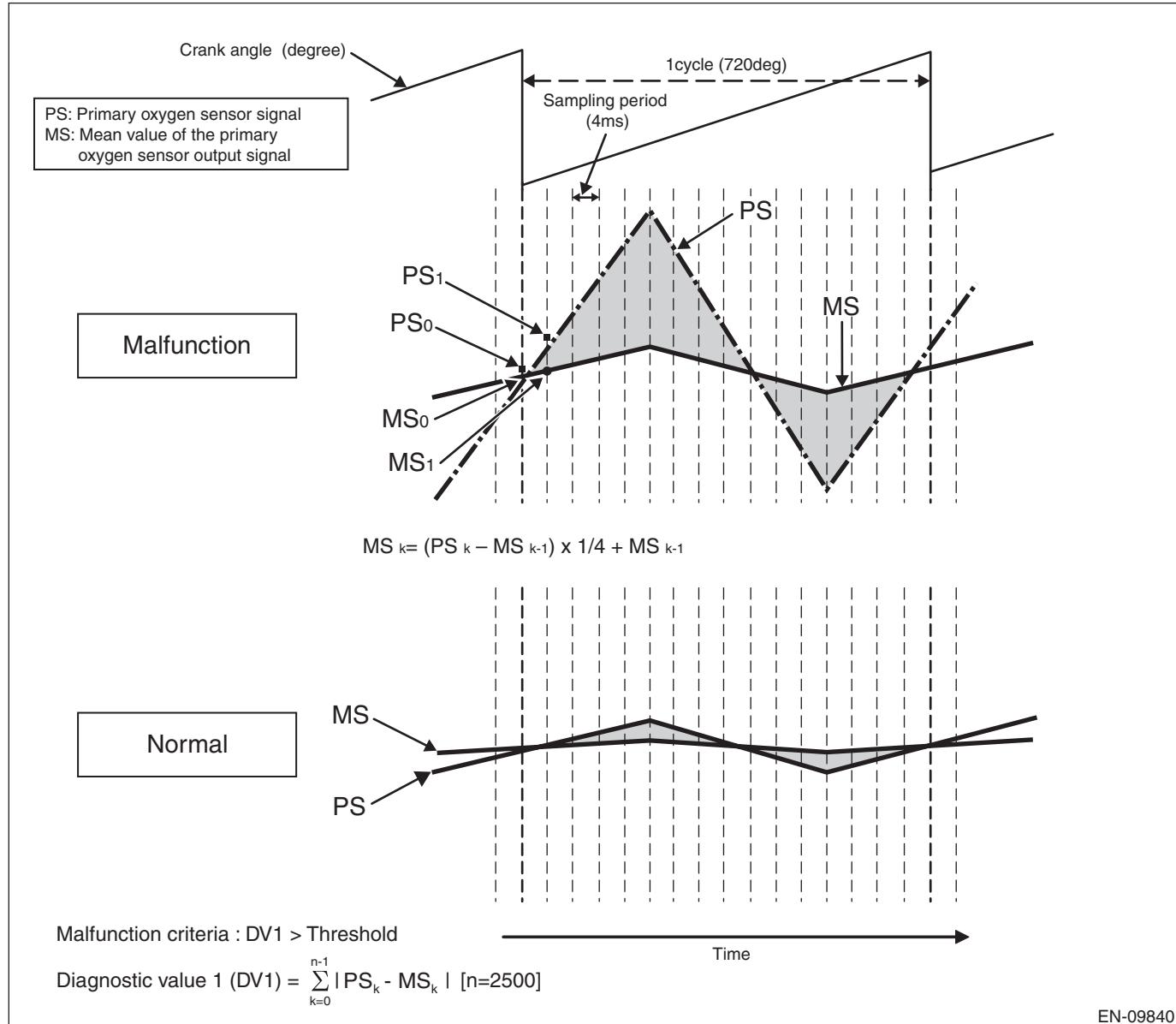
Monitor A1

When there is an air-fuel ratio cylinder imbalance malfunction, the primary oxygen sensor output fluctuates widely compared with a normal sensor, as shown by the chain line in Figure 1 below. This monitor makes a diagnosis based on this phenomenon. Each primary oxygen sensor signal (PS) and mean value of the primary oxygen sensor signal (MS) is calculated from the primary oxygen sensor signal. The absolute values of $(PS - MS)$ are sampled every 4 ms as shown in the figure. Diagnostic value 1 (DV1) is obtained by integrating the absolute value of $(PS - MS)$ for 2500 times. A malfunction is determined when DV1 exceeds the threshold. The judgment values are determined experimentally.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Figure 1. Compare malfunctioned primary oxygen sensor output with a normal sensor



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

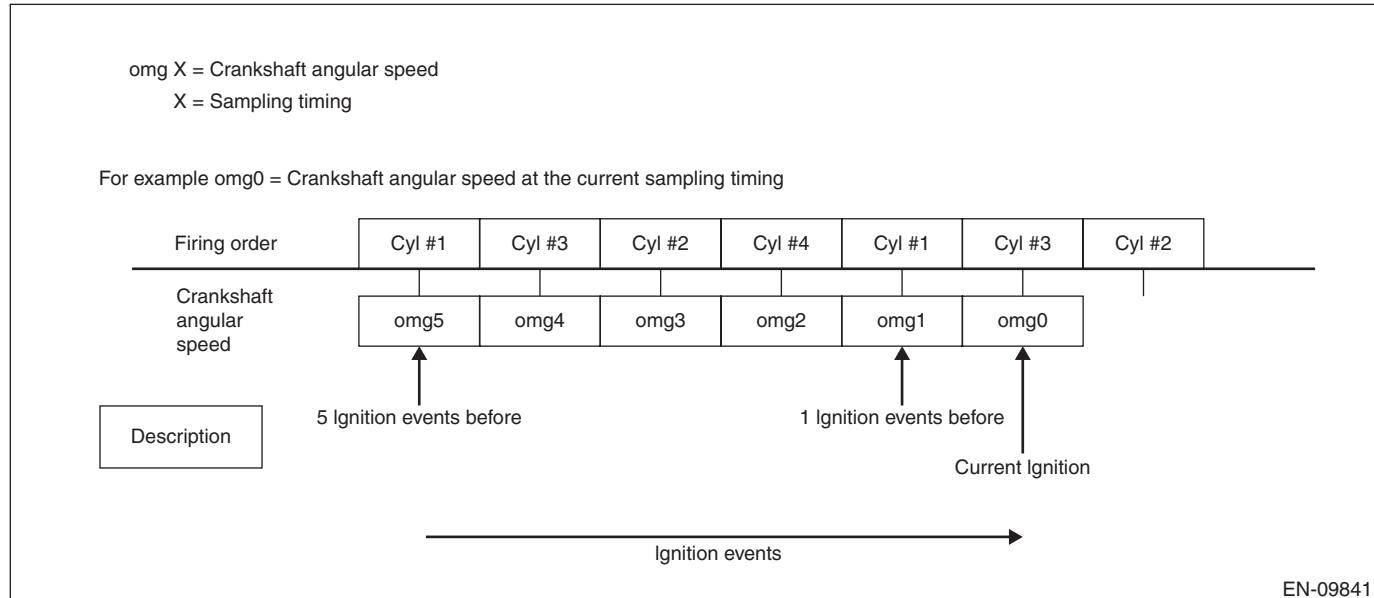
Monitor B1

Method used: Difference method of 360 degrees CA

Monitor value: $\text{domg360} = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 3 - \text{omg } 2)$ = angular speed

Each crankshaft angular speed is defined as Figure 2 below.

Figure 2. Description of domg360 output

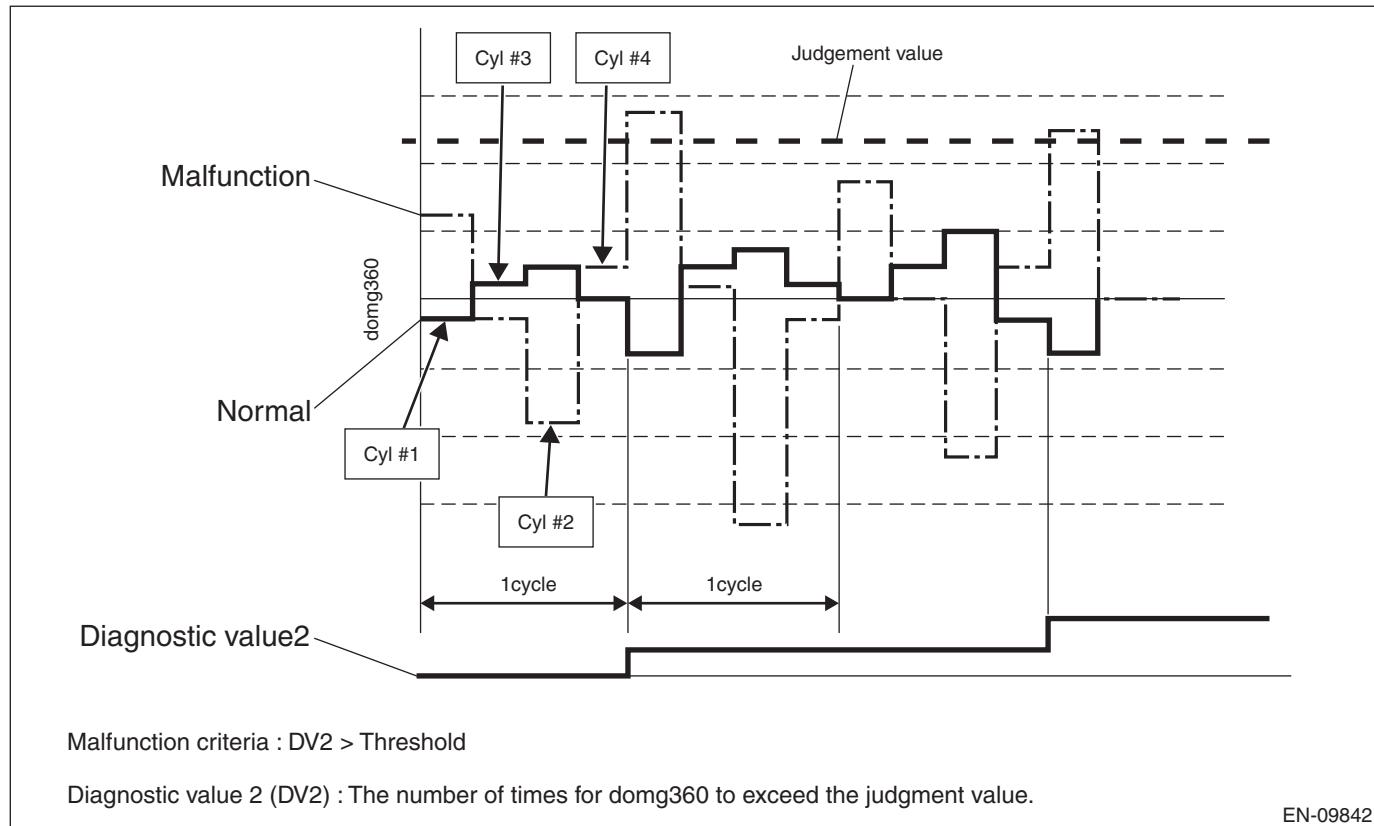


EN-09841

This method uses the fact that the domg360 of lean conditioned cylinder caused by imbalance malfunction indicates big value, as shown by the chain line in Figure 3 below.

The number of times for domg360 to exceed the judgment value in 1000 revolutions (500 cycles) is calculated as diagnostic value 2 (DV2). A malfunction is determined when DV2 exceeds the threshold.

Figure 3. Compare malfunctioned domg360 output with a normal output



EN-09842

2. ENABLE CONDITIONS

Monitor A1: Primary oxygen sensor fluctuation

Secondary Parameters	Enable Conditions
Closed loop control with primary oxygen sensor	Active
Engine speed	> 1400 rpm and < 3000 rpm
Engine coolant temperature	> 70 °C (158 °F) (Except for C6 model) > 200 °C (392 °F) (C6 model)
Intake air mass	≥ 0.9 g/rev (0.03 oz/rev) (CVT model) ≥ 0.9 g/rev (0.03 oz/rev) (MT model)
Integrated time of canister purge after engine start	≥ 0 s
Learning value of EVAP density during purge	< 1

Monitor B1: Crankshaft speed fluctuation

Secondary Parameters	Enable Conditions
Misfire diagnosis monitor	Active
Engine coolant temperature	> 70 °C (158 °F) (Except for C6 model) > 200 °C (392 °F) (C6 model)
Idle switch	ON
Vehicle speed	≤ 1.93 km/h (1.2 MPH)
Engine speed	> 450 rpm and < 900 rpm (CVT model) > 500 rpm and < 900 rpm (MT model)
Intake air mass per revolution	< 0.5 g/rev (0.02 oz/rev) (CVT model) < 0.4 g/rev (0.01 oz/rev) (MT model)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Judge as NG when Monitor A1 and Monitor B1 are both NG, and when either is OK, judge as OK.

• Abnormality Judgment

Monitor A1

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnostic value 1 (DV1)	> Threshold value 1 (TV1)

Threshold value 1 (TV1):

$$\sum_{k=0}^{n-1} \text{Map}_k \quad [n=2500]$$

EN-09888

Map (CVT model except for PZEV)

		Engine load (g/rev (oz/rev))				
		0.8 (0.03)	0.9 (0.03)	1 (0.04)	1.1 (0.04)	1.2 (0.04)
Engine speed (rpm)	1400	0.015224	0.021900	0.027964	0.036184	0.033342
	1600	0.019831	0.0322	0.030819	0.037736	0.034578
	1800	0.016229	0.0231	0.023019	0.028572	0.032015
	2000	0.014416	0.017476	0.021986	0.025152	0.031138
	2200	0.014970	0.0205	0.0244	0.0342	0.038278
	2400	0.016596	0.021058	0.027574	0.035320	0.040443
	2600	0.017777	0.023760	0.028024	0.033470	0.037612
	2800	0.016837	0.020633	0.024428	0.033470	0.037612

Map (MT model except for PZEV)

		Engine load (g/rev (oz/rev))				
		0.8 (0.03)	0.9 (0.03)	1 (0.04)	1.1 (0.04)	1.2 (0.04)
Engine speed (rpm)	1400	0.015224	0.021900	0.027964	0.036184	0.033342
	1600	0.019831	0.025623	0.030819	0.037736	0.034578
	1800	0.016229	0.021391	0.023019	0.028572	0.032015
	2000	0.014416	0.017476	0.021986	0.025152	0.031138
	2200	0.014970	0.020520	0.027191	0.031733	0.038278
	2400	0.016596	0.021058	0.027574	0.035320	0.040443
	2600	0.017777	0.023760	0.028024	0.033470	0.037612
	2800	0.016837	0.020633	0.024428	0.033470	0.037612

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map (PZEV CVT model)

		Engine load (g/rev (oz/rev))				
		0.8 (0.03)	0.9 (0.03)	1 (0.04)	1.1 (0.04)	1.2 (0.04)
Engine speed (rpm)	1400	0.0087	0.0097	0.0146	0.0136	0.0136
	1600	0.0121	0.0322	0.0301	0.0202	0.0202
	1800	0.0160	0.0231	0.0196	0.0214	0.0202
	2000	0.0103	0.0106	0.0114	0.0180	0.0180
	2200	0.0145	0.0205	0.0244	0.0342	0.0272
	2400	0.0144	0.0193	0.0216	0.0243	0.0243
	2600	0.0146	0.0178	0.0214	0.0254	0.0259
	2800	0.0111	0.0143	0.0175	0.0242	0.0242

Map (PZEV MT model)

		Engine load (g/rev (oz/rev))				
		0.8 (0.03)	0.9 (0.03)	1 (0.04)	1.1 (0.04)	1.2 (0.04)
Engine speed (rpm)	1400	0.008731	0.016930	0.018728	0.017359	0.013645
	1600	0.012082	0.025284	0.025284	0.020175	0.020175
	1800	0.015995	0.021391	0.021391	0.020160	0.020160
	2000	0.010316	0.010623	0.011373	0.018047	0.018047
	2200	0.014455	0.020520	0.027191	0.027191	0.027191
	2400	0.014424	0.018377	0.027191	0.018377	0.018377
	2600	0.014555	0.017838	0.017838	0.017838	0.017838
	2800	0.011069	0.014261	0.014261	0.014261	0.014261

Time Needed for Diagnosis:

- 4 ms × 2500 time(s) (CVT model)
- 4 ms × 2500 time(s) (MT model)

Monitor B1

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnostic Value2 (DV2)	> 45 time(s) (CVT model except for PZEV) > 30 time(s) (MT model except for PZEV) > 17 time(s) (PZEV CVT model) > 17 time(s) (PZEV MT model)

Time Needed for Diagnosis: 1000 engine revs.

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Monitor A1

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnostic value 1 (DV1)	\leq Threshold value 1 (TV1)

Time Needed for Diagnosis:

- 4 ms \times 2500 time(s) (CVT model)
- 4 ms \times 2500 time(s) (MT model)

Monitor B1

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnostic Value2 (DV2)	\leq 45 time(s) (CVT model except for PZEV) \leq 30 time(s) (MT model except for PZEV) \leq 17 time(s) (PZEV CVT model) \leq 17 time(s) (PZEV MT model)

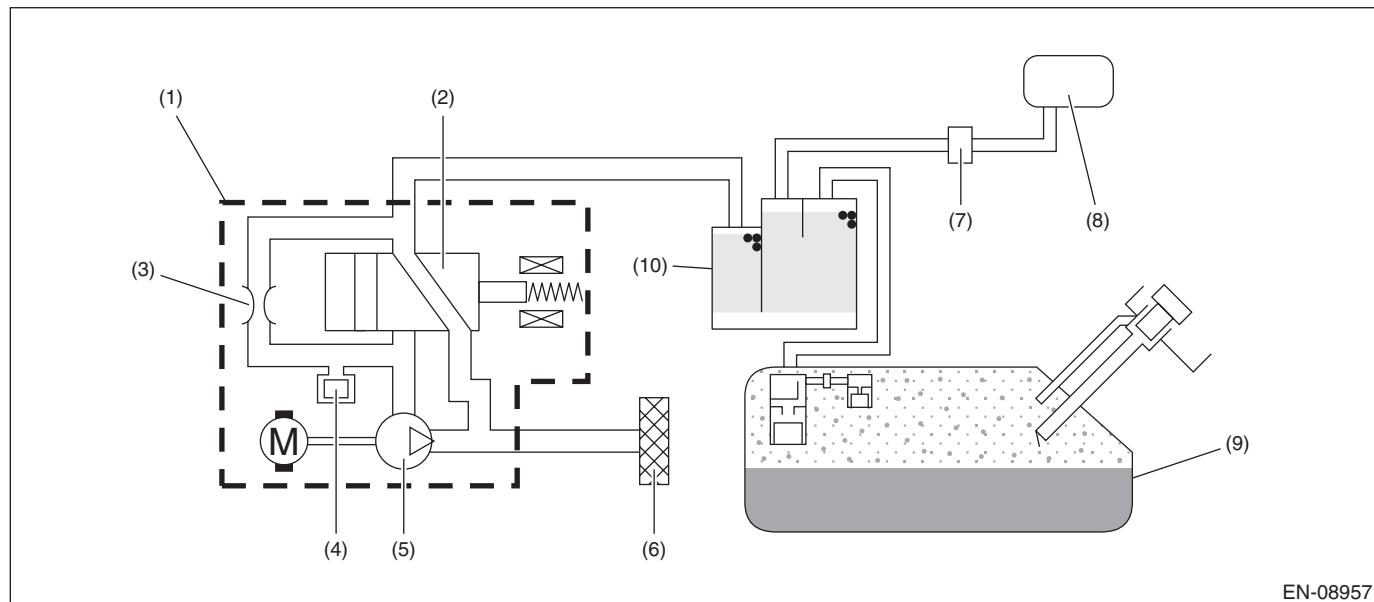
Time Needed for Diagnosis: 1000 engine revs.

EW:DTC P2401 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM vacuum pump.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

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

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
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs OFF signal	High

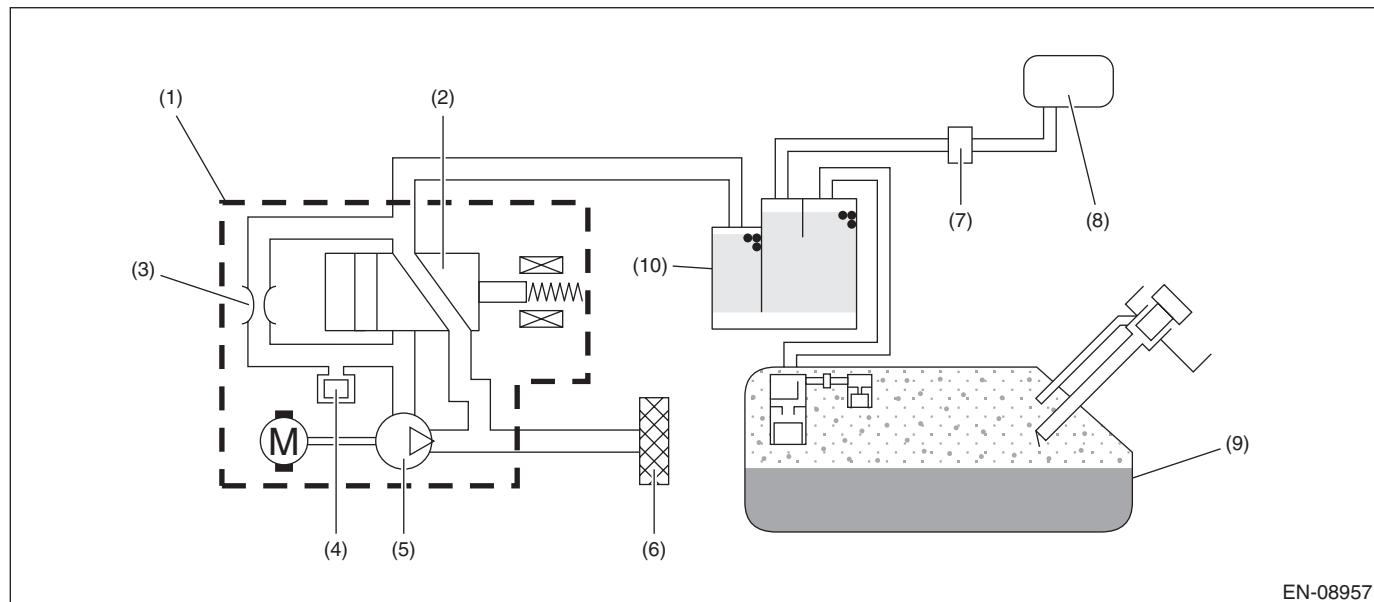
Time Needed for Diagnosis: Less than 1 second

EX:DTC P2402 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM vacuum pump.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

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

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
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs ON signal	Low

Time Needed for Diagnosis: Less than 1 second

EY:DTC P2404 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP SENSE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

NOTE:

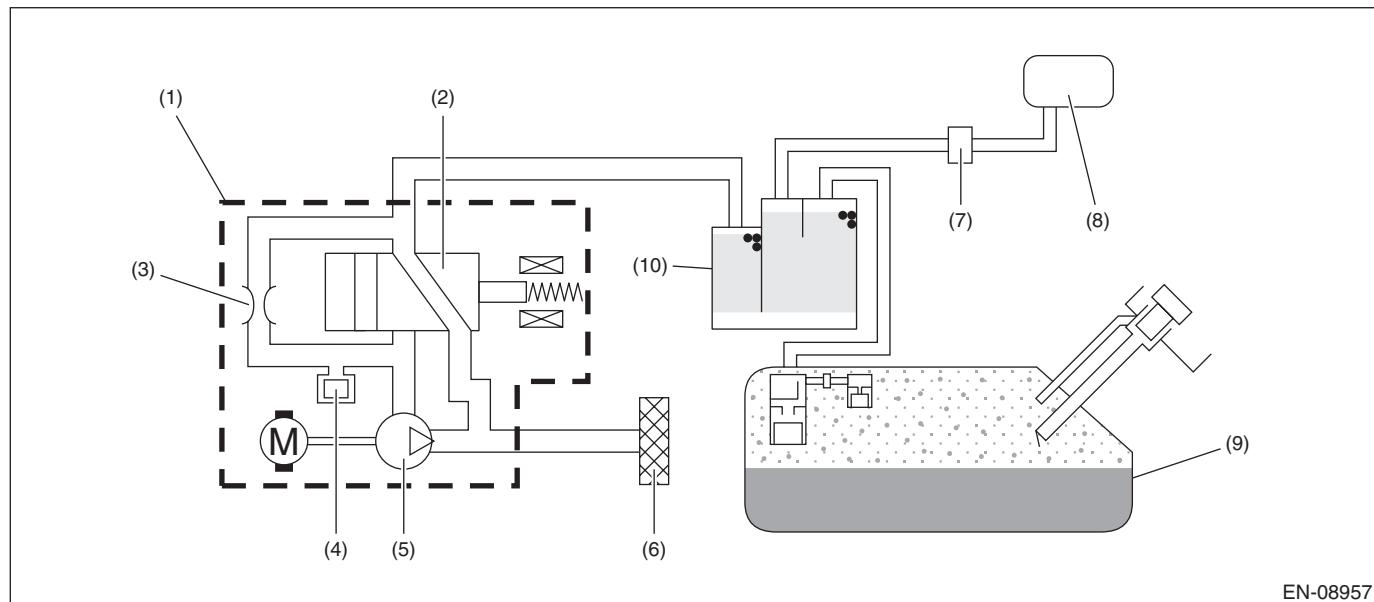
For the detection standard, refer to DTC P0455. <Ref. to GD(H4DO)-140, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EZ:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM switching valve.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

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

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
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs OFF signal	High

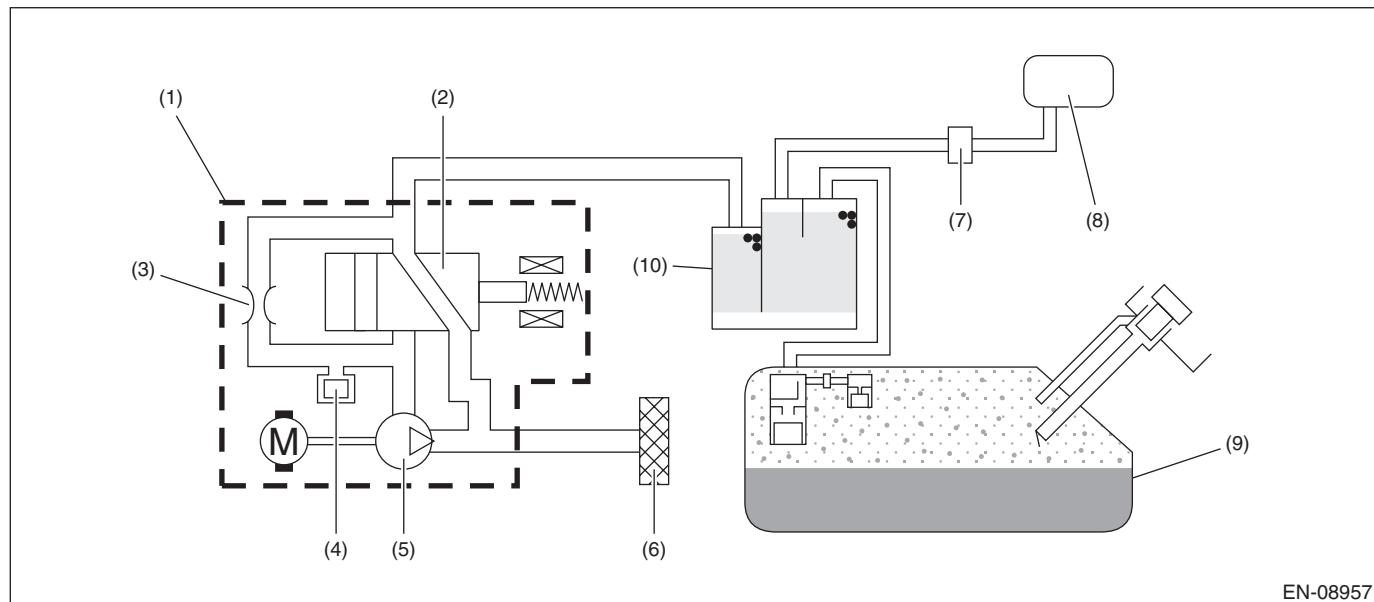
Time Needed for Diagnosis: Less than 1 second

FA:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM switching valve.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM	(5) Vacuum pump	(9) Fuel tank
(2) Switching valve	(6) Drain filter	(10) Canister
(3) Reference orifice (0.02 inch orifice)	(7) Purge control solenoid valve	
(4) Pressure sensor	(8) Intake manifold	

3. ENABLE CONDITIONS

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

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
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs ON signal	Low

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

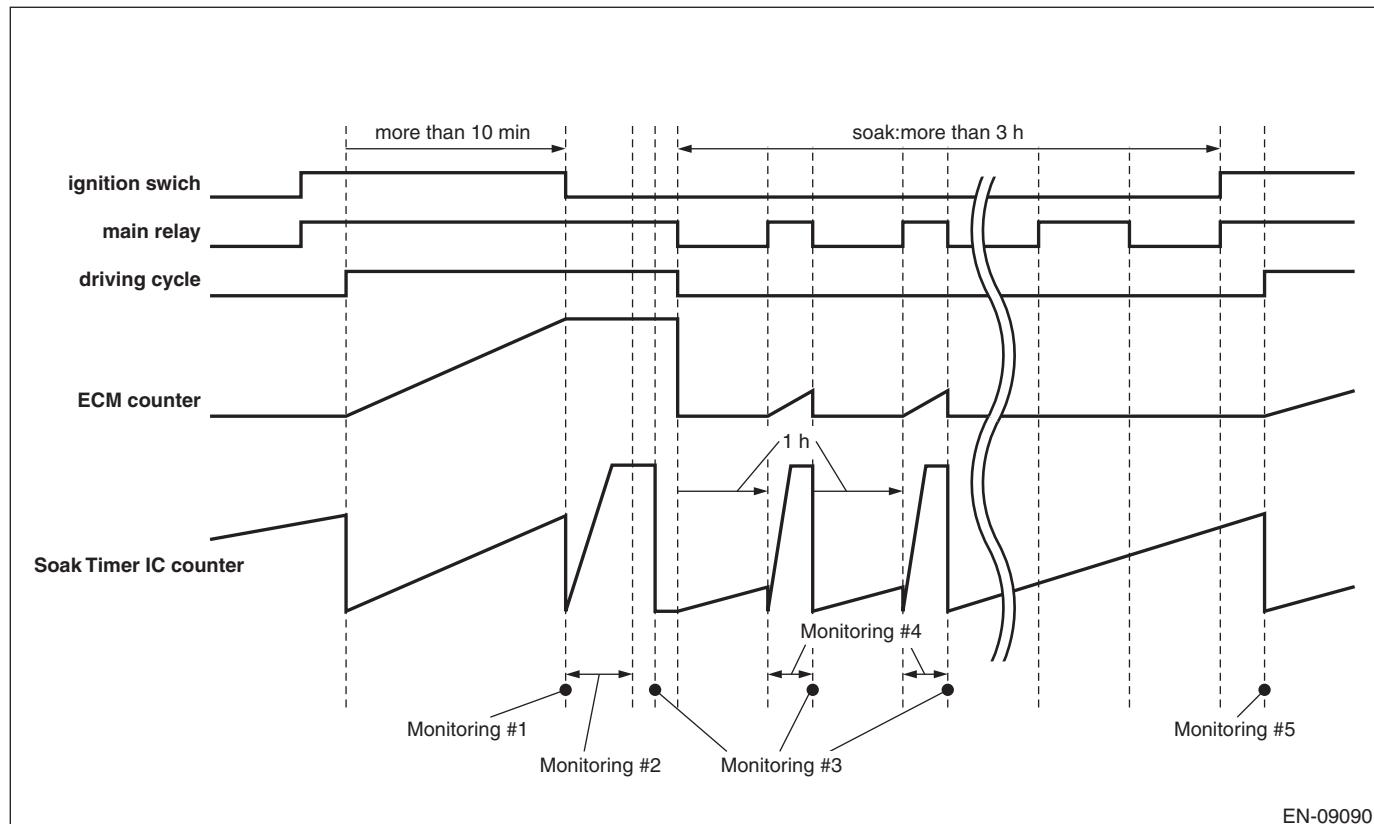
GENERAL DESCRIPTION

FB:DTC P2610 ECM/PCM INTERNAL ENGINE OFF TIMER PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunction of soaking timer IC by the five diagnoses below.

Monitor Number	Explanation	Time required for diagnosis
Monitor #1 <Timer diagnosis>	Perform diagnosis of the soaking timer IC accuracy	196 ms
Monitor #2 <Full count diagnosis>	Perform diagnosis of the soaking timer IC counter function	4000 ms
Monitor #3 <Soaking timer IC setting diagnosis>	Perform diagnosis of communication between ECM and soaking timer IC	196 ms
Monitor #4 <Timer diagnosis (during soaking)>	Perform diagnosis of the soaking timer IC accuracy during soaking	3000 ms
Monitor #5 <Wake-up diagnosis>	Perform diagnosis of wake-up function	64 ms



EN-09090

2. COMPONENT DESCRIPTION

The soaking timer IC is built into the ECM.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
<Timer diagnosis>	
Battery voltage	≥ 10.9 V
Ignition switch	OFF
Elapsed time after starting the engine	> 600 s
< Full count diagnosis & soaking timer IC setting diagnosis>	
Battery voltage	≥ 10.9 V
Ignition switch	OFF
<Timer diagnosis (during soaking)>	
Battery voltage	≥ 10.9 V
Ignition switch	OFF
Number of wake-up	= 1, 2, 3, 4, 6, 8 time(s)
<Wake-up diagnosis>	
Ignition switch	ON
Wake-up activation time setting	Completed
Time in the soaking timer IC	> 3600 s

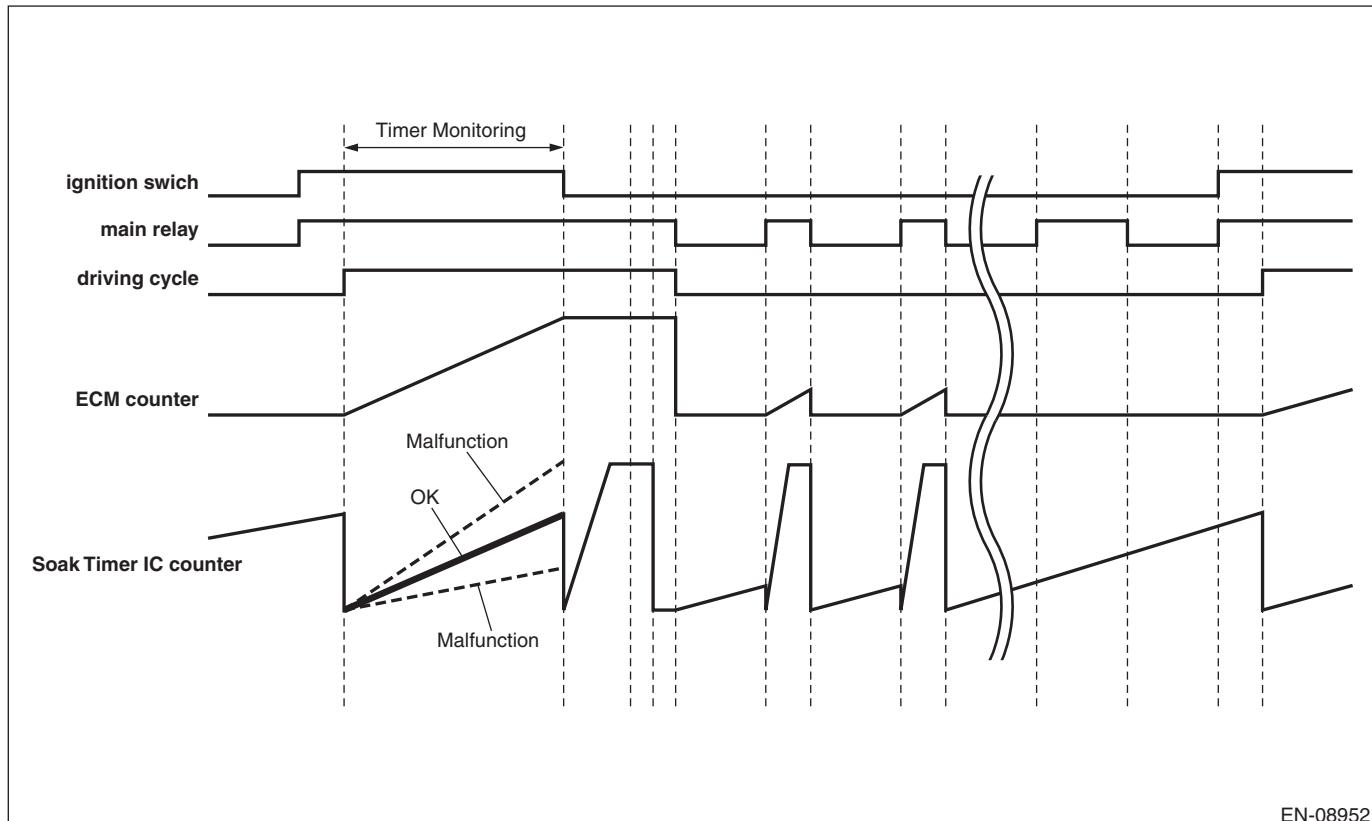
4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when the ignition switch is OFF and when the ignition switch is ON after the soaking of one hour or more.

5. DIAGNOSTIC METHOD

<Timer diagnosis>

Start the count up operation of counters in ECM and in soaking timer IC when the engine is started. Judge as timer malfunction if the difference between the counter in ECM and counter in soaking timer IC exceeds the allowable limit when the ignition switch is OFF.



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
$ \text{osoaktimcpu} - \text{osoaktimic} / \text{osoaktimcpu}$	> 0.24

osoaktimcpu = Counter in ECM
osoaktimic = Counter in soaking timer IC

• Normality Judgment

Judge as OK when the following conditions are established.

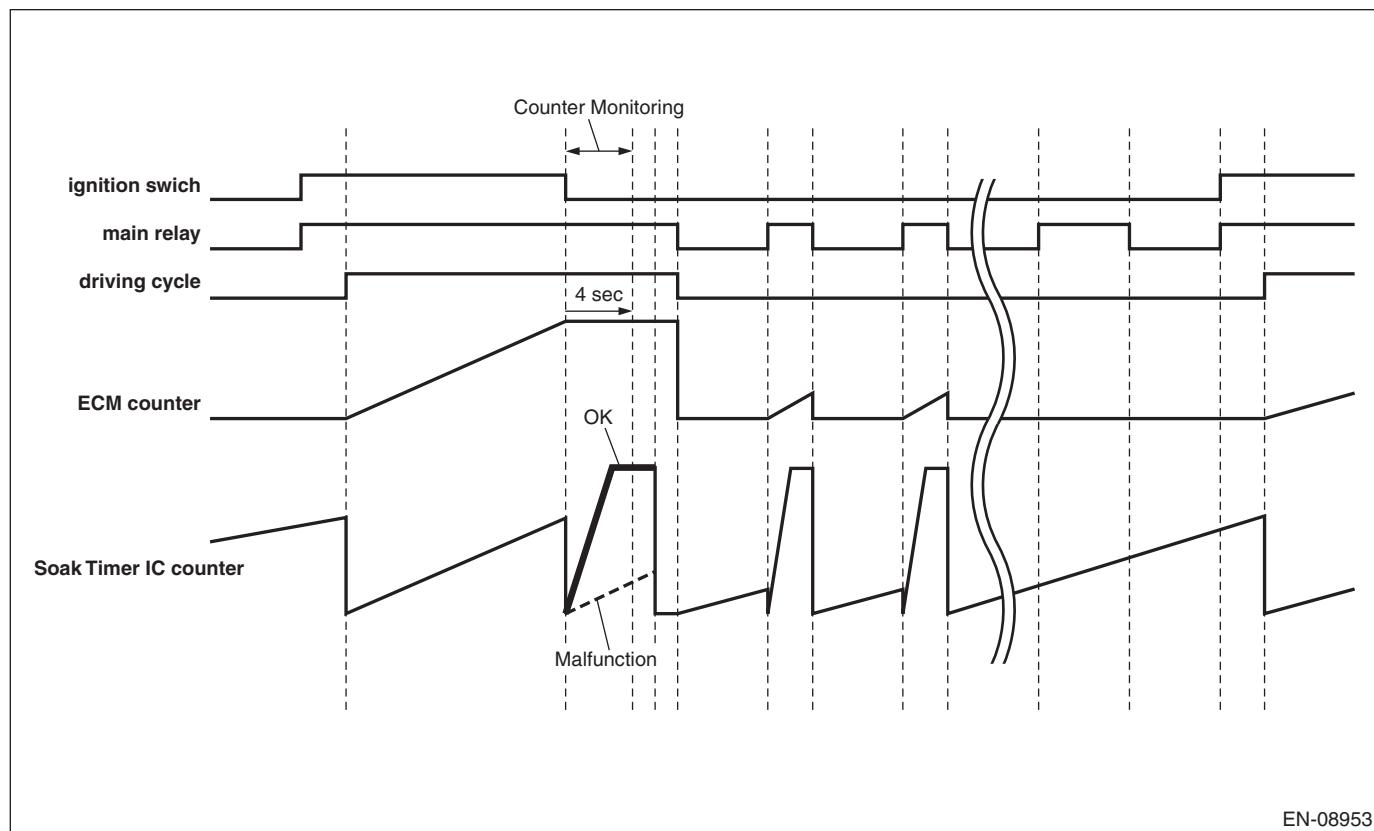
Judgment Value

Malfunction Criteria	Threshold Value
$ \text{osoaktimcpu} - \text{osoaktimic} / \text{osoaktimcpu}$	≤ 0.24

<Full count diagnosis>

Reset the counter in soaking timer IC and start the count up operation.

Judge as full count diagnosis malfunction if counter in soaking timer IC is not \$3FF (1023 count) after 4 seconds.



EN-08953

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
osoakfcntic	$\neq \$3FF$ (1023 count)

osoakfcntic = Counter in soaking timer IC

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

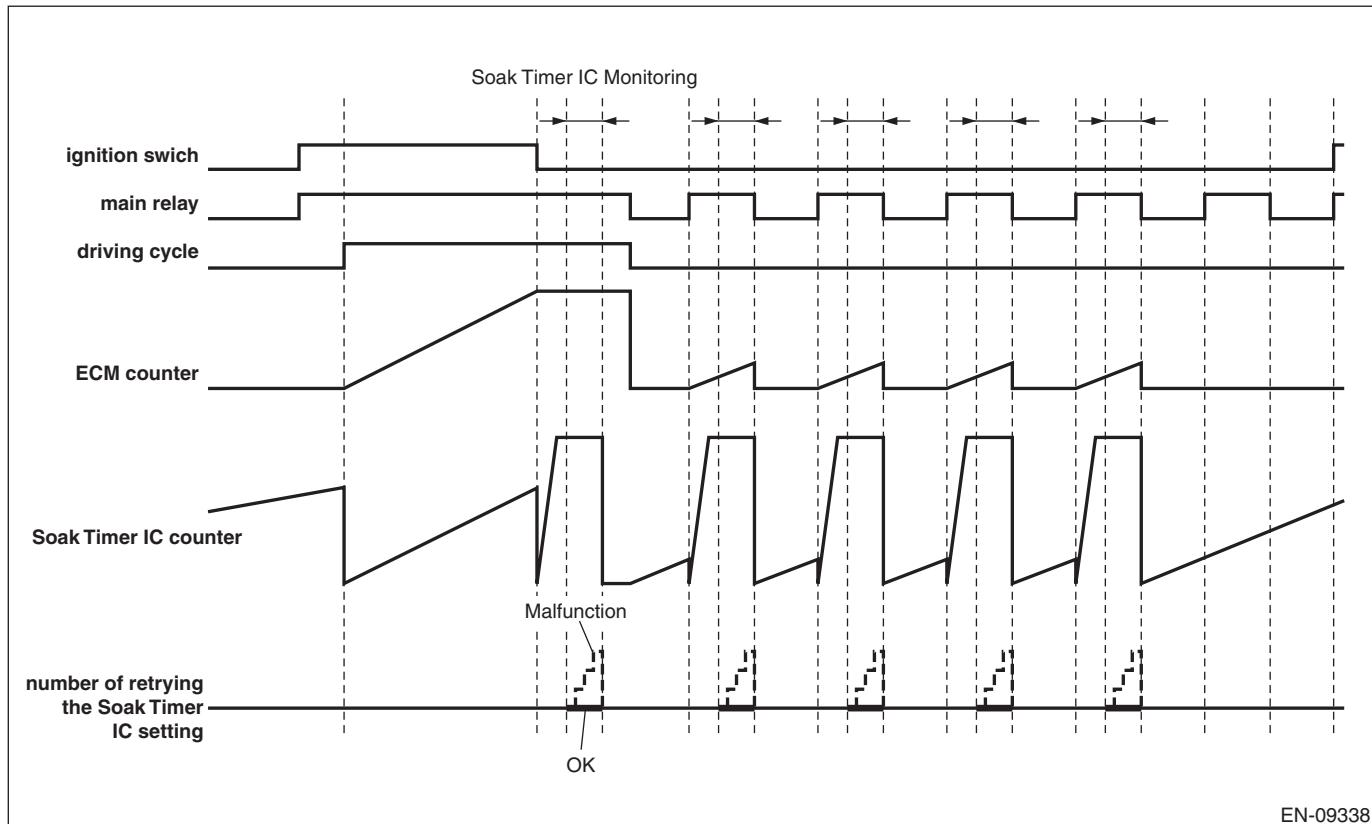
Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
osoakfcntic	= \$3FF (1023 count)

<Soaking timer IC setting diagnosis>

When setting the activation setting time to soaking timer IC, compare the writing value to soaking timer IC with read out value. Judge as malfunction if the values do not match 3 times in a row.



• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Writing value and read out value when setting the soaking timer	Unmatch
Number of retrying the soaking timer setting	≥ 3 times

• Normality Judgment

Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Writing value and read out value when setting the soaking timer	Match

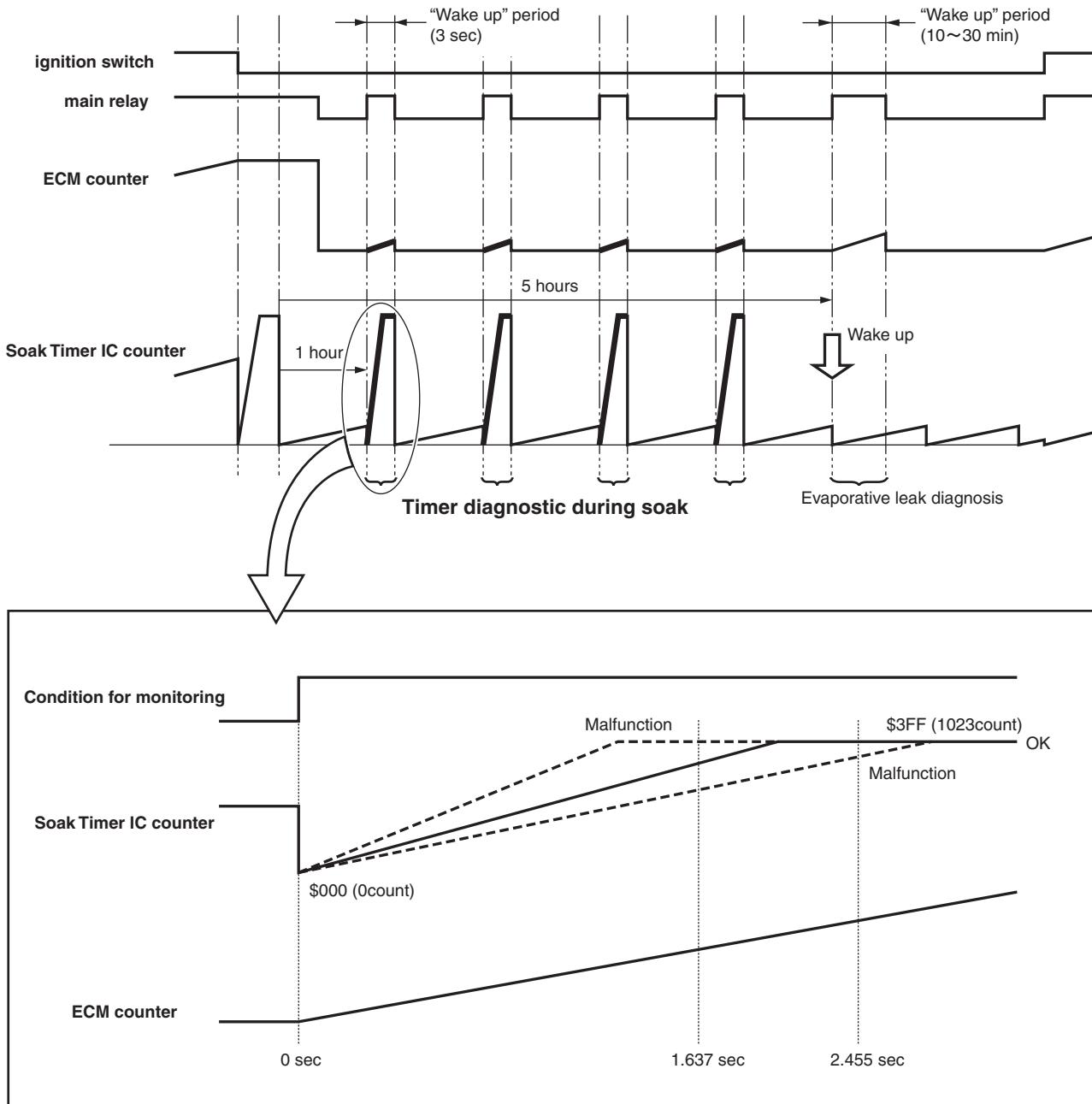
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

<Timer diagnosis (during soaking)>

Wake-up at the predetermined interval until 5, 7 or 9.5 hours have passed after the ignition switch is OFF, and compare the counter in soaking timer IC with the counter in ECM.

Judge as malfunction if the counter in soaking timer IC is counted up to maximum value (1023 count) when the counter in ECM is 1637 ms, or if the counter in soaking timer IC is not counted up to maximum value (1023 count) when the counter in ECM is 2455 ms.



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
When any one of the followings is established.	
• All of the following conditions are established. Counter in ECM Counter in soaking timer IC	≤ 1637 ms = \$3FF (1023 count)
• All of the following conditions are established. Counter in ECM Counter in soaking timer IC	≥ 2455 ms ≠ \$3FF (1023 count)

• Normality Judgment

Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Following conditions are established.	
• All of the following conditions are established. Counter in ECM Counter in soaking timer IC	≤ 1637 ms ≠ \$3FF (1023 count)
• All of the following conditions are established. Counter in ECM Counter in soaking timer IC	≥ 2455 ms = \$3FF (1023 count)

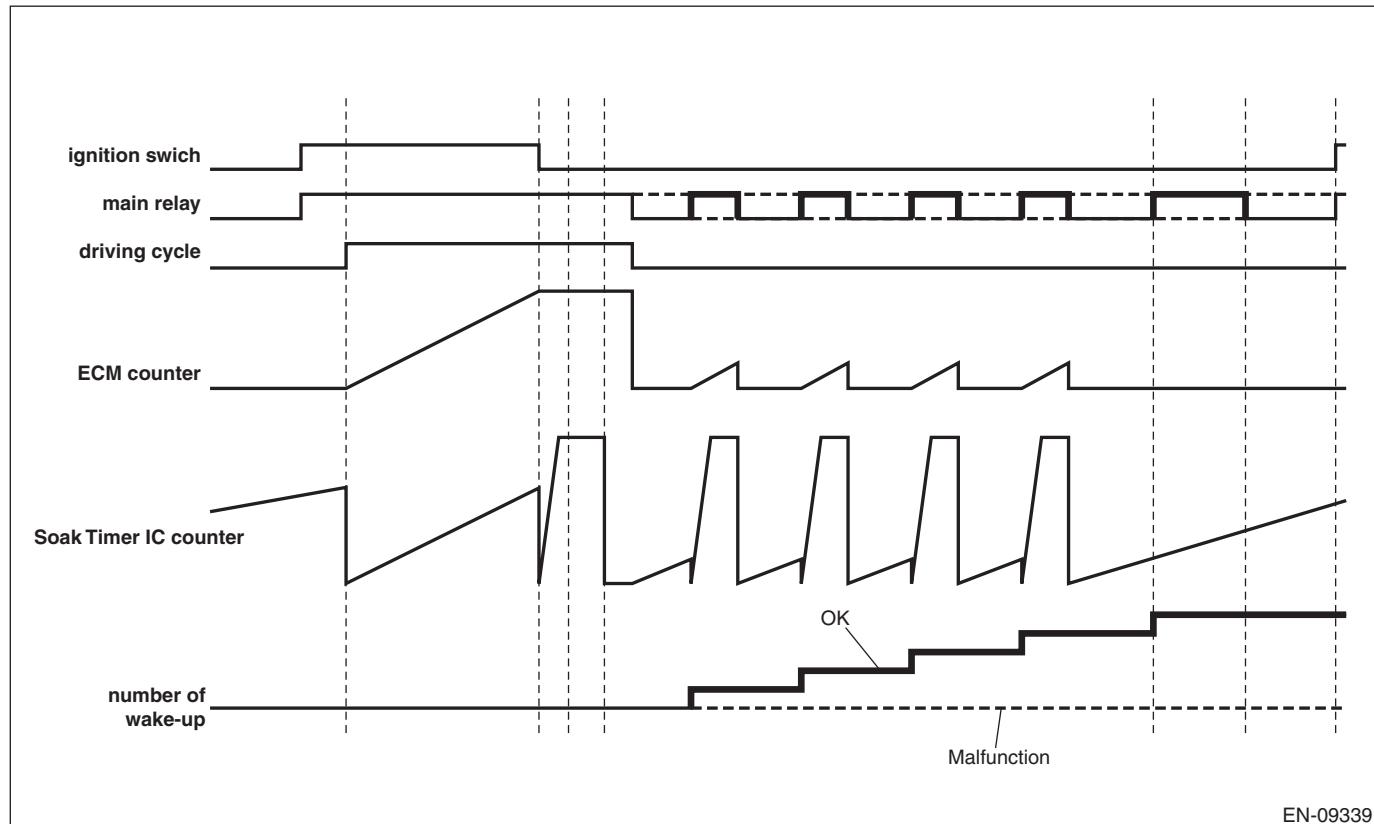
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

<Wake-up diagnosis>

Store the number of wake-up activation when the ECM wakes up by the soaking timer IC.

Next time when the ignition switch is ON, if the number of wake-up activation does not reach the predetermined value even though the counter in soaking timer IC operates 1 hour or more, judge as wake-up malfunction.



EN-09339

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of wake-up	< Wake-up indication count

• Normality Judgment

Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of wake-up	\geq Wake-up indication count

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Driving cycle	Completed
When any one of the followings is established.	
• Timer diagnosis	NG
• Full count diagnosis	NG
• Soaking timer IC setting diagnosis	NG
• Timer diagnosis (during soaking)	NG
• Wake-up diagnosis	NG

Time Needed for Diagnosis: Approx. 5 to 9.5 hours

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

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Driving cycle	Completed
All of the following conditions are established.	
• Timer diagnosis	OK
• Full count diagnosis	OK
• Soaking timer IC setting diagnosis	OK
• Timer diagnosis (during soaking)	OK
• Wake-up diagnosis	OK

Time Needed for Diagnosis: Approx. 5 to 9.5 hours

FC:DTC U0073 CONTROL MODULE COMMUNICATION BUS “A” OFF

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.

Judge as NG when CAN communication failure has occurred.

2. COMPONENT DESCRIPTION

(Common Specifications)

CAN Protocol 2.0 B (Active)

Frame Format: 11 Bit ID Frame (Standard Frame)

Conforms to ISO11898

Communication Speed: 500 kbps

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	set (error)

Time Needed for Diagnosis: 436 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Engine	run
bus off flag or error warning flag	clear (No error)

Time Needed for Diagnosis: 1000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

FD:DTC U0101 LOST COMMUNICATION WITH TCM

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.

Judge as NG when CAN communication failure has occurred between TCM, VDC CM and body integrated unit.

2. COMPONENT DESCRIPTION

(Common Specifications)

CAN Protocol 2.0 B (Active)

Frame Format: 11 Bit ID Frame (Standard Frame)

Conforms to ISO11898

Communication Speed: 500 kbps

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
ID received from control module connected to CAN	None during 500 milliseconds

Time Needed for Diagnosis: 500 ms

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 conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Engine	run
ID received from control module connected to CAN	Yes

Time Needed for Diagnosis: 1000 ms

FE:DTC U0122 LOST COMMUNICATION WITH VEHICLE DYNAMICS CONTROL MODULE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC U0101. <Ref. to GD(H4DO)-266, DTC U0101 LOST COMMUNICATION WITH TCM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

FF:DTC U0155 LOST COMMUNICATION WITH INSTRUMENT PANEL CLUSTER (IPC) CONTROL MODULE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC U0101. <Ref. to GD(H4DO)-266, DTC U0101 LOST COMMUNICATION WITH TCM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

FG:DTC U0402 INVALID DATA RECEIVED FROM TCM

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.

Judge as NG when data received from TCM, VDC CM and body integrated unit is not normal.

2. COMPONENT DESCRIPTION

(Common Specifications)

CAN Protocol 2.0 B (Active)

Frame Format: 11 Bit ID Frame (Standard Frame)

Conforms to ISO11898

Communication Speed: 500 kbps

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
Data updated from control module connected to CAN	None during 2000 milliseconds

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 if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Engine	run
Data updated from control module connected to CAN	Yes

Time Needed for Diagnosis: 1000 ms

FH:DTC U0416 INVALID DATA RECEIVED FROM VEHICLE DYNAMICS CONTROL MODULE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC U0402. <Ref. to GD(H4DO)-268, DTC U0402 INVALID DATA RECEIVED FROM TCM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

FI: DTC U0423 INVALID DATA RECEIVED FROM INSTRUMENT PANEL CLUSTER CONTROL MODULE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC U0402. <Ref. to GD(H4DO)-268, DTC U0402 INVALID DATA RECEIVED FROM TCM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ENGINE 2 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(H4DOTC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4DOTC)
INTAKE (INDUCTION)	IN(H4DOTC)
MECHANICAL	ME(H4DOTC)
EXHAUST	EX(H4DOTC)
COOLING	CO(H4DOTC)
LUBRICATION	LU(H4DOTC)
SPEED CONTROL SYSTEMS	SP(H4DOTC)
IGNITION	IG(H4DOTC)
STARTING/CHARGING SYSTEMS	SC(H4DOTC)
ENGINE (DIAGNOSTICS)	EN(H4DOTC) (diag)
GENERAL DESCRIPTION	GD(H4DOTC)

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOTC)

	Page
1. General Description	2
2. Throttle Body	16
3. Intake Manifold	19
4. Tumble Generator Valve Assembly	43
5. Tumble Generator Valve Actuator	45
6. Fuel Insulator	46
7. Fuel Injector	51
8. Fuel Pressure Sensor	71
9. High Pressure Fuel Pump	75
10. Engine Wiring Harness	86
11. Engine Coolant Temperature Sensor	94
12. Engine Oil Temperature Sensor	96
13. Crankshaft Position Sensor	98
14. Crankshaft Position Sensor Plate	103
15. Camshaft Position Sensor	104
16. Oil Control Solenoid	109
17. Knock Sensor	112
18. Throttle Position Sensor	118
19. Mass Air Flow and Intake Air Temperature Sensor	119
20. Manifold Absolute Pressure and Intake Air Temperature Sensor	121
21. Wastegate Control Solenoid Valve	125
22. Front Oxygen (A/F) Sensor	127
23. Rear Oxygen Sensor	130
24. SI-DRIVE (SUBARU Intelligent Drive) Selector	133
25. Engine Control Module (ECM)	134
26. Main Relay	138
27. IG Relay	140
28. Oxygen Sensor Relay	142
29. Electronic Throttle Control Relay	144
30. Fuel Pump Relay	146
31. Fuel Injector Relay	148
32. Fuel Pump Control Unit	150
33. Fuel	151
34. Fuel Tank Protector	155
35. Fuel Tank	156
36. Fuel Filler Pipe	171
37. Fuel Pump	178
38. Fuel Level Sensor	184
39. Fuel Sub Level Sensor	187
40. Fuel Filter	194
41. Fuel Delivery and Evaporation Lines	205
42. Fuel System Trouble in General	215