DIC29–03

DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

DTC	P0156	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0031 on page DI–35.

DTC No.	DTC Detecting Condition	Trouble Area
P0136 P0156	The following condition continues 5 minute or more. • During driving with the engine warmed up, rear heated oxygen sensor output does not change.	• Open or short in rear heated oxygen sensor circuit • Rear heated oxygen sensor • Rear heated oxygen sensor heater • EFI or ECD relay

HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Bank 2 refers to bank that does not includes cylinder No. 1.
- Sensor 2 refers to the sensor farther away from the engine assembly.

MONITOR DESCRIPTION

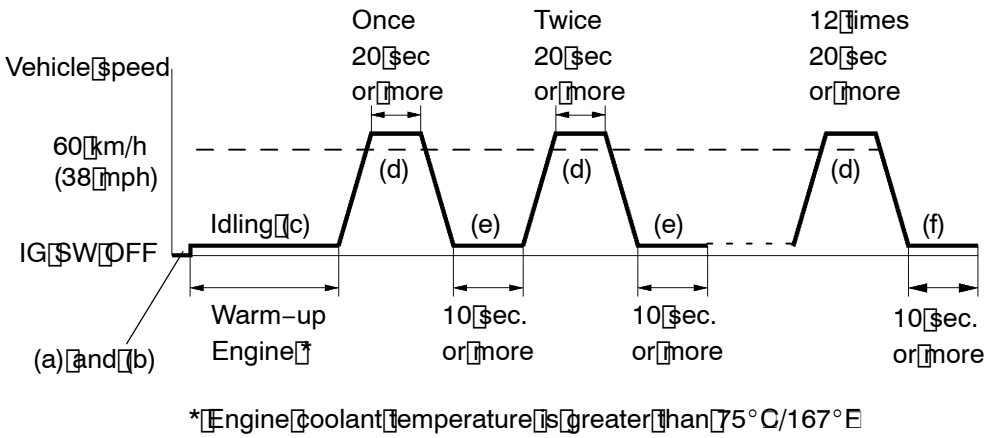
The ECM monitors the HO2S (sensor 2) by checking to make sure:

- The HO2S voltage does not remain Rich (above 0.5 volts) or Lean (below 0.4 volts) while the vehicle is accelerating and decelerating for 4 to 8 minutes. If the voltage remains either Rich or Lean, the ECM interprets this as a malfunction, illuminates the MIL and sets a DTC.

WIRING DIAGRAM

Refer to DTC P0031 on page DI–35.

CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch from normal mode to check mode (see page DI–3).
(c) Warm up the engine until the engine coolant temperature reaches to 75°C (167°F).
(d) Drive the vehicle at 60 km/h (38 mph) or more for 20 seconds or more.
(e) Allow the engine to idle for 10 seconds or more.
(f) Perform steps (d) to (e) at least 12 times.

HINT:
If a malfunction exists, the check engine warning light is illuminated during step (f).

NOTICE:
If the conditions in this test are not strictly followed, detection of a malfunction will not occur. If you do not have the Intelligent Tester II, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:
Hand–held tester only:
The narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (Heated oxygen sensor or another can be distinguished).

(a) Perform ACTIVE TEST by hand–held tester (A/F CONTROL).

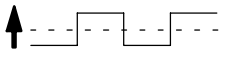
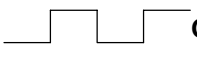
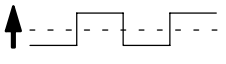
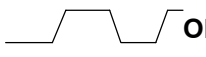
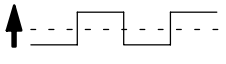
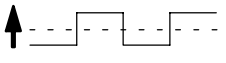
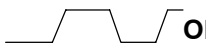
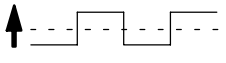
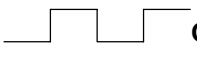
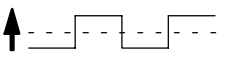
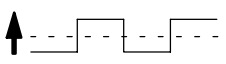
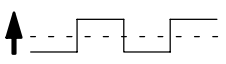
HINT:
”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 seconds.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
However, there is a few seconds delay in the sensor 1 (front sensor) output. And there is a maximum 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of the heated oxygen sensors.
For displaying the graph indication, first enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”02S B1S1and O2S B1S2” by pressing ”YES” button, and push ”ENTER” button before pressing ”F4” button.
HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Are there any other codes (besides DTC P0136 or P0156) being output?**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES.

CHECK:

Read the DTC using the hand–held tester.

RESULT:

Display (DTC Output)	Proceed to
P0136 or P0156	A
"P0136 or P0156" and other DTCs	B

HINT:

If any other codes besides P0136 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–19).**

A

2	**Check output voltage of heated oxygen sensor.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Run the engine at 2,500 rpm for 3 minutes.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / O2S B1 S2 or B2 S2.

CHECK:

Read the voltage output of the heated oxygen sensor when the engine speed is suddenly increased.

HINT:

Quickly accelerate the engine to 4,000 rpm 3 minutes by using the accelerator pedal.

OK:

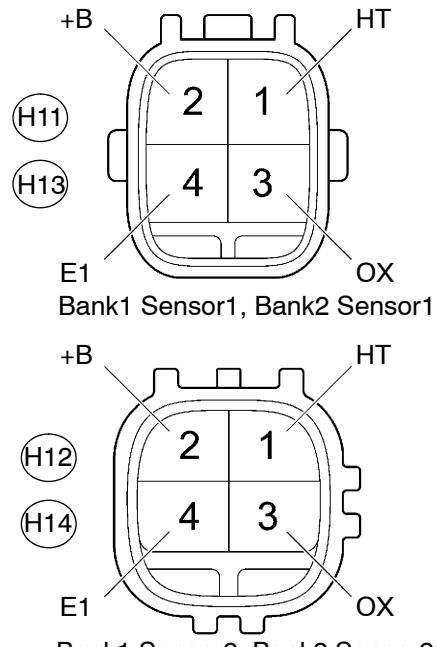
Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.

OK → **Go to step 6.**

NG

3	Check resistance of heated oxygen sensor heater.

Components Side:



PREPARATION:

Disconnect the H11, H12, H13 or H14 heated oxygen sensor connector.

CHECK:

Measure resistance between terminals of the heated oxygen sensor.

OK:

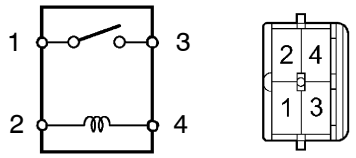
Tester Connection	Specified Condition
HT (H11–1) – +B (H11–2)	11.7 to 14.3 Ω (20°C)
HT (H12–1) – +B (H12–2)	11.7 to 14.3 Ω (20°C)
HT (H13–1) – +B (H13–2)	11.7 to 14.3 Ω (20°C)
HT (H14–1) – +B (H14–2)	11.7 to 14.3 Ω (20°C)

NG → **Replace heated oxygen sensor.**

OK

4	Check EFI or ECD relay.

EFI or ECD Relay



PREPARATION:

Remove the EFI or ECD relay from the engine room R/B.

CHECK:

Inspect the EFI or ECD relay.

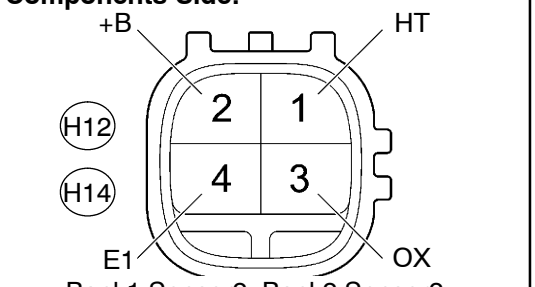
OK:

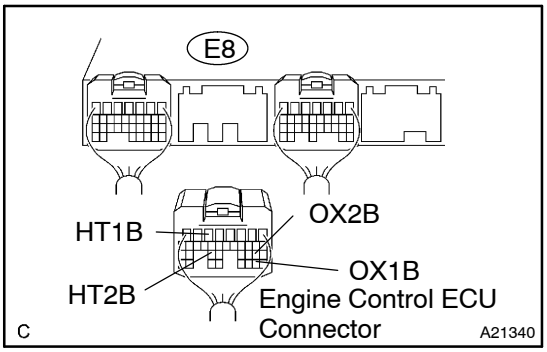
Terminal No.	Condition	Specified Condition
1 – 3	Usually	10 kΩ or higher
	Apply B+ between terminals 2 and 4	Below 1 Ω

NG → **Replace EFI or ECD relay.**

OK

5	**Check for open and short in harness and connector between engine control ECU and heated oxygen sensor.**





PREPARATION:

(a) Disconnect the H12 or H14 heated oxygen sensor connector.

(b) Disconnect the E8 engine control ECU connector.

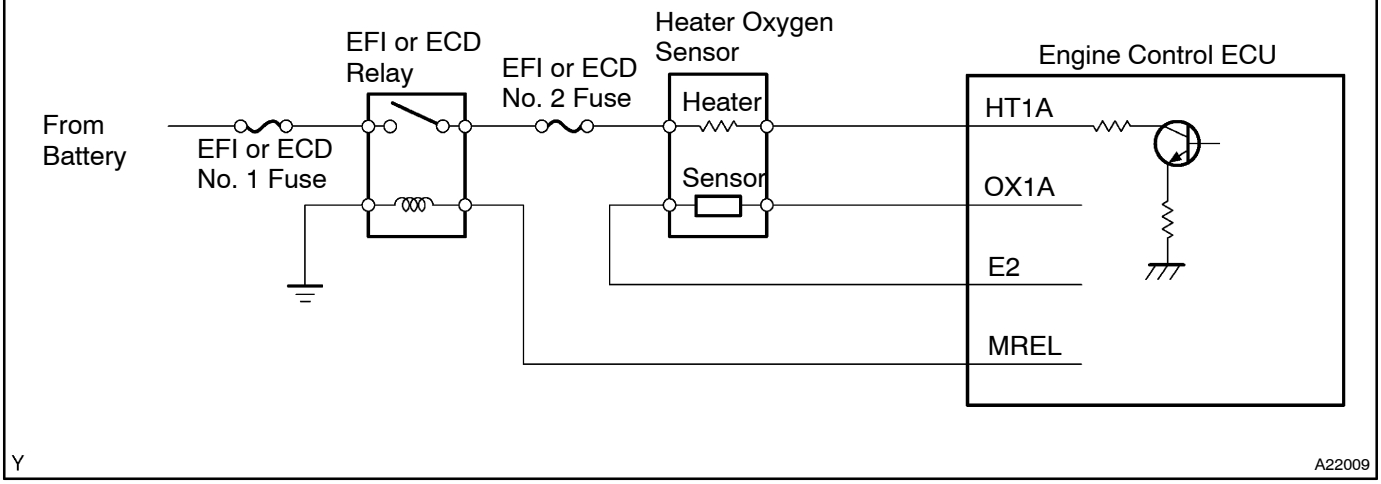
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Tester Connection	Specified Condition
OX (H12–3) – OX1B (E8–29)	Below 1 Ω
HT (H12–1) – HT1B (E8–5)	Below 1 Ω
OX (H14–3) – OX2B (E8–21)	Below 1 Ω
HT (H14–1) – HT2B (E8–25)	Below 1 Ω
OX (H12–3) or OX1B (E8–29) – Body ground	10 kΩ or higher
HT (H12–1) or HT1B (E8–5) – Body ground	10 kΩ or higher
OX (H14–3) or OX2B (E8–21) – Body ground	10 kΩ or higher
HT (H14–1) or HT2B (E8–25) – Body ground	10 kΩ or higher

Reference (Bank 1 Sensor 1 System Drawing)



NG → **Repair or replace harness or connector.**

OK

Replace heated oxygen sensor.

6	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

Go

7	**Is the DTC P0136 or P0156 being output again?**

NO → **Check for intermittent problems.**

YES

Replace heated oxygen sensor.