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 P0130 on page 05–363.

DTC No	DTC Detection Condition	Trouble Area
P0136 P0156	If the following two conditions are satisfied at a time (2 trip detection logic): (a) The ECM records cycles which the vehicle driving and stops 8 times or more. (b) There was no change in the rich and lean outputs from heated oxygen sensor (sensor 2) for the 360 seconds under air fuel ratio feedback control. (Throttle was not closed)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 2) circuit • Heated oxygen sensor (bank 1, 2 sensor 2) • Heated oxygen sensor heater (bank 1, 2 sensor 2) • EFI relay

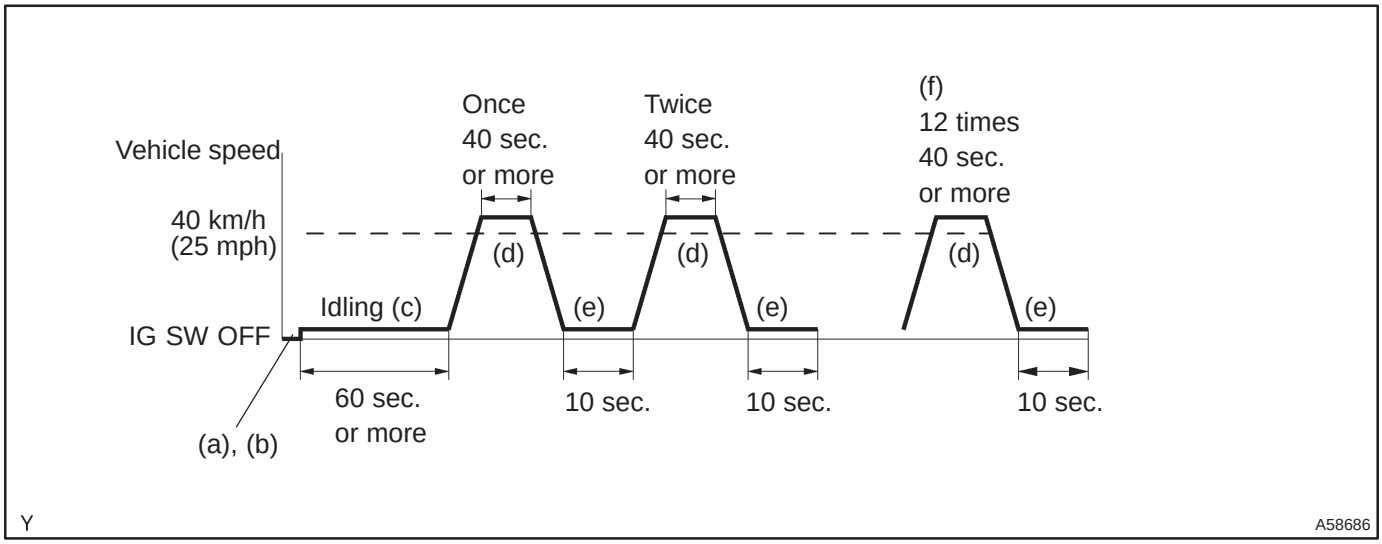
HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check (test) mode (See page 05–294).
(c) Start the engine and let the engine idle for 60 seconds or more.
(d) Drive the vehicle at 40 km/h (25 mph) or more for 40 seconds or more.
(e) Let the engine idle for 10 seconds or more.
(f) Perform steps (d) and (e) 12 times.

HINT:

If a malfunction exists, the CHK ENG will be illuminated on the multi information display 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 a hand–held tester, 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:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

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

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –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 by running the engine at 2,500 rpm for approximately 90 sec.
(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 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 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 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean 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 outputs of both the heated oxygen sensors.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- 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	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0136 AND/OR P0156)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0136 and/or P0156” are output	A
”P0136 or P0156” and other DTCs are output	B

HINT:
If any other codes besides ”P0136 and/or P0156” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
(b) Read the output voltage of the heated oxygen sensor (sensor 2) when the engine rpm is suddenly increased.

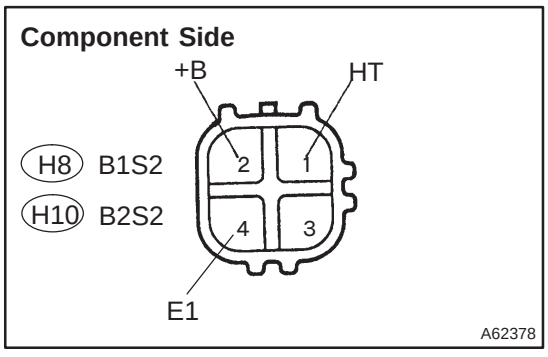
HINT:
Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.

The output voltage of heated oxygen sensor (sensor 2): Alternates from 0.4 V or less to 0.5 V or more.

OK → **Go to step 6**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



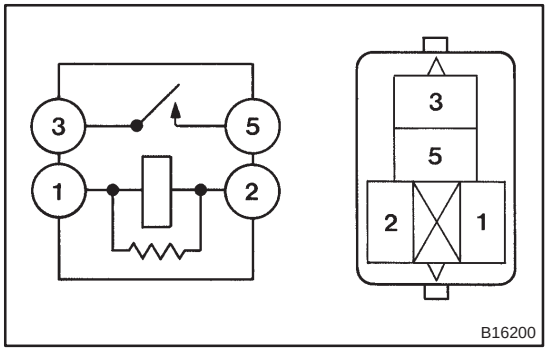
(a) Disconnect the H8 or H10 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.
Standard (Bank 1, 2 Sensor 2):

Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.
(b) Inspect the EFI relay.

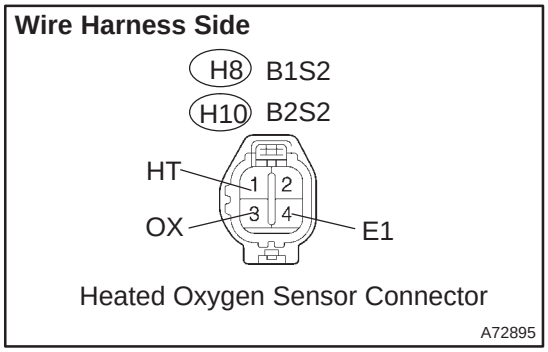
Standard:

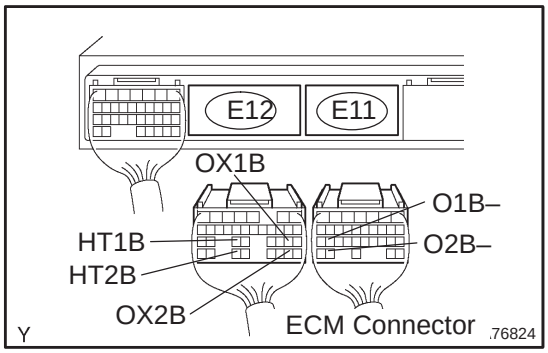
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H8 or H10 heated oxygen sensor connector.
(b) Disconnect the E11 and E12 ECM connectors.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H8–3) – OX1B (E12–21)	Continuity
HT (H8–1) – HT1B (E12–25)	
E1 (H8–4) – O1B– (E11–26)	
OX (H10–3) – OX2B (E12–29)	
HT (H10–1) – HT2B (E12–33)	
E1 (H10–4) – O2B– (E11–31)	

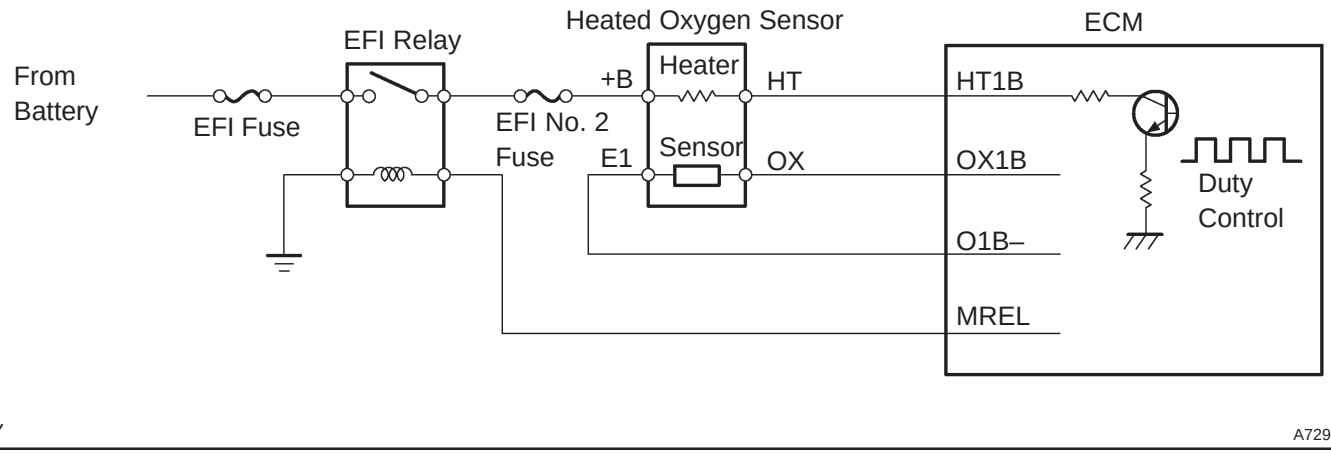
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H8–3) or OX1B (E12–21) – Body ground	No continuity
HT (H8–1) or HT1B (E12–25) – Body ground	
OX (H10–3) or OX2B (E12–29) – Body ground	
HT (H10–1) or HT2B (E12–33) – Body ground	

HINT:

- The OX1B and HT1B means the heated oxygen sensor bank 1 sensor 2.
- The OX2B and HT2B means the heated oxygen sensor bank 2 sensor 2.

Reference (Bank 1 Sensor 2 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	READ OUTPUT DTC(DTC P0136 AND/OR P0156 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0136 and/or P0156” are not output again	A
”P0136 and/or P0156” are output again	B

B → **REPLACE HEATED OXYGEN SENSOR**

A

CHECK FOR INTERMITTENT PROBLEMS