DTC	P0136/27	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0156/29	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 2 SENSOR 2)

CIRCUIT DESCRIPTION

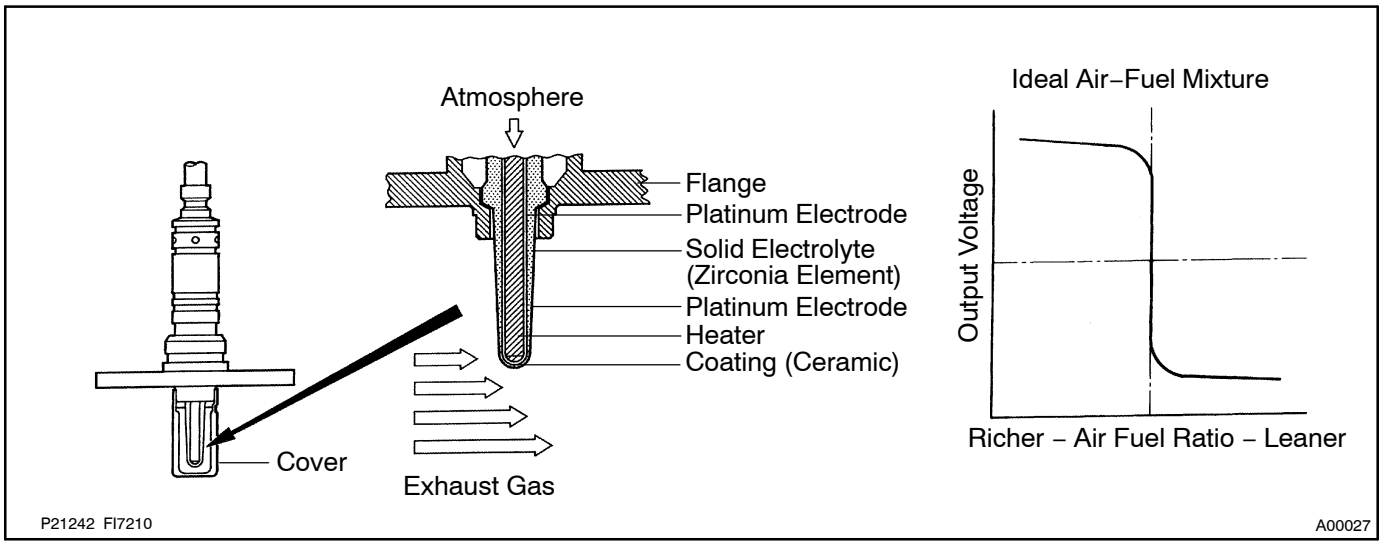
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: < 0.45 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: > 0.45 V). The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.

The main heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.



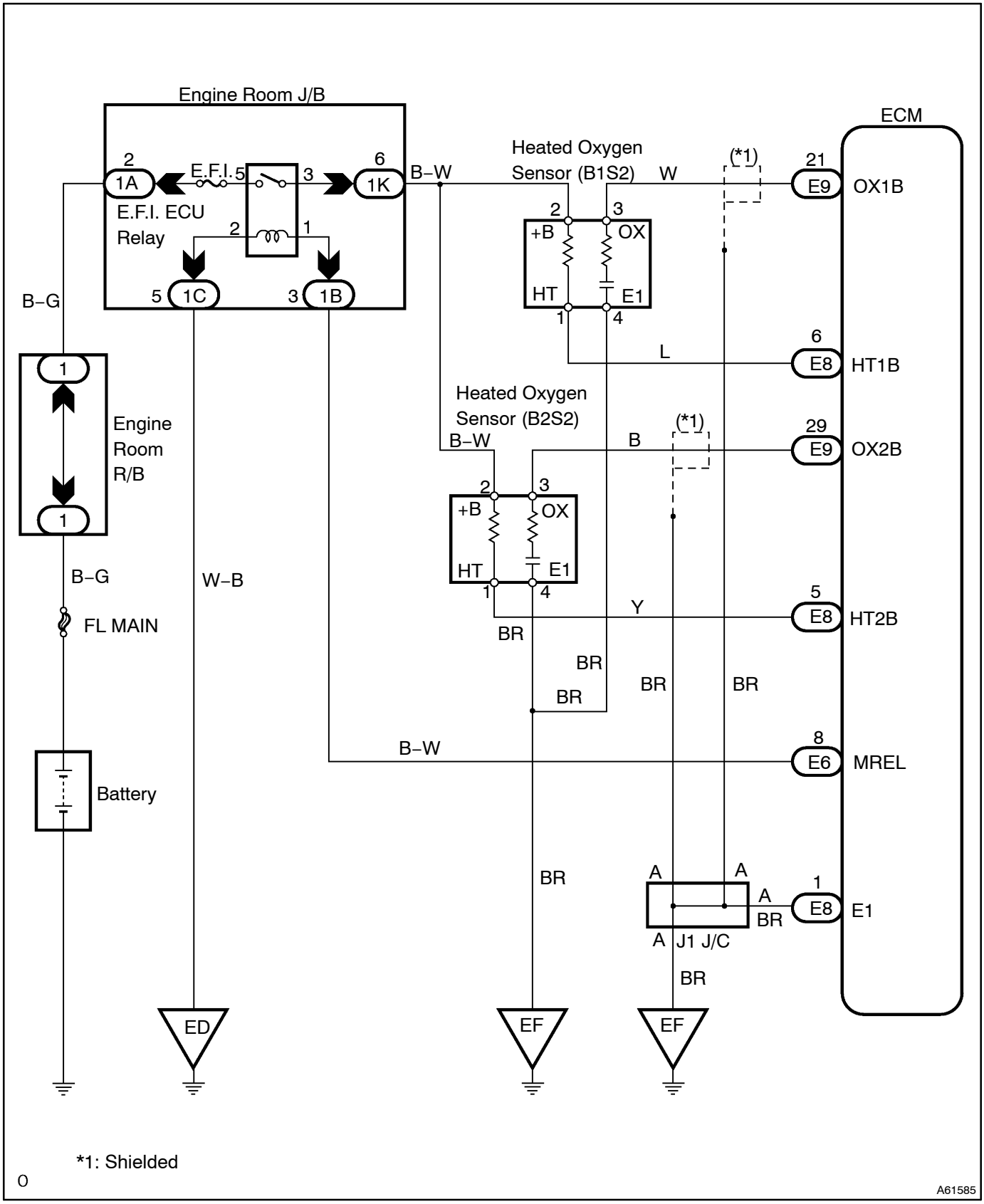
DTC No	DTC Detecting Condition	Trouble Area
P0136/27 P0156/29	Condition (a) and (b) continues for 60 secs. or more: (a) Voltage output of oxygen sensor remains at 0.35 V or more, or 0.55 V or less, during idling after engine is warmed up (b) Oxygen sensor output voltage amplitude is less than 0.3 V.	• Open or short in heated oxygen sensor circuit • Oxygen sensor

HINT:

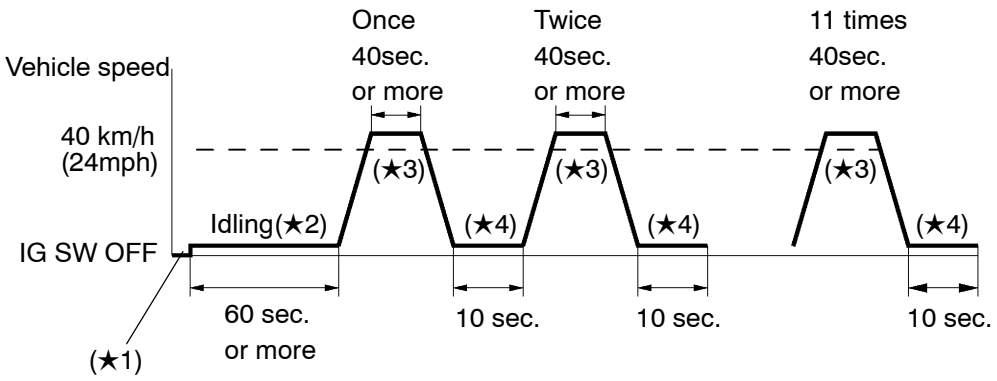
- Bank 1 refers to bank that includes cylinder No.1.
- Bank 2 refers to bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor closer to the engine body.

- The heated oxygen sensor's output voltage and the short – term fuel trim value can be read using the hand – held tester or OBD II scan tool.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



1. **Connect the hand–held tester to the DLC3. (★1)**
2. **Switch the hand–held tester from the normal mode to the check (test) mode (See page 05–7). (★1)**
3. **Start the engine and let the engine idle for 60 seconds or more. (★2)**
4. **Drive the vehicle at 40 km/h (24 mph) or more for 40 seconds or more. (★3)**
5. **Let the engine idle for 10 seconds or more. (★4)**
6. **Perform steps (★3) to (★4) 11 times. (★5)**

HINT:

If a malfunction exists, the CHECK ENG will light up on the multi information display during step (★5).

NOTICE:

If the conditions in this test are not strictly followed, detection of the malfunction will not be possible. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from (★2) to (★5), then perform steps from (★2) to (★5) again.

INSPECTION PROCEDURE

NOTICE:

If the vehicle run out of fuel, the air–fuel ratio becomes LEAN and DTC P0125 will be recorded. and the check engine warning light then comes on.

HINT:

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

When using Hand–held Tester:

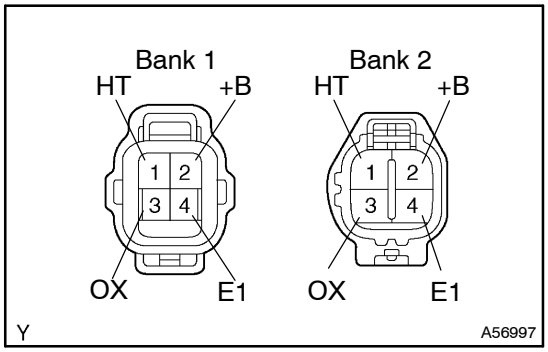
1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0136,P0156)

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

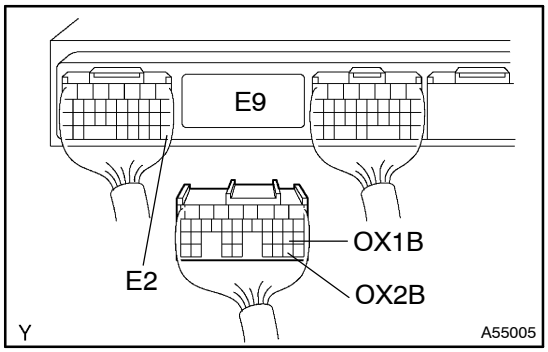
YES → **GO TO RELEVANT DTC CHART**

NO

2	CHECK HARNESS AND CONNECTOR(ECM – OXYGEN SENSOR)



(a) Disconnect the oxygen sensor connector.
(b) Disconnect the ECM E9 connector.
(c) Check continuity between the terminals OX1B and OX2B of the ECM connector and OX of the oxygen sensor connector.
Resistance: 1 Ω or less
(d) Check for short between the terminals OX1B, OX2B and E2 of the ECM connector.
Resistance: 1 MΩ or more



NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3	READ VALUE OF HAND–HELD TESTER(OXIGEN SENSOR)

(a) Connect the hand–held tester to the DLC3.
(b) Warm up the engine to normal operating temperature.
(c) Read the voltage output of the oxygen sensor when the engine is suddenly raced.

HINT:

Perform quick racing to 4,000 rpm 3 min. using the accelerator pedal.

Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.6 V or more.

OK → **CHECK THAT EACH CONNECTOR IS PROPERLY CONNECTED**

NG

REPLACE OXYGEN NO.2 SENSOR

When not using Hand–held Tester:

1	CHECK OTHER DTC OUTPUT(BESIDES CORD 27 OR 29)

YES → **GO TO RELEVANT DTC CHART**

NO

REPLACE OXYGEN NO.2 SENSOR