DIB7I–01

CIRCUIT INSPECTION

DTC	P0031	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 1)

DTC	P0032	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 1)

DTC	P0037	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)

DTC	P0038	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)

DTC	P0051	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 1)

DTC	P0052	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 1)

DTC	P0057	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)

DTC	P0058	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)

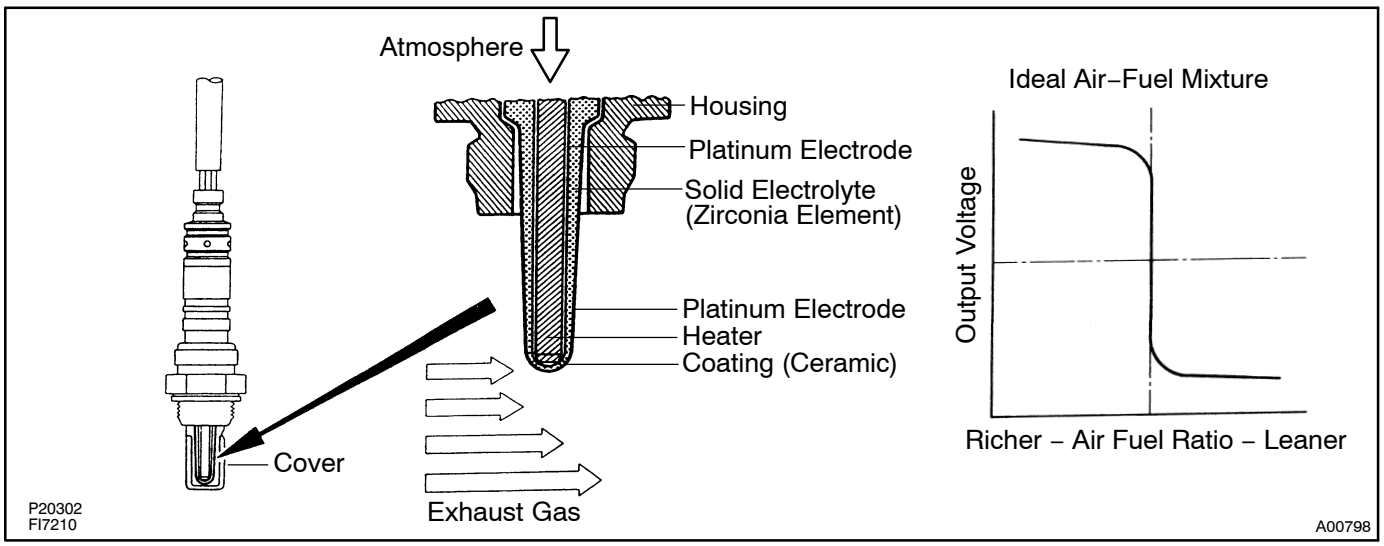
CIRCUIT DESCRIPTION

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 heated oxygen sensor has the characteristic which its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback to control the air–fuel ratio.

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

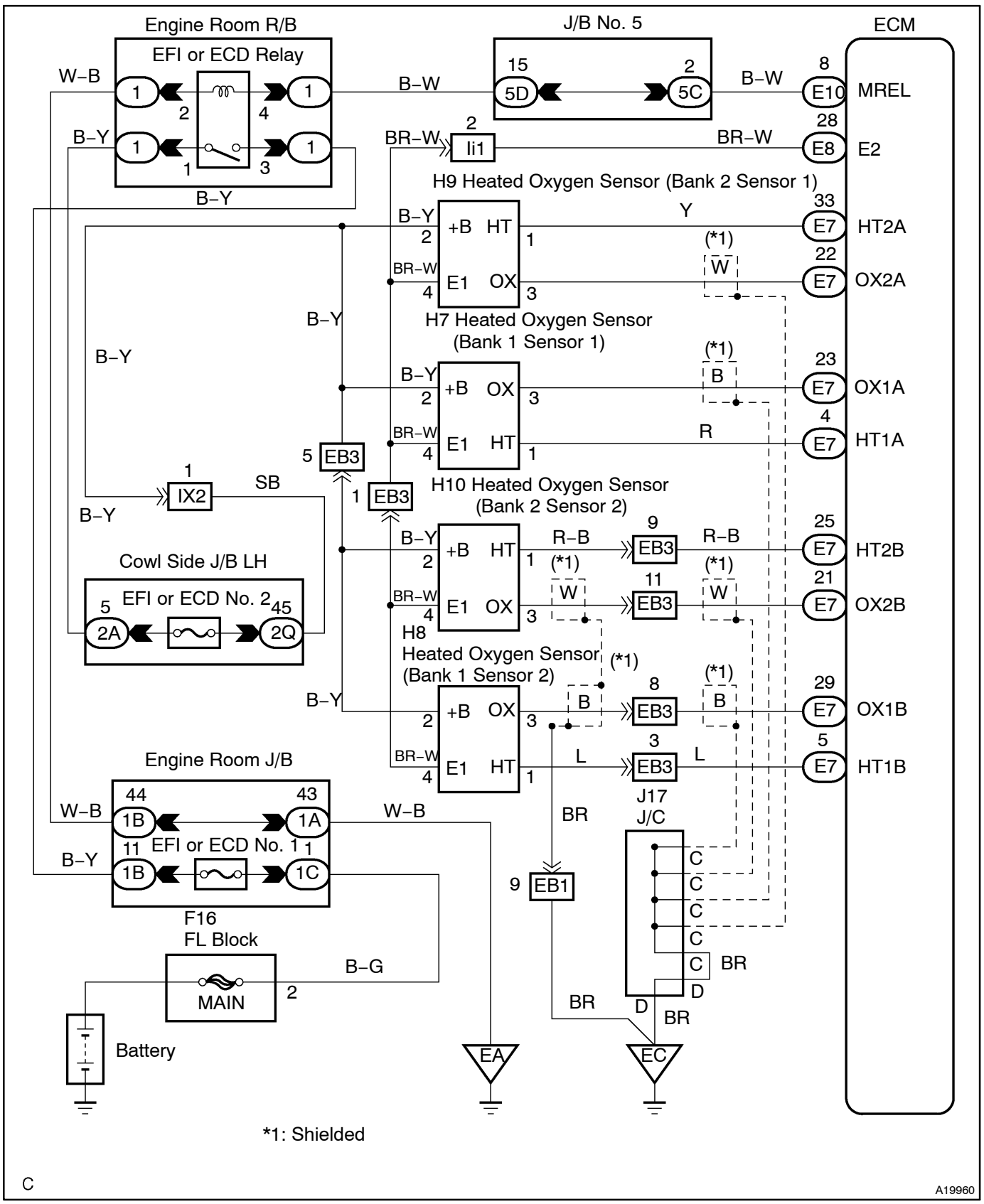


DTC No.	DTC Detecting Condition	Trouble Area
P0031 P0037	Heater current of 0.2 A or less when heater operates with +B > 10.5 V and < 11.5 V (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM
P0051 P0057	Heater current of 0.25 A or less when heater operates with +B ≧ 11.5 V (1 trip detection logic)	
P0032 P0038 P0052 P0058	When heater operates, heater current exceeds 2 A (1 trip detection logic)	

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.
- Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

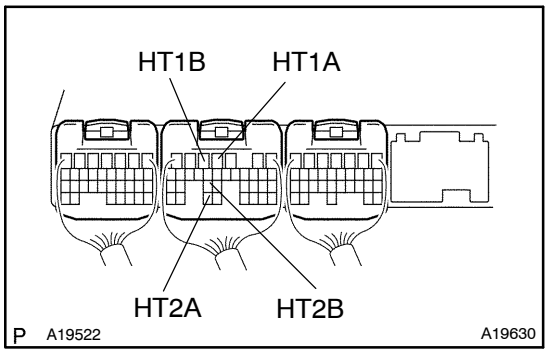
Read freeze frame data using hand–held tester or the OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, this is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio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

1	**Check resistance of heated oxygen sensor heater (See page SF–57).**

NG → **Replace heated oxygen sensor.**

OK

2	**Check voltage between terminals HT1A, HT2A, HT1B, HT2B of ECM connectors and body ground.**



PREPARATION:

(a) Remove the glove compartment door (See page SF–60).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals HT1A, HT2A, HT1B, HT2B of the ECM connectors and body ground.

HINT:

- Connect terminal HT1A to bank 1 sensor 1.
- Connect terminal HT2A to bank 2 sensor 1.
- Connect terminal HT1B to bank 1 sensor 2.
- Connect terminal HT2B to bank 2 sensor 2.

OK:

Voltage: 9 – 14 V

OK → **Check and replace ECM (See page IN–36).**

NG

Check and repair harness or connector between EFI main relay (Marking: EFI) and heated oxygen sensor, and heated oxygen sensor and ECM (See page IN–36).