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)

HINT:

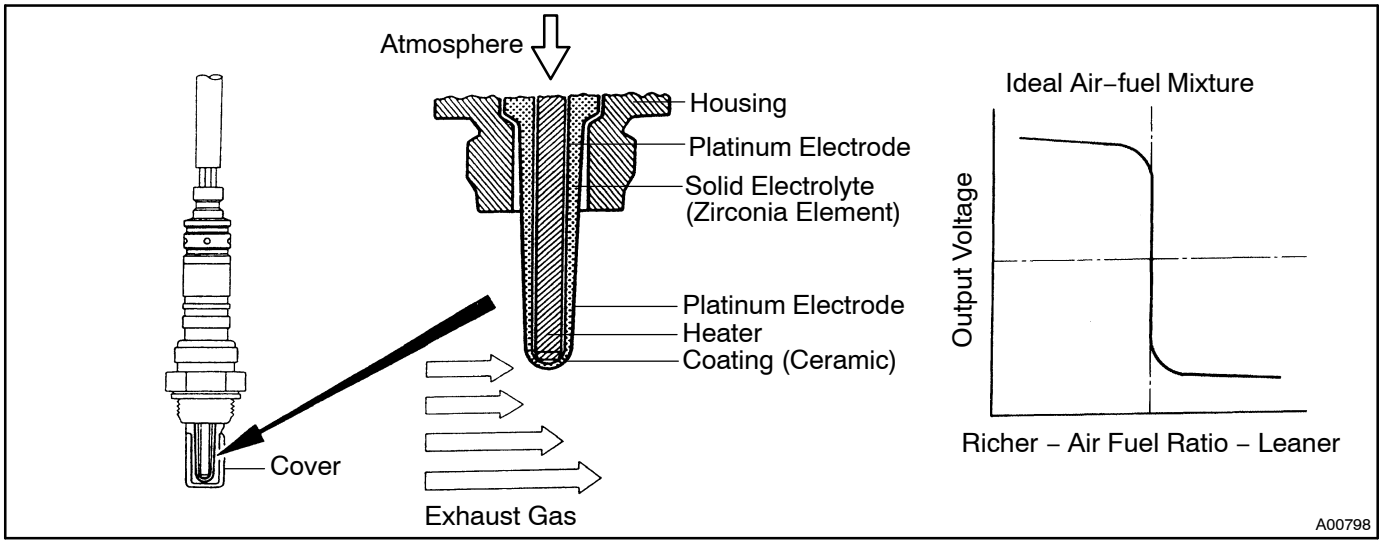
- Bank 1 refers to the bank that includes cylinder No. 1.
- Bank 2 refers to the bank that does not include cylinder No. 1.
- Cylinder No. 1 is located in the front part of the engine, opposite the transmission.
- Sensor 1 refers to the sensor closest to the engine body.
- Sensor 2 refers to the sensor farthest away from the engine body.

CIRCUIT DESCRIPTION

The Heated Oxygen Sensor (HO2S) is used to monitor oxygen concentration in the exhaust gas. For optimum catalytic converter operation, the air–fuel mixture must be maintained near the ideal stoichiometric ratio. The HO2S output voltage changes suddenly in the vicinity of the stoichiometric ratio. The ECM adjusts the fuel injection time so that the air–fuel ratio is nearly stoichiometric.

If the oxygen concentration in the exhaust gas increases, the air–fuel ratio is LEAN. The HO2S voltage drops below 0.45 V and the HO2S informs the ECM of the LEAN condition.

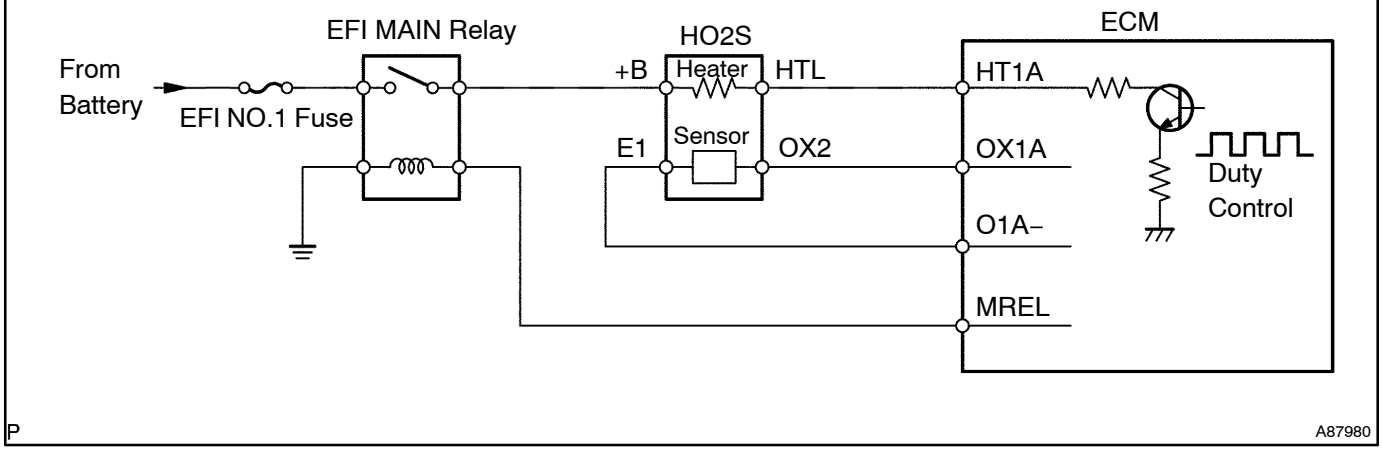
If oxygen is not in the exhaust gas, the air–fuel ratio is RICH. The HO2S voltage increases above 0.45 V and the HO2S informs the ECM of the RICH condition.



HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The HO2S heater circuit uses a relay on the +B side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing):



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0037 P0051 P0057	HO2S heater current is below 0.25 A when heater operates with +B greater than 11.5 V (1 trip detection logic)	• Open or short in HO2S heater circuit • HO2S heater • EFI MAIN relay • ECM
P0032 P0038 P0052 P0058	HO2S heater current exceeds 2 A when heater operates (1 trip detection logic)	• Open or short in HO2S heater circuit • HO2S heater • EFI MAIN relay • ECM

MONITOR DESCRIPTION

The sensing portion of the HO2S has a zirconia element which is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and difference of the oxygen concentration between the inside and outside surface of the sensor is large, the zirconia element will generate voltage signals. In order to increase the oxygen concentration detecting capacity in the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When current in the HO2S heater is out of the standard operating range, the ECM interprets this as a fault in the HO2S heater. The ECM illuminates the MIL and sets a DTC.

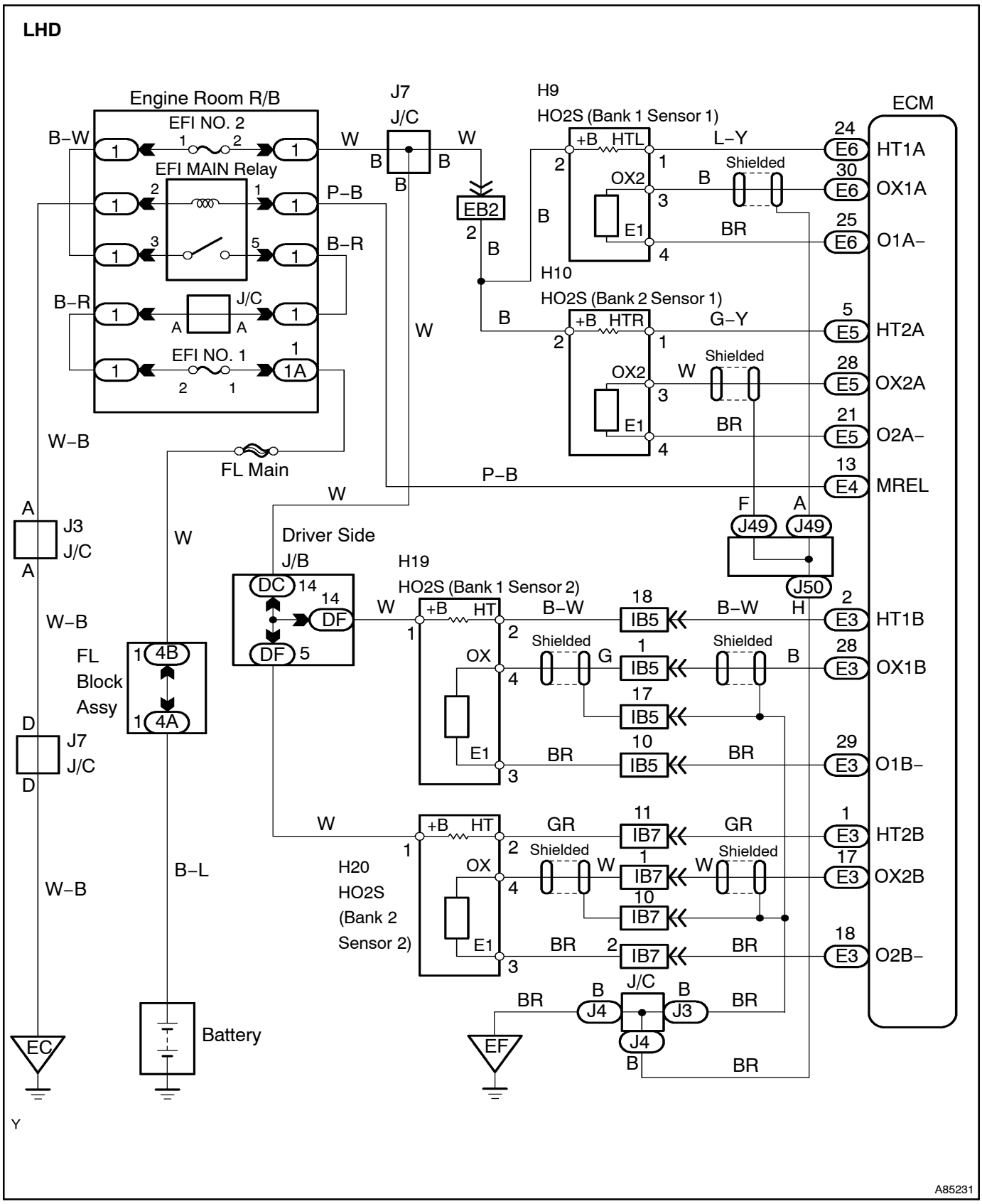
Normally, the HO2S heater current is 0.4 to 1.0 A.

Example:

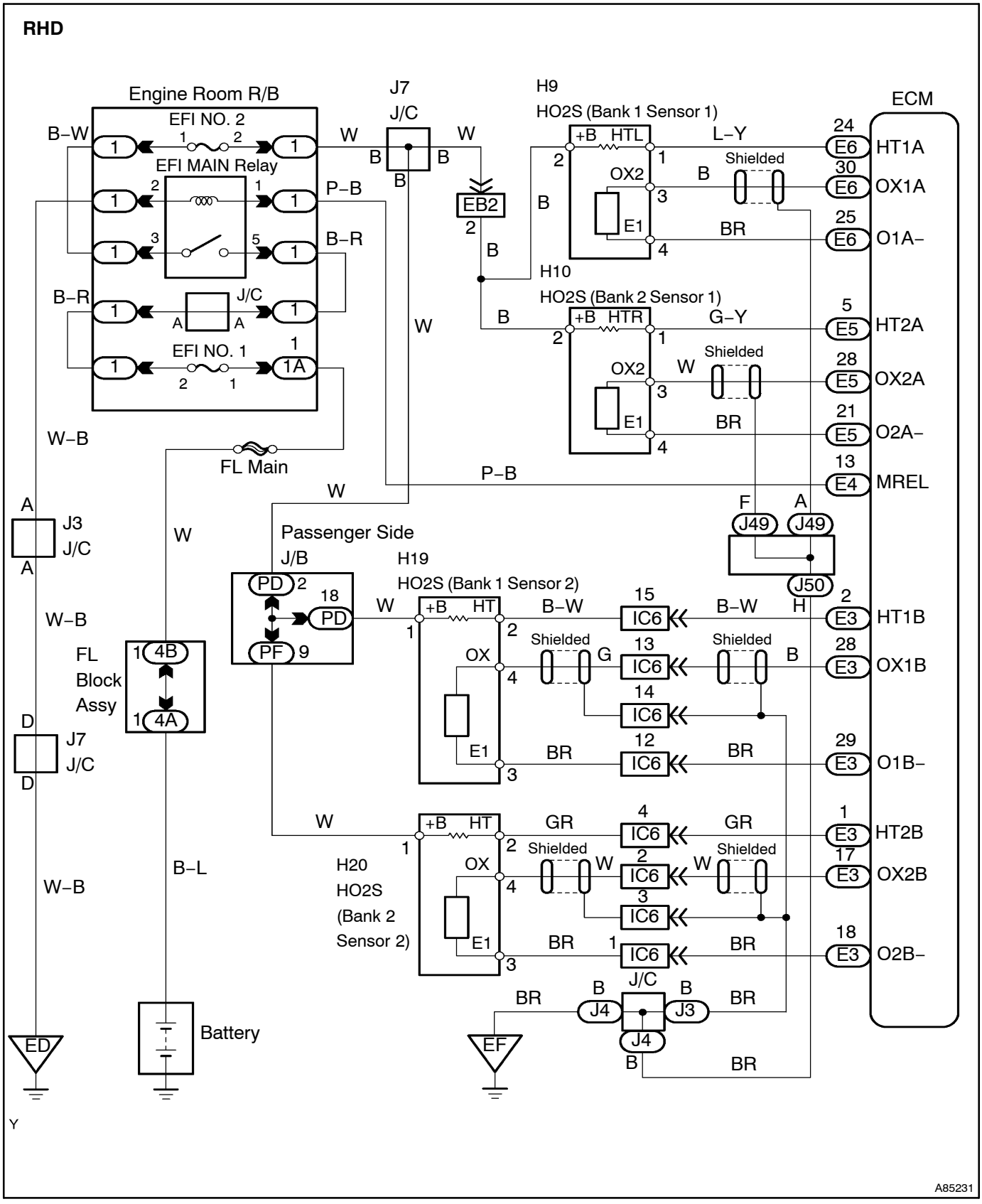
The ECM will set a high current DTC if the current in the sensor is more than 2 A. Similarly, the ECM will set a low current DTC if the current is less than 0.25 A.

The monitor runs if the engine is started and run at idle for 9 minutes or more.

WIRING DIAGRAM



RHD

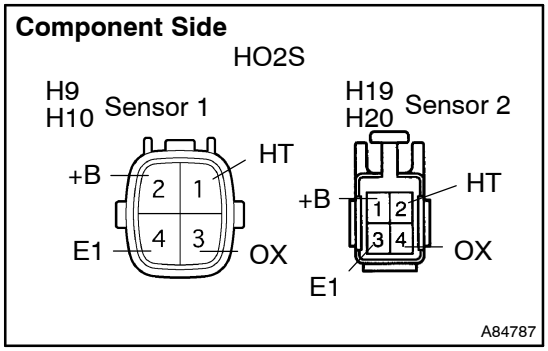

Engine Room R/B
EFI NO. 2
EFI MAIN Relay
EFI NO. 1
J/C
FL Main
FL Block Assy
Battery
J7 J/C
J3 J/C
Passenger Side J/B
H9 HO2S (Bank 1 Sensor 1)
H10 HO2S (Bank 2 Sensor 1)
H19 HO2S (Bank 1 Sensor 2)
H20 HO2S (Bank 2 Sensor 2)
EB2
J49
J50
J4
J3
IC6
E1
ECM
HT1A
OX1A
O1A–
HT2A
OX2A
O2A–
MREL
HT1B
OX1B
O1B–
HT2B
OX2B
O2B–
Shielded
ED
EF
A85231

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Intelligent Tester II. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	INSPECT HEATED OXYGEN SENSOR (HT1A, HT2A, HT1B, HT2B VOLTAGE)



(a) Disconnect the H9, H10, H19 or H20 HO2S connector.

(b) Measure the resistance between the terminals of the HO2S connector.

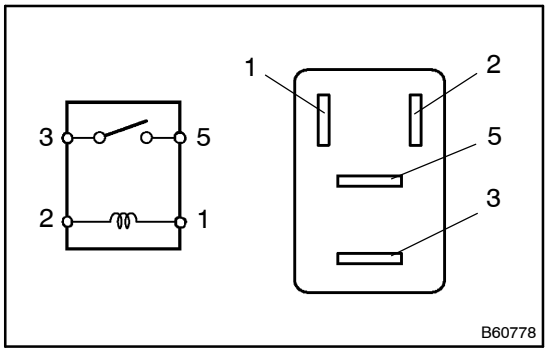
Standard:

Tester Connection	Specified Condition
H9–1 (HT) – H9–2 (+B)	5 to 10 Ω at 20°C (68°F)
H9–1 (HT) – H9–4 (E1)	10 kΩ or higher
H10–1 (HT) – H10–2 (+B)	5 to 10 Ω at 20°C (68°F)
H10–1 (HT) – H10–4 (E1)	10 kΩ or higher
H19–2 (HT) – H19–1 (+B)	5 to 10 Ω at 20°C (68°F)
H19–2 (HT) – H19–3 (E1)	10 kΩ or higher
H20–2 (HT) – H20–1 (+B)	5 to 10 Ω at 20°C (68°F)
H20–2 (HT) – H20–3 (E1)	10 kΩ or higher

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2	INSPECT EFI MAIN RELAY (HEATER RESISTANCE)



(a) Remove the EFI MAIN relay from the engine room R/B.

(b) Measure the resistance of the EFI MAIN relay.

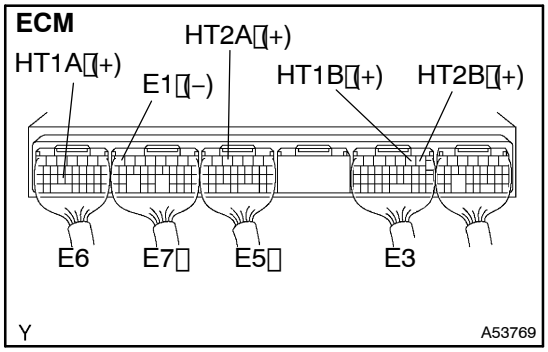
Standard:

Tester Connection	Specified Condition
3 – 5	10 kΩ or higher
3 – 5	Below 1 Ω (apply battery voltage to terminals 1 and 2)

NG → **REPLACE EFI MAIN RELAY**

OK

3 INSPECT ECM (HT1A, HT2A, HT1B, HT2B VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage of the ECM.

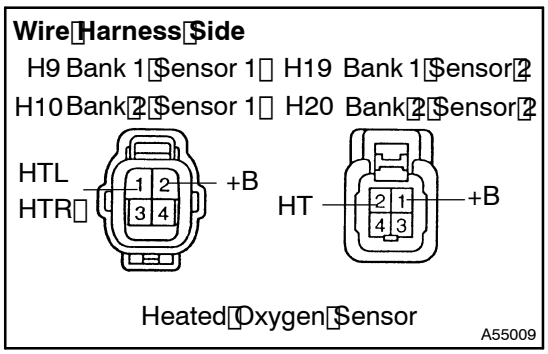
Standard:

Tester Connection	Specified Condition
E6–24 (HT1A) – E7–7 (E1)	9 to 14 V
E5–5 (HT2A) – E7–7 (E1)	9 to 14 V
E3–2 (HT1B) – E7–7 (E1)	9 to 14 V
E3–1 (HT2B) – E7–7 (E1)	9 to 14 V

OK → REPLACE ECM (See page 10–21)

NG

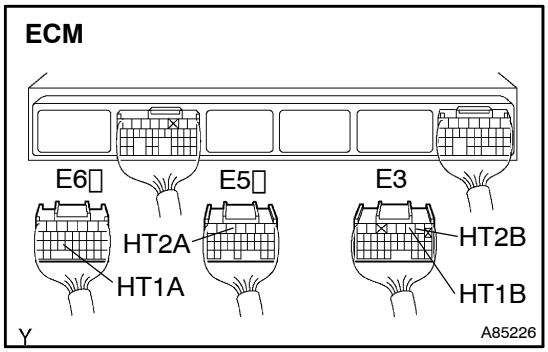
4 CHECK WIRE HARNESS (ENGNE ROOM R/B – HO2S – ECM AND GROUND)

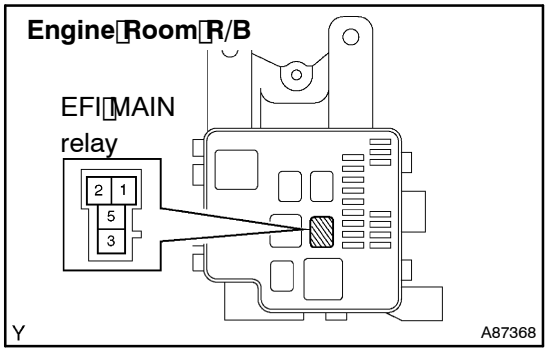


(a) Check the wire harnesstween the ECM and HO2S.
(1) Disconnect the H9, H10, H19 or H20 HO2S connector.
(2) Disconnect the E3, E5 or E6 ECM connector.
(3) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
H9–1 (HTL) – E6–24 (HT1A)	Below 1 Ω
H10–1 (HTR) – E5–5 (HT2A)	Below 1 Ω
H19–2 (HT) – E3–2 (HT1B)	Below 1 Ω
H20–2 (HT) – E3–1 (HT2B)	Below 1 Ω
H9–1 (HTL) or E6–24 (HT1A) – Body ground	10 kΩ or higher
H10–1 (HTR) or E5–5 (HT2A) – Body ground	10 kΩ or higher
H19–2 (HT) or E3–2 (HT1B) – Body ground	10 kΩ or higher
H20–2 (HT) or E3–1 (HT1B) – Body ground	10 kΩ or higher





(b) Check the wire harness between the HO2S and EFI MAIN relay.

(1) Disconnect the H9, H10, H19 or H20 HO2S connector.

(2) Remove the EFI MAIN relay from the engine room R/B.

(3) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
H9–2 – R/B EFI MAIN relay terminal 3	Below 1 Ω
H10–2 (+B) – R/B EFI MAIN relay terminal 3	Below 1 Ω
H19–1 (+B) – R/B EFI MAIN relay terminal 3	Below 1 Ω
H20–1 (+B) – R/B EFI MAIN relay terminal 3	Below 1 Ω
H9–2 (+B) – Body ground	10 kΩ or higher
H10–2 (+B) – Body ground	10 kΩ or higher
H19–2 (+B) – Body ground	10 kΩ or higher
H20–2 (+B) – Body ground	10 kΩ or higher

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

OK

REPLACE ECM (See page 10–21)