DTC	P2238	OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR) (BANK 1 SENSOR 1)

DTC	P2239	OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR) (BANK 1 SENSOR 1)

DTC	P2252	OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR) (BANK 1 SENSOR 1)

DTC	P2253	OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR) (BANK 1 SENSOR 1)

HINT:
Although the each DTC title says "oxygen sensor", these DTCs are related to the A/F sensor.

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page 05–165.

DTC No.	DTC Detecting Condition	Trouble Area
P2238	• Conditions (a) or (b) continues for 5 seconds or more: (a) AF+ is 0.5 V or less (b) (AF+) – (AF–) is 0.8 V or more • A/F sensor admittance: Less than 0.022 1/Ω	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • ECM
P2239	• Condition (a) continues for 5.0 seconds or more: (a) AF+ is more than 4.5 V (b) (AF+) – (AF–) is more than 0.8 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • ECM
P2252	AF– is 0.5 V or less for 5.0 seconds or more	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • ECM
P2253	AF– is more than 4.5 V for 5.0 seconds or more	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • ECM

WIRING DIAGRAM

Refer to DTC P2195 on page 05–165.

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be found by performing the Active Test / A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform Active Test using the intelligent tester II.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the intelligent tester II to the DLC3 on the vehicle.

(2) Turn the power switch ON (IG).

(3) Put the engine in inspection mode (see page 05–1).

(4) Warm up the engine by running the engine at 2,500 rpm, depressing the accelerator pedal more than 60 % for approximately 90 seconds.

(5) Select the item: Powertrain / Engine and ECT / Active Test / Control the Injection Volume for A/F Sensor.

(6) Select the monitor item: AFS B1S1 and O2S B1S2.

(7) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: Less than 3.0 V

–12.5 % → lean output: More than 3.35 V

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

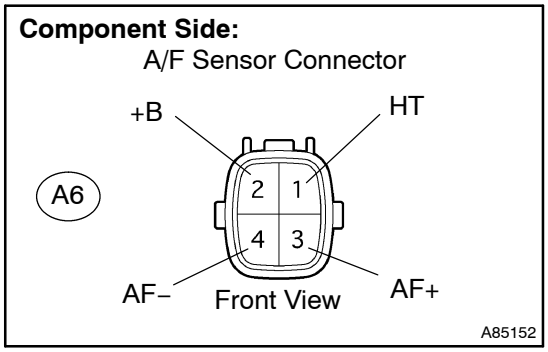
NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0 V **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 Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, sensor heater, sensor circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Heated oxygen sensor (heated oxygen sensor, sensor heater, sensor 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 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 both A/F sensor and heated oxygen sensor.
To display the graph, select the item on the tester: View / Line graph.
HINT:
Read freeze frame data using the intelligent tester II. Freeze frame data records the engine condition when 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 AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



(a) Disconnect the A6 A/F sensor connector.
(b) Measure the resistance between the terminals of the A/F sensor.

Resistance:

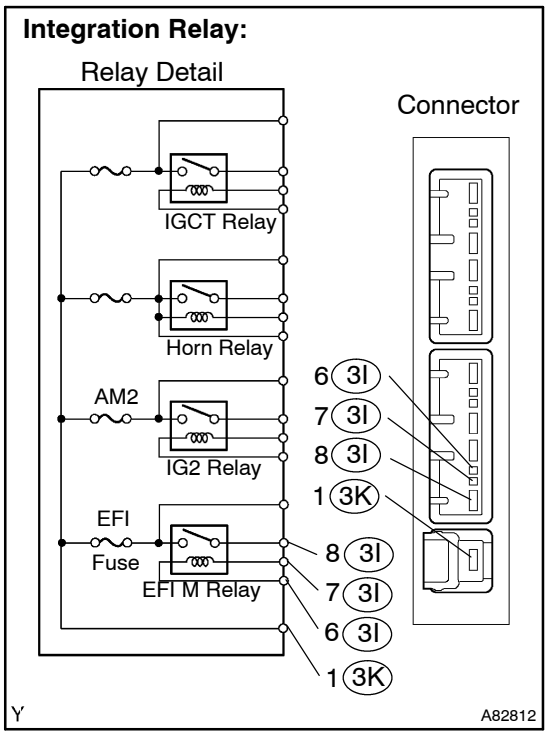
Tester Connection	Resistance
HT (1) – +B (2)	1.8 to 3.4 Ω at 20°C (68°F)

(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2 INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the EFI M relay.

Standard:

Tester Connection	Specified Condition
(3K–1) – (3I–8)	10 kΩ or higher
(3K–1) – (3I–8)	Below 1 Ω (Apply battery voltage to terminals 3I–6 and 3I–7)

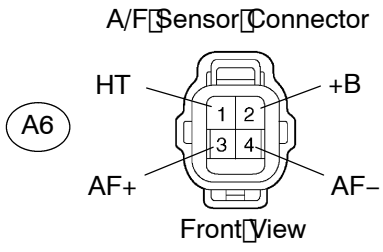
(c) Reinstall the integration relay.

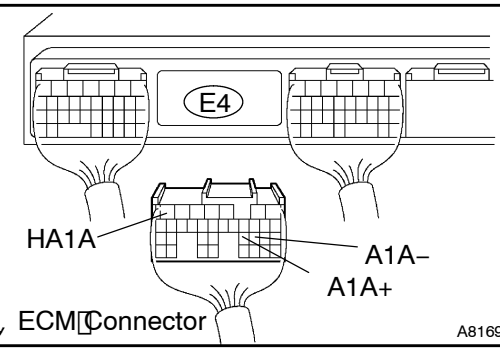
NG → **REPLACE INTEGRATION RELAY**

OK

3 CHECK HARNESS AND CONNECTOR (A/F SENSOR – ECM)

Wire Harness Side:





(a) Disconnect the A6 A/F sensor connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

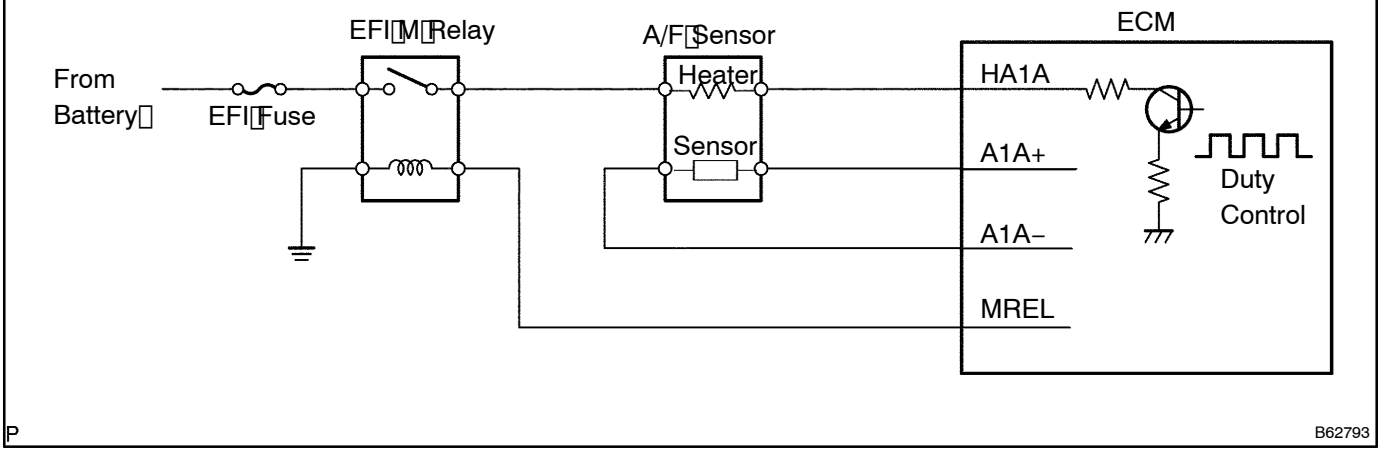
Tester Connection	Specified Condition
AF+ (A6–3) – A1A+ (E4–23)	Below 1 Ω
AF– (A6–4) – A1A– (E4–22)	Below 1 Ω
HT (A6–1) – HA1A (E4–7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A6–3) or A1A+ (E4–23) – Body ground	10 kΩ or higher
AF– (A6–4) or A1A– (E4–22) – Body ground	10 kΩ or higher
HT (A6–1) or HA1A (E4–7) – Body ground	10 kΩ or higher

(d) Reconnect the A/F sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Diagram):



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

OK →

REPLACE ECM (See page 10–24)