

<b>DTC</b>	<b>P2238/21</b>	<b>OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR) (BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2239/21</b>	<b>OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR) (BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2252/21</b>	<b>OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR) (BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2253/21</b>	<b>OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR) (BANK 1 SENSOR 1)</b>

## CIRCUIT DESCRIPTION

### HINT:

These DTCs are set when the A/F sensor has a malfunction, although the caption is the oxygen sensor. Refer to DTC P2195 on [page 05-192](#).

DTC No.	DTC Detection Condition	Trouble Area
P2238/21	<ul style="list-style-type: none"> <li>Condition (a) or (b) continues for 5.0 seconds or more:               <ul style="list-style-type: none"> <li>(a) AF+ is 0.5 V or less</li> <li>(b) (AF+) - (AF-) is 0.8 V or more</li> </ul> </li> <li>A/F sensor admittance: Less than 0.022 1/Ω</li> </ul>	<ul style="list-style-type: none"> <li>Open or short in A/F sensor (sensor 1) circuit</li> <li>A/F sensor (sensor 1)</li> <li>A/F sensor heater</li> <li>EFI relay</li> <li>A/F sensor heater and relay circuit</li> <li>ECM</li> </ul>
P2239/21	<ul style="list-style-type: none"> <li>Condition (a) or (b) continues for 5.0 seconds or more:               <ul style="list-style-type: none"> <li>(a) AF+ is more than 4.5 V</li> <li>(b) (AF+) - (AF-) is more than 0.8 V</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Open or short in A/F sensor (sensor 1) circuit</li> <li>A/F sensor (sensor 1)</li> <li>A/F sensor heater</li> <li>EFI relay</li> <li>A/F sensor heater and relay circuit</li> <li>ECM</li> </ul>
P2252/21	AF- is 0.5 V or less for 5.0 seconds or more	<ul style="list-style-type: none"> <li>Open or short in A/F sensor (sensor 1) circuit</li> <li>A/F sensor (sensor 1)</li> <li>A/F sensor heater</li> <li>EFI relay</li> <li>A/F sensor heater and relay circuit</li> <li>ECM</li> </ul>
P2253/21	AF- is more than 4.5 V for 5.0 seconds or more	<ul style="list-style-type: none"> <li>Open or short in A/F sensor (sensor 1) circuit</li> <li>A/F sensor (sensor 1)</li> <li>A/F sensor heater</li> <li>EFI relay</li> <li>A/F sensor heater and relay circuit</li> <li>ECM</li> </ul>

## WIRING DIAGRAM

Refer to DTC P2195 on [page 05-192](#).

## INSPECTION PROCEDURE

HINT:

Intelligent tester II only:

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 by 12.5 % or increases the injection volume by 25 %.

- (1) Connect the intelligent tester II to the DLC3.
- (2) Start the engine and turn the intelligent tester II ON.
- (3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
- (4) On the intelligent tester II, select the following menu items: Powertrain / Engine and ECT / Active Test / A/F Control.
- (5) Select the following monitor items: AFS B1 S1 and O2S B1 S2.
- (6) Perform the A/F Control operation with the engine in an idling condition (press the right or left button).

**Result:**

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

**+25 % → Rich output: Less than 3.0 V**

**-12.5 % → Lean output: More than 3.35 V**

**The heated oxygen sensor reacts in accordance with increase and decrease of the 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 <b>OK</b>	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V <b>OK</b>	—
Case 2	Injection volume +25 % -12.5 % Output voltage Almost no reaction <b>NG</b>	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V <b>OK</b>	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 <b>OK</b>	Injection volume +25 % -12.5 % Output voltage Almost no reaction <b>NG</b>	Heated oxygen sensor (Heated oxygen sensor, sensor heater, sensor circuit)
Case 4	Injection volume +25 % -12.5 % Output voltage Almost no reaction <b>NG</b>	Injection volume +25 % -12.5 % Output voltage Almost no reaction <b>NG</b>	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.

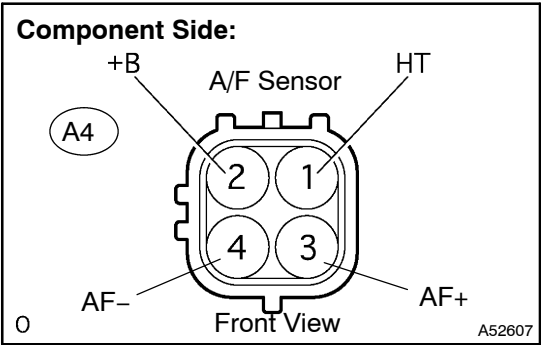
To display the graph, select the following menu items on the tester: View / Line graph.

**HINT:**

- Read freeze frame data using the intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, 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.
- A low A/F sensor voltage could be caused by a rich air-fuel mixture. Check the conditions that would cause the engine to run with the rich air-fuel mixture.
- A high A/F sensor voltage could be caused by a lean air-fuel mixture. Check the conditions that would cause the engine to run with the lean air-fuel mixture.

1

INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



- (a) Disconnect the A4 A/F sensor connector.
- (b) Measure the resistance between the terminals of the A/F sensor.

**Standard:**

Tester Connection	Specified Condition
HT (1) - +B (2)	1.8 to 3.4 $\Omega$ at 20°C (68°F)

- (c) Reconnect the A/F sensor connector.

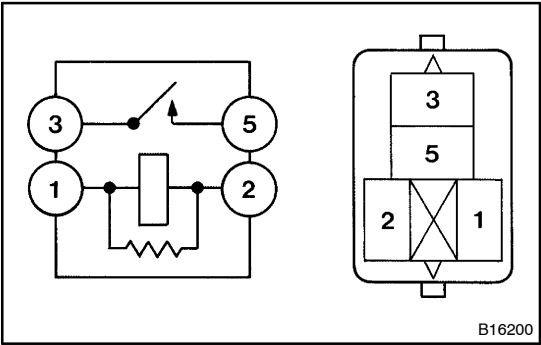
NG

REPLACE AIR FUEL RATIO SENSOR

OK

2

INSPECT EFI RELAY



- (a) Remove the EFI relay from the engine room R/B.
- (b) Check the EFI relay resistance.

**Standard:**

Tester Connection	Specified condition
3 - 5	10 k $\Omega$ or higher
3 - 5	Below 1 $\Omega$ (Apply battery voltage to terminals 1 and 2)

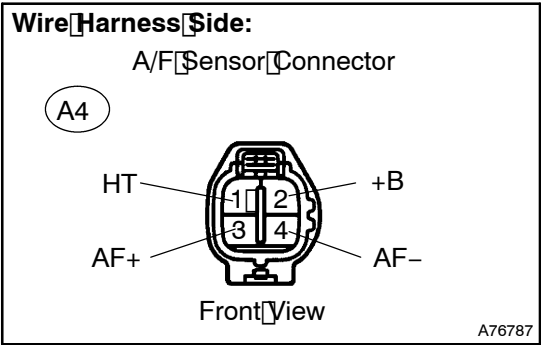
- (c) Reinstall the EFI relay.

NG

REPLACE EFI RELAY

OK

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



- (a) Disconnect the A4 A/F sensor connector.
- (b) Disconnect the E10 ECM connector.
- (c) Check the resistance.

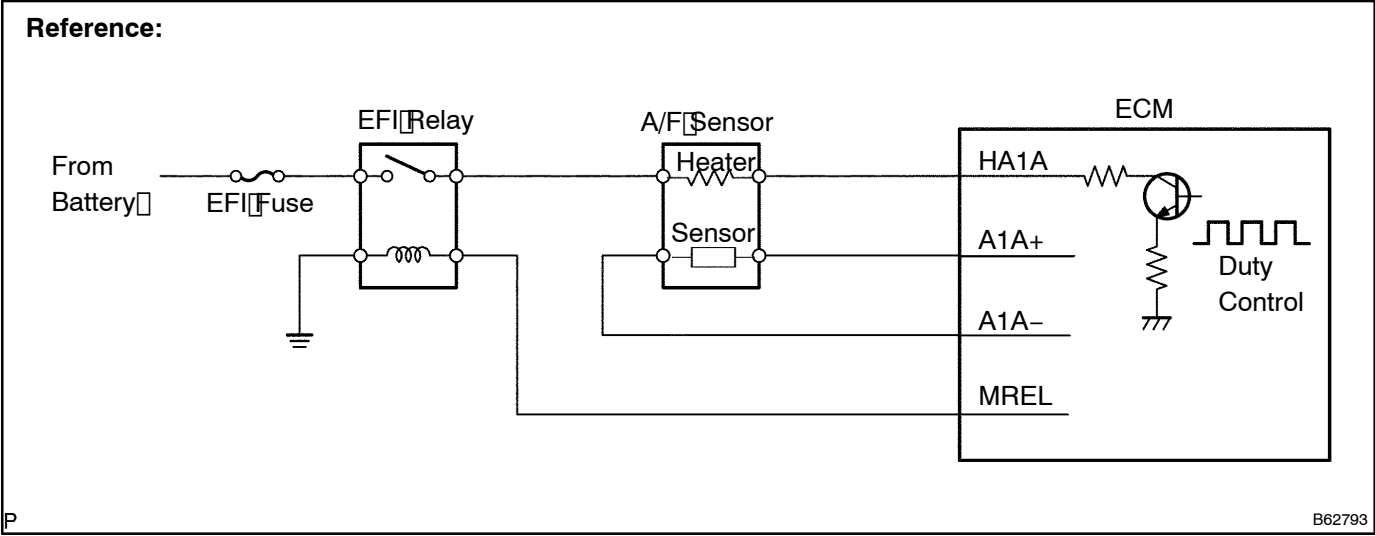
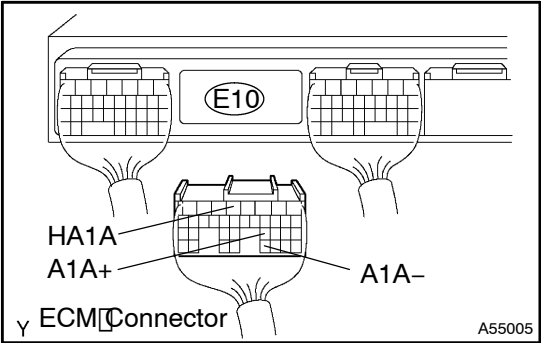
Standard (Check for open):

Tester Connection	Specified Condition
HT (A4-1) - HA1A (E10-5)	Below 1 $\Omega$
AF+ (A4-3) - A1A+ (E10-23)	Below 1 $\Omega$
AF- (A4-4) - A1A- (E10-31)	Below 1 $\Omega$

Standard (Check for short):

Tester Connection	Specified Condition
HT (A4-1) or HA1A (E10-5) - Body ground	10 k $\Omega$ or higher
AF+ (A4-3) or A1A+ (E10-23) - Body ground	10 k $\Omega$ or higher
AF- (A4-4) or A1A- (E10-31) - Body ground	10 k $\Omega$ or higher

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



NG REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (See page 10-30)