

<b>DTC</b>	<b>P2237</b>	<b>OXYGEN SENSOR PUMPING CURRENT CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2238</b>	<b>OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2239</b>	<b>OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2240</b>	<b>OXYGEN SENSOR PUMPING CURRENT CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 2 SENSOR 1)</b>
<b>DTC</b>	<b>P2241</b>	<b>OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 2 SENSOR 1)</b>
<b>DTC</b>	<b>P2242</b>	<b>OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 2 SENSOR 1)</b>
<b>DTC</b>	<b>P2251</b>	<b>OXYGEN SENSOR REFERENCE GROUND CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2252</b>	<b>OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2253</b>	<b>OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)</b>
<b>DTC</b>	<b>P2254</b>	<b>OXYGEN SENSOR REFERENCE GROUND CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 2 SENSOR 1)</b>

<b>DTC</b>	<b>P2255</b>	<b>OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 2 SENSOR 1)</b>
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<b>DTC</b>	<b>P2256</b>	<b>OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 2 SENSOR 1)</b>
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## CIRCUIT DESCRIPTION

### HINT:

This DTC is recorded when A/F sensor has a malfunction, although the caption is oxygen sensor.

Refer to DTC P2195 on page [05-195](#) .

DTC No.	DTC Detecting Condition	Trouble Area
P2237 P2240	A/F sensor circuit (bank 1 sensor 1)	HINT : Main trouble area • Open or short in A/F sensor circuit
	Condition (a) and (b) continues for 5.0 sec. or more : (a) AF+ $\leq$ 0.5 V (b) AF+ > 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater
	Condition (a) and (b) continues for 5.0 sec. or more : (a) (AF+) - (AF-) $\leq$ 0.1 V (b) (AF+) - (AF-) > 0.8 V	• A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
P2238 P2241	A/F sensor circuit low (bank 1 sensor 1)	HINT : Main trouble area • Open in A/F sensor circuit
	Condition (a) continues for 5.0 sec. or more : (a) AF+ $\leq$ 0.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater
	Condition (a) continues for 5.0 sec. or more : (a) (AF+) - (AF-) $\leq$ 0.1 V	• A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
P2239 P2242	A/F sensor circuit high (bank 1 sensor 1)	HINT : Main trouble area • Short in A/F sensor circuit
	Condition (a) continues for 5.0 sec. or more : (a) AF+ > 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater
	Condition (a) continues for 5.0 sec. or more : (a) (AF+) - (AF-) > 0.8 V	• A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
P2251 P2254	Condition (a) and (b) continues for 5.0 sec. or more : (a) AF- $\leq$ 0.5 V (b) AF- > 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater
P2252 P2255	Condition (a) continues for 5.0 sec. or more : (a) AF- $\leq$ 0.5 V	• A/F sensor heater relay • A/F sensor heater and relay circuit
P2253 P2256	Condition (a) continues for 5.0 sec. or more : (b) AF- > 4.5 V	• ECM

### HINT:

- DTC P2237, P2238, P2239, P2251, P2252 and P2253 means malfunction related to bank 1 A/F sensor circuit.
- DTC P2240, P2241, P2242, P2254, P2255 and P2256 means malfunction related to bank 2 A/F sensor circuit.
- Bank 1 refers to the bank that includes cylinder No. 1.
- Bank 2 refers to the bank that includes cylinder No. 2.

## WIRING DIAGRAM

Refer to DTC P2195 on page [05-195](#) .

## INSPECTION PROCEDURE

HINT:

Hand-held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following "A/F CONTROL" (A/F sensor, heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST by the hand-held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is an ACTIVE TEST which changes the injection volume to -12.5 % or +25 %.

- (1) Connect the hand-held tester to the DLC3 on the vehicle.
- (2) Turn the ignition switch ON.
- (3) Warm up the engine with the engine speed at 2,500 rpm for approx. 90 sec.
- (4) Select the item "DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST/ A/F CONTROL".
- (5) Perform "A/F CONTROL" when 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**

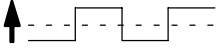

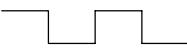
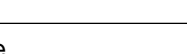
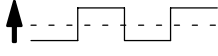

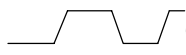
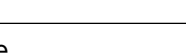
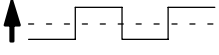


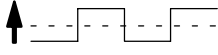

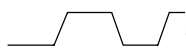
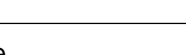
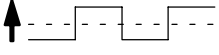

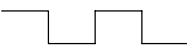
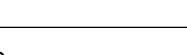
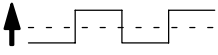

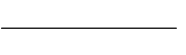
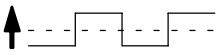

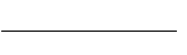
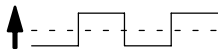

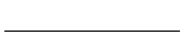
**Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:**

**+25 % → rich output: More than 0.55 V**

**-12.5 % → lean output: Less than 0.4 V**

**NOTICE:**

However, there is a few second delay in the A/F sensor output. And there is about 20 seconds delay in the heated oxygen sensor output.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Mainly 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 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, heater, A/F 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 No reaction  <b>NG</b>	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 %  -12.5 %  Output voltage No reaction  <b>NG</b>	Injection volume +25 %  -12.5 %  Output voltage No reaction  <b>NG</b>	Extremely rich or lean of the actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

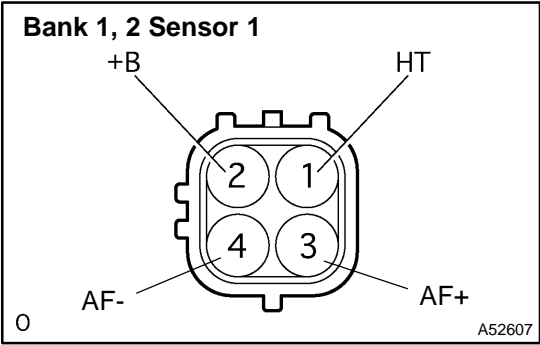
The following procedure of A/F CONTROL enable the user to check its output (show its graph indication) of A/F sensor and heated oxygen sensor.

For displaying the graph indication, enter "ACTIVE TEST/ A/F CONTROL/USER DATA", then select "AFS B1S1 and O2S B1S2" or "AFS B2S1 and O2S B2S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button.

#### HINT:

- If DTC P2237, P2238, P2239, P2251, P2252 or P2253 is displayed, check bank 1 sensor 1 circuit.
- If DTC P2240, P2241, P2242, P2254, P2255 or P2256 is displayed, check bank 2 sensor 1 circuit.
- Read freeze frame data using the hand-held tester or the OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it 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 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)**

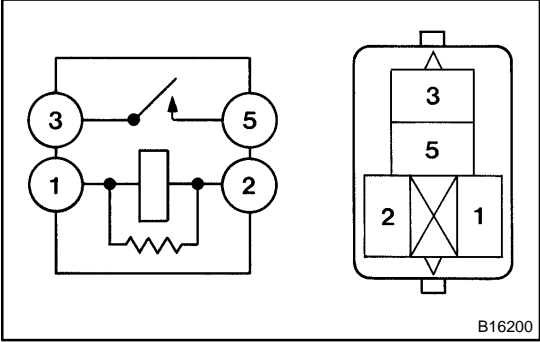


- (a) Disconnect the air fuel ratio sensor connector.
- (b) Measure resistance between the terminals HT and +B of the air fuel ratio sensor.  
**Resistance: 1.8 to 3.4  $\Omega$  (20°C)**

**NG** **REPLACE AIR FUEL RATIO SENSOR**

**OK**

**2 INSPECT AIR FUEL RATIO SENSOR HEATER RELAY**



- (a) Remove the A/F sensor heater relay from the engine room R/B.
- (b) Inspect the A/F sensor heater relay.  
**Standard:**

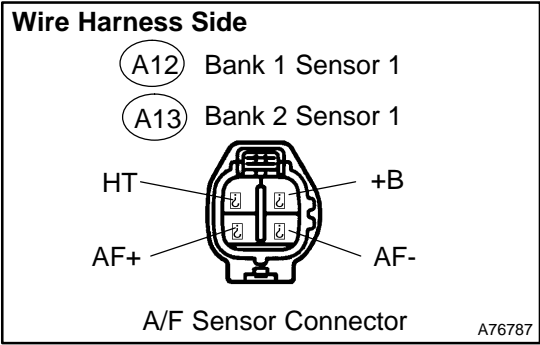
Terminal No.	Specified condition
1 - 2	Continuity
3 - 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

**NG** **REPAIR OR REPLACE AIR FUEL RATIO SENSOR HEATER RELAY**

**OK**

3

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



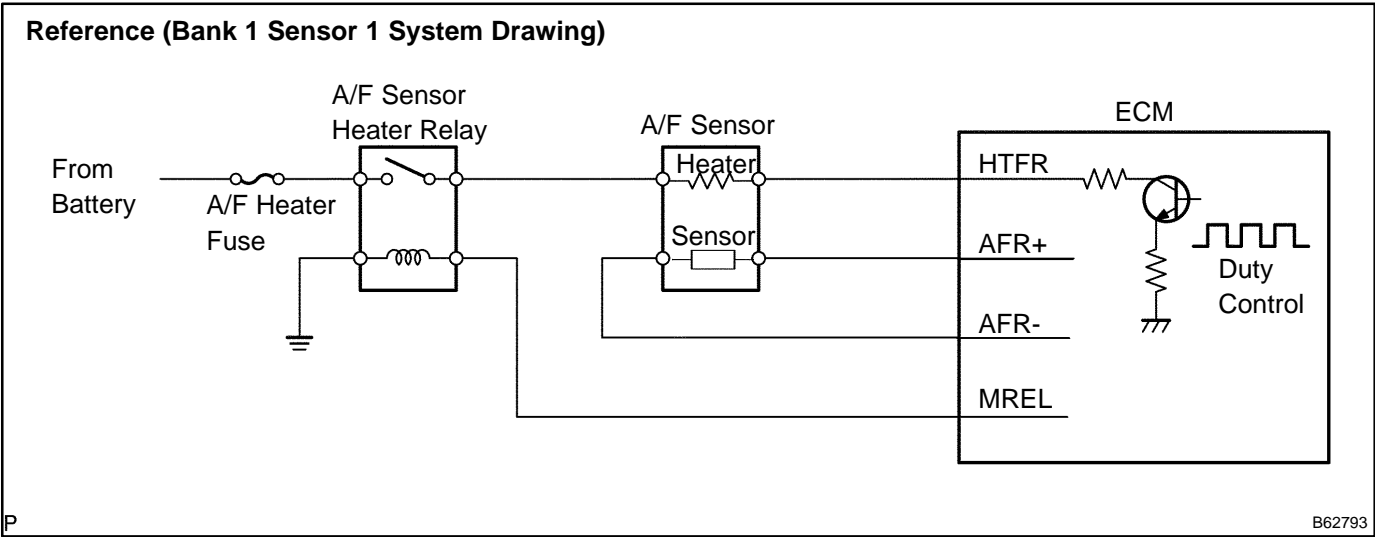
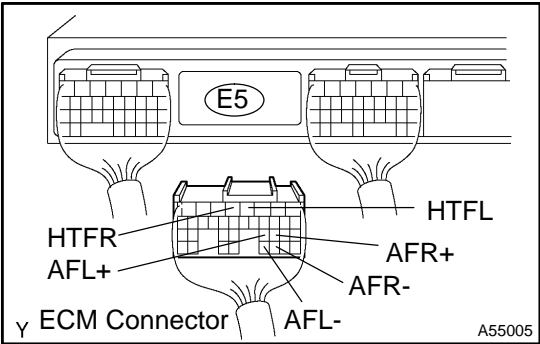
- (a)
- Disconnect the A12 or A13 heated oxygen sensor connector.
- (b)
- Disconnect the E5 ECM connector.
- (c)
- Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
AF+ (A12-3) - AFR+ (E5-22)	Continuity
AF- (A12-4) - AFR- (E5-30)	
HT (A12-1) - HAFL (E5-5)	
AF+ (A13-3) - AFL+ (E5-23)	
AF- (A13-4) - AFL- (E5-31)	
HT (A13-1) - HAFL (E5-4)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
AF+ (A12-3) or AFR+ (E5-22) - Body ground	No continuity
AF- (A12-4) or AFR- (E5-30) - Body ground	
HT (A12-1) or HTFR (E5-5) - Body ground	
AF+ (A13-3) or AFL+ (E5-23) - Body ground	
AF- (A13-4) or AFL- (E5-31) - Body ground	
HT (A13-1) or HTFL (E5-4) - Body ground	



NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01-35 )