

DTC	P2A00	A/F Sensor Circuit Slow Response (Bank 1 Sensor 1)
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CIRCUIT DESCRIPTION

Refer to DTC P2195 on page [DI-185](#).

DTC No.	DTC Detection Condition	Trouble Area
P2A00	After engine is warmed up and during vehicle driving at engine speed 1,500 rpm or more and vehicle speed 60 km/h (28 mph) or more, if response characteristic of A/F sensor becomes deteriorated (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI main relay • Air induction system • Fuel pressure • Injector • ECM

WIRING DIAGRAM

Refer to DTC P0134 on page [DI-50](#).

INSPECTION PROCEDURE

HINT:

Hand-held tester only:

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

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

HINT:

"A/F CONTROL" is an ACTIVE TEST which change 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 ← or → button).

Result:

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

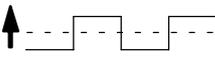
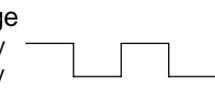
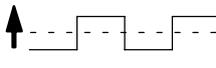
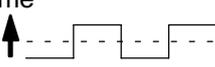
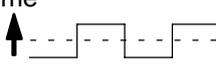
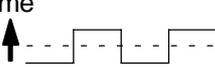
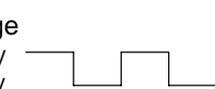
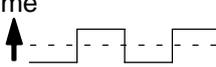
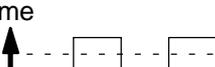
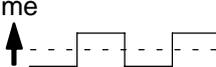
(+25 % → rich output: Less than 3.0 V, -12.5 % → lean output: More than 3.35 V)

Heated oxygen sensor reacts in synchronizing 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 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  OK	Injection volume +25 % ↑ -12.5 %  Output voltage More than 0.55 V Less than 0.4 V  OK	—
Case 2	Injection volume +25 % ↑ -12.5 %  Output voltage No reaction  NG	Injection volume +25 % ↑ -12.5 %  Output voltage More than 0.55 V Less than 0.4 V  OK	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 3.0 V  OK	Injection volume +25 % ↑ -12.5 %  Output voltage No reaction  NG	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % ↑ -12.5 %  Output voltage No reaction  NG	Injection volume +25 % ↑ -12.5 %  Output voltage No reaction  NG	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 that to check its output (show its graph indication) of A/F sensor and heated oxygen sensor.

To display the graph indication. Select and push the "YES or NO" button 2 data "AFS B1S1 and O2S B1S2" or "AFS B2S1 and O2S B2S2" and press button "4" after selecting "ACTIVE TEST/ A/F CONTROL/USER DATA".

HINT:

- A low A/F sensor voltage could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.
- Read freeze frame data using the hand-held tester or the OBD II scan tool, as freeze frame 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	Are there any other codes (besides DTC P2A00) being output?
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YES

Go to relevant DTC chart (See page [DI-16](#)).

NO

2	Connect OBDII scan tool or hand-held tester, and read value for voltage output of A/F sensor.
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PREPARATION:

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC 3.
- (b) Warm up the A/F sensor (bank 1 sensor 1) with the engine at 2,500 rpm for approximately 90 seconds.
- (c) Read A/F sensor voltage on the OBD II scan tool or hand-held tester.

CHECK:

- (a) Hand-held tester only:
Select the "DIAGNOSIS/ENHANCED OBD II/SNAPSHOT/MANUAL SNAPSHOT/USER DATA" mode on the hand-held tester.
- (b) Select "AFS B1 S1/ENGINE SPD" and press button "YES".
- (c) Monitor the A/F sensor voltage carefully.
- (d) Check the A/F sensor voltage under the condition as follows.
 - (1) Allow engine to idle for 30 seconds.
 - (2) Engine is racing at approx. 2,500 rpm (when engine revolution is not suddenly changed).
 - (3) Raise the engine speed to 4,000 rpm and release the accelerator pedal fully closed quickly.

OK:

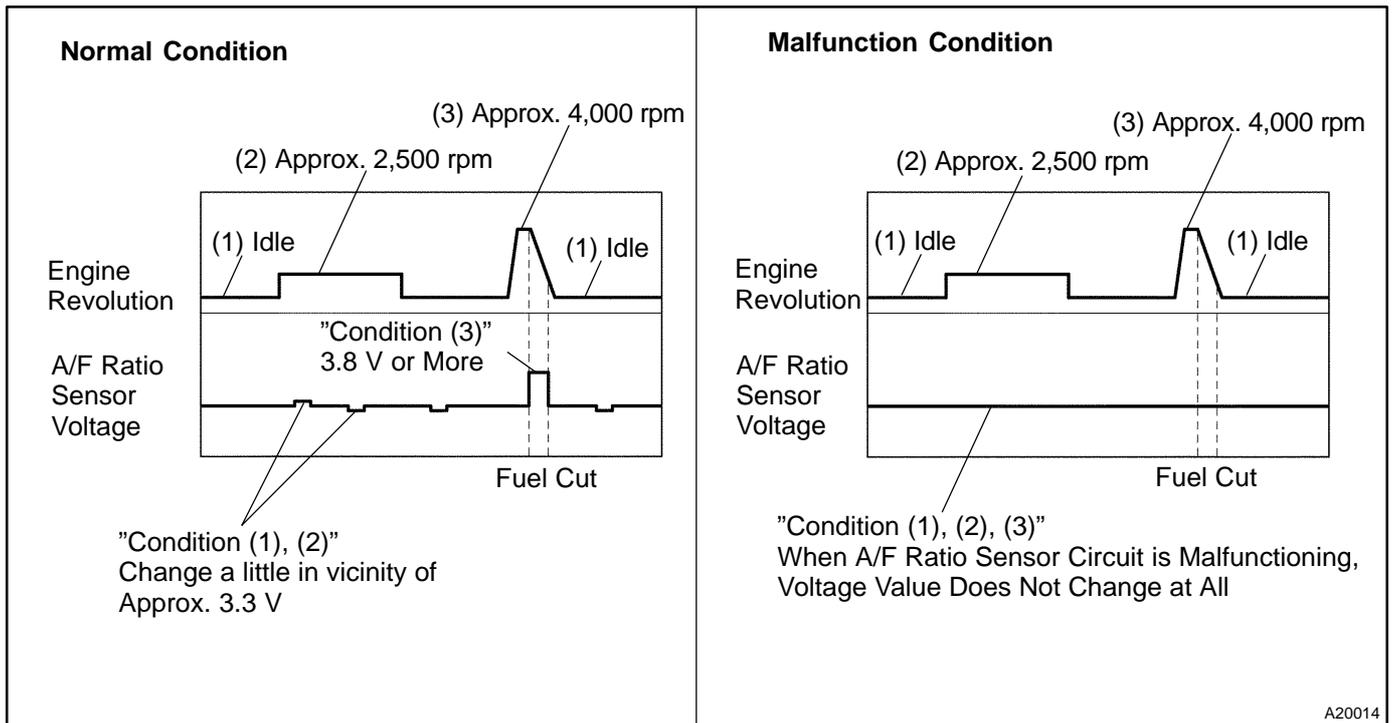
Standard:

Condition (1) and (2)

Voltage change a little in the vicinity of 3.3 V (0.66 V)* (between approx. 3.1 – 3.5 V) as shown in the illustration.

Condition (3)

A/F ratio sensor voltage increase to 3.8 V (0.76 V)* or more during engine deceleration (when fuel cut) as shown in the illustration.

**HINT:**

- Whenever the output voltage of the A/F sensor remains at approx. 3.3 V (0.660 V)* (see dwg. 2) under any conditions as well as the above conditions, the A/F sensor may have an open-circuit. (This will happen also when the A/F sensor heater has an open-circuit.)
- Whenever the output voltage of the A/F sensor remains at a certain value of approx. 3.8 V (0.76 V)* or more, or 2.8 V (0.56 V)* or less (see dwg. 2) under any conditions as well as the above conditions, the A/F sensor may have a short-circuit.
- The ECM will stop fuel injection (fuel cut) during engine deceleration. This will cause a lean condition and should result in a momentary increase in A/F ratio sensor voltage.
- The ECM must establish a closed throttle position learned value to perform fuel cut. If the battery terminal has been disconnected, the vehicle must be driven over 10 mph to allow the ECM to relearn the closed throttle position.
- When the vehicle is driven:
In the case that the output voltage of the A/F sensor is below 2.8 V (0.76 V)* during fuel enrichment (for example, when the vehicle tries to overtake another vehicle on a highway, the vehicle speed is suddenly increased with the accelerator pedal fully depressed), the A/F sensor are functioning normally.
- The A/F sensor is a current output element, and therefore the current is converted into voltage inside the ECM. If measuring voltage at connectors of A/F ratio sensor or ECM, you can obtain a constant voltage.

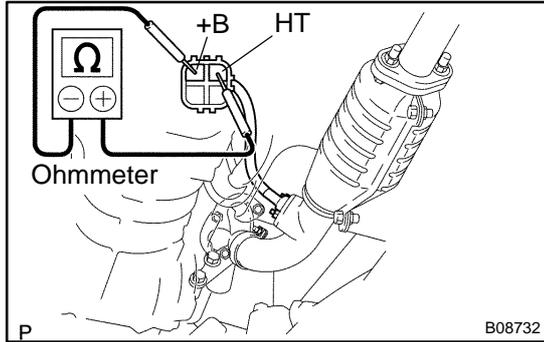
*: When using the OBD II scan tool (excluding hand-held tester).

OK

Go to step 14.

NG

3 Check resistance of A/F sensor heater.



PREPARATION:

Disconnect the sensor connector.

CHECK:

Using an ohmmeter, measure the resistance between terminals +B and HT.

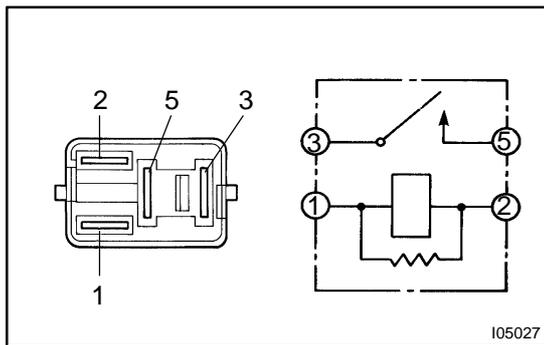
OK:

at 20°C (68°F)	0.8 – 1.4 Ω
at 800°C (1,472°F)	1.8 – 3.2 Ω

NG Replace A/F sensor.

OK

4 Check EFI main relay (Marking: EFI).



PREPARATION:

Remove the EFI main relay from RB No. 2.

CHECK:

Inspect the EFI main relay.

OK:

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
	3 – 5	No continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

NG Replace EFI main relay.

OK

5 Check for open and short in harness and connector between ECM and A/F sensor (See page IN-28).

NG Repair or replace harness or connector.

OK

6	Check air induction system (See page SF-1).
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NG	Repair or replace.
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OK

7	Only for 3RZ-FE: Check EGR system (See page EC-13).
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NG	Repair EGR system.
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OK

8	Check fuel pressure (See page SF-5).
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NG	Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF-1).
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OK

9	Check injector injection (See page SF-18).
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NG	Replace injector.
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OK

10	Replace A/F sensor.
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GO

11	Perform confirmation driving pattern (See page DI-185).
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GO

12 Is there DTC P2A00 being output again?

YES

Check and replace ECM (See page [IN-28](#)) and perform confirmation driving pattern (See page [DI-185](#))

NO

13 Did vehicle run out of fuel in past?

NO

Check for intermittent problems (See page [DI-3](#)).

YES

DTC P2A00 is caused by shortage of fuel.

14 Perform confirmation driving pattern (See page [DI-185](#)).

Go

15 Is there DTC P2A00 being output again?

NO

Go to step 19.

YES

16 Replace A/F sensor.

GO

17 Perform confirmation driving pattern (See page [DI-185](#)).

GO

18 Is there DTC P2A00 being output again?

YES Check and replace ECM (See page [IN-28](#)) and perform confirmation driving pattern (See page [DI-185](#))

NO

19 Did vehicle run out of fuel in past?

NO Check for intermittent problems (See page [DI-3](#)).

YES

DTC P2A00 is caused by shortage of fuel.