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DTC P2A00, P2A03 A/F SENSOR 1

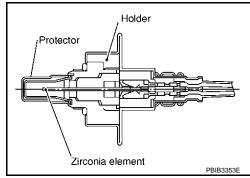
Component Description

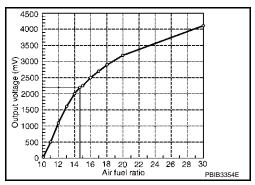
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement λ = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 800°C (1,472°F).





CONSULT-III Reference Value in Data Monitor Mode

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Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1) A/F SEN1 (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V

On Board Diagnosis Logic

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To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored not to be shifted to LEAN side or RICH side.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P2A00 2A00 (Bank 1) P2A03 2A03 (Bank 2)	Air fuel ratio (A/F) sensor 1 circuit range/performance	 The output voltage computed by ECM from the A/F sensor 1 signal is shifted to the lean side for a specified period. The A/F signal computed by ECM from the A/F sensor 1 signal is shifted to the rich side for a specified period. 	Air fuel ratio (A/F) sensor 1 Air fuel ratio (A/F) sensor 1 heater Fuel pressure Fuel injector Intake air leaks

DTC Confirmation Procedure

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NOTE:

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.

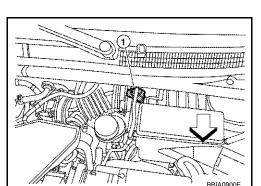
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[QR25DE]

- Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CON-SULT-III.
- 4. Clear the self-learning coefficient by touching "CLEAR".
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
- Check 1st trip DTC.
- 10. If 1st trip DTC is detected, go to EC-1595, "Diagnosis Procedure".

WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Disconnect mass air flow sensor (1) harness connector.
- <□: Vehicle front</p>
- 4. Start engine and let it idle for at least 5 seconds.
- Stop engine and reconnect mass air flow sensor harness connector.
- Select Service \$03 with GST and check that DTC P0102 is detected.
- 7. Select Service \$04 with GST and erase the DTC P0102.
- 8. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
- 9. Let engine idle for 1 minute.
- 10. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
- Select Service \$07 with GST.
 If 1st trip DTC is detected, go to <u>EC-1595</u>, "<u>Diagnosis Procedure</u>".



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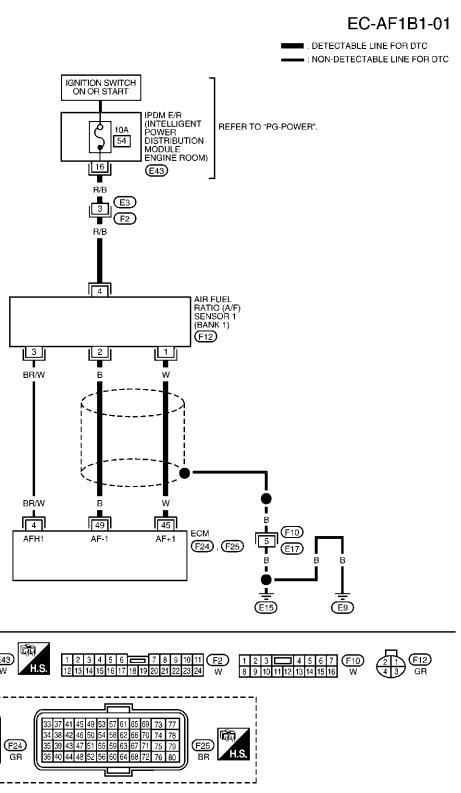
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Wiring Diagram

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BANK 1



AABWA0260GE

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. CAUTION:

DTC P2A00, P2A03 A/F SENSOR 1

< SERVICE INFORMATION >

[QR25DE]

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground ot her than ECM terminals, such as the ground.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
4	BR/W	A/F sensor 1 heater (Bank 1)	 [Engine is running] Warm-up condition Idle speed (More than 140 seconds after starting engine) 	Approximately 2.9 - 8.8 V★ Some Some	
45	W	A/F sensor 1 (Bank 1)	[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	Approximately 1.8 V Output voltage varies with air fuel ratio.	
49	В	A/F sensor 1 (Bank 1)	[Ignition switch: ON]	Approximately 2.2 V	

^{★:} Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

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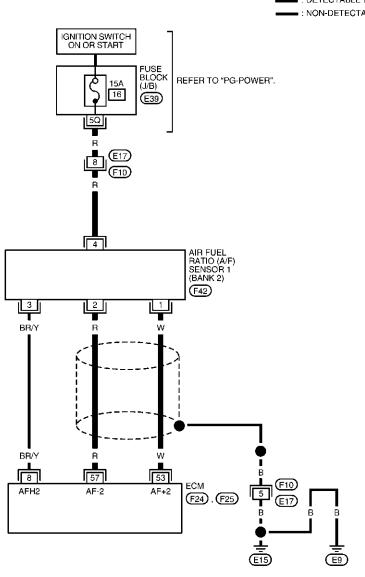
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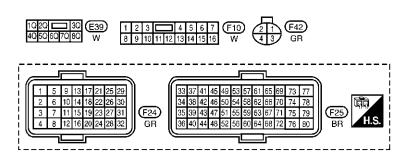
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BANK 2

EC-AF1B2-01 1: DETECTABLE LINE FOR DTC 1: NON-DETECTABLE LINE FOR DTC





AABWA0261GE

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground ot her than ECM terminals, such as the ground.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
8	BR/Y	A/F sensor 1 heater (Bank 2)	[Engine is running]Warm-up conditionIdle speed (More than 140 seconds after starting engine)	Approximately 2.9 - 8.8 V★ Significant	
53	W	A/F sensor 1 (Bank 2)	[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	Approximately 1.8 V Output voltage varies with air fuel ratio.	
57	R	A/F sensor 1 (Bank 2)	[Ignition switch: ON]	Approximately 2.2 V	

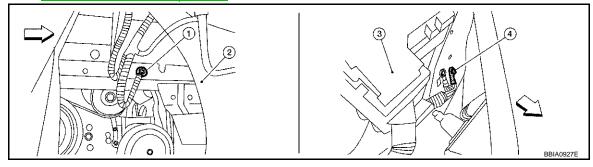
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

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1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screws on the body. Refer to <u>EC-1218</u>, "Ground Inspection".



- ∀ Vehicle front
- Body ground E9 (view with front wheel RH and fender protector RH removed.)
- 2. Washer tank

3. Fuse and fusible link box

4. Body ground E15

OK or NG

OK >> GO TO 2.

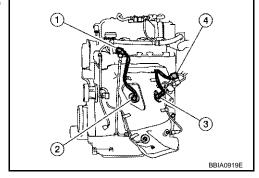
NG >> Repair or replace ground connections.

2.RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

Loosen and retighten the air fuel ratio (A/F) sensor 1 (2). Refer to EM-137, "Removal and Installation".

- Air fuel ratio (A/F) sensor 1 (Bank 1) harness connector (1)
- Air fuel ratio (A/F) sensor 1 (Bank 1) (2)
- Air fuel ratio (A/F) sensor 1 (Bank 2) (3)
- Air fuel ratio (A/F) sensor 1 (Bank 2) harness connector (4)

>> GO TO 3.



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3.check for intake air leak

- 1. Start engine and run it at idle.
- Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

4. CLEAR THE SELF-LEARNING DATA.

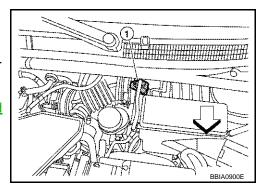
(II) With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III.
- 3. Clear the self-learning control coefficient by touching "CLEAR".
- 4. Run engine for at least 10 minutes at idle speed.
- 5. Check 1st trip DTC.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine? Is it difficult to start engine?

8 Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF.
- 3. Disconnect mass air flow sensor (1) harness connector.
- <□: Vehicle front
- 4. Restart engine and let it idle for at least 5 seconds.
- Stop engine and reconnect mass air flow sensor harness connector.
- 6. Check that DTC P0102 is displayed.
- 7. Erase the DTC memory. Refer to <u>EC-1127</u>, "<u>Emission-related</u> <u>Diagnostic Information</u>".
- 8. Check that DTC P0000 is displayed.
- 9. Run engine for at least 10 minutes at idle speed. Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine? Is it difficult to start engine?



Yes or No

Yes \rightarrow Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to <u>EC-266</u> or <u>EC-272</u>. No \rightarrow GO TO 5.

5. CHECK HARNESS CONNECTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
- Air fuel ratio (A/F) sensor 1 (Bank 1) harness connector (1)
- Air fuel ratio (A/F) sensor 1 (Bank 1) (2)
- Air fuel ratio (A/F) sensor 1 (Bank 2) (3)
- Air fuel ratio (A/F) sensor 1 (Bank 2) harness connector (4)
- Check harness connector for water.

Water should no exist.

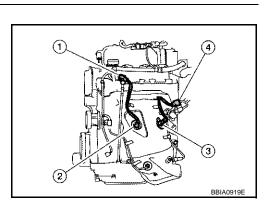
OK or NG

OK >> GO TO 6.

NG >> Repair or replace harness connector.

6. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.



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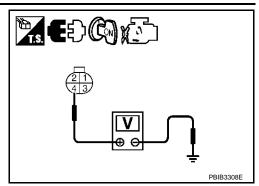
[QR25DE]

Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 8. NG >> GO TO 7.



7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E3, F2 (Bank 1)
- Harness connectors E17, F10 (Bank 2)
- Fuse block (J/B) connector E43 (Bank 1)
- Fuse block (J/B) connector E39 (Bank 2)
- 10 A fuse (Bank 1)
- 15 A fuse (Bank 2)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

8.check a/f sensor 1 input signal circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between the following terminals. Refer to Wiring Diagram.

Bank	A/F sensor 1 terminal	ECM terminal
1	1	45
ı	2	49
2	1	53
	2	57

Continuity should exist.

Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor terminal	ECM terminal	A/F sensor terminal	ECM terminal
1	45	1	53
2	49	2	57

Continuity should not exist.

Also check harness for short to power.

OK or NG

OK >> GO TO 9.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK A/F SENSOR 1 HEATER

Refer to EC-1234, "Component Inspection".

OK or NG

OK >> GO TO 10.

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NG >> GO TO 11.

10. CHECK INTERMITTENT INCIDENT

Perform EC-1212.

OK or NG

OK >> GO TO 11.

NG >> Repair or replace.

11. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1.

CAUTION:

- Discard any air fuel ratio (A/F) sensor which has b een dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new air fuel ra tio (A/F) sensor, clean exhaust syst em threads using heated oxygen sensor thread cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).

>> GO TO 12.

12.CONFIRM A/F ADJUSTMENT DATA

- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check that "0.000" is displayed on CONSULT-III screen.

OK or NG

OK >> INSPECTION END

NG >> GO TO 13.

13.clear the self-learning data

- (P) With CONSULT-III
- 1. Start engine and warm it up to normal operating temperature.
- Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III.
- Clear the self-learning control coefficient by touching "CLEAR".
- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF.
- 3. Disconnect mass air flow sensor harness (1) connector.
- <□: Vehicle front
- 4. Restart engine and let it idle for at least 5 seconds.
- Stop engine and reconnect mass air flow sensor harness connector.
- 6. Check that DTC P0102 is displayed.
- Erase the DTC memory. Refer to <u>EC-1127</u>, "<u>Emission-related</u> <u>Diagnostic Information</u>".
- 8. Check that DTC P0000 is displayed.



14.CONFIRM A/F ADJUSTMENT DATA

- Turn ignition switch OFF and then ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check that "0.000" is displayed on CONSULT-III screen.



Removal and Installation

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AIR FUEL RATIO SENSOR

Refer to EM-137.

