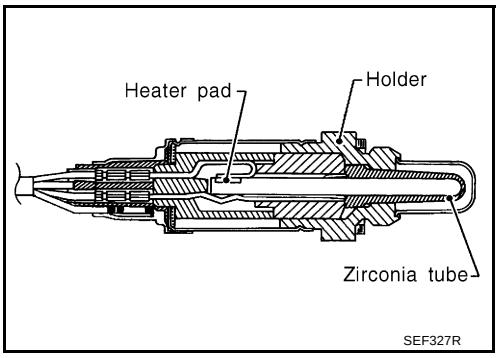
DTC P0138, P0158 HO2S2

PFP:226A0

Component Description

ABS003BB

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

ABS003BC

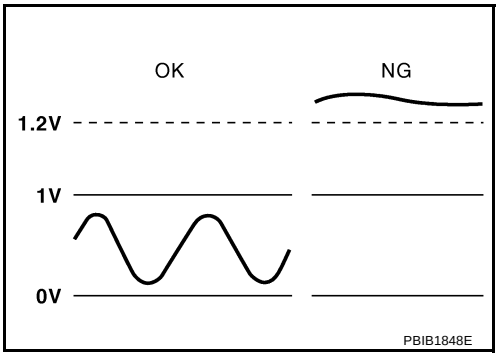
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Warm-up condition ● After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH

On Board Diagnosis Logic

ABS003BD

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity before the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138 (Bank 1)	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2
P0158 0158 (Bank 2)			

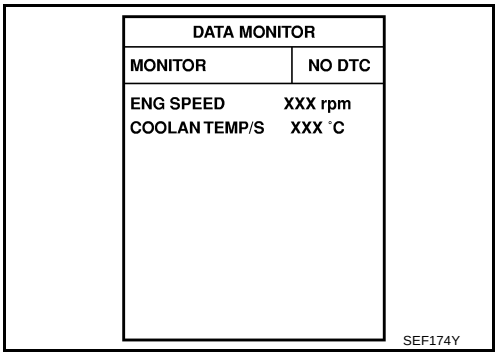
DTC Confirmation Procedure

ABS003BE

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.

WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-225, "Diagnostic Procedure" .

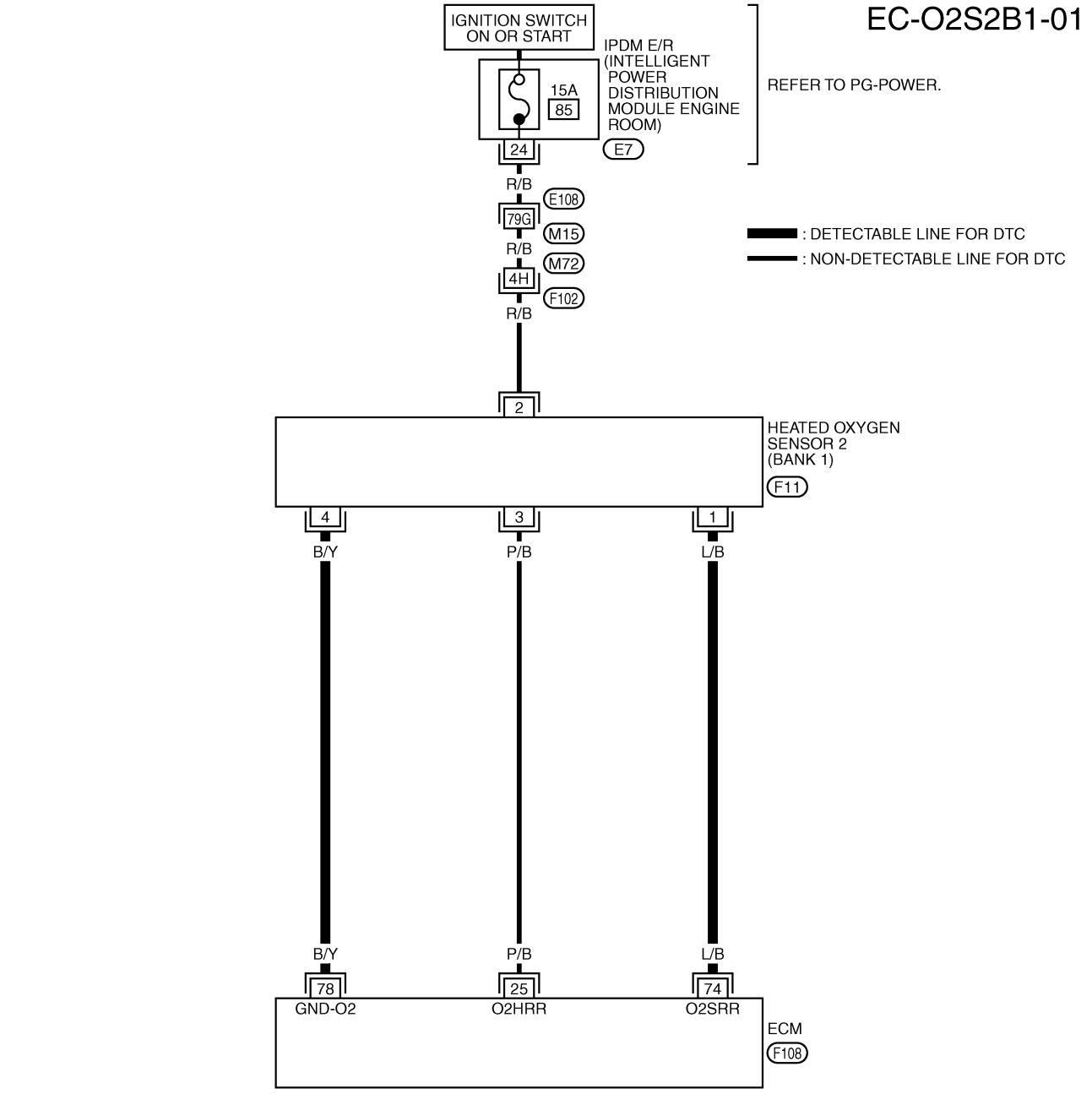


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram
BANK 1

ABS003BF



TBWM0807E

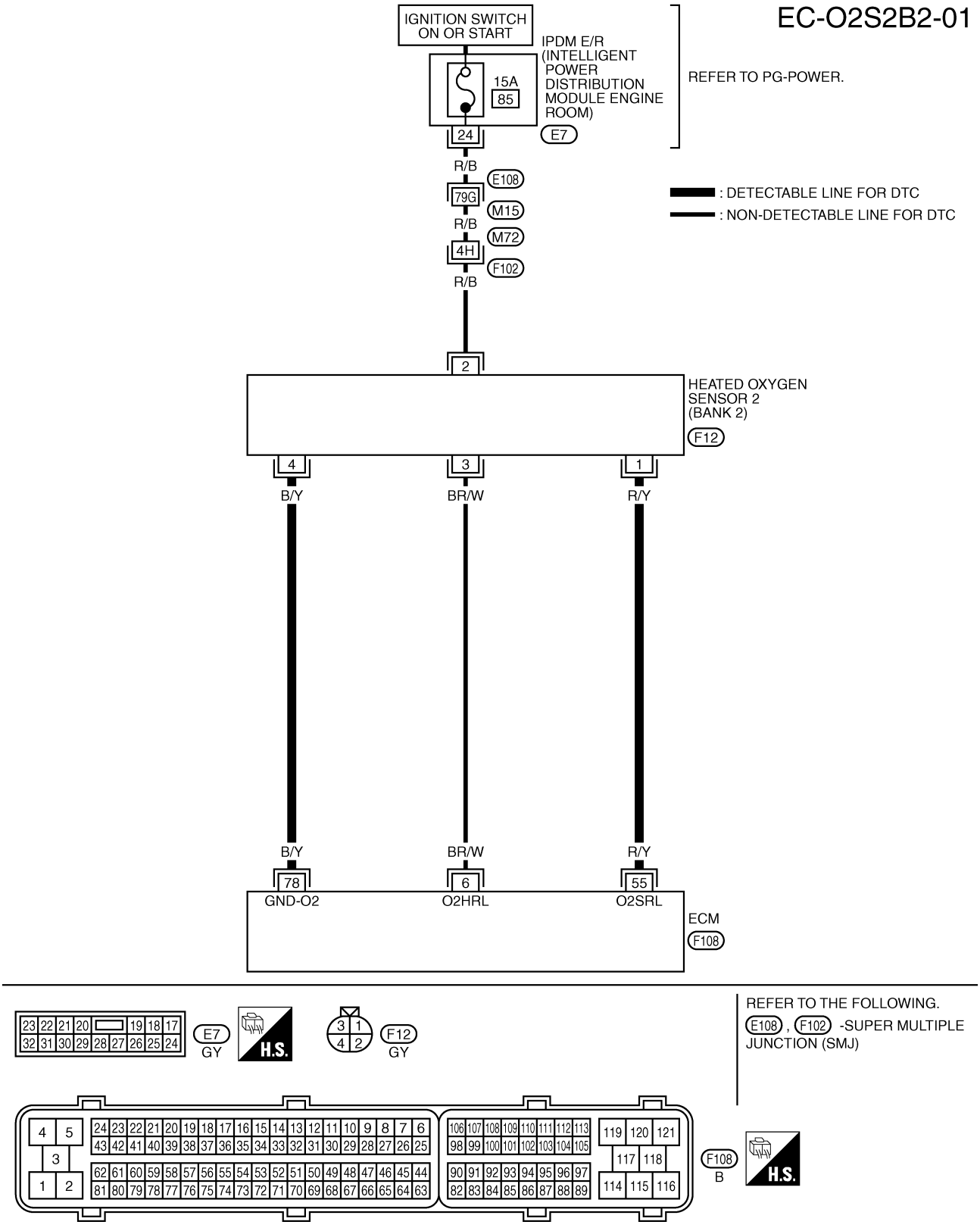
Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	L/B	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Revving engine from idle to 3,000 rpm quickly after the following conditions are met. – After keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.	0 - Approximately 1.0V
78	B/Y	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

BANK 2



TBWM0808E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

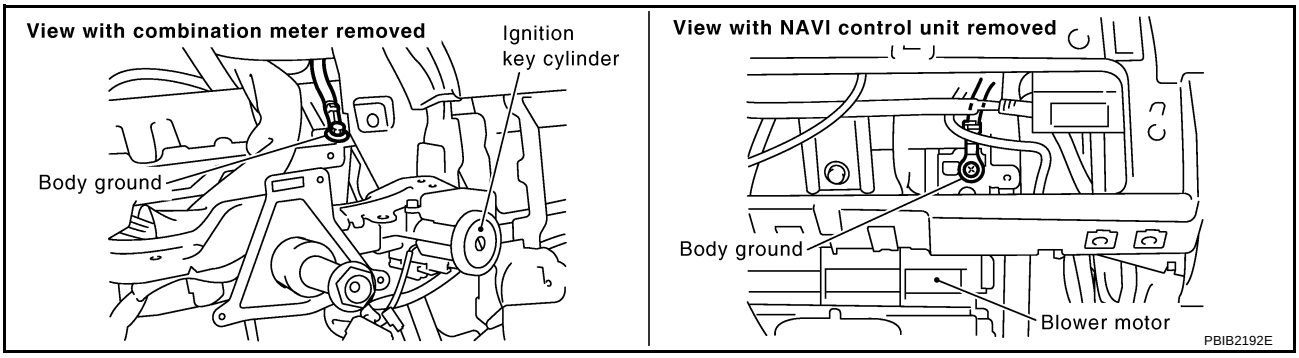
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
55	R/Y	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Revving engine from idle to 3,000 rpm quickly after the following conditions are met. – After keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.	0 - Approximately 1.0V
78	B/Y	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

ABS003BG

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten two ground screws on the body. Refer to EC-162, "Ground Inspection" .

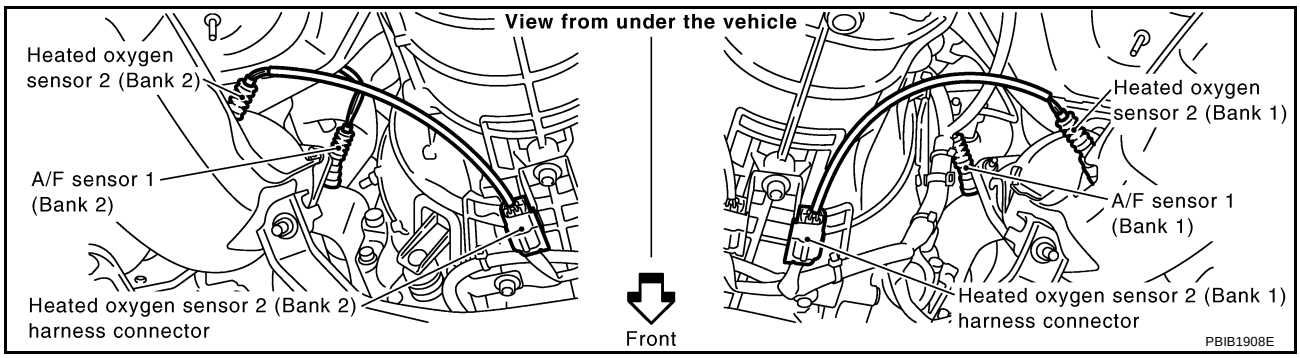


OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Disconnect heated oxygen sensor 2 harness connector.



3. Check harness continuity between HO2S2 terminal 4 and ECM terminal 78.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	74	1	1
P0158	55	1	2

Continuity should exist.

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

DTC	Terminals		Bank
	ECM	Sensor	
P0138	74	1	1
P0158	55	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-227, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace malfunctioning heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

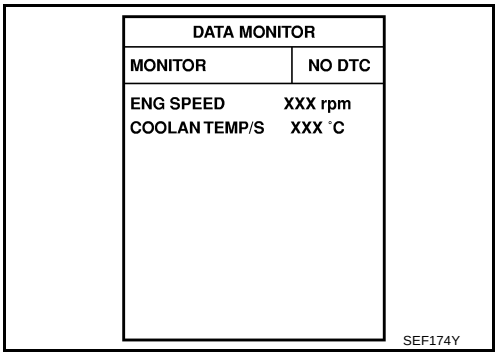
Component Inspection

ABS003BH

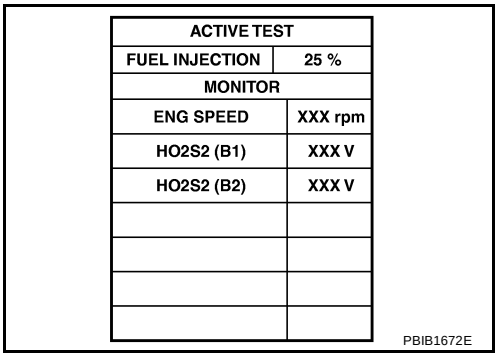
HEATED OXYGEN SENSOR 2

With CONSULT-II

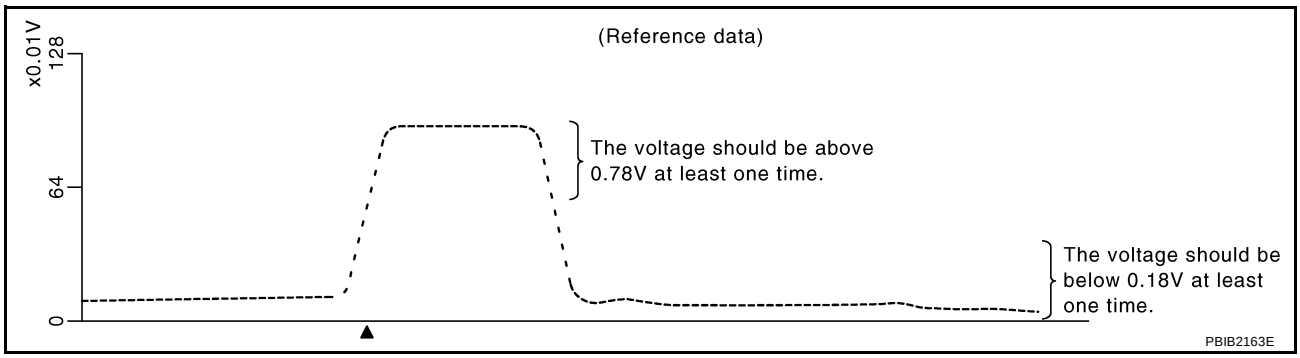
1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.



6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-II.



7. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



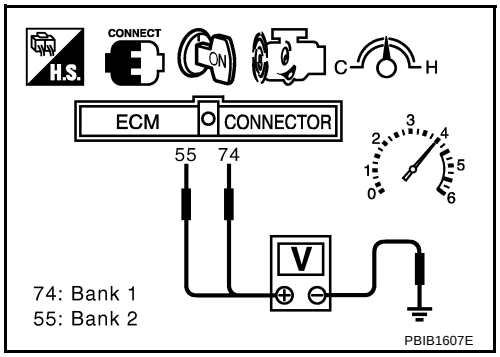
“HO2S2 (B1)/(B2)” should be above 0.78V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18V at least once when the “FUEL INJECTION” is –25%.

CAUTION:

- **Discard any heated oxygen sensor which has been 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 oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] or 55 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.78V at least once during this procedure.
   If the voltage is above 0.78V at step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position (A/T), 4th gear position (M/T).
   The voltage should be below 0.18V at least once during this procedure.



8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been 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 oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

ABS003BI

HEATED OXYGEN SENSOR 2

Refer to EM-24, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .