SECTION EC
ENGINE CONTROL SYSTEM

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EBS00K2T

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-39.

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-116, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

×: Applicable –: Not applicable

Items (CONSULT-II screen terms)	DTC*1		Trip	MI lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
A/T 1ST GR FNCTN	P0731	0731	2	×	AT-133
A/T 2ND GR FNCTN	P0732	0732	2	×	AT-139
A/T 3RD GR FNCTN	P0733	0733	2	×	AT-145
A/T 4TH GR FNCTN	P0734	0734	2	×	AT-151
APP SEN 1/CIRC	P0227	0227	1	×	EC-218
APP SEN 1/CIRC	P0228	0228	1	×	EC-218
APP SEN 2/CIRC	P1227	1227	1	×	EC-345
APP SEN 2/CIRC	P1228	1228	1	×	EC-345
APP SENSOR	P0226	0226	1	×	EC-211
ATF TEMP SEN/CIRC	P0710	0710	2	×	AT-117
BRAKE SW/CIRCUIT	P1805	1805	2	–	EC-360
CAN COMM CIRCUIT	U1000	1000*5	1	×	EC-116
CAN COMM CIRCUIT	U1001	1001*5	2	–	EC-116
CKP SEN/CIRCUIT	P0335	0335	2	×	EC-234
CMP SEN/CIRC-B1	P0340	0340	2	×	EC-240
CTP LEARNING	P1225	1225	2	–	EC-341
CTP LEARNING	P1226	1226	2	–	EC-343
CYL 1 MISFIRE	P0301	0301	2	×	EC-225
CYL 2 MISFIRE	P0302	0302	2	×	EC-225
CYL 3 MISFIRE	P0303	0303	2	×	EC-225
CYL 4 MISFIRE	P0304	0304	2	×	EC-225
ECM	P0605	0605	1 or 2	× or –	EC-265
ECM BACK UP/CIRC	P1065	1065	2	×	EC-268
ECT SEN/CIRCUIT	P0117	0117	1	×	EC-144
ECT SEN/CIRCUIT	P0118	0118	1	×	EC-144
ENG OVER TEMP	P1217	1217	1	×	EC-324
ENGINE SPEED SIG	P0725	0725	1	×	AT-129
ETC ACTR	P1121	1121	1 or 2	×	EC-276
ETC FUNCTION/CIRC	P1122	1122	1	×	EC-278
ETC MOT	P1128	1128	1	×	EC-291
ETC MOT PWR	P1124	1124	1	×	EC-285
ETC MOT PWR	P1126	1126	1	×	EC-285
FUEL SYS-LEAN-B1	P0171	0171	2	×	EC-186
FUEL SYS-RICH-B1	P0172	0172	2	×	EC-193
HO2S1 (B1)	P0132	0132	2	×	EC-149

Items (CONSULT-II screen terms)	DTC*1		Trip	MI lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
HO2S1 (B1)	P0133	0133	2	×	EC-155
HO2S1 (B1)	P0134	0134	2	×	EC-165
HO2S1 (B1)	P1143	1143	2	×	EC-296
HO2S1 (B1)	P1144	1144	2	×	EC-302
HO2S1 HTR (B1)	P0031	0031	2	×	EC-122
HO2S1 HTR (B1)	P0032	0032	2	×	EC-122
HO2S2 (B1)	P0138	0138	2	×	EC-172
HO2S2 (B1)	P0139	0139	2	×	EC-178
HO2S2 (B1)	P1146	1146	2	×	EC-308
HO2S2 (B1)	P1147	1147	2	×	EC-316
HO2S2 HTR (B1)	P0037	0037	2	×	EC-128
HO2S2 HTR (B1)	P0038	0038	2	×	EC-128
IAT SEN/CIRCUIT	P0112	0112	2	×	EC-140
IAT SEN/CIRCUIT	P0113	0113	2	×	EC-140
INT/V TIM CONT-B1	P0011	0011	2	–	EC-119
INT/V TIM V/CIR-B1	P1111	1111	2	×	EC-272
KNOCK SEN/CIRC-B1	P0327	0327	2	–	EC-230
KNOCK SEN/CIRC-B1	P0328	0328	2	–	EC-230
L/PRESS SOL/CIRC	P0745	0745	2	×	AT-164
MAF SEN/CIRCUIT	P0102	0102	1	×	EC-134
MAF SEN/CIRCUIT	P0103	0103	1	×	EC-134
MULTI CYL MISFIRE	P0300	0300	2	×	EC-225
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	2	–	EC-49
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	–	Flashing*4	EC-50
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	–	–	—
O/R CLTCH SOL/CIRC	P1760	1760	2	×	AT-187
PNP SW/CIRC	P0705	0705	2	×	AT-111
P-N POS SW/CIRCUIT	P1706	1706	2	×	EC-356
PURG VOLUME CONT/V	P0444	0444	2	×	EC-251
PW ST P SEN/CIRC	P0550	0550	2	–	EC-260
SENSOR POWER/CIRC	P1229	1229	1	×	EC-352
SFT SOL A/CIRC	P0750	0750	1	×	AT-171
SFT SOL B/CIRC	P0755	0755	1	×	AT-176
TCC SOLENOID/CIRC	P0740	0740	2	×	AT-159
TP SEN 1/CIRC	P0222	0222	1	×	EC-205
TP SEN 1/CIRC	P0223	0223	1	×	EC-205
TP SEN 2/CIRC	P1223	1223	1	×	EC-335
TP SEN 2/CIRC	P1224	1224	1	×	EC-335
TP SENSOR	P0221	0221	1	×	EC-199
TPV SEN/CIRC A/T	P1705	1705	1	×	AT-181

Items (CONSULT-II screen terms)	DTC*1		Trip	MI lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
TW CATALYST SYS-B1	P0420	0420	2	×	EC-246
VEH SPD SEN/CIR AT*6	P0720	0720	2	×	AT-123
VEH SPEED SEN/CIRC	P0500	0500	2	×	EC-257

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur, the MI illuminates.

DTC No. Index

EBS00K2U

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-39.

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-116, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

×: Applicable –: Not applicable

DTC*1		Items (CONSULT-II screen terms)	Trip	MI lighting up	Reference page
CONSULT-II GST*2	ECM*3				
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	–	Flashing*4	EC-50
U1000	1000*5	CAN COMM CIRCUIT	1	×	EC-116
U1001	1001*5	CAN COMM CIRCUIT	2	–	EC-116
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	–	–	—
P0011	0011	INT/V TIM CONT-B1	2	–	EC-119
P0031	0031	HO2S1 HTR (B1)	2	×	EC-122
P0032	0032	HO2S1 HTR (B1)	2	×	EC-122
P0037	0037	HO2S2 HTR (B1)	2	×	EC-128
P0038	0038	HO2S2 HTR (B1)	2	×	EC-128
P0102	0102	MAF SEN/CIRCUIT	1	×	EC-134
P0103	0103	MAF SEN/CIRCUIT	1	×	EC-134
P0112	0112	IAT SEN/CIRCUIT	2	×	EC-140
P0113	0113	IAT SEN/CIRCUIT	2	×	EC-140
P0117	0117	ECT SEN/CIRCUIT	1	×	EC-144
P0118	0118	ECT SEN/CIRCUIT	1	×	EC-144
P0132	0132	HO2S1 (B1)	2	×	EC-149
P0133	0133	HO2S1 (B1)	2	×	EC-155
P0134	0134	HO2S1 (B1)	2	×	EC-165
P0138	0138	HO2S2 (B1)	2	×	EC-172
P0139	0139	HO2S2 (B1)	2	×	EC-178
P0171	0171	FUEL SYS-LEAN-B1	2	×	EC-186
P0172	0172	FUEL SYS-RICH-B1	2	×	EC-193
P0221	0221	TP SENSOR	1	×	EC-199

DTC*1		Items (CONSULT-II screen terms)	Trip	MI lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P0222	0222	TP SEN 1/CIRC	1	×	EC-205
P0223	0223	TP SEN 1/CIRC	1	×	EC-205
P0226	0226	APP SENSOR	1	×	EC-211
P0227	0227	APP SEN 1/CIRC	1	×	EC-218
P0228	0228	APP SEN 1/CIRC	1	×	EC-218
P0300	0300	MULTI CYL MISFIRE	2	×	EC-225
P0301	0301	CYL 1 MISFIRE	2	×	EC-225
P0302	0302	CYL 2 MISFIRE	2	×	EC-225
P0303	0303	CYL 3 MISFIRE	2	×	EC-225
P0304	0304	CYL 4 MISFIRE	2	×	EC-225
P0327	0327	KNOCK SEN/CIRC-B1	2	–	EC-230
P0328	0328	KNOCK SEN/CIRC-B1	2	–	EC-230
P0335	0335	CKP SEN/CIRCUIT	2	×	EC-234
P0340	0340	CMP SEN/CIRC-B1	2	×	EC-240
P0420	0420	TW CATALYST SYS-B1	2	×	EC-246
P0444	0444	PURG VOLUME CONT/V	2	×	EC-251
P0500	0500	VEH SPEED SEN/CIRC	2	×	EC-257
P0550	0550	PW ST P SEN/CIRC	2	–	EC-260
P0605	0605	ECM	1 or 2	× or –	EC-265
P0705	0705	PNP SW/CIRC	2	×	AT-111
P0710	0710	ATF TEMP SEN/CIRC	2	×	AT-117
P0720	0720	VEH SPD SEN/CIRC AT*6	2	×	AT-123
P0725	0725	ENGINE SPEED SIG	2	×	AT-129
P0731	0731	A/T 1ST GR FNCTN	2	×	AT-133
P0732	0732	A/T 2ND GR FNCTN	2	×	AT-139
P0733	0733	A/T 3RD GR FNCTN	2	×	AT-145
P0734	0734	A/T 4TH GR FNCTN	2	×	AT-151
P0740	0740	TCC SOLENOID/CIRC	2	×	AT-159
P0745	0745	L/PRESS SOL/CIRC	2	×	AT-164
P0750	0750	SFT SOL A/CIRC	1	×	AT-171
P0755	0755	SFT SOL B/CIRC	1	×	AT-176
P1065	1065	ECM BACK UP/CIRC	2	×	EC-268
P1111	1111	INT/V TIM V/CIR-B1	2	×	EC-272
P1121	1121	ETC ACTR	1 or 2	×	EC-276
P1122	1122	ETC FUNCTION/CIRC	1	×	EC-278
P1124	1124	ETC MOT PWR	1	×	EC-285
P1126	1126	ETC MOT PWR	1	×	EC-285
P1128	1128	ETC MOT	1	×	EC-291
P1143	1143	HO2S1 (B1)	2	×	EC-296
P1144	1144	HO2S1 (B1)	2	×	EC-302
P1146	1146	HO2S2 (B1)	2	×	EC-308
P1147	1147	HO2S2 (B1)	2	×	EC-316

DTC*1		Items (CONSULT-II screen terms)	Trip	MI lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P1217	1217	ENG OVER TEMP	1	×	EC-324
P1223	1223	TP SEN 2/CIRC	1	×	EC-335
P1224	1224	TP SEN 2/CIRC	1	×	EC-335
P1225	1225	CTP LEARNING	2	–	EC-341
P1226	1226	CTP LEARNING	2	–	EC-343
P1227	1227	APP SEN 2/CIRC	1	×	EC-345
P1228	1228	APP SEN 2/CIRC	1	×	EC-345
P1229	1229	SENSOR POWER/CIRC	1	×	EC-352
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	2	–	EC-49
P1705	1705	TPV SEN/CIRC A/T	1	×	AT-181
P1706	1706	P-N POS SW/CIRCUIT	2	×	EC-356
P1760	1760	O/R CLTCH SOL/CIRC	2	×	AT-187
P1805	1805	BRAKE SW/CIRCUIT	2	–	EC-360

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The trouble shooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur, the MI illuminates.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EBS00K2V

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harness connectors.**

On Board Diagnostic (OBD) System of Engine and A/T

EBS00K2W

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

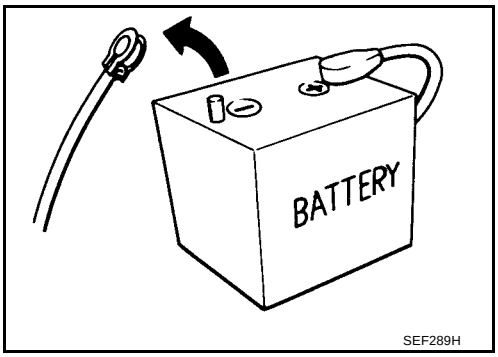
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to EL-7.**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

Precaution

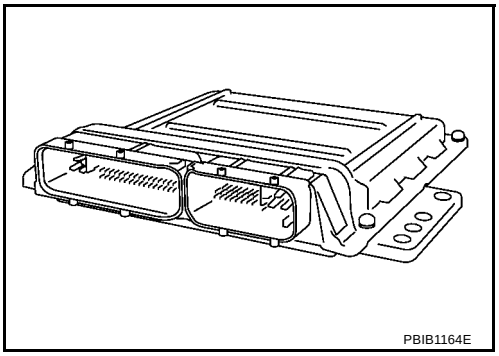
EBS00K2X

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**

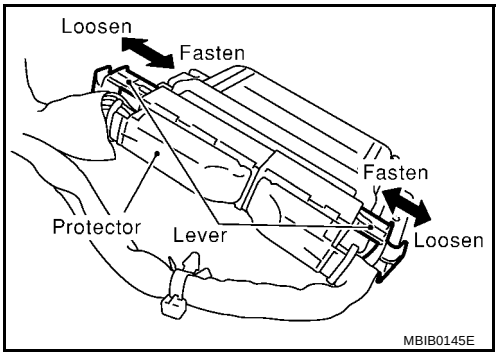


SEF289H

- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

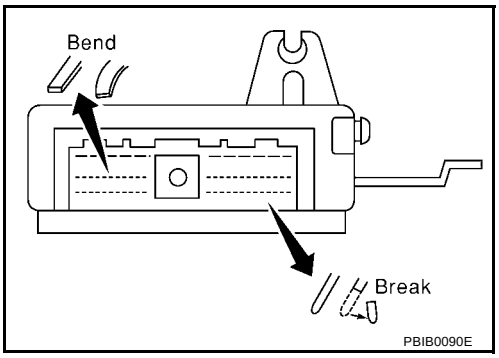

PBIB1164E

- **When connecting ECM harness connector, fasten it securely with levers as far as they will go as shown at right.**



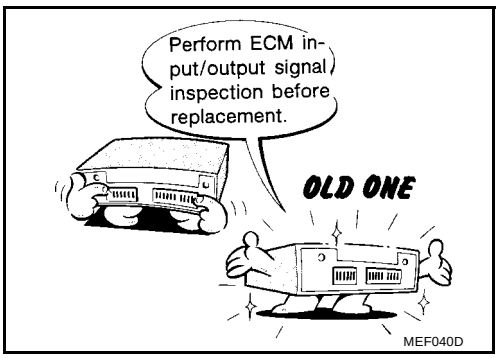
MBIB0145E

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



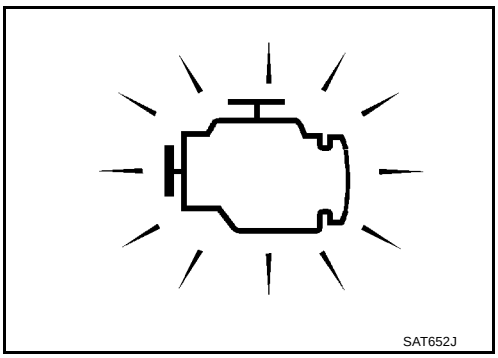
PBIB0090E

- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-80, "ECM Terminals and Reference Value" .**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

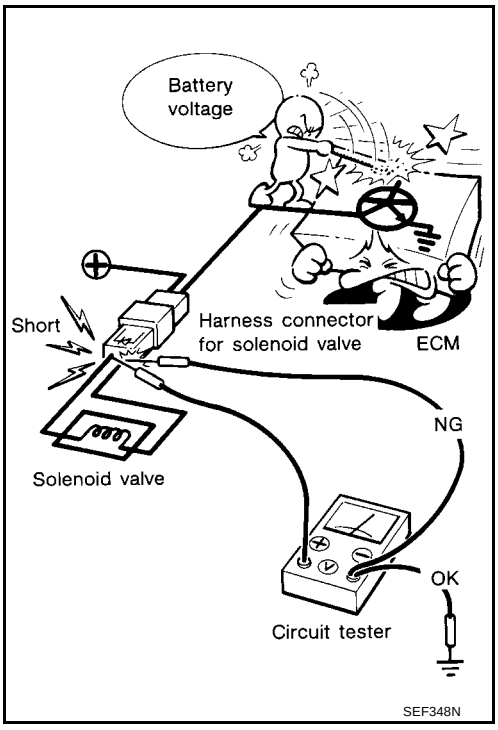


MEF040D

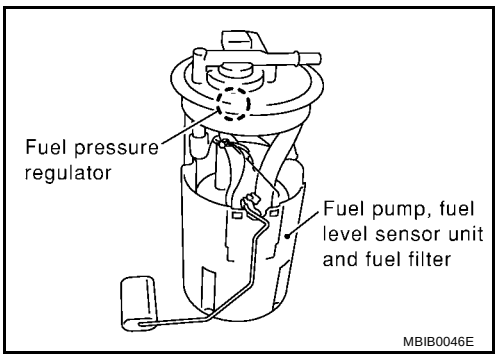
- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



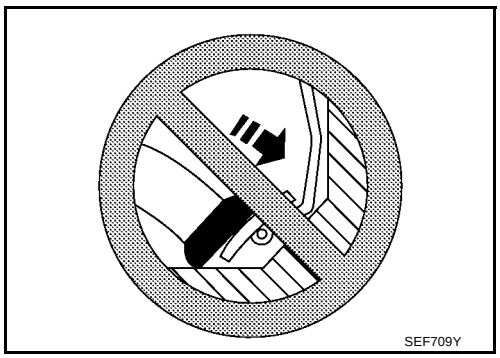
- **When measuring ECM signals with a circuit tester, connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.**
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **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.**



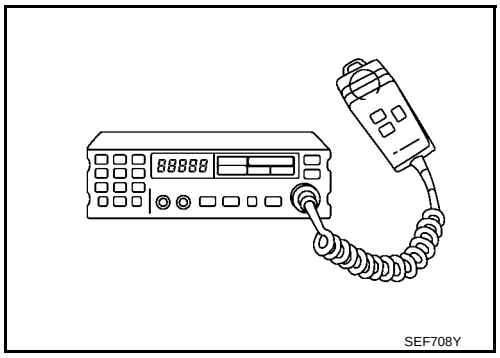
- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**



SEF708Y

Wiring Diagrams and Trouble Diagnosis

EBS00K2Y

When you read wiring diagrams, refer to the following:

- GI-12
- EL-11 for power distribution circuit

When you perform trouble diagnosis, refer to the following:

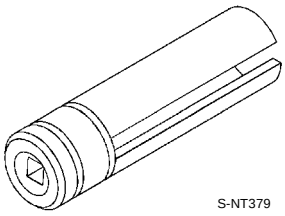
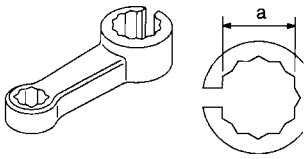
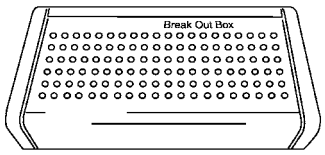
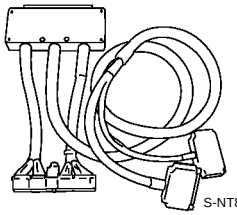
- GI-32
- GI-22

PREPARATION

PFP:00002

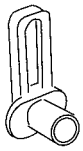
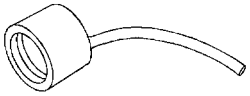
Special Service Tools

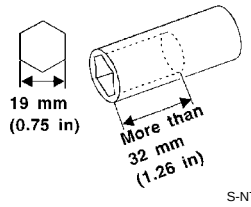
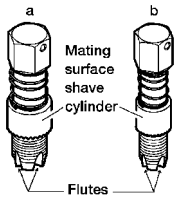
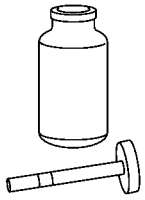
EBS00K2Z

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensors **a: 22 mm (0.87 in)**
KV109E0010 Break-out box	 S-NT825	Measuring the ECM signals with a circuit tester
KV109E0080 Y-cable adapter	 S-NT826	Measuring the ECM signals with a circuit tester

Commercial Service Tools

EBS00K30

Tool name	Description	
Quick connector release	 PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
Fuel filler cap adapter	 S-NT653	Checking fuel tank vacuum relief valve opening pressure

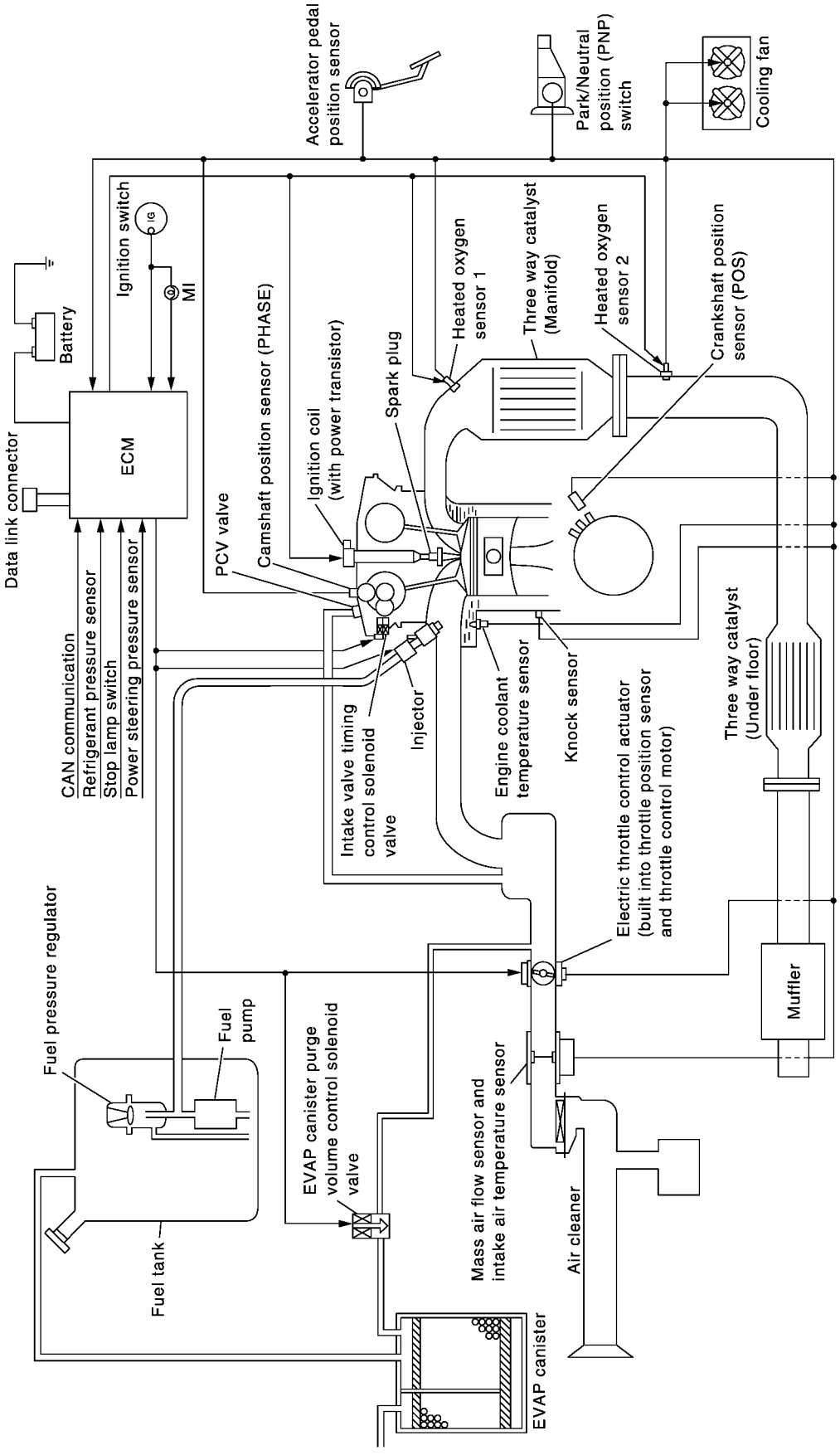
Tool name	Description	
Socket wrench	 S-NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner ie: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant ie: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

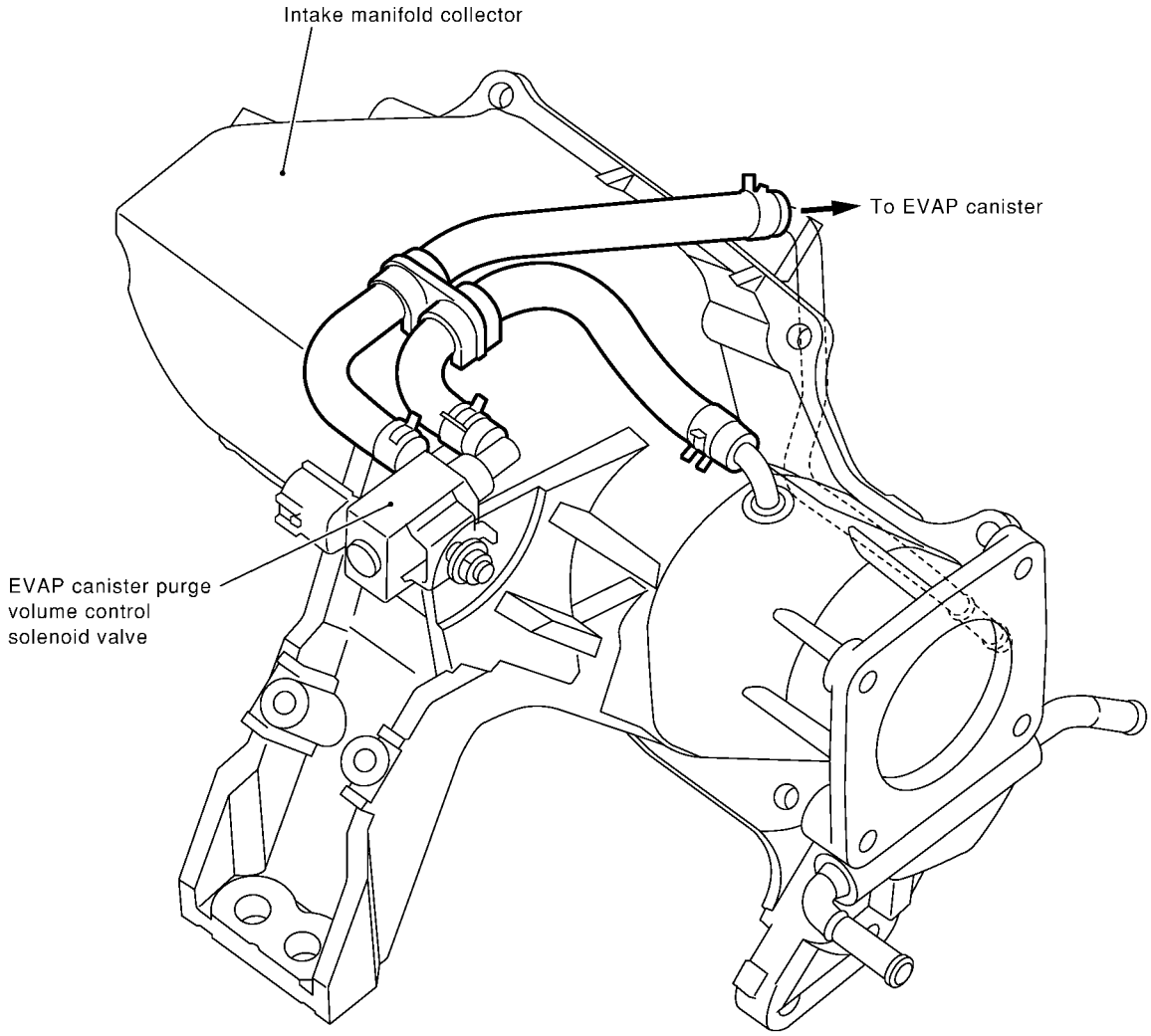
EBS00K31



MBIB0239E

Vacuum Hose Drawing

EBS00K33



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

MBIB0013E

Refer to EC-21, "System Diagram" for Vacuum Control System.

System Chart

EBS00K34

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering pressure sensor ● Ignition switch ● Stop lamp switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● Heated oxygen sensor 2*1 ● TCM (Transmission control module)*2 ● Air conditioner switch*2 ● Vehicle speed signal*2 ● Electrical load signal*2	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	On board diagnostic system	MI (On the instrument panel)*3
	Intake valve timing control	Intake valve timing control solenoid valve
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay*3
	Cooling fan control	Cooling fan relay*3

*1: This sensor is not used to control the engine system under normal conditions.
*2: The signals are sent to the ECM through CAN communication line.
*3: The output signals are sent from the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

EBS00K35

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*3 and piston position	Fuel injection & mixture ratio control	Fuel injectors
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage*3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
Vehicle speed signal*2	Vehicle speed		
Air conditioner switch*2	Air conditioner operation		

*1: Under normal conditions, this sensor is not for engine control operation.
*2: This signal is sent to the ECM through CAN communication line.
*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the

ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), the camshaft position sensor (PHASE) and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

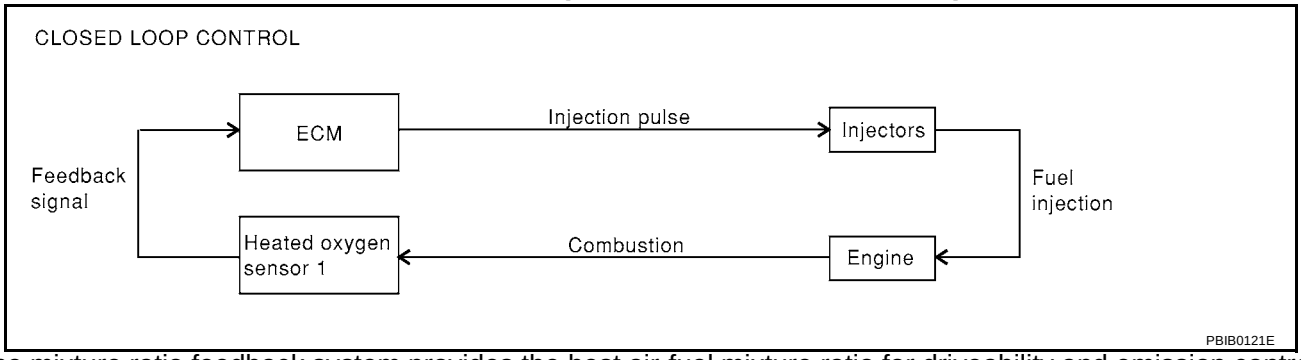
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (A/T models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-155 . This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

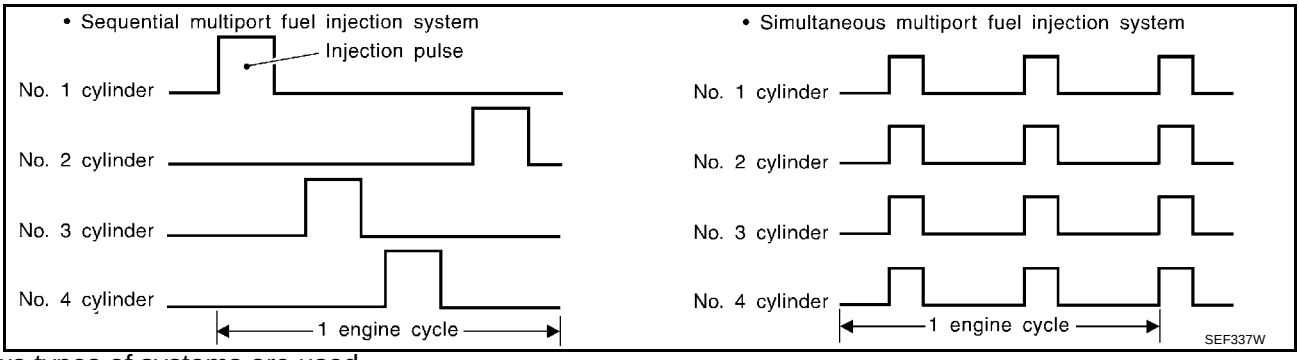
- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (A/T models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as orig-

inally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

EBS00K36

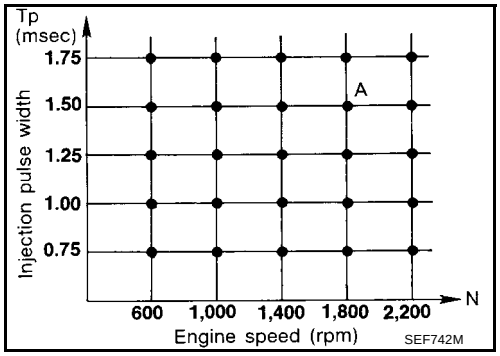
INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2 and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage*2		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC



During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

EBS00K37

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Air conditioner switch*1	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Vehicle speed signal*1	Vehicle speed		

*1: These signals are sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Fuel Cut Control (at No Load and High Engine Speed)

EBS00K38

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-23 .

CAN Communication

EBS00K39

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

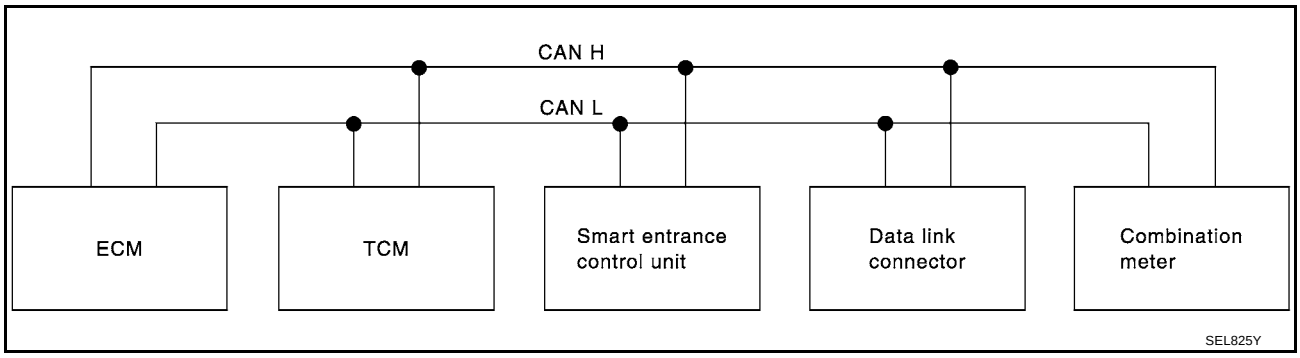
CAN COMMUNICATION UNIT

Body type	Sedan/ 5DH/B/ 3DH/B	
Axle	2WD	
Engine	QG18DE	QG15DE/QG18DE
Transmission	A/T	M/T
Brake control	ABS	
CAN communication unit		
ECM	×	×
TCM	×	
Smart entrance control unit	×	×
Data link connector	×	×
Combination meter	×	×
CAN communication type	EC-28, "Type 1"	EC-29, "Type 2"

×:Applicable

Type 1

SYSTEM DIAGRAM



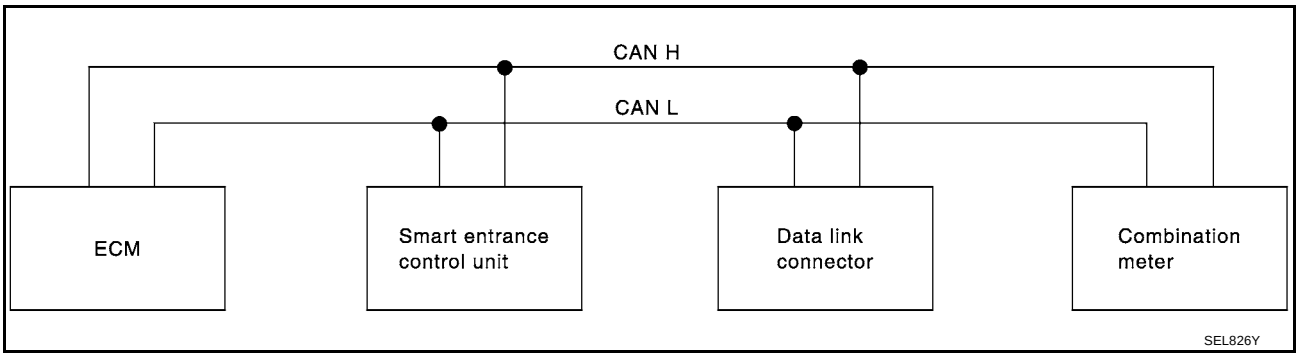
INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	TCM	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Brake switch signal		R		T
Rear window defogger signal	R		T	
Heater fan switch signal	R			T
Air conditioner switch signal	R			T
MI signal	T			R
Current gear position signal		T		R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
A/C compressor signal	T		R	
Accelerator pedal position signal	T	R		
Output shaft revolution signal	R	T		
OD OFF switch signal		R		T
OD OFF indicator signal		T		R
A/T self-diagnosis signal	R	T		

Type 2

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	Smart entrance control unit	Combination meter
Engine speed signal	T		R
Rear window defogger signal	R	T	
Heater fan switch signal	R		T
Air conditioner switch signal	R		T
MI signal	T		R
Engine coolant temperature signal	T		R
Fuel consumption signal	T		R
Vehicle speed signal	R		T
Seat belt reminder signal		R	T
Headlamp switch signal		T	R
Flashing indicator signal		T	R
Engine cooling fan speed signal	T	R	
Child lock indicator signal		T	R
Door switches state signal		T	R
A/C compressor signal	T	R	

BASIC SERVICE PROCEDURE

PFP:00018

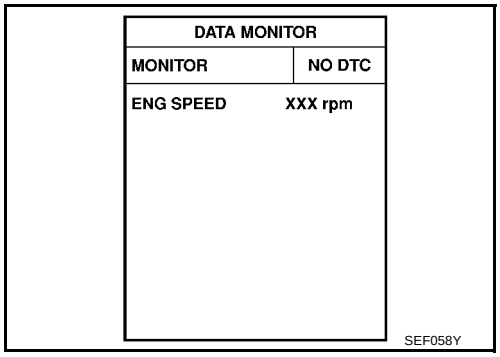
Idle Speed and Ignition Timing Check

EBS00K3A

IDLE SPEED

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.



With GST

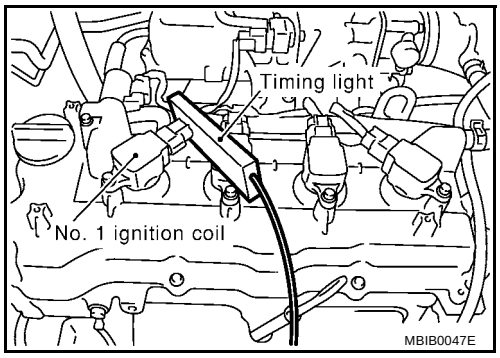
Check idle speed in “MODE 1” with GST.

IGNITION TIMING

Any of following two methods may be used.

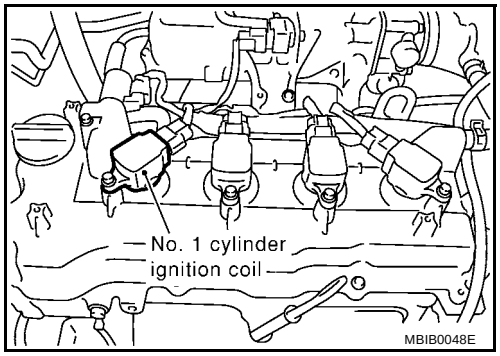
Method A

1. Slide the harness protector of ignition coil No. 1 to clear the wires.
2. Attach timing light to the wires as shown.
3. Check ignition timing.

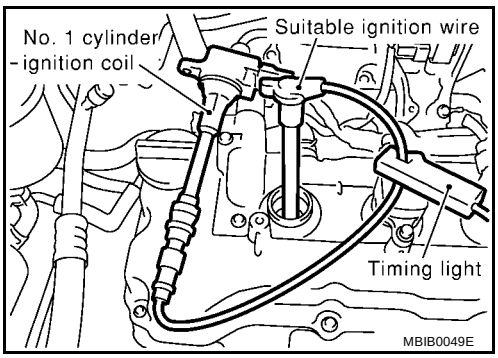


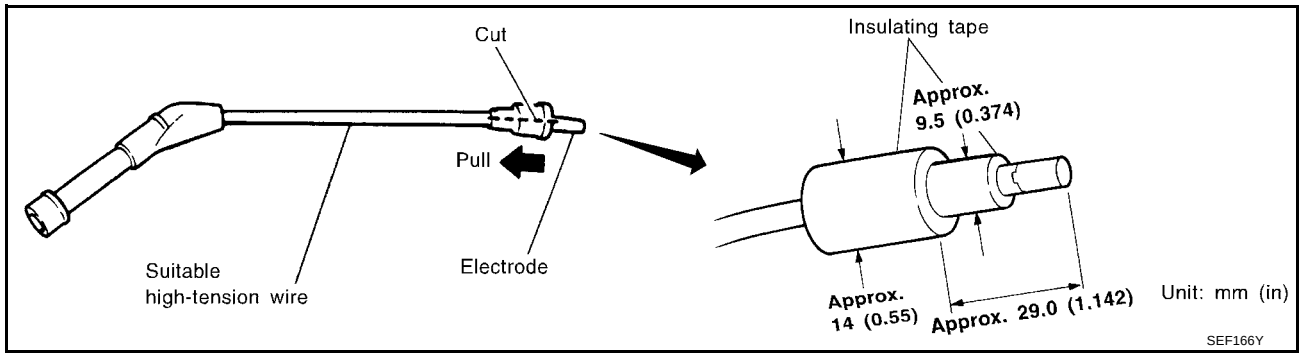
Method B

1. Remove No. 1 ignition coil.



2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.

Accelerator Pedal Released Position Learning

EBS00K3B

DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

Throttle Valve Closed Position Learning

EBS00K3C

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

EBS00K3D

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

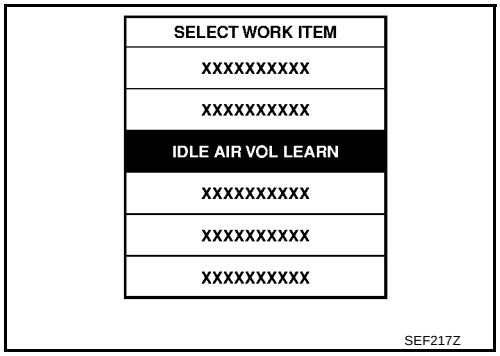
Before performing “Idle Air Volume Learning”, make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For A/T models with CONSULT-II, drive vehicle until “FLUID TEMP SE” in “DATA MONITOR” mode of “A/T” system indicates less than 0.9V.
  For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

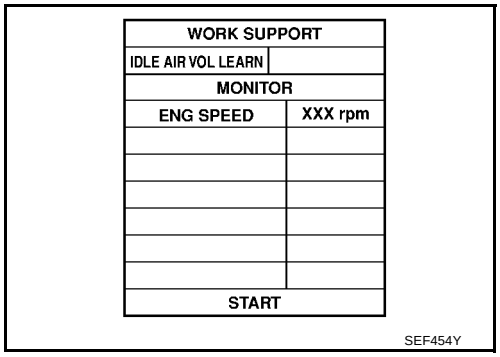
OPERATION PROCEDURE

With CONSULT-II

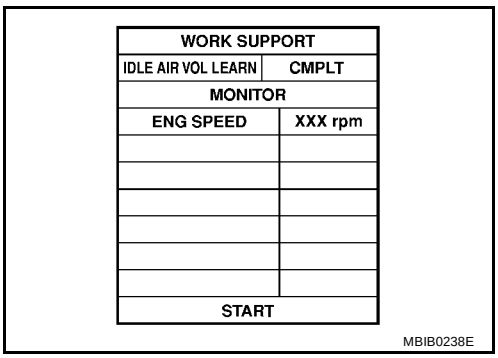
1. Perform EC-31, "Accelerator Pedal Released Position Learning" .
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.



6. Touch “START” and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “CMPLT” is not displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 8±5° BTDC A/T: 10±5° BTDC (in “P” or “N” position)

Without CONSULT-II

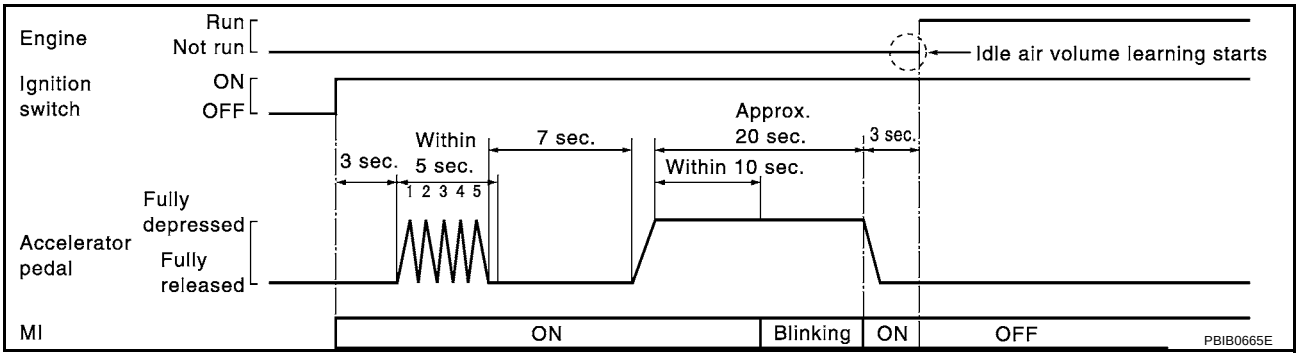
NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-31, "Accelerator Pedal Released Position Learning" .
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MI turned ON.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 8±5° BTDC A/T: 10±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, ″Idle Air Volume Learning″ will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.**
   It is useful to perform EC-105, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform "Idle air volume learning" all over again:**

- **Engine stalls.**
- **Erroneous idle.**

Fuel Pressure Check

EBS00K3E

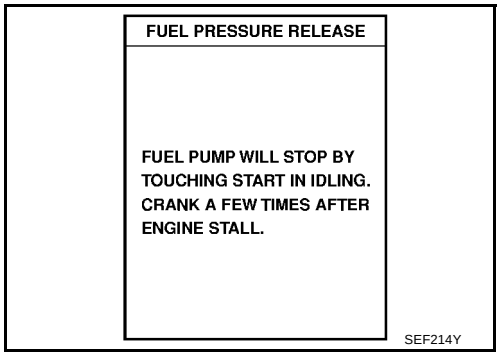
FUEL PRESSURE RELEASE

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because N16 models do not have fuel return system.

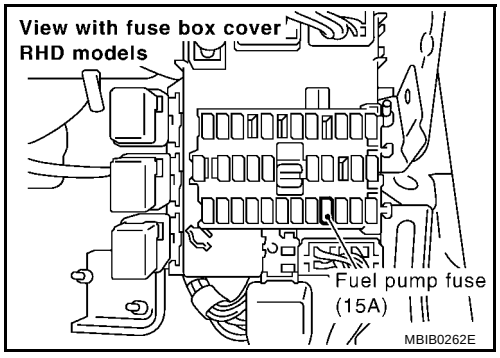
With CONSULT-II

1. Turn ignition switch "ON".
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch "OFF".



Without CONSULT-II

1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch "OFF".
5. Reinstall fuel pump fuse after servicing fuel system.



FUEL PRESSURE CHECK

NOTE:

- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**

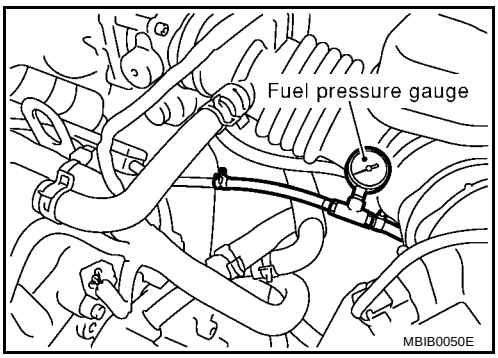
1. Release fuel pressure to zero. Refer to EC-34, "FUEL PRESSURE RELEASE" .

2. Install the fuel pressure gauge into the fuel line as shown in the figure.
3. Turn ignition switch “ON”, and check for fuel leakage.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

At idling: **Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)**

6. If result is unsatisfactory, go to next step.
7. Check the following.
   - Fuel hoses and fuel tubes for clogging
   - Fuel filter for clogging
   - Fuel pump
   - Fuel pressure regulator for clogging

   If OK, replace fuel pressure regulator.
   If NG, repair or replace.



ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

EBS00K3F

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information	ISO Standard
Diagnostic Trouble Code (DTC)	Mode 3 of ISO 15031-5
Freeze Frame data	Mode 2 of ISO 15031-5
System Readiness Test (SRT) code	Mode 1 of ISO 15031-5
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of ISO 15031-5
1st Trip Freeze Frame data	
Test values and Test limits	Mode 6 of ISO 15031-5
Calibration ID	Mode 9 of ISO 15031-5

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	×	×	×	×	×	—
GST	×	×*1	×	—	×	×
ECM	×	×*2	—	—	—	—

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.
*2: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-63 .)

Two Trip Detection Logic

EBS00K3G

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MI will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MI lights up. The MI lights up at the same time when the DTC is stored. <2nd trip>
The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MI, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MI				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up	Blinking	Lighting up				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-10 .)	—	×	—	—	×	—	×	—
Except above	—	—	—	×	—	×	×	—

When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting MI up when there is malfunction on engine control system.
Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function.

The fail-safe function also operates when above diagnoses except MI circuit and demands the driver to repair the malfunction.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

Emission-related Diagnostic Information

EBS00K3H

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Value/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
CAN COMM CIRCUIT	U1000	1000*3	—	—	—	EC-116
CAN COMM CIRCUIT	U1001	1001*3	—	—	×	EC-116
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	—	—
INT/V TIM CONT-B1	P0011	0011	—	—	×	EC-119
HO2S1 HTR (B1)	P0031	0031	×	×	×*4	EC-122
HO2S1 HTR (B1)	P0032	0032	×	×	×*4	EC-122
HO2S2 HTR (B1)	P0037	0037	×	×	×*4	EC-128
HO2S2 HTR (B1)	P0038	0038	×	×	×*4	EC-128
MAF SEN/CIRCUIT	P0102	0102	—	—	—	EC-134
MAF SEN/CIRCUIT	P0103	0103	—	—	—	EC-134
IAT SEN/CIRCUIT	P0112	0112	—	—	×	EC-140
IAT SEN/CIRCUIT	P0113	0113	—	—	×	EC-140
ECT SEN/CIRCUIT	P0117	0117	—	—	—	EC-144
ECT SEN/CIRCUIT	P0118	0118	—	—	—	EC-144
HO2S1 (B1)	P0132	0132	×	×	×*4	EC-149
HO2S1 (B1)	P0133	0133	×	×	×*4	EC-155
HO2S1 (B1)	P0134	0134	×	×	×*4	EC-165
HO2S2 (B1)	P0138	0138	×	×	×*4	EC-172
HO2S2 (B1)	P0139	0139	×	×	×*4	EC-178
FUEL SYS-LEAN-B1	P0171	0171	—	—	×	EC-186
FUEL SYS-RICH-B1	P0172	0172	—	—	×	EC-193
TP SENSOR	P0221	0221	—	—	—	EC-199
TP SEN 1/CIRC	P0222	0222	—	—	—	EC-205
TP SEN 1/CIRC	P0223	0223	—	—	—	EC-205
APP SENSOR	P0226	0226	—	—	—	EC-211
APP SEN 1/CIRC	P0227	0227	—	—	—	EC-218
APP SEN 1/CIRC	P0228	0228	—	—	—	EC-218
MULTI CYL MISFIRE	P0300	0300	—	—	×	EC-225
CYL 1 MISFIRE	P0301	0301	—	—	×	EC-225
CYL 2 MISFIRE	P0302	0302	—	—	×	EC-225
CYL 3 MISFIRE	P0303	0303	—	—	×	EC-225
CYL 4 MISFIRE	P0304	0304	—	—	×	EC-225
KNOCK SEN/CIRC-B1	P0327	0327	—	—	×	EC-230
KNOCK SEN/CIRC-B1	P0328	0328	—	—	×	EC-230
CKP SEN/CIRCUIT	P0335	0335	—	—	×	EC-234

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Value/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
CMP SEN/CIRC-B1	P0340	0340	—	—	×	EC-240
TW CATALYST SYS-B1	P0420	0420	×	×	×*4	EC-246
PURG VOLUME CONT/V	P0444	0444	—	—	×	EC-251
VEH SPEED SEN/CIRC	P0500	0500	—	—	×	EC-257
PW ST P SEN/CIRC	P0550	0550	—	—	×	EC-260
ECM	P0605	0605	—	—	×	EC-265
PNP SW/CIRC	P0705	0705	—	—	×	AT-111
ATF TEMP SEN/CIRC	P0710	0710	—	—	×	AT-117
VEH SPD SEN/CIRC AT*5	P0720	0720	—	—	×	AT-123
ENGINE SPEED SIG	P0725	0725	—	—	×	AT-129
A/T 1ST GR FNCTN	P0731	0731	—	—	×	AT-133
A/T 2ND GR FNCTN	P0732	0732	—	—	×	AT-139
A/T 3RD GR FNCTN	P0733	0733	—	—	×	AT-145
A/T 4TH GR FNCTN	P0734	0734	—	—	×	AT-151
TCC SOLENOID/CIRC	P0740	0740	—	—	×	AT-159
L/PRESS SOL/CIRC	P0745	0745	—	—	×	AT-164
SFT SOL A/CIRC	P0750	0750	—	—	—	AT-171
SFT SOL B/CIRC	P0755	0755	—	—	—	AT-176
ECM BACK UP/CIRC	P1065	1065	—	—	×	EC-268
INT/V TIM V/CIR-B1	P1111	1111	—	—	×	EC-272
ETC ACTR	P1121	1121	—	—	×	EC-276
ETC FUNCTION/CIRC	P1122	1122	—	—	—	EC-278
ETC MOT PWR	P1124	1124	—	—	—	EC-285
ETC MOT PWR	P1126	1126	—	—	—	EC-285
ETC MOT	P1128	1128	—	—	—	EC-291
HO2S1 (B1)	P1143	1143	×	×	×*4	EC-296
HO2S1 (B1)	P1144	1144	×	×	×*4	EC-302
HO2S2 (B1)	P1146	1146	×	×	×*4	EC-308
HO2S2 (B1)	P1147	1147	×	×	×*4	EC-316
ENG OVER TEMP	P1217	1217	—	—	—	EC-324
TP SEN 2/CIRC	P1223	1223	—	—	—	EC-335
TP SEN 2/CIRC	P1224	1224	—	—	—	EC-335
CTP LEARNING	P1225	1225	—	—	×	EC-341
CTP LEARNING	P1226	1226	—	—	×	EC-343
APP SEN 2/CIRC	P1227	1227	—	—	—	EC-345
APP SEN 2/CIRC	P1228	1228	—	—	—	EC-345
SENSOR POWER/CIRC	P1229	1229	—	—	—	EC-352
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	—	—	×	EC-49
TPV SEN/CIRC A/T	P1705	1705	—	—	—	AT-181
P-N POS SW/CIRCUIT	P1706	1706	—	—	×	EC-356

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Value/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
O/R CLTCH SOL/CIRC	P1760	1760	—	—	×	AT-187
BRAKE SW/CIRCUIT	P1805	1805	—	—	×	EC-360

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: The trouble shooting for this DTC needs CONSULT-II.
*4: These are not displayed with GST.

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MI during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
For malfunctions in which 1st trip DTCs are displayed, refer to EC-37, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" . These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-II.
1st trip DTC is specified in Mode 7 of ISO 15031-5. 1st trip DTC detection occurs without lighting up the MI and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-59, "WORK FLOW" . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II
With GST
CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P0705, P0750, etc.
These DTCs are prescribed by ISO 15031-5.
(CONSULT-II also displays the malfunctioning component or system.)

No Tools
The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0102, 0340 etc.
These DTCs are controlled by NISSAN.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST or the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.

If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

PBIB0911E

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-90, "Freeze Frame Data and 1st Trip Freeze Frame Data" .
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15031-5.
As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.
If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.
In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.
Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:
The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:
If MI is “ON” during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”) and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item (CONSULT-II indication)	Performance Priority*1	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
HO2S	1	Heated oxygen sensor 1	P0132
		Heated oxygen sensor 1	P0133
		Heated oxygen sensor 1	P0134
		Heated oxygen sensor 1	P1143
		Heated oxygen sensor 1	P1144
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139
		Heated oxygen sensor 2	P1146
		Heated oxygen sensor 2	P1147
HO2S HTR	1	Heated oxygen sensor 1 heater	P0031, P0032
		Heated oxygen sensor 2 heater	P0037, P0038

*1: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT-II.

SRT Set Timing

SRT is set as “CMPLT” after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON →	OFF ← ON →	OFF ← ON →	OFF ← ON →
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MI “ON”)
		SRT of EGR	“INCMP”	“INCMP”	“INCMP”	“CMPLT”

OK: Self-diagnosis is carried out and the result is OK.
NG: Self-diagnosis is carried out and the result is NG.
—: Self-diagnosis is not carried out.

When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above
When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above

If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above

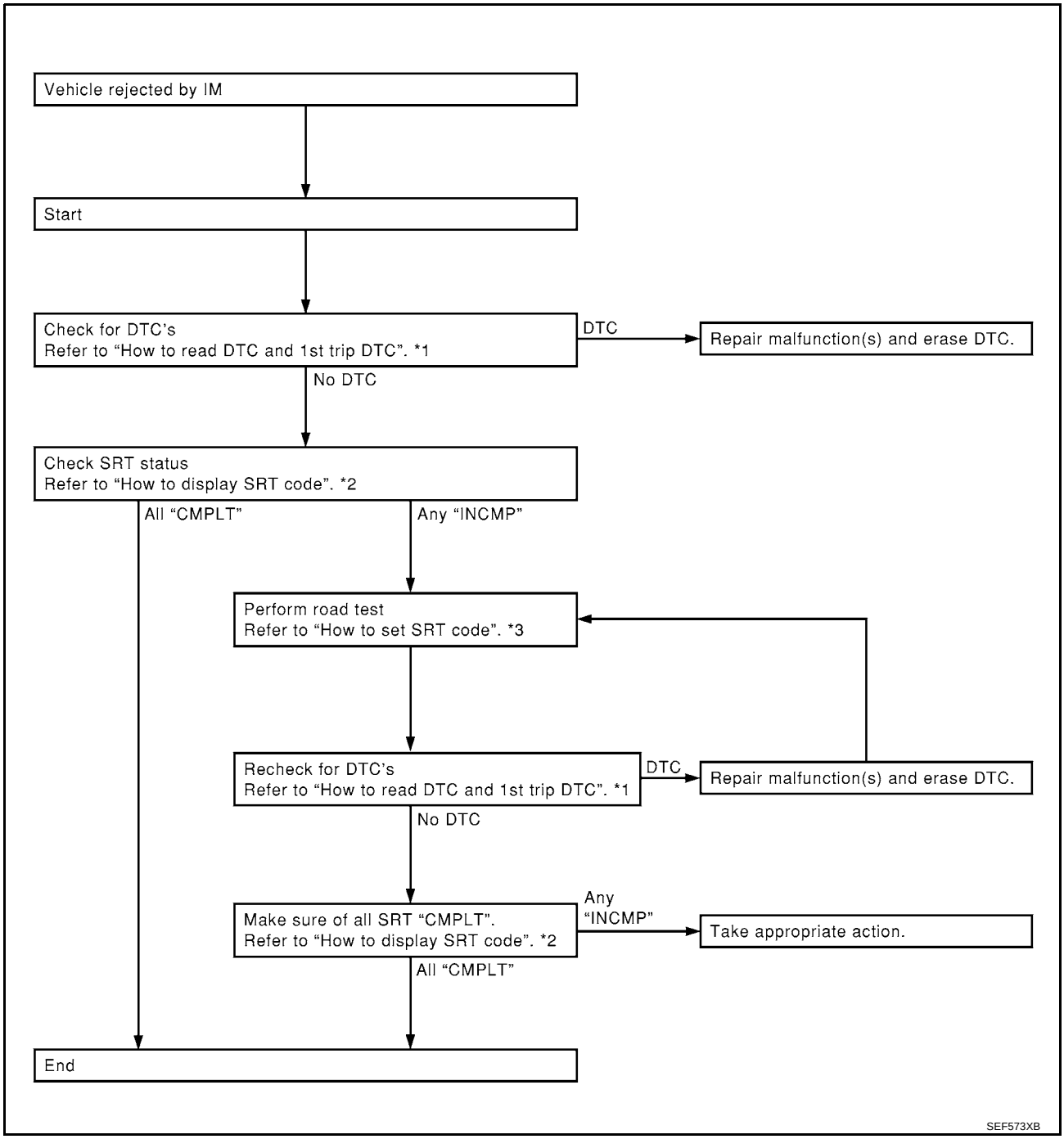
The table above shows that the minimum number of cycles for setting SRT as “INCMP” is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to “CMPLT” of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:
SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

SRT Service Procedure

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating “INCMP”, review the flowchart diagnostic sequence on the next page.



*1 EC-39 *2 EC-44 *3 EC-45

How to Display SRT Code

WITH CONSULT-II

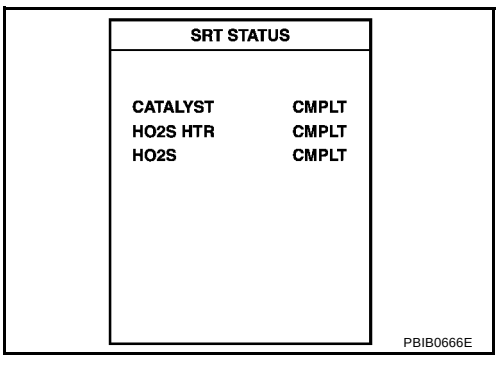
Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.

For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.

A sample of CONSULT-II display for SRT code is shown at right.

"INCMP" means the self-diagnosis is incomplete and SRT is not set.

"CMPLT" means the self-diagnosis is complete and SRT is set.



WITH GST

Selecting Mode 1 with GST (Generic Scan Tool)

How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

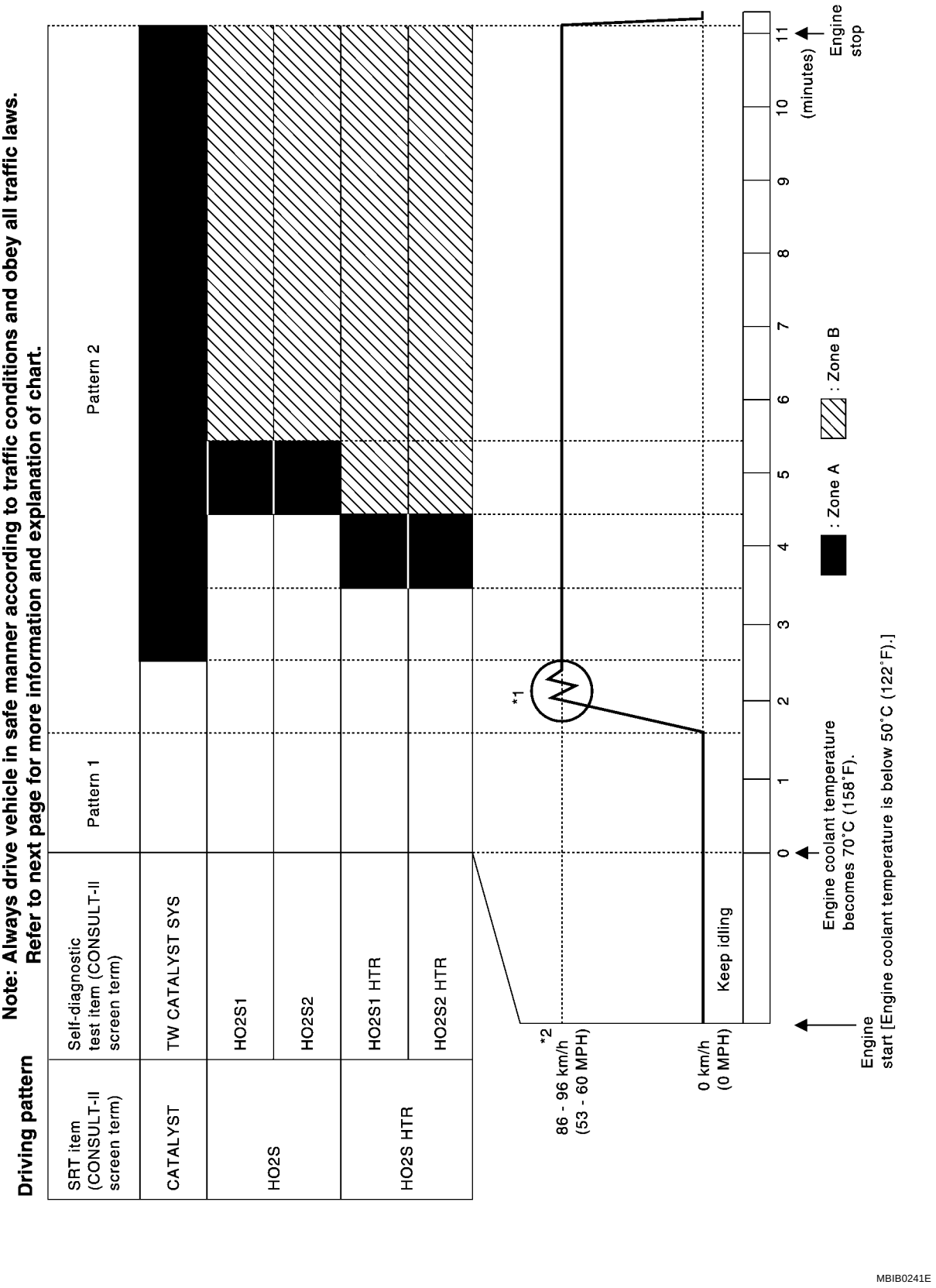
WITH CONSULT-II

Perform corresponding DTC Confirmation Procedure one by one based on “Performance Priority” in the table on EC-42, "SRT Item" .

WITHOUT CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern



MBIB0241E

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 72 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 72 and ground is lower than 1.4V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.
*2: Checking the vehicle speed with GST is advised.

Suggested Transmission Gear Position for A/T Models

Set the selector lever in the “D” position with the overdrive switch turned ON.

TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-II)

The following is the information specified in Mode 6 of ISO 15031-5.
The test value is a parameter used to determine whether a system/circuit diagnostic test is “OK” or “NG” while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items.
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

×: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function	01H	01H	Max.	×
HO2S	Heated oxygen sensor 1	09H	04H	Max.	×
		0AH	84H	Min.	×
		0BH	04H	Max.	×
		0CH	04H	Max.	×
		0DH	04H	Max.	×
	Heated oxygen sensor 2	19H	86H	Min.	×
		1AH	86H	Min.	×
		1BH	06H	Max.	×
		1CH	06H	Max.	×
HO2S HTR	Heated oxygen sensor 1 heater	29H	08H	Max.	×
		2AH	88H	Min.	×
	Heated oxygen sensor 2 heater	2DH	0AH	Max.	×
		2EH	8AH	Min.	×

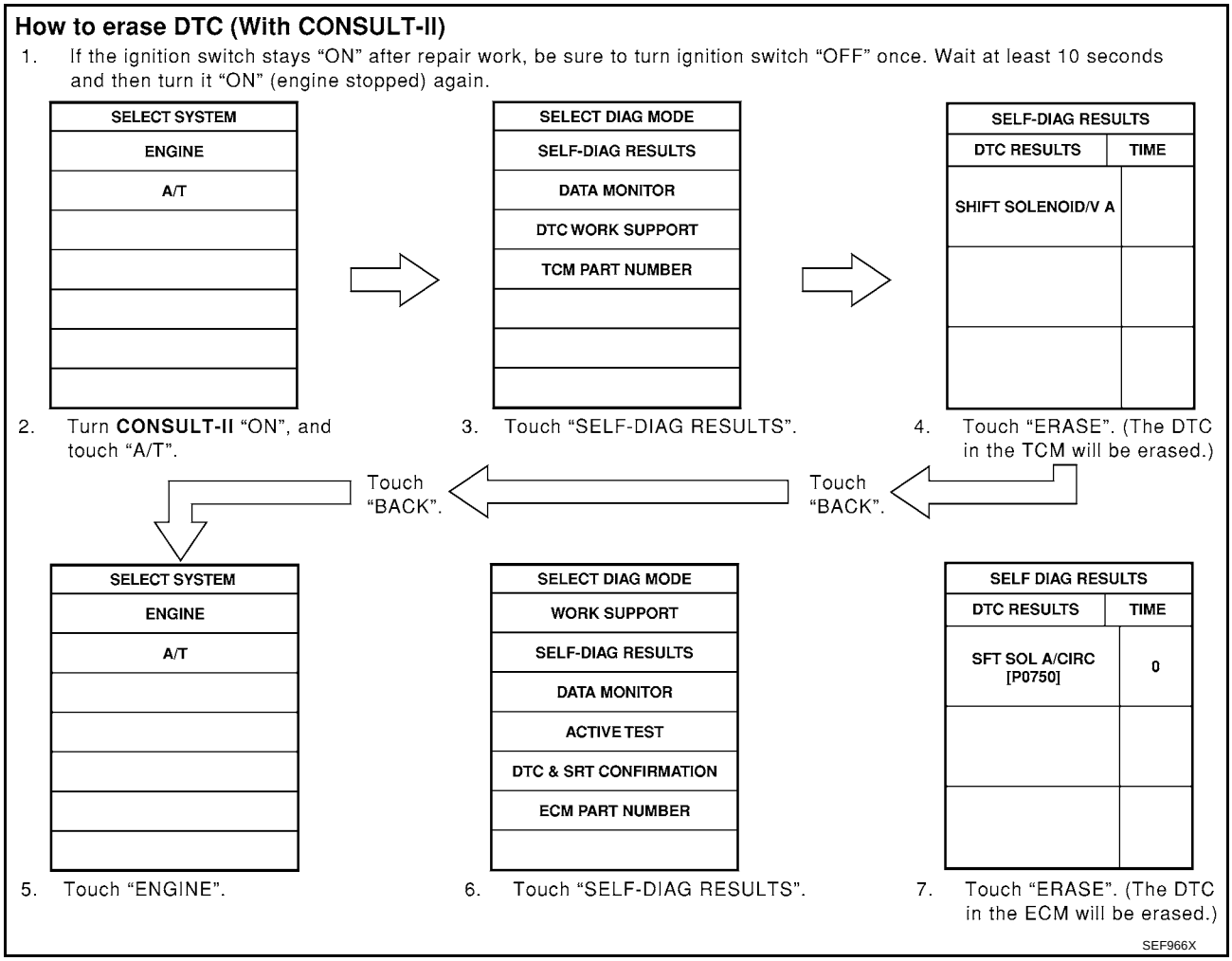
HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC (With CONSULT-II)

The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.
If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

NOTE:
If the DTC is not for A/T related items (see EC-10, "INDEX FOR DTC"), skip steps 2 through 4.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “A/T”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. [The DTC in the TCM (Transmission control module) will be erased.] Then touch “BACK” twice.
5. Touch “ENGINE”.
6. Touch “SELF-DIAG RESULTS”.
7. Touch “ERASE”. (The DTC in the ECM will be erased.)



How to Erase DTC (With GST)

The emission related diagnostic information in the ECM can be erased by selecting Mode 4 with GST.

NOTE:
If the DTC is not for A/T related items (see EC-10, "INDEX FOR DTC"), skip step 2.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.

2. Perform “SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)” in AT section titled “TROUBLE DIAGNOSIS”, “Self-diagnosis”. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

How to Erase DTC (No Tools)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch OFF” once.
2. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-51, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

– Diagnostic trouble codes
– 1st trip diagnostic trouble codes
– Freeze frame data
– 1st trip freeze frame data
– System readiness test (SRT) codes
– Test values
– Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

NATS (Nissan Anti-theft System)

EBS00K3I

- **If the security indicator lights up with the ignition switch in the “ON” position or “NATS MALFUNCTION” is displayed on “SELF-DIAG RESULTS” screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to EL-386.**
- **Confirm no self-diagnostic results of NATS is displayed before touching “ERASE” in “SELF-DIAG RESULTS” mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  Therefore, be sure to receive all keys from vehicle owner.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

SELF DIAG RESULTS	
DTC RESULTS	TIME
NATS MALFUNCTION [P1610]	0

SEF515Y

Malfunction Indicator (MI)

EBS00K3J

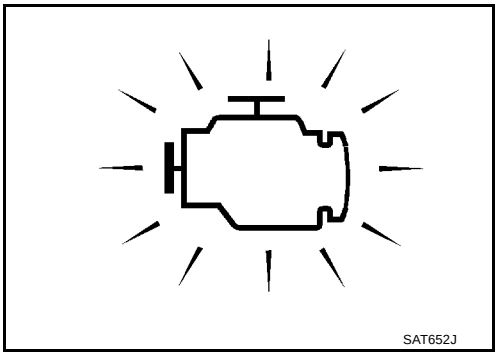
DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.

- If the MI does not light up, refer to EL-129, or see EC-397 .

2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.



SAT652J

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MI in the 1st trip. ● “Misfire (Possible three way catalyst damage)” ● ″One trip detection diagnoses″
Mode II	Ignition switch in “ON” position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running 	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting MI up when there is malfunction on engine control system.
Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function.
The fail-safe function also operates when above diagnoses except MI circuit and demands the driver to repair the malfunction.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

MI Flashing without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode, EC-51, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later, EC-51, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned “OFF”.**

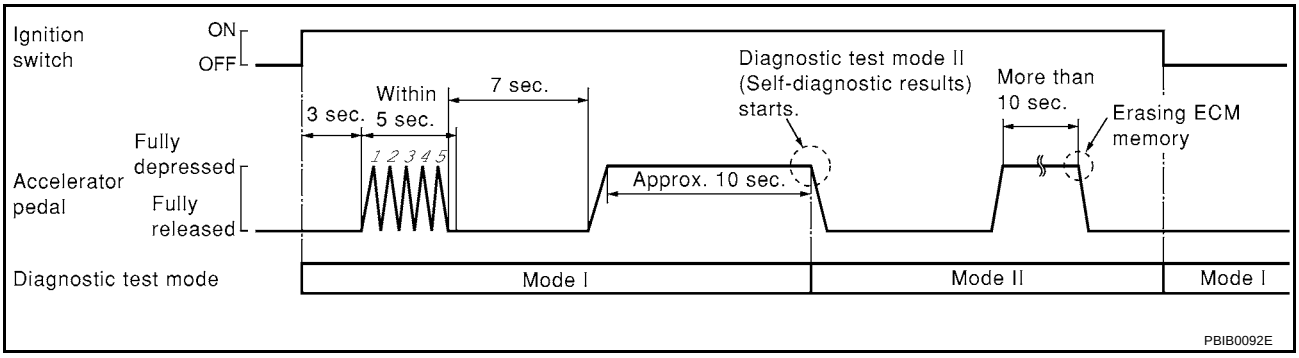
How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-51, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-51, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL-129 or see EC-397 .

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

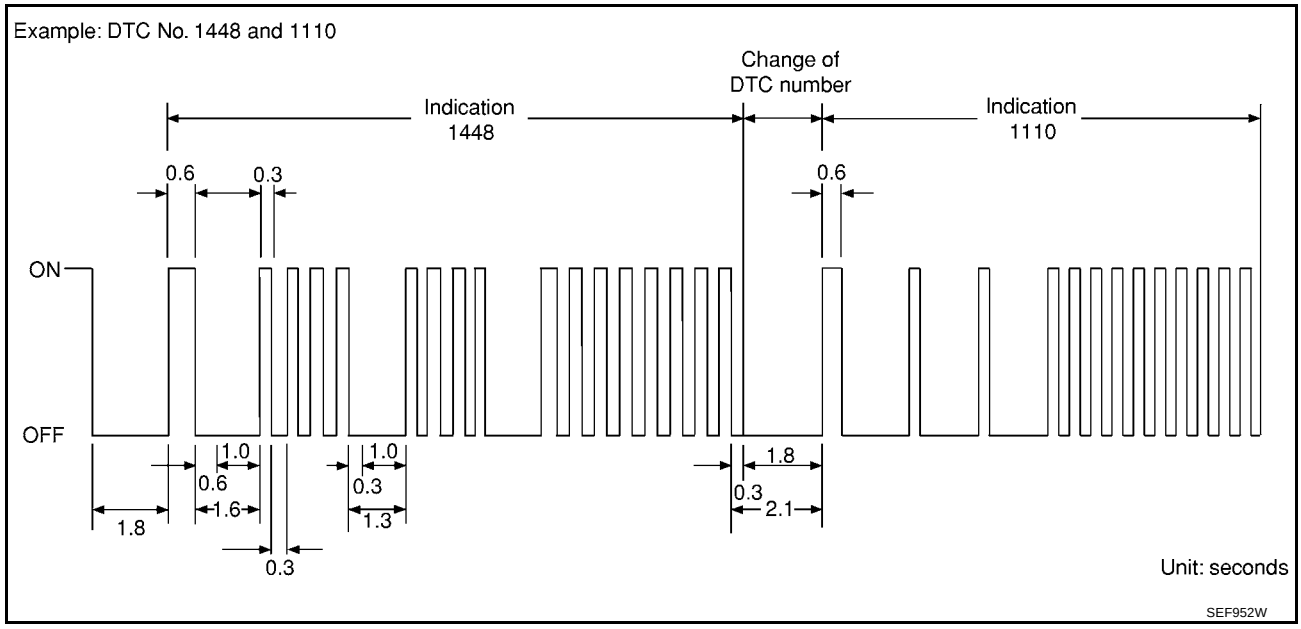
MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

- These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI as shown below.
The DTC and 1st trip DTC are displayed at the same time. If the MI does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MI illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified

codes can be identified by using the CONSULT-II or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-10, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-51, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

OBD System Operation Chart

EBS00K3K

RELATIONSHIP BETWEEN MI, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MI will come on. For details, refer to EC-36, "Two Trip Detection Logic" .

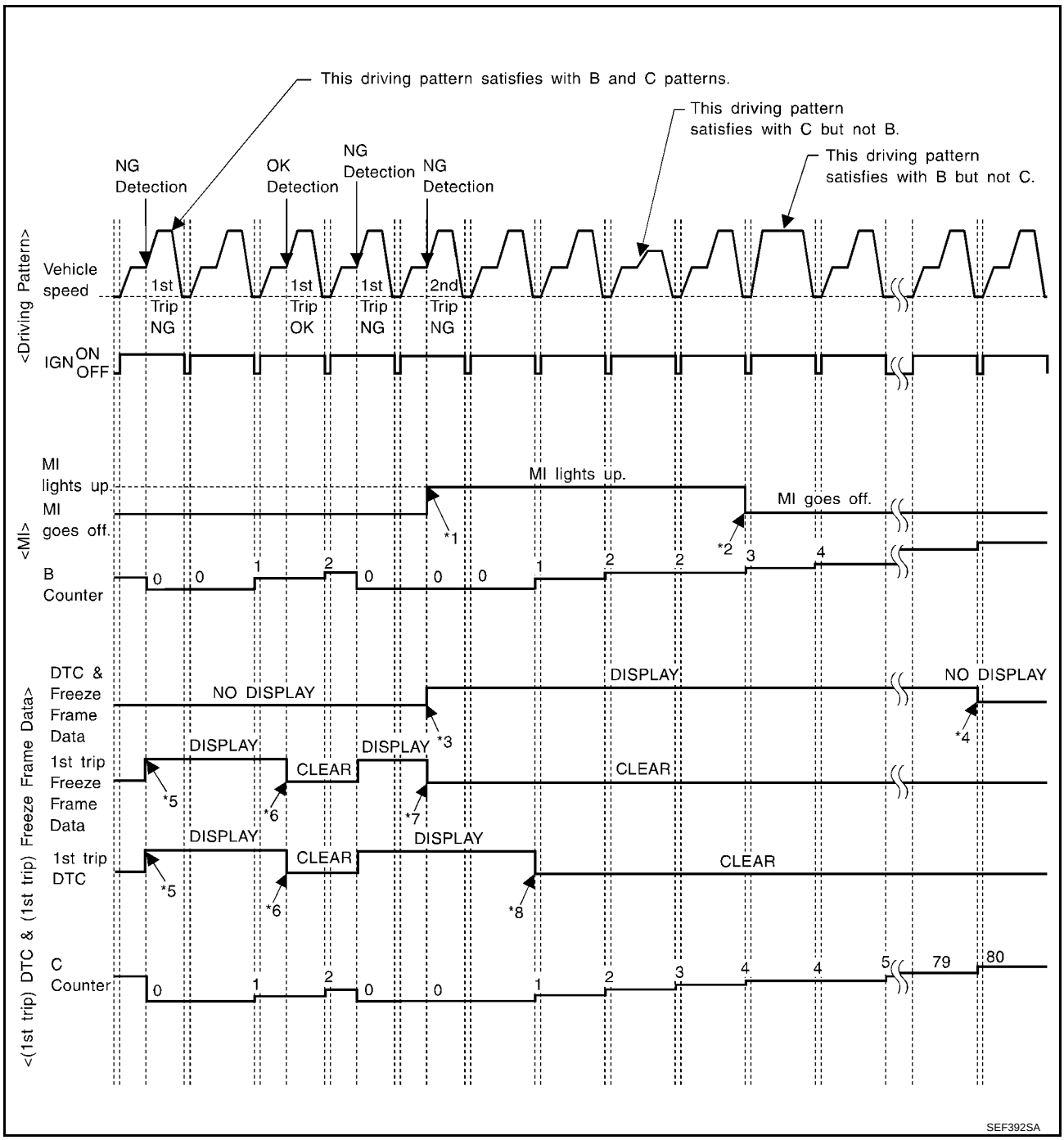
- The MI will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in “OK” for the 2nd trip.

SUMMARY CHART

Items	Fuel Injection System	Misfire	Other
MI (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

For details about patterns “B” and “C” under “Fuel Injection System” and “Misfire”, see EC-55 .
For details about patterns “A” and “B” under “Other”, see EC-57 .
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

RELATIONSHIP BETWEEN MI, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>, "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MI will light up.

*2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MI will go off when the B counter reaches 3. (*2 in “OBD SYSTEM OPERATION CHART”)

<Driving Pattern C>

Driving pattern C means the vehicle operation as follows:

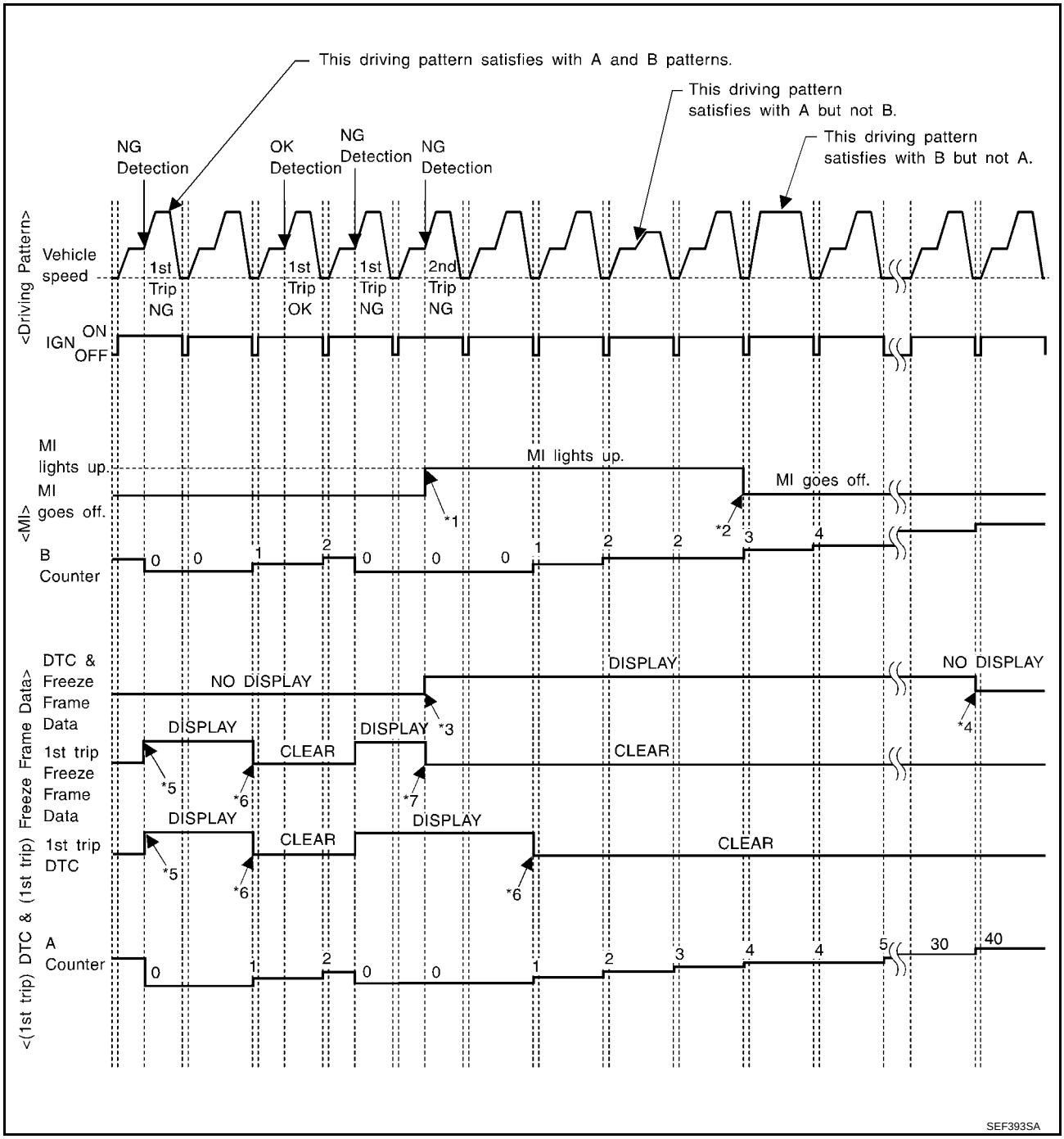
1. The following conditions should be satisfied at the same time:
   Engine speed: (Engine speed in the freeze frame data) ±375 rpm
   Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
   Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), “T” should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), “T” should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of (1).
- The C counter will be counted up when (1) is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MI, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MI will light up.

*2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

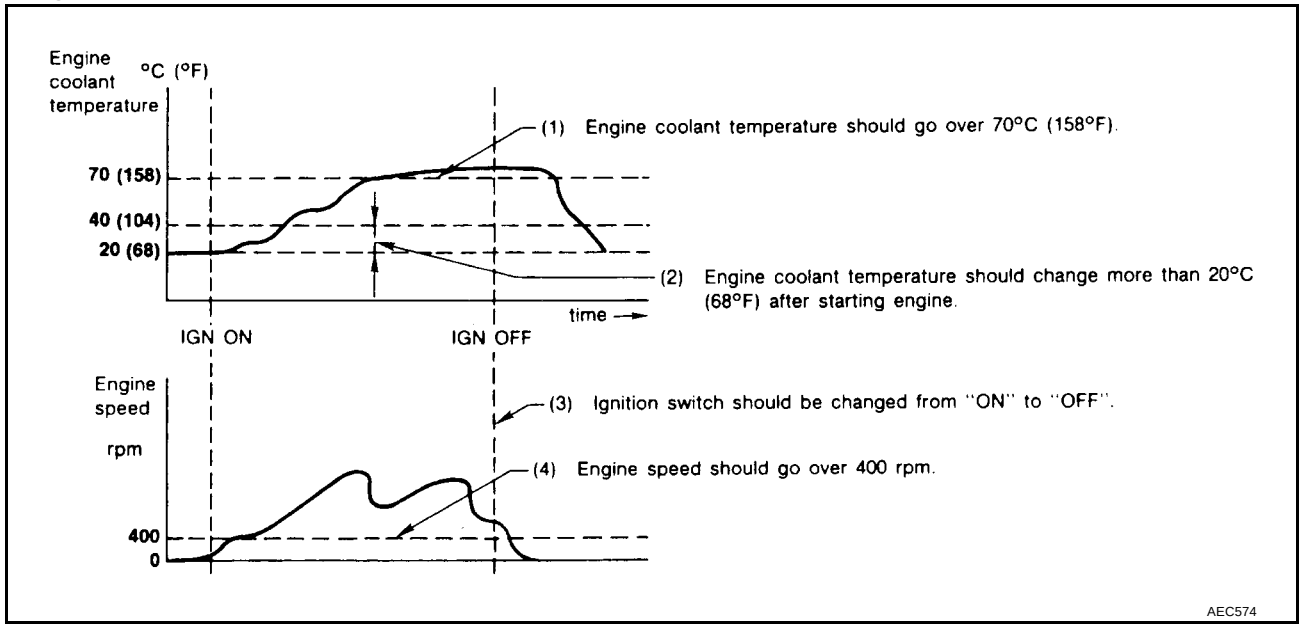
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MI will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").

TROUBLE DIAGNOSIS

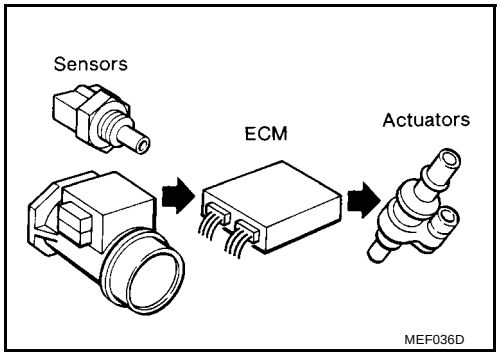
PFP:00004

Trouble Diagnosis Introduction

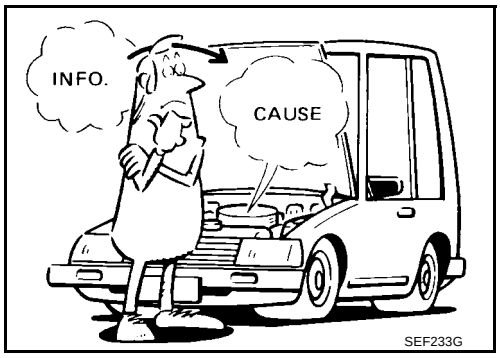
EBS00K3L

INTRODUCTION

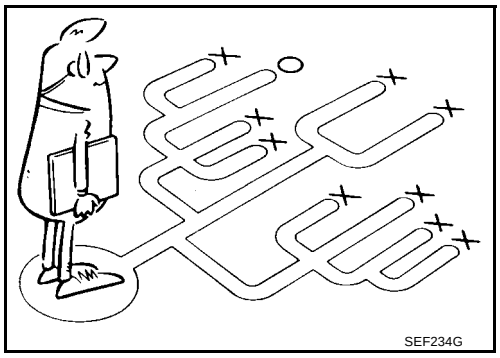
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.



It is much more difficult to diagnose a incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

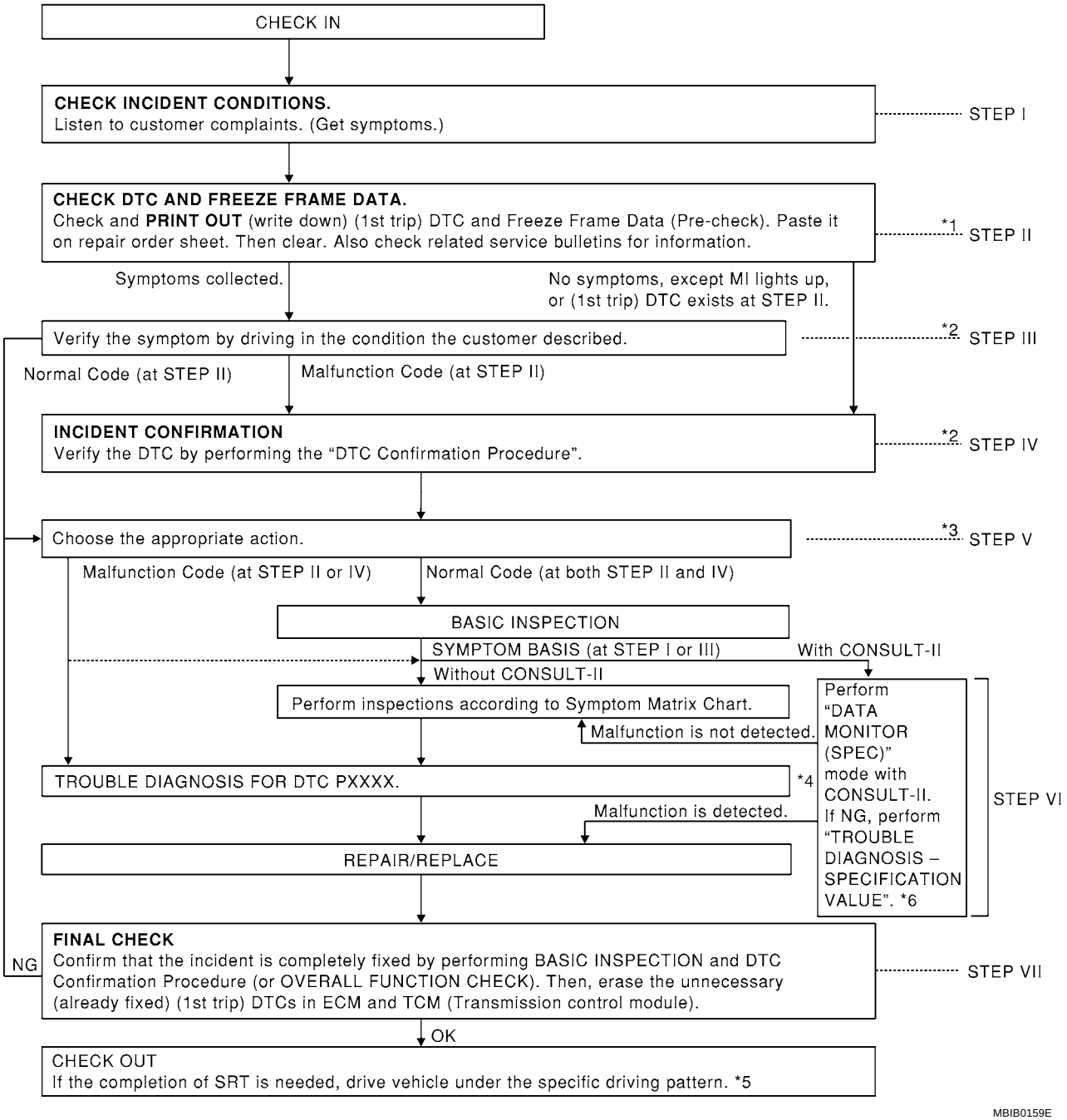


A visual check only may not find the cause of the incidents. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-59 .
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-62 should be used.
Start your diagnosis by looking for “conventional” malfunctions first. This will help troubleshoot driveability malfunctions on an electronically controlled engine vehicle.



WORK FLOW

Flow Chart



MBIB0159E

*1: If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2: If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-110, "POWER SUPPLY CIRCUIT FOR ECM" .

*4: If malfunctioning part cannot be detected, perform EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5: EC-46, "Driving Pattern"

*6: EC-105, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE"

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-61 .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or GST) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer toEC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-70 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-65 .) If COSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TOROUBLE DIAGNOSIS – SPECIFICATION VALUE”. (Refer to EC-105 .) (If malfunction is detected, proceed to “PERAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-70 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-80 , EC-99 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to “Circuit Inspection” in GI-22. Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer toEC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and AT-39, "HOW TO ERASE DTC" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.
Some conditions may cause the MI to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

EBS00K3M

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-116, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

Priority	Detected items (DTC)
1	● U1000 U1001 CAN communication line ● P0102 P0103 Mass air flow sensor ● P0112 P0113 Intake air temperature sensor ● P0117 P0118 Engine coolant temperature sensor ● P0221 P0222 P0223 P1223 P1224 P1225 P1226 P1229 Throttle position sensor ● P0226 P0227 P0228 P1227 P1228 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0500 Vehicle speed sensor ● P0705 Park/Neutral position (PNP) switch ● P0605 ECM ● P1610-P1615 NATS ● P1706 Park/Neutral position (PNP) switch
2	● P0031 P0032 Heated oxygen sensor 1 heater ● P0037 P0038 Heated oxygen sensor 2 heater ● P0132 P0133 P0134 P1143 P1144 Heated oxygen sensor 1 ● P0138 P0139 P1146 P1147 Heated oxygen sensor 2 ● P0550 Power steering pressure sensor ● P0710-P0725 P0740-P0755 P1705 P1760 A/T related sensors and solenoid valves ● P1065 ECM power supply ● P1111 Intake valve timing control solenoid valve ● P1122 Electric throttle control function ● P1124 P1126 P1128 Electric throttle control actuator ● P1805 Brake switch
3	● P0011 Intake valve timing control ● P0171 P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0420 Three way catalyst function ● P0444 EVAP canister purge volume control solenoid valve ● P0731-P0734 A/T function ● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT)

Fail-safe Chart

EBS00K3N

- When the DTC listed below is detected, the ECM enters fail-safe mode and the MI lights up.

DTC No.	Detected items	Engine operating condition in fail-safe mode
P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0221
P0222
P0223
P1223
P1224</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P0226
P0227
P0228
P1227
P1228</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P1121</td><td>Electric throttle control actuator
(ECM detect the throttle valve is stuck open.)</td><td colspan="2">While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1122</td><td>Electric throttle control function</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1124
P1126</td><td>Throttle control motor relay</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1128</td><td>Throttle control motor</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring</td></tr>
<tr><td>P1229</td><td>Sensor power supply</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
</table>

- When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting MI up when there is malfunction on engine control system.
  Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function.
  The fail-safe function also operates when above diagnoses except MI circuit and demands the driver to repair the trouble.

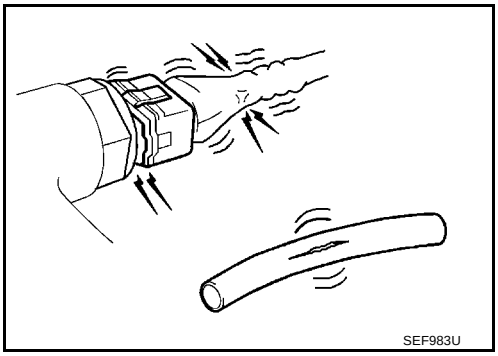
Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

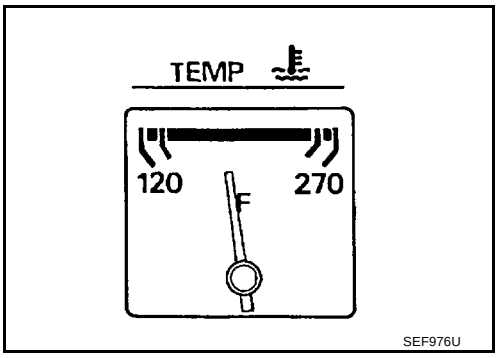
Basic Inspection

EBS00K3O

1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
   - Harness connectors for improper connections
   - Wiring harness for improper connections, pinches and cut
   - Vacuum hoses for splits, kinks and improper connections
   - Hoses and ducts for leaks
   - Air cleaner clogging
   - Gasket
3. Confirm that electrical or mechanical loads are not applied.
   - Headlamp switch is OFF.
   - Air conditioner switch is OFF.
   - Rear window defogger switch is OFF.
   - Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
   Ensure engine stays below 1,000 rpm.


SEF983U

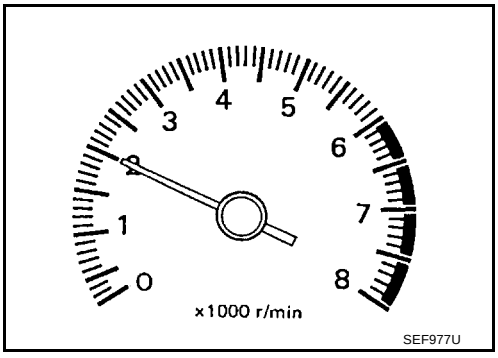


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

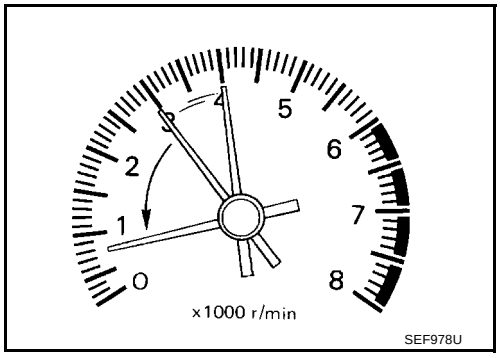
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

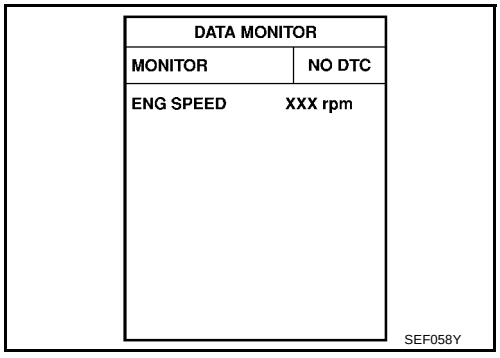
With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-31, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-31, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-31, "Idle Air Volume Learning" .

Is "Idle Air Volume Learning" carried out successfully?

Yes or No

Yes >> GO TO 7.
No >> 1. Follow the construction of "Idle Air Volume Learning".
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in "DATA MONITOR" mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in "P" or "N" position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in "P" or "N" position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-240 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-234 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-49, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 8 ± 5° BTDC
A/T: 10 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-31, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-31, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-31, "Idle Air Volume Learning" .

Is ″Idle Air Volume Learning″ carried out successfully?

Yes or No

Yes >> GO TO 14.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 8 ± 5° BTDC
A/T: 10 ± 5° BTDC (in "P" or "N" position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-47, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-240 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-234 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-49, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

Symptom Matrix Chart
SYSTEM — BASIC ENGINE CONTROL SYSTEM

EBS00K3P

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-381
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-34
	Injector circuit	1	1	2	3	2		2	2			2			EC-375
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-251, EC-399
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-402
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-65
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-276, EC-278 , EC-285 , EC-291
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-65
	Ignition circuit	1	1	2	2	2		2	2			2			EC-365
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-110
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-134
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-144
Throttle position sensor circuit			1	2		2	2	2	2	2		2			EC-199, EC-205 , EC-335 , EC-341 , EC-343 , EC-352
Accelerator pedal position sensor circuit				3	2	1	2			2					EC-211, EC-218 , EC-345
Heated oxygen sensor 1 circuit			1	2	3	2		2	2			2			EC-149, EC-155 , EC-165 , EC-296 , EC-302
Knock sensor circuit				2	2							3			EC-230
Crankshaft position sensor (POS) circuit		2	2												EC-234
Camshaft position sensor (PHASE) circuit		2	2												EC-240
Vehicle speed signal circuit			2	3		3						3			EC-257

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Power steering pressure sensor circuit		2				3	3	3	3					EC-260
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-265, EC-268
Intake valve timing control solenoid valve circuit	3	3	2		1	3	2	2	3		3			EC-272
PNP switch circuit			3		3	3	3	3	3		3			EC-356
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-387
Electrical load signal circuit						3	3	3	3					EC-392
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	ATC-29

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FE-4
	Fuel piping			5	5	5		5	5			5			FE-4
	Vapor lock														—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—

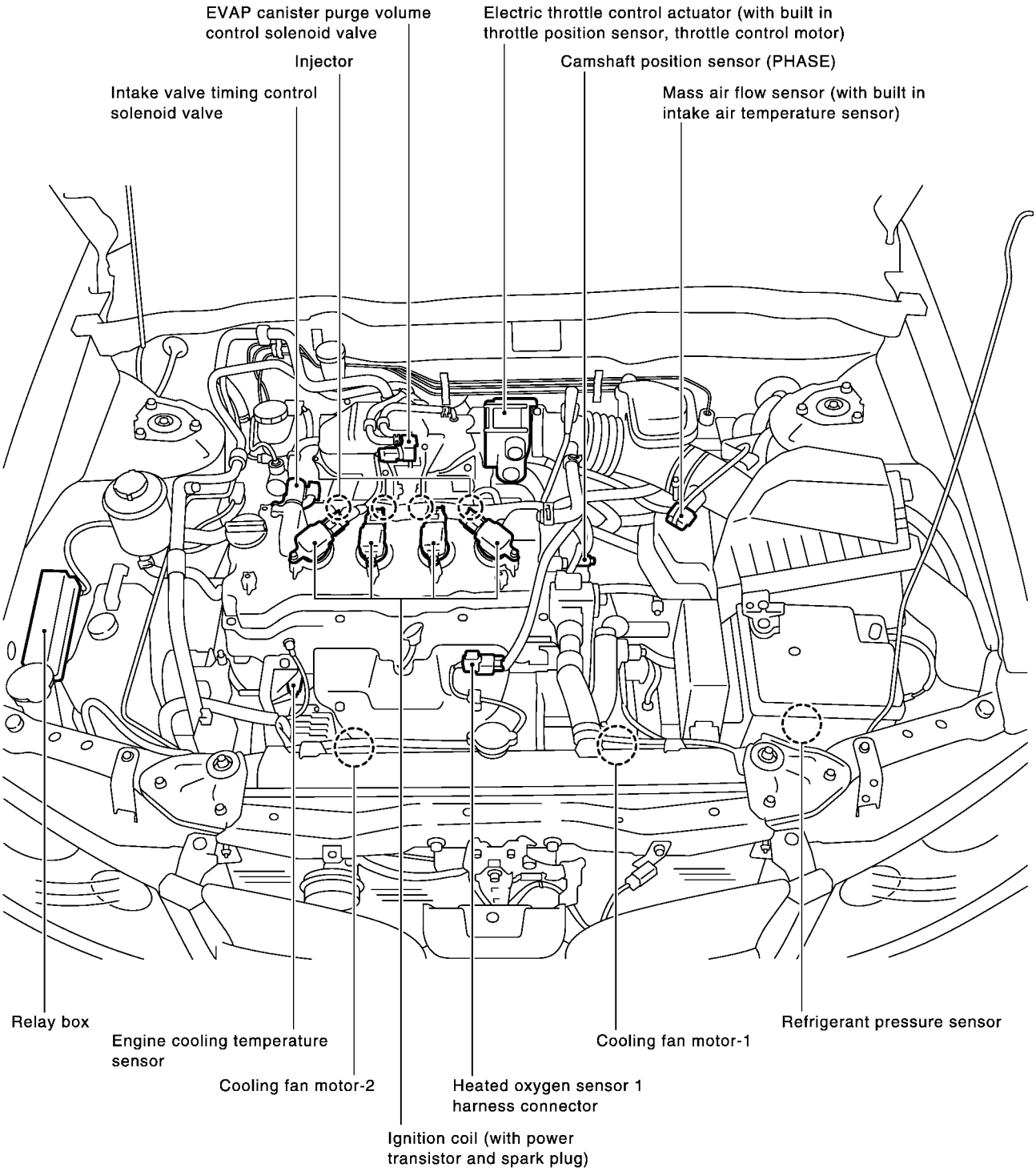
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Air duct		5	5		5		5	5			5			EM-14
	Air cleaner														EM-14
	Air leakage from air duct (Mass air flow sensor —electric throttle control actuator)	5			5		5			5					EM-14
	Electric throttle control actuator														EM-16
	Air leakage from intake manifold/ Collector/Gasket														EM-16
Cranking	Battery	1	1	1		1		1	1			1		1	SC-3
	Alternator circuit														SC-27
	Starter circuit	3													SC-13
	Signal plate/Flywheel/Drive plate	6													EM-70
	PNP switch	4													AT-116, MT-21
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-57
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-70
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-47
	Camshaft														EM-32
	Intake valve timing control														EM-47
	Intake valve												3		EM-57
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-19, FE-26
	Three way catalyst														
Lubrica-tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5	2		EM-22, LC-5, LC-9, LC-4
	Oil level (Low)/Filthy oil														LC-8

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		2	5			LC-12
	Thermostat									5					LC-15
	Water pump														LC-14
	Water gallery														LC-12
	Cooling fan									5					LC-17
	Coolant level (low)/Contaminated coolant														LC-17
NATS (Nissan Anti-Theft System)		1	1												EC-49 or EL-386

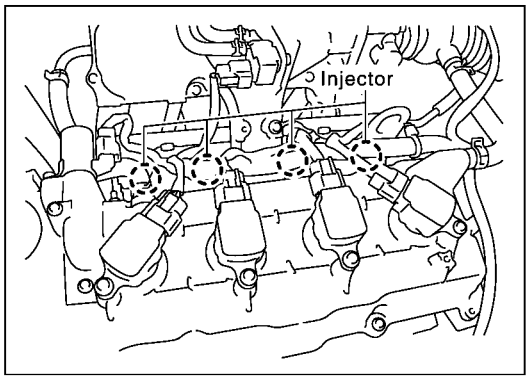
1 - 6: The numbers refer to the order of inspection.

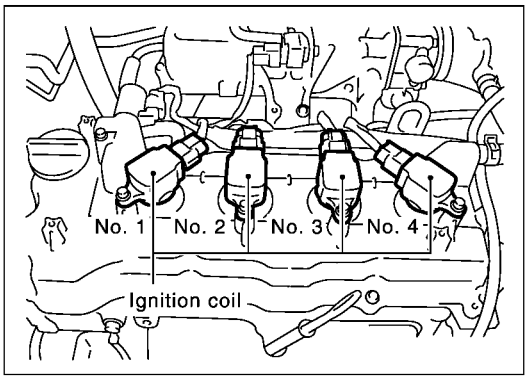
Engine Control Component Parts Location

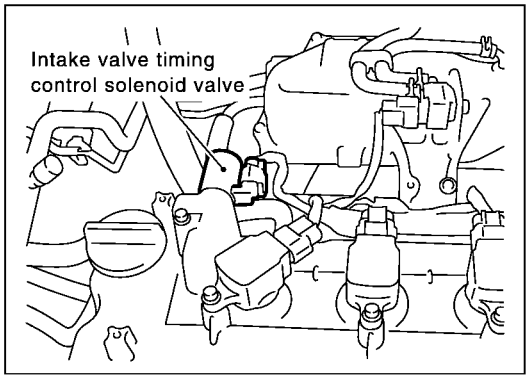
EBS00K3Q

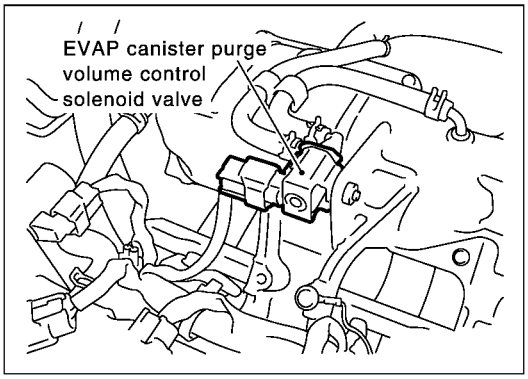


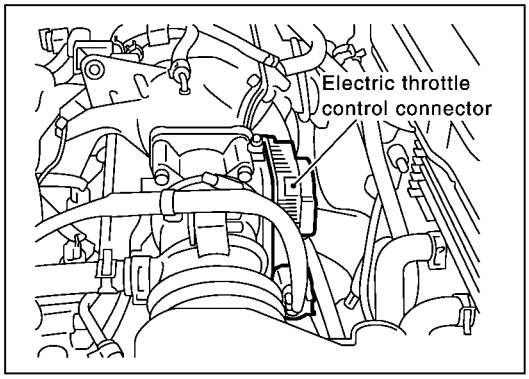
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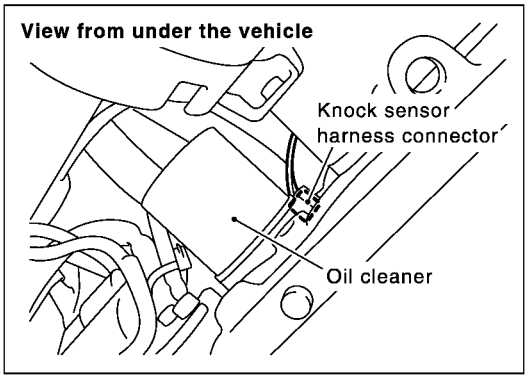

Injector

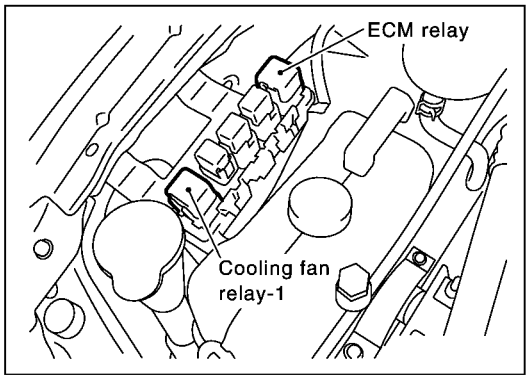

No. 1
No. 2
No. 3
No. 4
Ignition coil

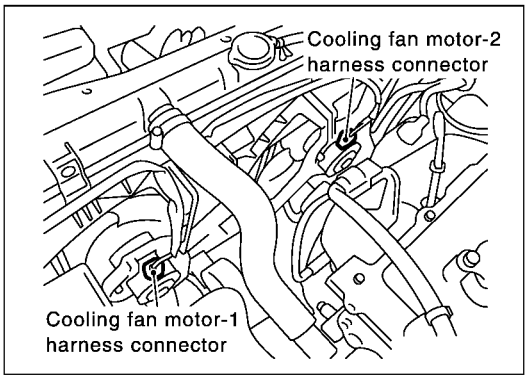

Intake valve timing
control solenoid valve


EVAP canister purge
volume control
solenoid valve

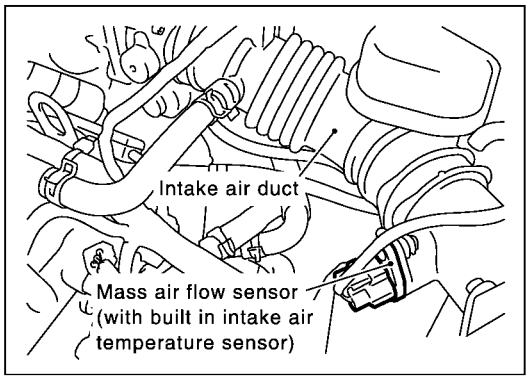

Electric throttle
control connector

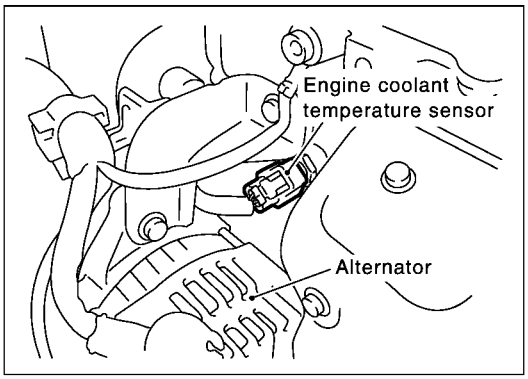

View from under the vehicle
Knock sensor
harness connector
Oil cleaner

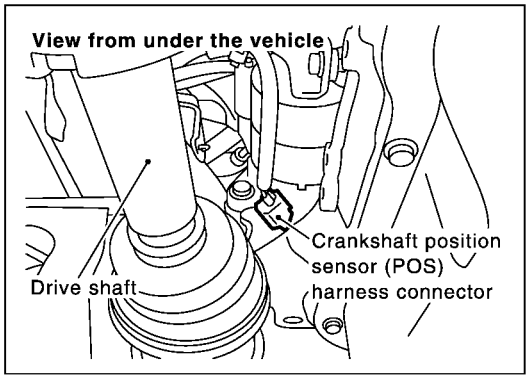

ECM relay
Cooling fan
relay-1

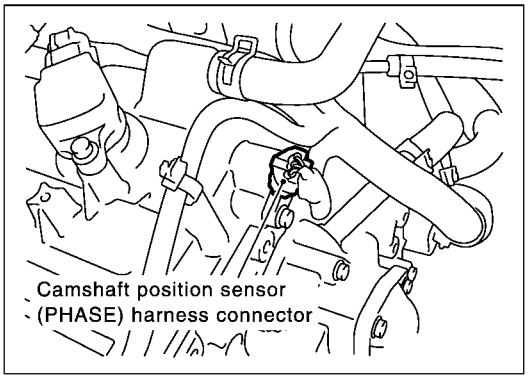

Cooling fan motor-2
harness connector
Cooling fan motor-1
harness connector

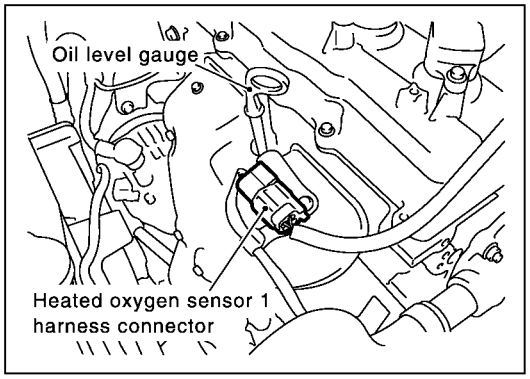
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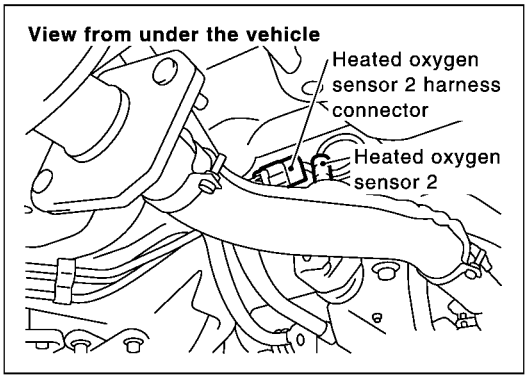

Intake air duct
Mass air flow sensor
(with built in intake air
temperature sensor)

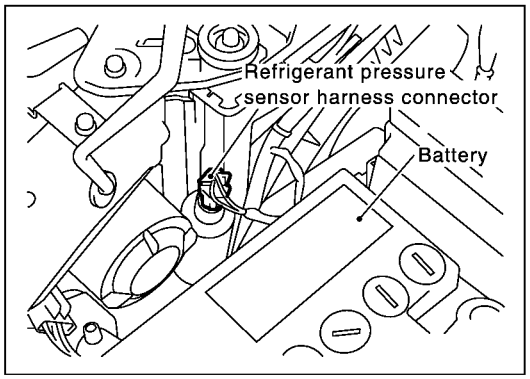

Engine coolant
temperature sensor
Alternator

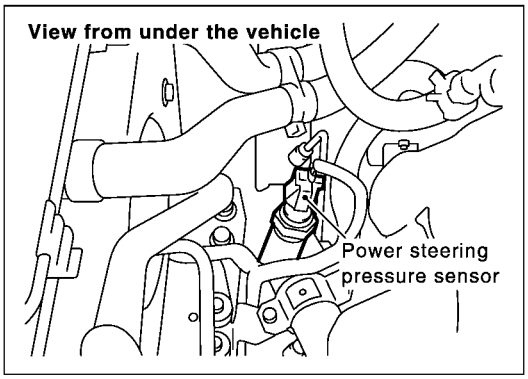

View from under the vehicle
Crankshaft position
sensor (POS)
harness connector
Drive shaft


Camshaft position sensor
(PHASE) harness connector

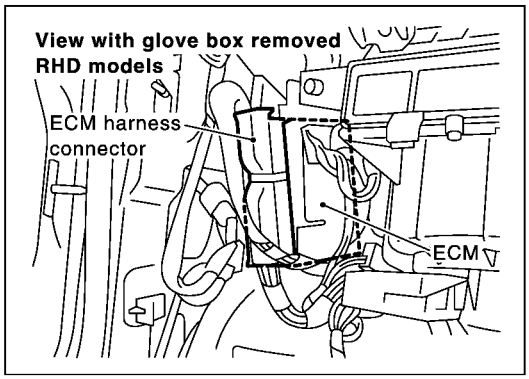

Oil level gauge
Heated oxygen sensor 1
harness connector

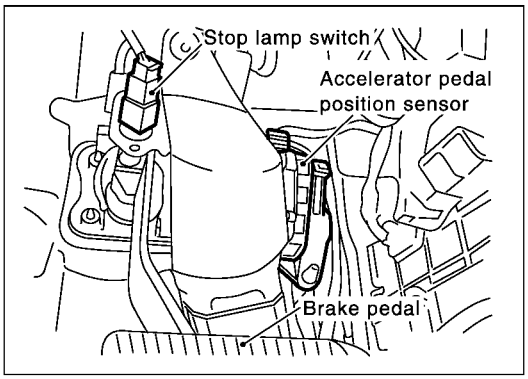

View from under the vehicle
Heated oxygen
sensor 2 harness
connector
Heated oxygen
sensor 2

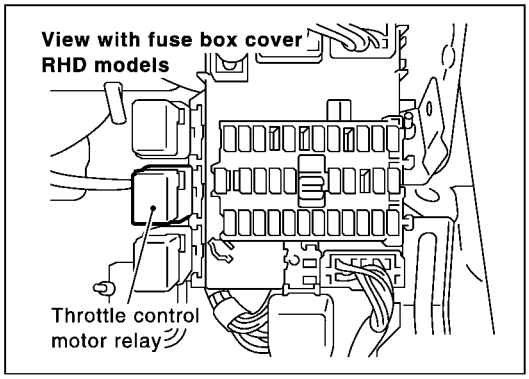

Refrigerant pressure
sensor harness connector
Battery

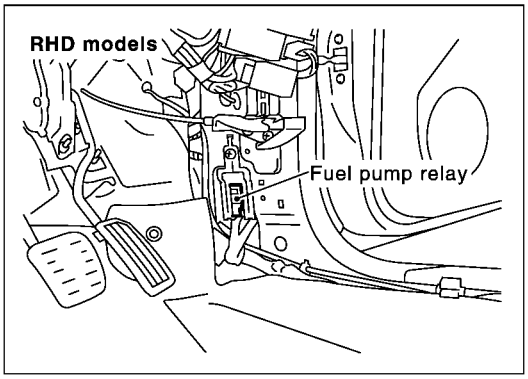

View from under the vehicle
Power steering
pressure sensor

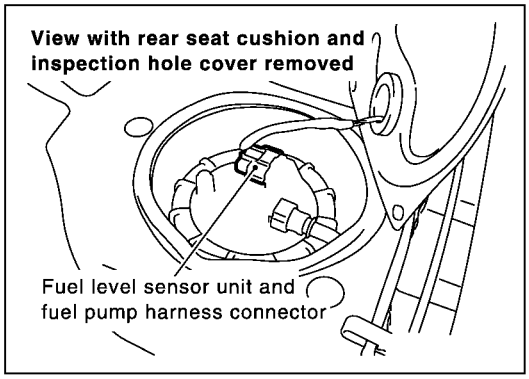
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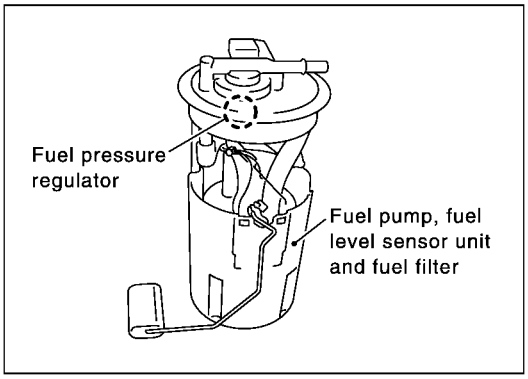

View with glove box removed
RHD models
ECM harness connector
ECM


Stop lamp switch
Accelerator pedal position sensor
Brake pedal


View with fuse box cover
RHD models
Throttle control motor relay


RHD models
Fuel pump relay

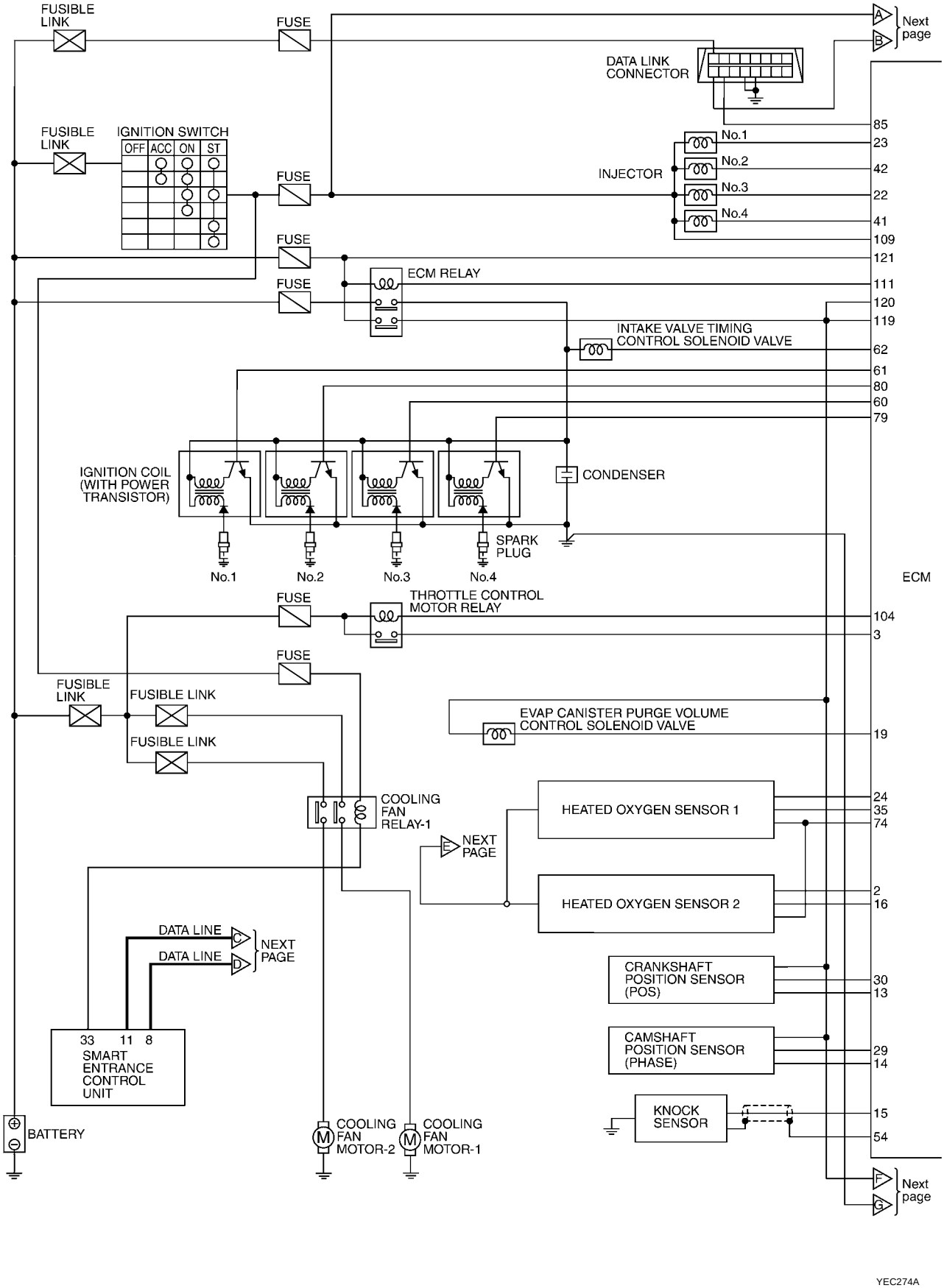

View with rear seat cushion and inspection hole cover removed
Fuel level sensor unit and fuel pump harness connector


Fuel pressure regulator
Fuel pump, fuel level sensor unit and fuel filter

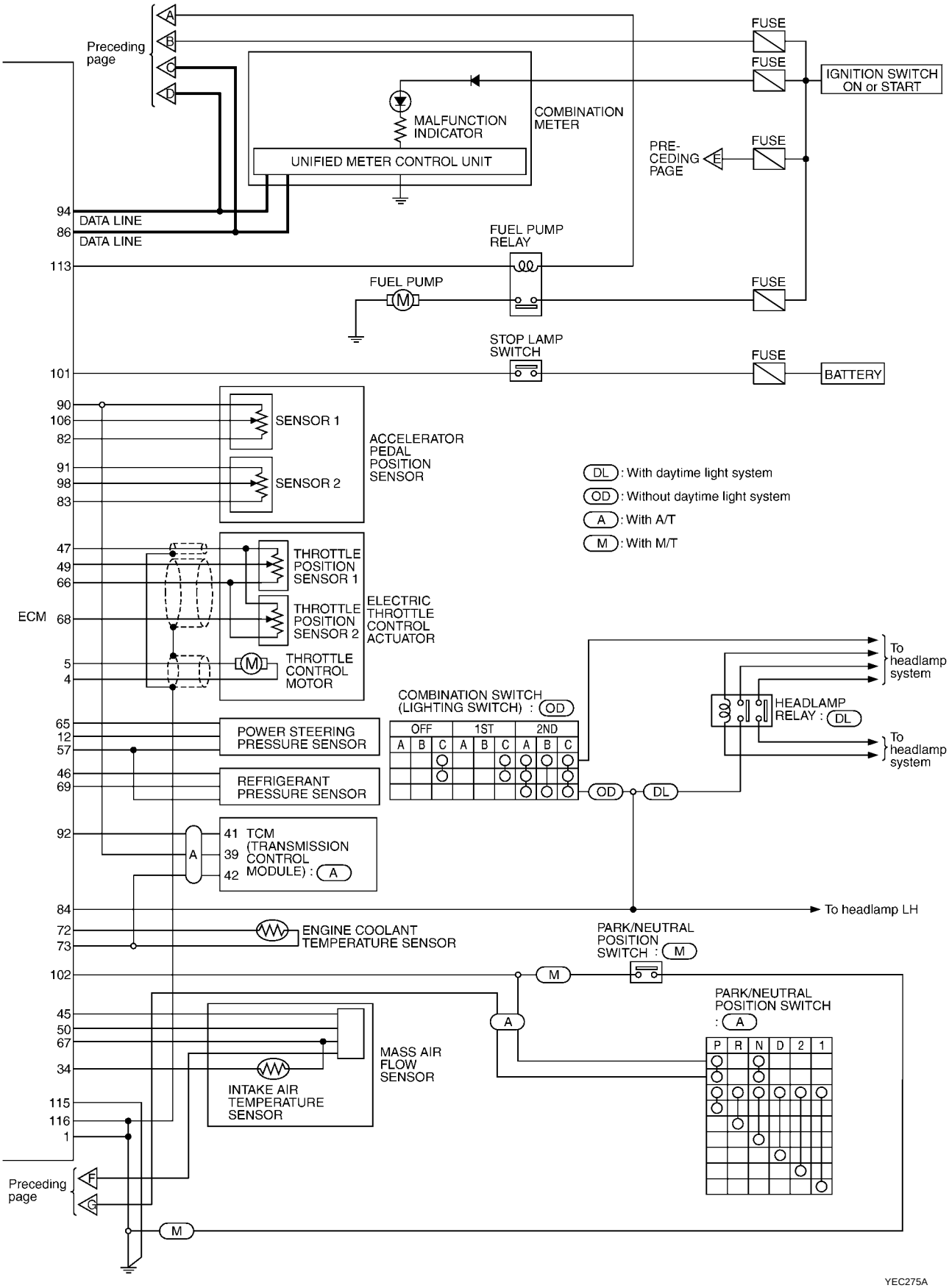
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Circuit Diagram

EBS00K3R

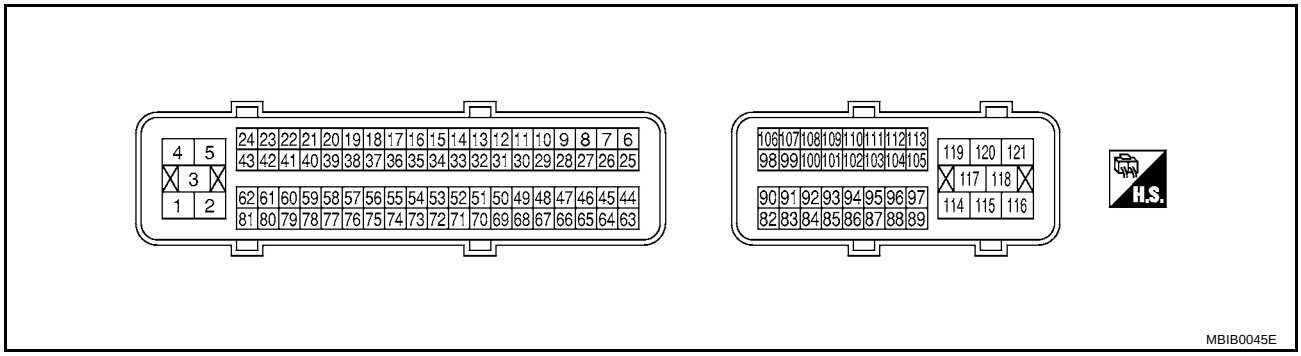


YEC274A


Preceding page
A
B
C
D
FUSE
FUSE
IGNITION SWITCH ON or START
MALFUNCTION INDICATOR
COMBINATION METER
UNIFIED METER CONTROL UNIT
PRE-CEDING PAGE
E
FUSE
94 DATA LINE
86 DATA LINE
FUEL PUMP RELAY
113
FUEL PUMP
M
FUSE
STOP LAMP SWITCH
FUSE
101
BATTERY
90
106
82
SENSOR 1
ACCELERATOR PEDAL POSITION SENSOR
91
98
83
SENSOR 2
DL : With daytime light system
OD : Without daytime light system
A : With A/T
M : With M/T
47
49
66
THROTTLE POSITION SENSOR 1
ECM
68
THROTTLE POSITION SENSOR 2
ELECTRIC THROTTLE CONTROL ACTUATOR
5
4
M
THROTTLE CONTROL MOTOR
COMBINATION SWITCH (LIGHTING SWITCH) : OD
To headlamp system
HEADLAMP RELAY : DL
To headlamp system
OFF
1ST
2ND
A B C A B C A B C
OD
DL
65
12
57
POWER STEERING PRESSURE SENSOR
46
69
REFRIGERANT PRESSURE SENSOR
92
A
41 TCM (TRANSMISSION CONTROL MODULE) : A
39
42
84
To headlamp LH
72
73
ENGINE COOLANT TEMPERATURE SENSOR
PARK/NEUTRAL POSITION SWITCH : M
102
M
PARK/NEUTRAL POSITION SWITCH : A
A
P R N D 2 1
45
50
67
34
MASS AIR FLOW SENSOR
INTAKE AIR TEMPERATURE SENSOR
115
116
1
Preceding page
F
G
M
YEC275A

ECM Harness Connector Terminal Layout

EBS00K3S

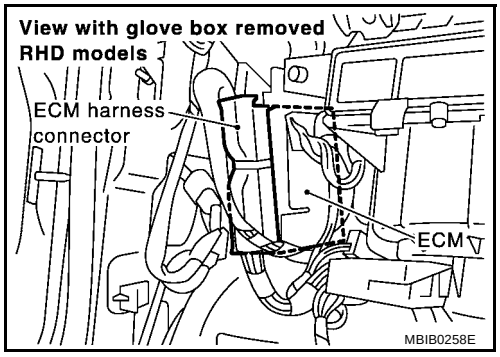


ECM Terminals and Reference Value

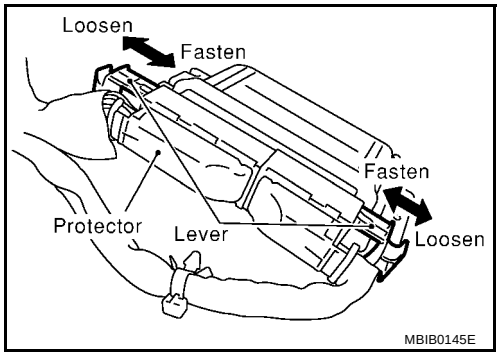
EBS00K3T

PREPARATION

1. ECM is located behind the glove box. For this inspection, remove glove box.
2. Remove ECM harness protector.



3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as shown at right.
4. Connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



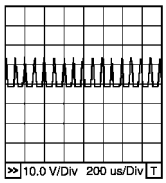
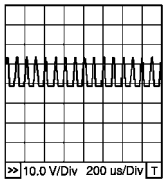
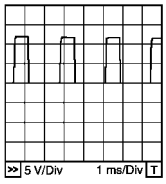
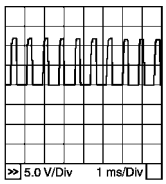
ECM INSPECTION TABLE

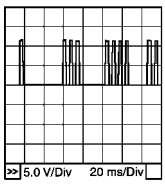
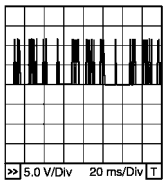
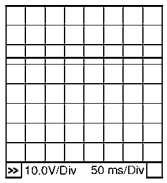
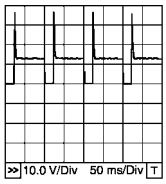
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

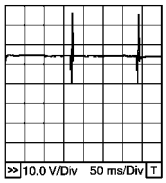
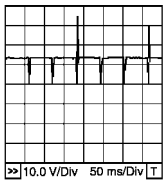
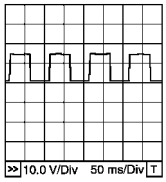
CAUTION:

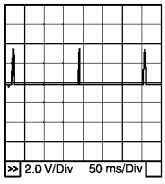
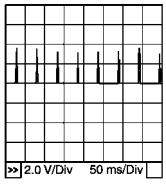
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

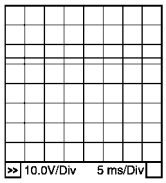
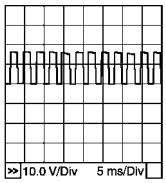
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed: Below 3,800 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,800 rpm.	BATTERY VOLTAGE (11 - 14V)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	W (LHD) BR (RHD)	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is releasing.	0 - 14V★  PBIB0534E
5	B (LHD) Y (RHD)	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is depressing.	0 - 14V★  PBIB0533E
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8V
13	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 3.0V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 3,000 rpm quickly after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	Approximately 10V★  PBIB0520E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,200 rpm (A/T models). ● Engine speed is below 3,600 rpm (M/T models).	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,200 rpm (A/T models). ● Engine speed is above 3,600 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V
30	B	Crankshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V
34	BR	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is ″D″ (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is ″D″ (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	Less than 4.75V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
54	-	Sensor ground (Knock sensor shield circuit)	**[Engine is running]** ● Idle speed	Approximately 0V
57	B	Sensor ground (Power steering pressure sensor/Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly.	7 - 10V★  PBIB0532E
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is ″D″ (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is ″D″ (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	More than 0.36V
69	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V
72	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
73	B	Sensor ground (Engine coolant temperature sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2nd" position.	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF".	Approximately 0V
85	LG	DATA link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	R	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.3V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
94	L	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.8V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.175 - 0.335V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 1.95V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released.	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed.	BATTERY VOLTAGE (11 - 14V)
102	P (A/T) G/OR (M/T)	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models). ● Shift lever position is "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position.	Approximately 5V
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.35 - 0.67V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 3.9V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
109	B/R	Ignition switch	**[Ignition switch “OFF”]**	0V
			[Ignition switch “ON”]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch “OFF”]** ● For 5 seconds after turning ignition switch “OFF”.	0 - 1.0V
			[Ignition switch “OFF”] ● 5 seconds passed after turning ignition switch “OFF”.	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch “ON”]** ● For 1 second after turning ignition switch “ON”. **[Engine is running]**	0 - 1.0V
			[Ignition switch “ON”] ● More than 1 second after turning ignition switch “ON”.	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch “OFF”]**	BATTERY VOLTAGE (11 - 14V)

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

CONSULT-II Function

EBS00K3U

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECM part number	ECM part number can be read.

*1: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE						
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	×			
		Camshaft position sensor (PHASE)		×	×	×	×			
		Mass air flow sensor		×		×	×			
		Engine coolant temperature sensor		×	×	×	×	×		
		Heated oxygen sensor 1		×		×	×		×	×
		Heated oxygen sensor 2		×		×	×		×	×
		Vehicle speed signal		×	×	×	×			
		Accelerator pedal position sensor		×		×	×			
		Throttle position sensor		×		×	×			
		Intake air temperature sensor		×	×	×	×			
		Knock sensor		×						
		Refrigerant pressure sensor				×	×			
		Closed throttle position switch (accelerator pedal position sensor signal)				×	×			
		Air conditioner switch				×	×			
		Park/neutral position (PNP) switch		×		×	×			
		Stop lamp switch		×		×	×			
		Power steering pressure sensor		×		×	×			
		Battery voltage				×	×			
		Electrical load signal				×	×			
	OUTPUT	Injectors				×	×	×		
		Power transistor (Ignition timing)				×	×	×		
		Throttle control motor relay		×		×	×			
		Throttle control motor		×						
		EVAP canister purge volume control solenoid valve		×		×	×	×		
		Air conditioner relay				×	×			
		Fuel pump relay	×			×	×	×		
		Cooling fan relay		×		×	×	×		
		Heated oxygen sensor 1 heater		×		×	×		×	
		Heated oxygen sensor 2 heater		×		×	×		×	
		Intake valve timing control solenoid valve		×		×	×	×		
		Calculated load value			×	×	×			

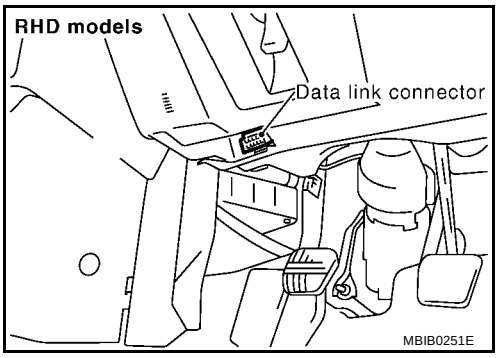
X: Applicable

*1: This item includes 1st trip DTCs.

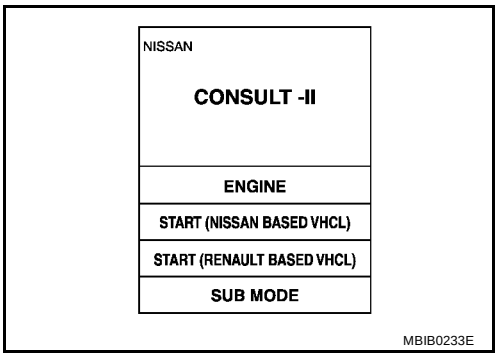
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-40, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .

CONSULT-II INSPECTION PROCEDURE

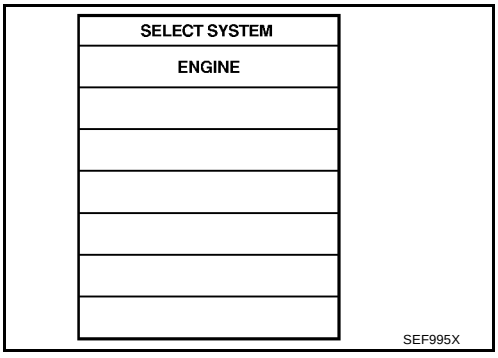
1. Turn ignition switch OFF.
2. Connect “CONSULT-II” and ″CONSULT-II CONVERTER″ to data link connector, which is located under the drivers side dash panel.
3. Turn ignition switch ON.



4. Touch “START (NISSAN BASED VHCL)”.

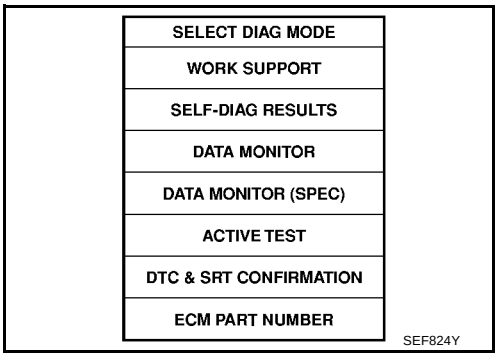


5. Touch “ENGINE”.
   If ″ENGINE″ is not indicated, go to GI-38.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to EC-10, "INDEX FOR DTC" .

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to EC-10, "INDEX FOR DTC" .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*1: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE
Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	CAN DIAG SUPPORT MNTR	Description	Remarks
ENG SPEED [rpm]	×	×		● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×		● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×		● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×		● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	×	×		● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×		● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1) [V]	×			● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	×	×		● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	×			● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	×	×		● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×		● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	×	×		● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×				

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
THRTL SEN 1 [V]	×	×		● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×				
INT/A TEMP SE [°C] or [°F]	×	×		● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the starter signal computed from the signals of the crankshaft position sensor (POS), camshaft position sensor (PHASE) and battery voltage.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×		● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×		● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×			● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×		● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		×		● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]				● “Calculated load value” indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]				● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
PURG VOL C/V [%]				● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]				● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]				● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
AIR COND RLY [ON/OFF]		×		● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×		● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
THRTL RELAY [ON/OFF]		×		● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [ON/OFF]				● Indicates the condition of the cooling fan (determined by ECM according to the input signals). ON ... Operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
VEHICLE SPEED [km/h] or [mph]	×			● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
IDL A/V LEARN [YET/CMPLT]				● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully.	
TRVL AFTER MIL [km] or [mile]				● Distance traveled while MI is activated.	
O2SEN HTR DTY [%]				● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals.	
AC PRESS SEN [V]	×			● The signal voltage from the refrigerant pressure sensor is displayed.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
Voltage [V]				● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]					
DUTY-HI					
DUTY-LOW					
PLS WIDTH-HI					
PLS WIDTH-LOW					
CAN COMM [OK/NG]			×	● Indicates the communication condition of CAN communication line.	● These items are not displayed in "SELECTION FROM MENU" mode.
CAN CIRC 1 [OK/UNKWN]			×		
CAN CIRC 2 [OK/UNKWN]			×		
CAN CIRC 3 [OK/UNKWN]			×		
CAN CIRC 4 [OK/UNKWN]			×		
CAN CIRC 5 [OK/UNKWN]			×		
CAN CIRC 6 [OK/UNKWN]			×		
CAN CIRC 7 [OK/UNKWN]			×		

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE
Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signal of the crankshaft position sensor (POS).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]		×	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform “Idle Air Volume Learning”.
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever: N (A/T models) Neutral (M/T models) ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN*	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

*: Leaving cooling fan ″OFF″ with CONSULT-II while engine is running may cause the engine to overheat.

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to EC-40, "SYSTEM READINESS TEST (SRT) CODE" .

SRT Work Support Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

DTC Work Support Mode

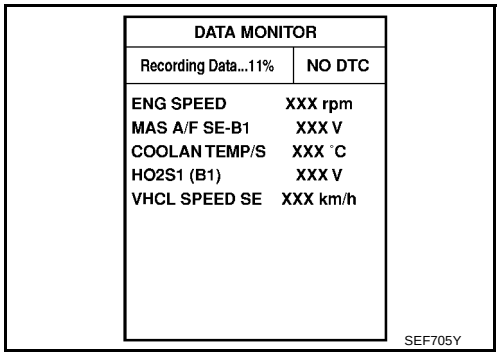
Test mode	Test item	Condition	Reference page
HO2S1	HO2S1 (B1) P0133	Refer to corresponding trouble diagnosis for DTC.	EC-155
	HO2S1 (B1) P0134		EC-165
	HO2S1 (B1) P1143		EC-296
	HO2S1 (B1) P1144		EC-302
H02S2	HO2S2 (B1) P0139		EC-178
	HO2S2 (B1) P1146		EC-308
	HO2S2 (B1) P1147		EC-316

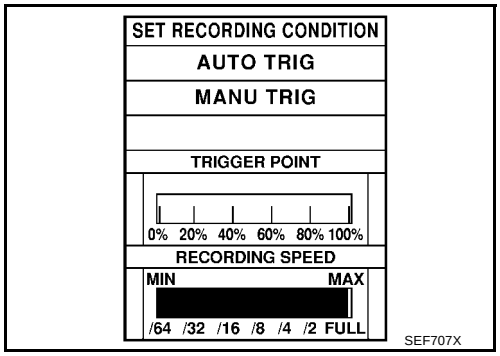
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

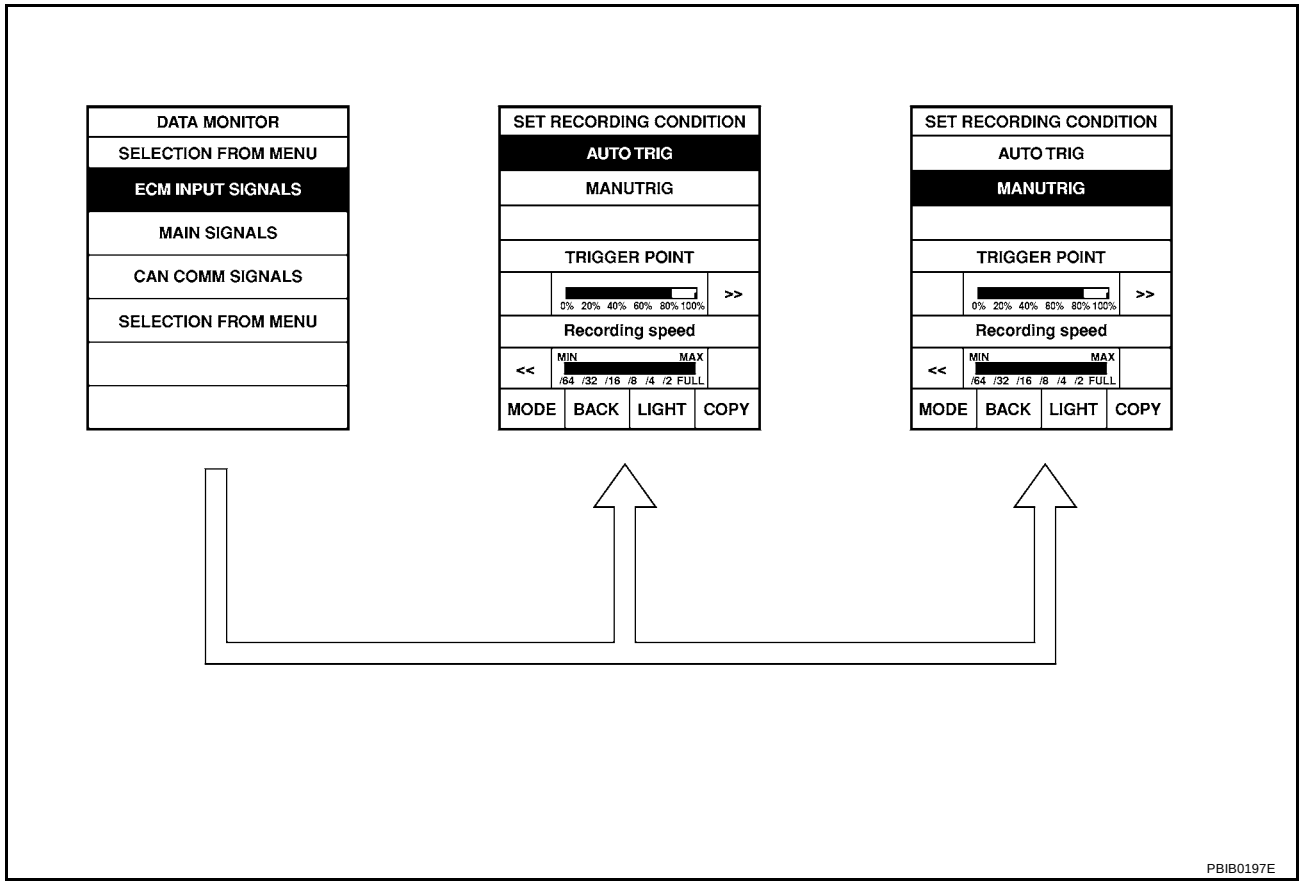
1. “AUTO TRIG” (Automatic trigger):
   - The malfunction will be identified on the CONSULT-II screen in real time.
     In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
     At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
     The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.
2. “MANU TRIG” (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.





Operation

1. “AUTO TRIG”
   - While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in GI-23.)
2. “MANU TRIG”
   - If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

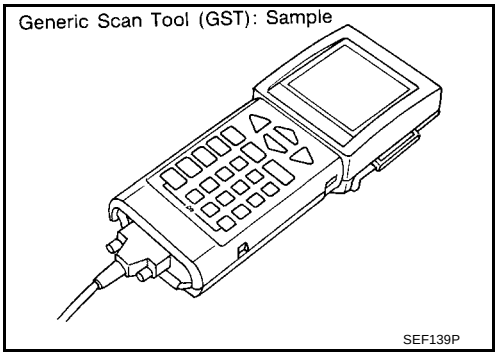


Generic Scan Tool (GST) Function

EBS00K3V

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with ISO 15031-4 has 8 different functions explained below.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.

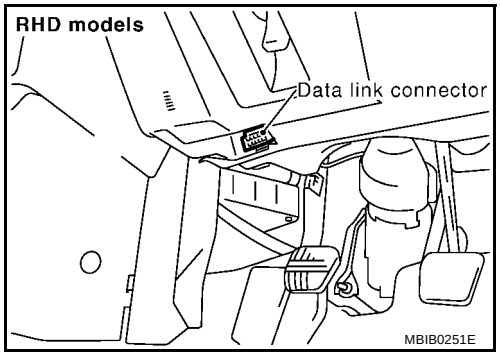


FUNCTION

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-40, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode is not applicable on this vehicle.
MODE 9	(CALIBRATION ID)	This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

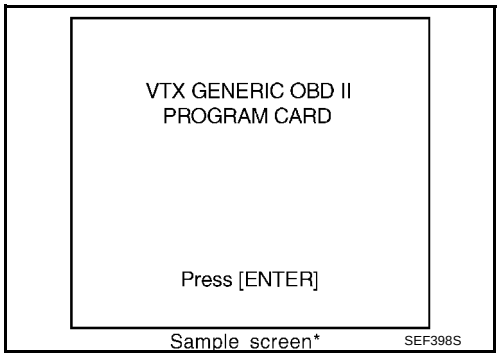
GST INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect “GST” to data link connector, which is located under the driver side dash panel near the fuse box cover.
3. Turn ignition switch ON.



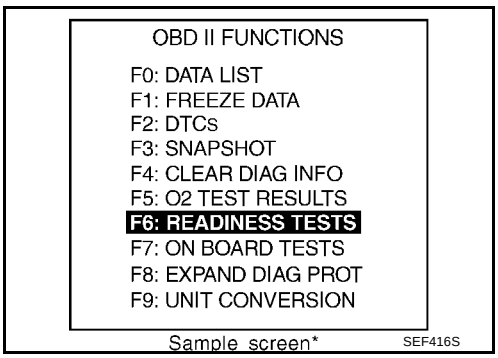
4. Enter the program according to instruction on the screen or in the operation manual.

(*: Regarding GST screens in this section, sample screens are shown.)



5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K3W

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	75% - 125%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T models) Neutral (M/T models)	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	M/T: 8°±5° BTDC A/T: 10°±5° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%

MONITOR ITEM	CONDITION		SPECIFICATION
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s
PURG VOL C/V	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
THRTL RELAY	● Ignition switch: ON		ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm (M/T models) Below 3,200 rpm (A/T models)		ON
	● Engine speed: Above 3,600 rpm (M/T models) Above 3,200 rpm (A/T models)		OFF
HO2S2 HTR (B1)	● Engine speed: Below 3,800 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load		ON
	● Engine speed: Above 3,800 rpm		OFF
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,280 km (0 - 40,565 mile)
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80° (176°F) ● Engine speed: Below 3,600 rpm (M/T models) Below 3,200 rpm (A/T models)		Approx. 50%

MONITOR ITEM	CONDITION	SPECIFICATION
AC PRESS SEN	● Ignition switch: ON (Engine stopped)	Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF	1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value
CAN COMM	● Ignition switch: ON	OK
CAN CIRC 1		OK
CAN CIRC 2		OK or UNKWN
CAN CIRC 3		UNKWN
CAN CIRC 4		OK
CAN CIRC 5		UNKWN
CAN CIRC 6		OK
CAN CIRC 7		UNKWN

*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

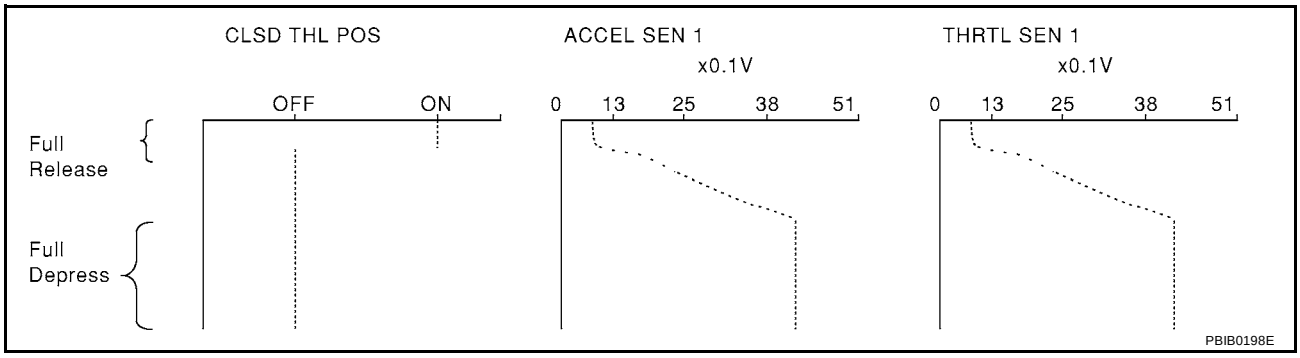
Major Sensor Reference Graph in Data Monitor Mode

EBS00K3X

The following are the major sensor reference graphs in “DATA MONITOR” mode.

CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

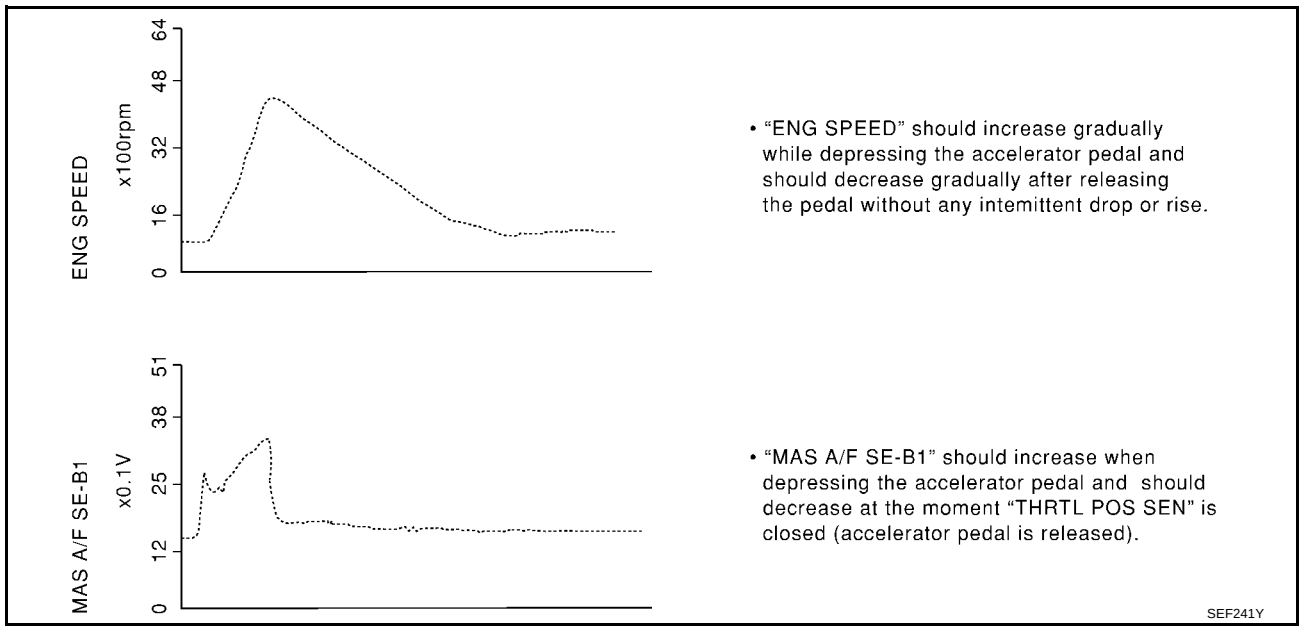
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position (A/T models) or with shift lever in “1st” position (M/T models).
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.



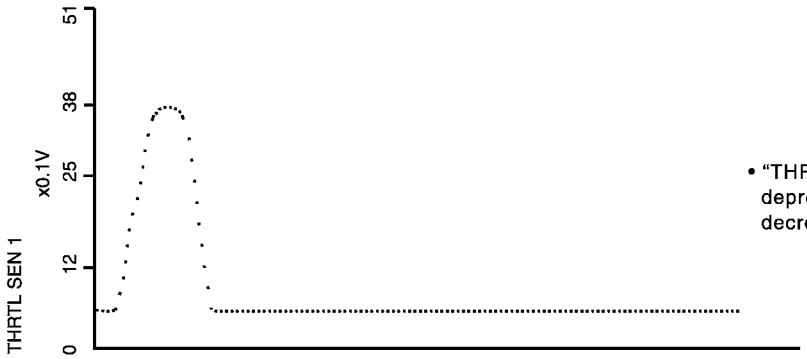
ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

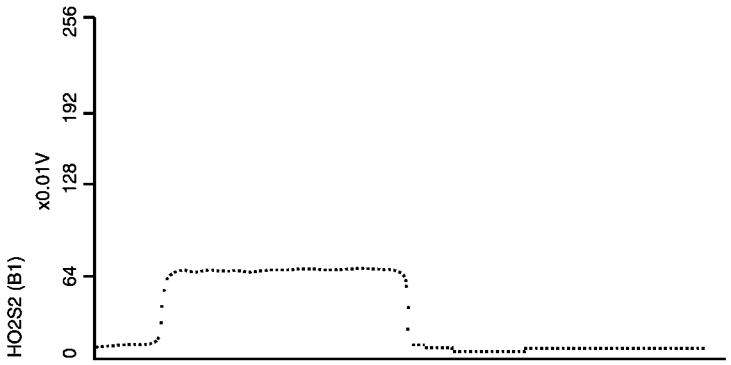
Each value is for reference, the exact value may vary.



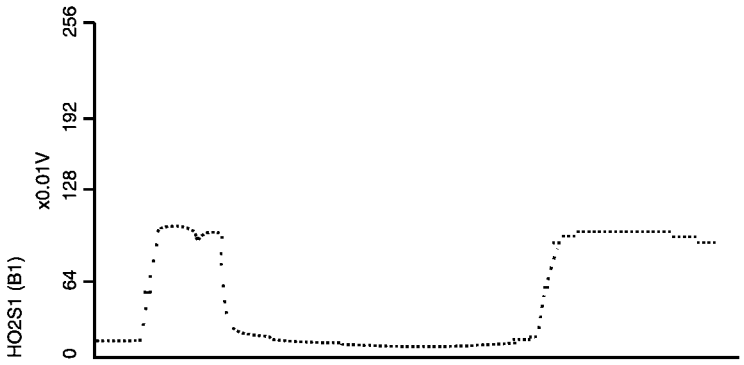
- "ENG SPEED" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intemittent drop or rise.
- "MAS A/F SE-B1" should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).



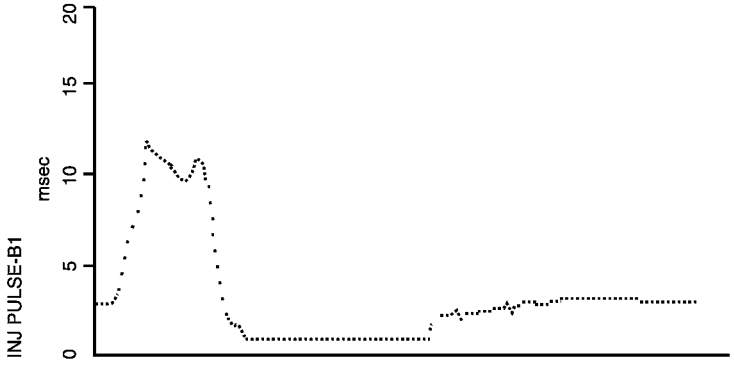
- "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



- "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



- "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



- "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

EBS00K3Y

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

EBS00K3Z

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.983 - 1.043 bar, 1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

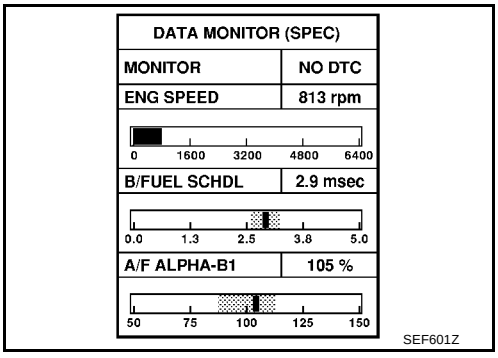
*1: For A/T models, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
For M/T models, after the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

Inspection Procedure

EBS00K40

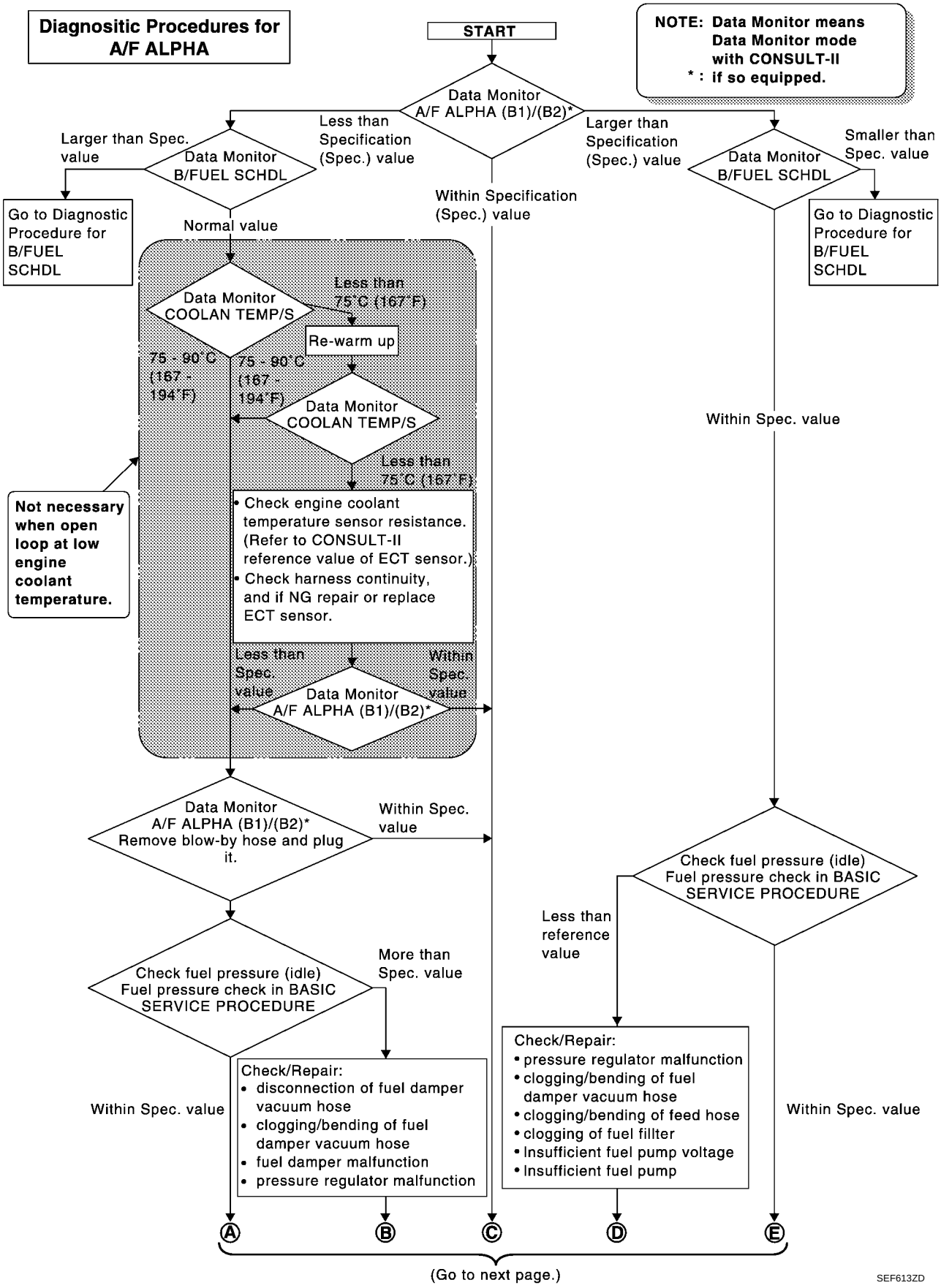
NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

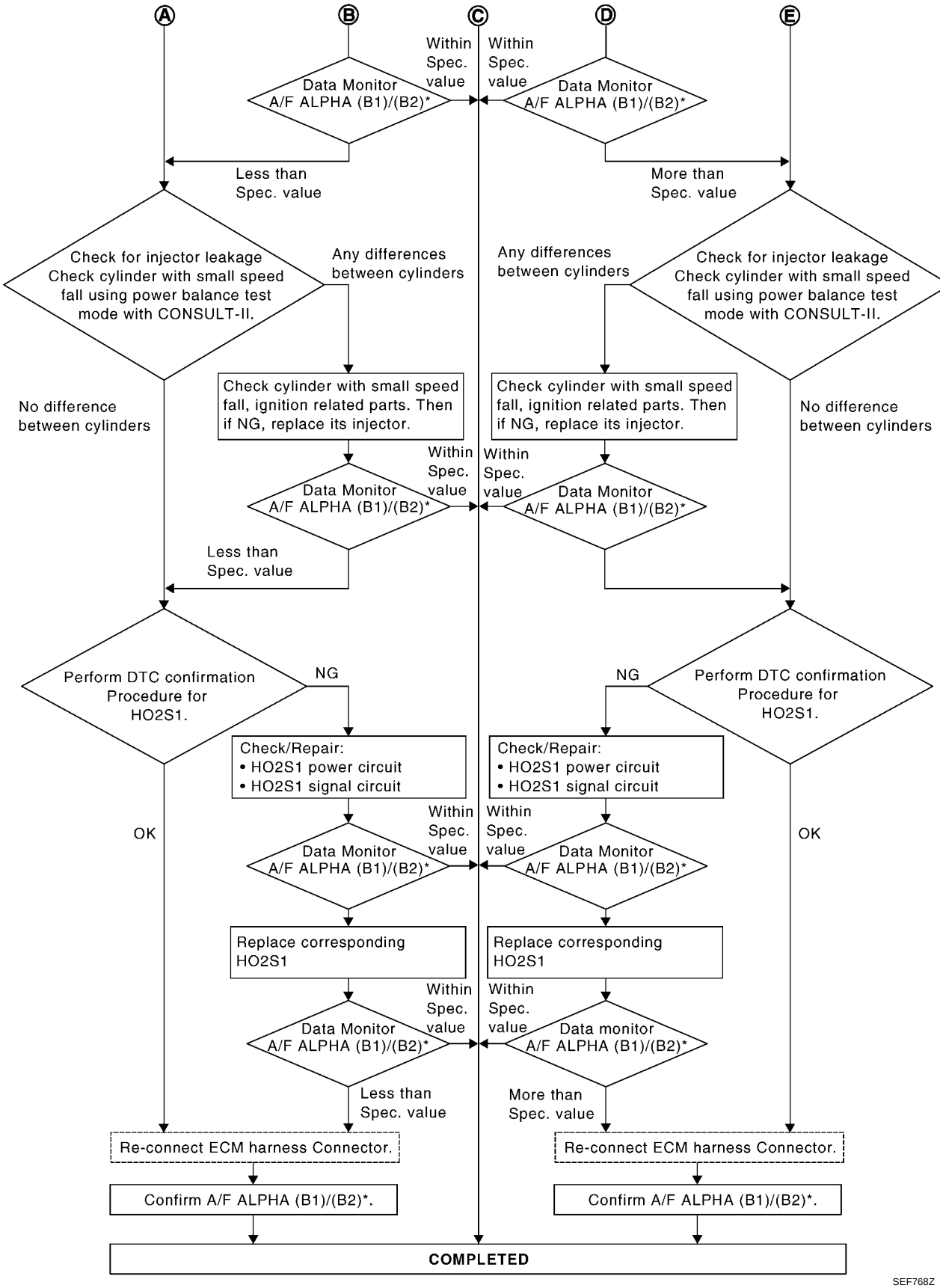
1. Perform EC-65, "Basic Inspection" .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1/B2” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-106, "Diagnostic Procedure" .



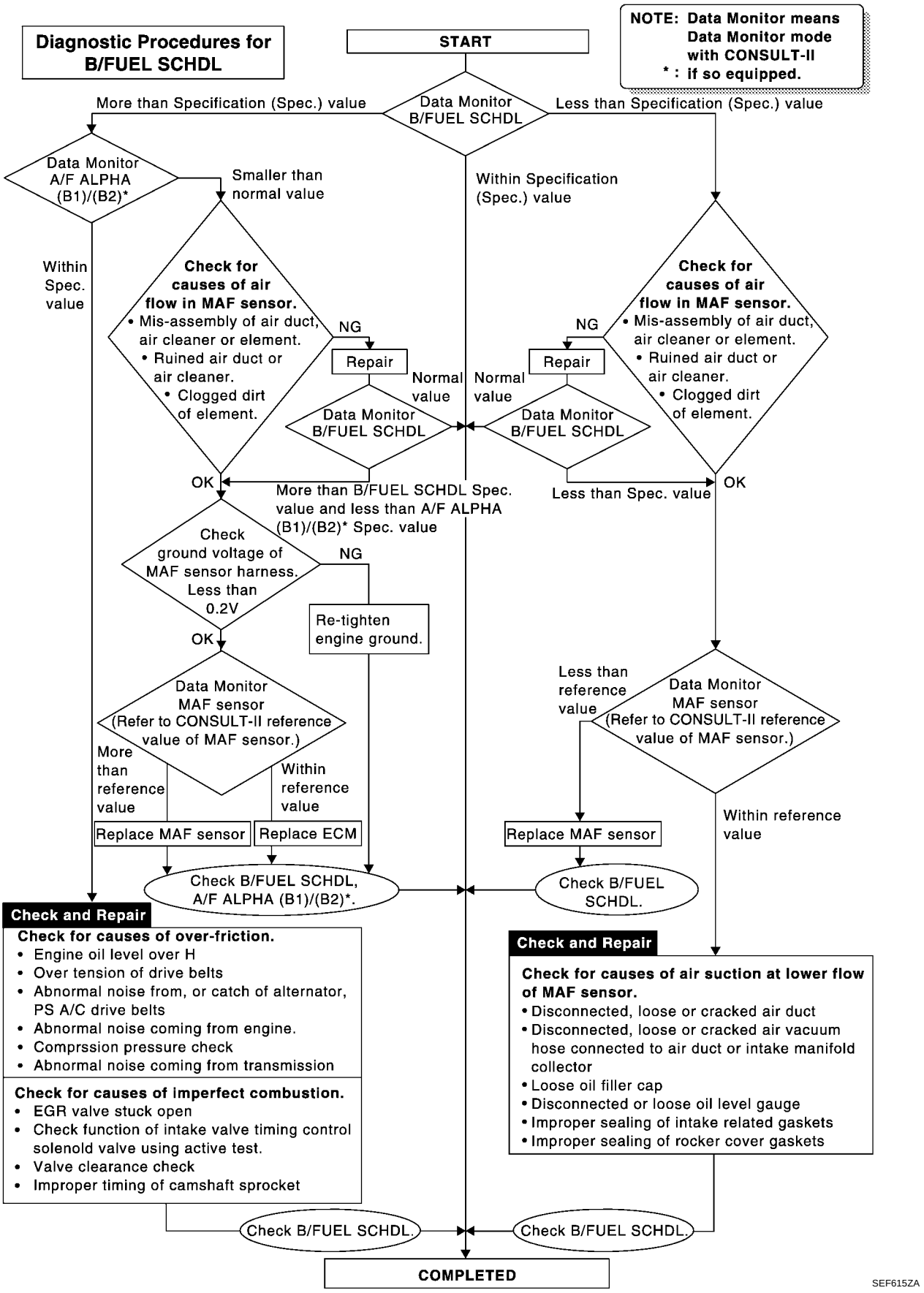
Diagnostic Procedure

EBS00K41




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED

SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
NG
Re-tighten engine ground.
OK
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check B/FUEL SCHDL.
Less than Spec. value
Less than reference value
Replace MAF sensor
Check B/FUEL SCHDL.
Within reference value
Check and Repair
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

EBS00K42

Intermittent incidents (I/I) may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “[1t]”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the malfunctioning area.

Diagnostic Procedure

EBS00K43

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-23, “Incident Simulation Tests”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-23, “Incident Simulation Tests”.

OK or NG

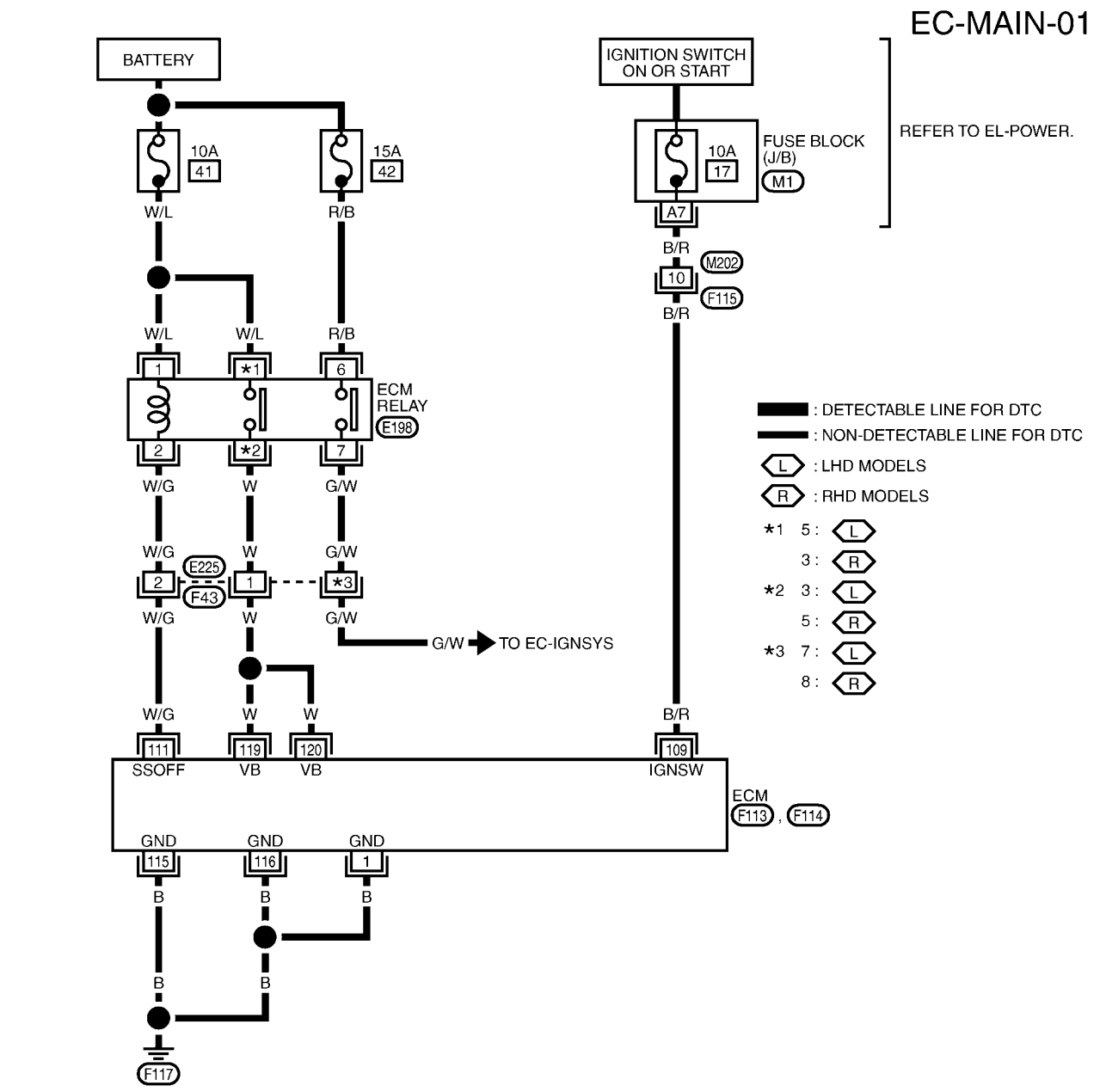
OK >> **INSPECTION END**
NG >> Repair or replace.

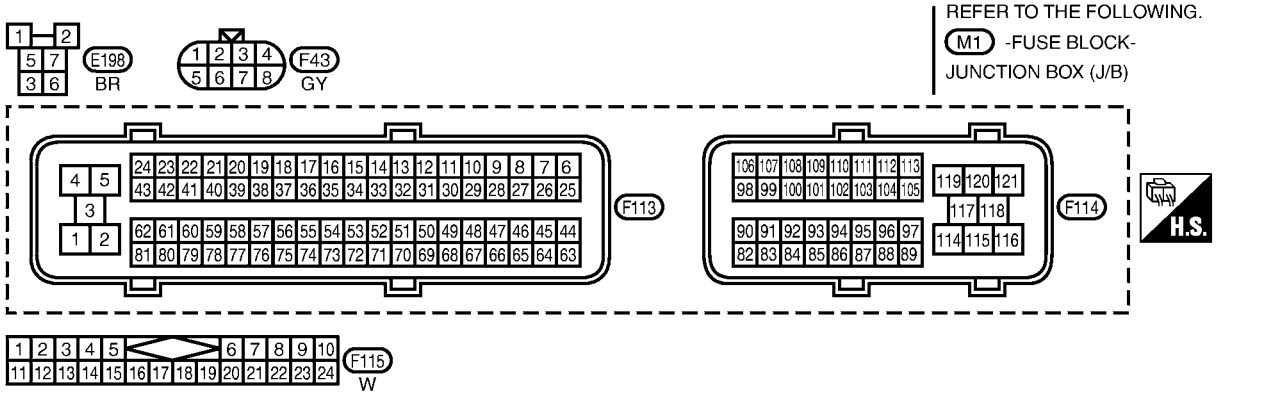
POWER SUPPLY CIRCUIT FOR ECM

PFP:24110

Wiring Diagram

EBS00K44





YEC276A

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)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 3 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 3 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00K45

1. INSPECTION START

Start engine.

Is engine running?

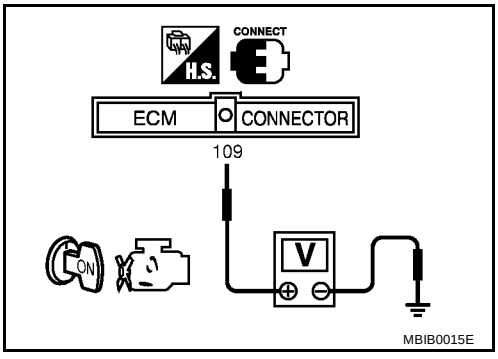
Yes or No

Yes >> GO TO 10.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and fuse

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

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

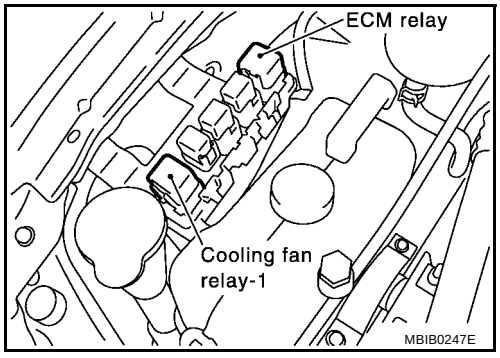
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

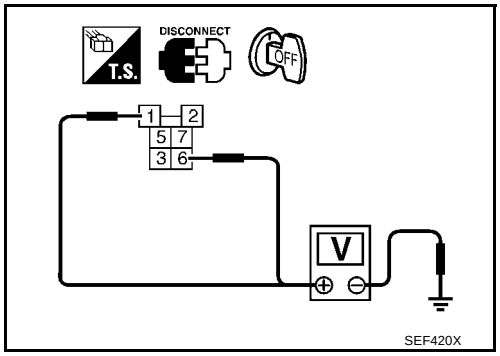
5. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminals 1 and 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- 15A fuse
- Harness for open or short between ECM relay and battery

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

7. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between ECM and ECM relay

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

9. CHECK ECM RELAY

Refer to EC-115, "Component Inspection" .

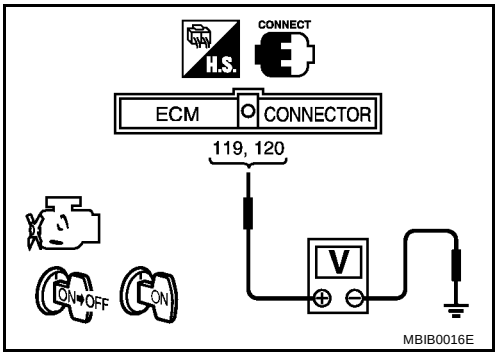
OK or NG

OK >> GO TO EC-365, "IGNITION SIGNAL" .
NG >> Replace ECM relay.

10. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Stop engine and wait at least 10 seconds.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

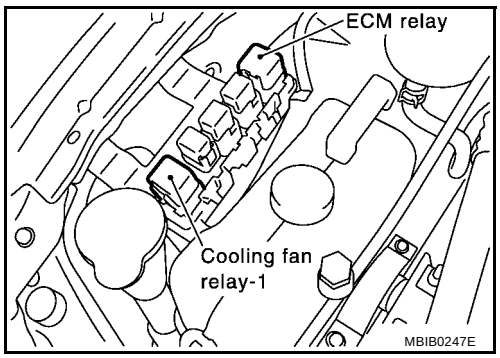


OK or NG

OK >> GO TO 14.
NG (Battery voltage does not exist.)>>GO TO 11.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 12.

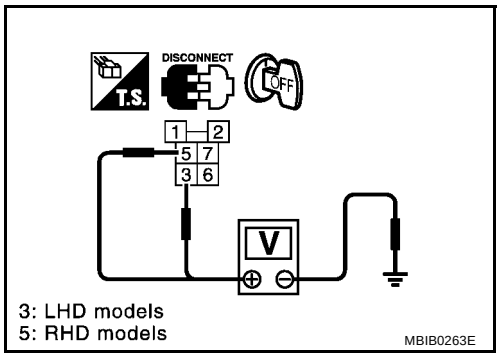
11. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 (LHD models) or 5 (RHD models) and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 119, 120 and ECM relay terminal 3 (RHD models) or 5 (LHD models).
   Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between ECM and ECM relay

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

14. CHECK ECM RELAY

Refer to EC-115, "Component Inspection" .

OK or NG

OK >> GO TO 15.
NG >> Replace ECM relay.

15. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to power in harness or connectors.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> **INSPECTION END**

Component Inspection

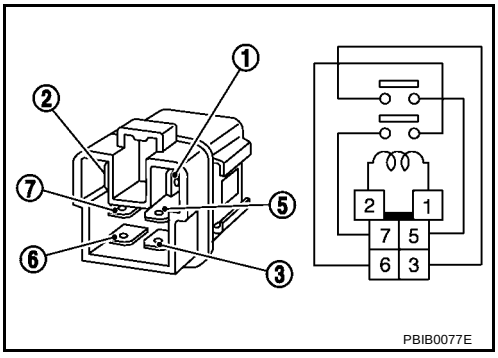
EBS00K46

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

EBS00K47

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

EBS00K48

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000*1 1000*1	CAN communication line	● ECM can not communicate to other control units. ● ECM can not communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted).
U1001*2 1001*2			

***1: This self-diagnosis has the one trip detection logic.**

***2: The MI will not light up for this diagnosis.**

DTC Confirmation Procedure

EBS00K49

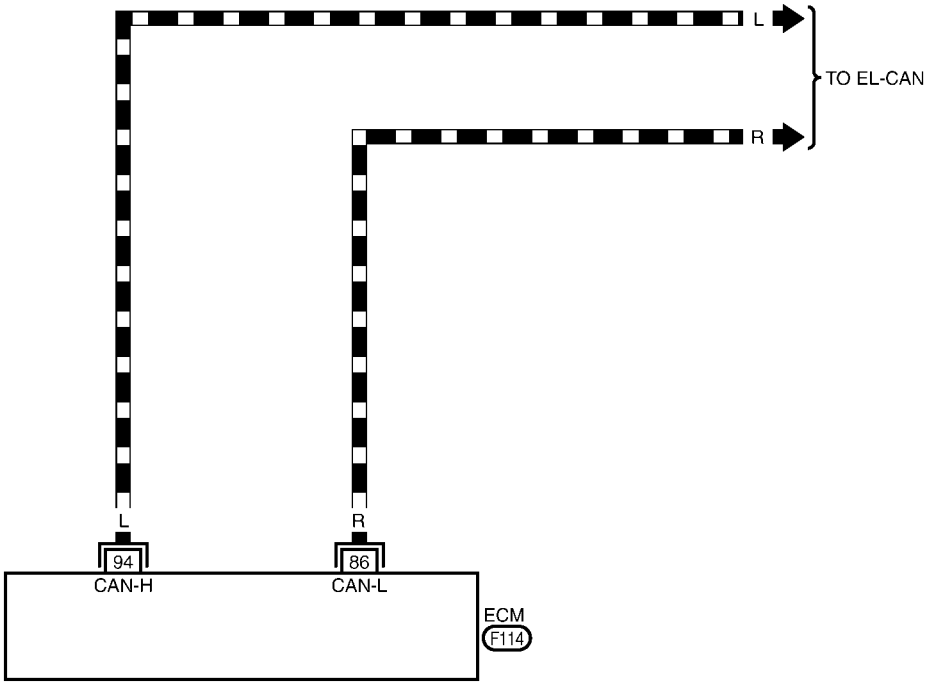
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-118, "Diagnostic Procedure" .

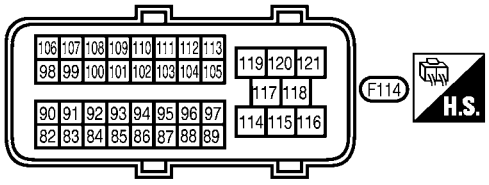
Wiring Diagram

EBS00K4A

EC-CAN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
: DATA LINE





YEC277A

Diagnostic Procedure

EBS00K4B

1. INSPECTION START

1. Turn ignition switch “ON”.
2. Select “CAN DIAG SUPPORT MNTR” in “DATA MONITOR” mode with CONSULT-II.
3. Print out the CONSULT-II screen.

A/T models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	OK
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0180E

M/T models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0179E

>> GO TO EL-509.

DTC P0011 IVT CONTROL

PFP:23796

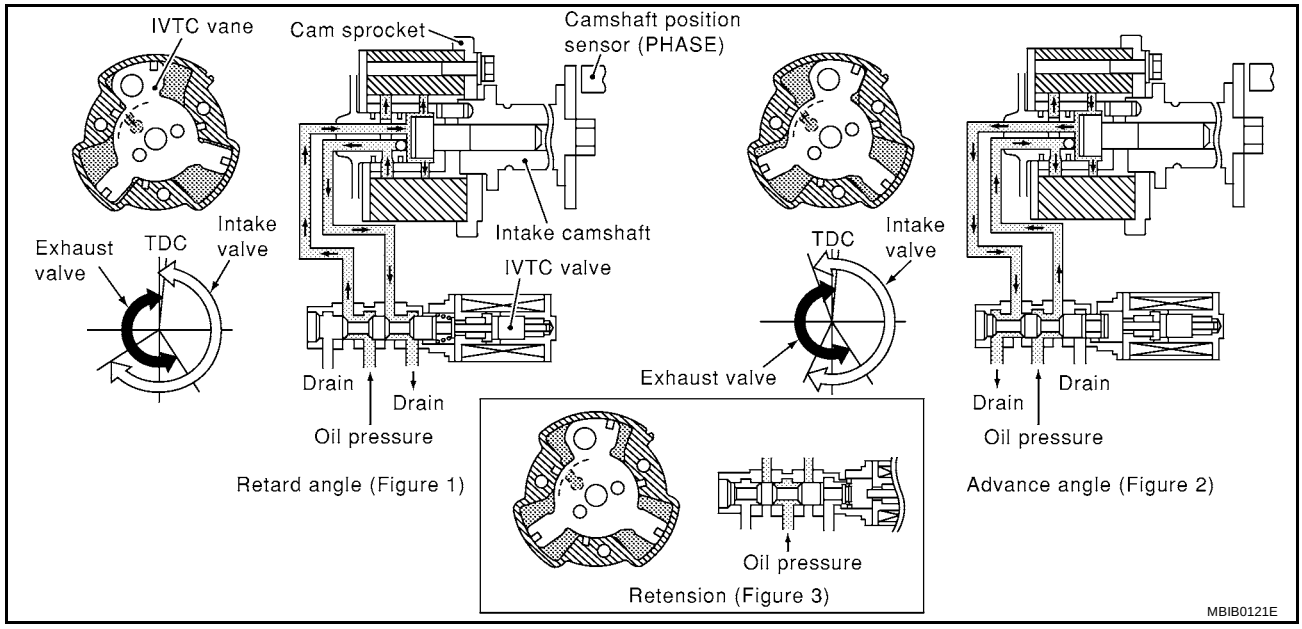
Description

EBS00K4C

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

CONSULT-II Reference Value in Data Monitor Mode

EBS00K4D

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%

On Board Diagnosis Logic

EBS00K4E

The MI will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	● Crankshaft position sensor (POS) ● Camshaft position sensor (PHASE) ● Accumulation of debris to the signal pick-up portion of the camshaft

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

EBS00K4F

CAUTION:
Always drive at a safe speed.

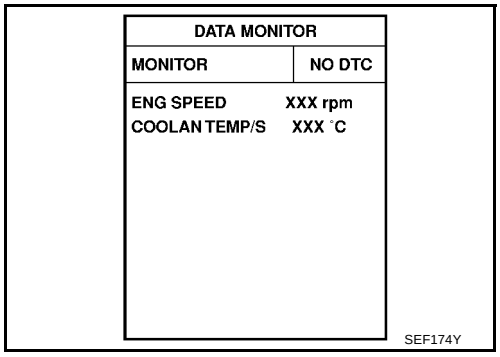
NOTE:

- **If DTC P0011 is displayed with DTC P1111, first perform trouble diagnosis for “DTC P1111”. See EC-272, "DTC P1111 IVT CONTROL SOLENOID VALVE" .**
- 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 between 10V and 16V at idle.

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. Maintain the following conditions for at least 20 consecutive seconds.



VHCL SPEED SE	100 - 120 km/h (63 - 75 MPH)
ENG SPEED	2,000 - 4,000 rpm
COOLANT TEMPS	60 - 120°C (140 - 248°F)
B/FUEL SCHDL	More than 3.38 msec
Selector lever	A/T models: D position M/T models: 5th position

4. Stop vehicle with engine running and let engine idle for 10 seconds.
5. If 1st trip DTC is detected, go to EC-121, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
6. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLANT TEMPS	70 - 105°C (176 - 194°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

7. If 1st trip DTC is detected, go to EC-121, "Diagnostic Procedure" .

WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00K4G

1. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-238, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace crankshaft position sensor (POS).

2. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-244, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace camshaft position sensor (PHASE).

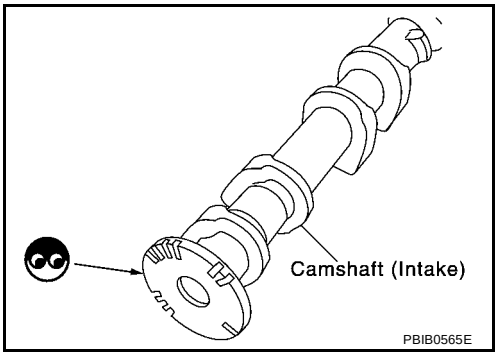
3. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 4.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



4. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For wiring diagram refer to EC-235, "Wiring Diagram" for CKP sensor (POS) and EC-241, "Wiring Diagram" for CMP sensor (PHASE).

>> **INSPECTION END**

DTC P0031, P0032 HO2S1 HEATER

PFP:22690

Description

EBS00K4H

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,200 (A/T models) Above 3,600 (M/T models)	OFF
Below 3,200 after warning up (A/T models). Below 3,600 after warning up (M/T models).	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00K4I

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,200 rpm (A/T models) Below 3,600 rpm (M/T models)	ON
	● Engine speed: Above 3,200 rpm (A/T models) Above 3,600 rpm (M/T models)	OFF

On Board Diagnosis Logic

EBS00K4J

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heater oxygen sensor 1 heater
P0032 0032	Heated oxygen sensor 1 heater control circuit high	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heater oxygen sensor 1 heater

DTC Confirmation Procedure

EBS00K4K

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.

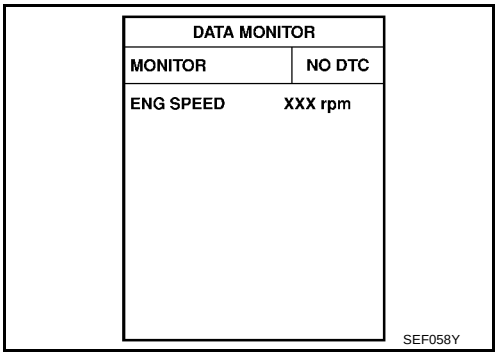
TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

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

3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and run it for at least 6 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-125, "Diagnostic Procedure" .



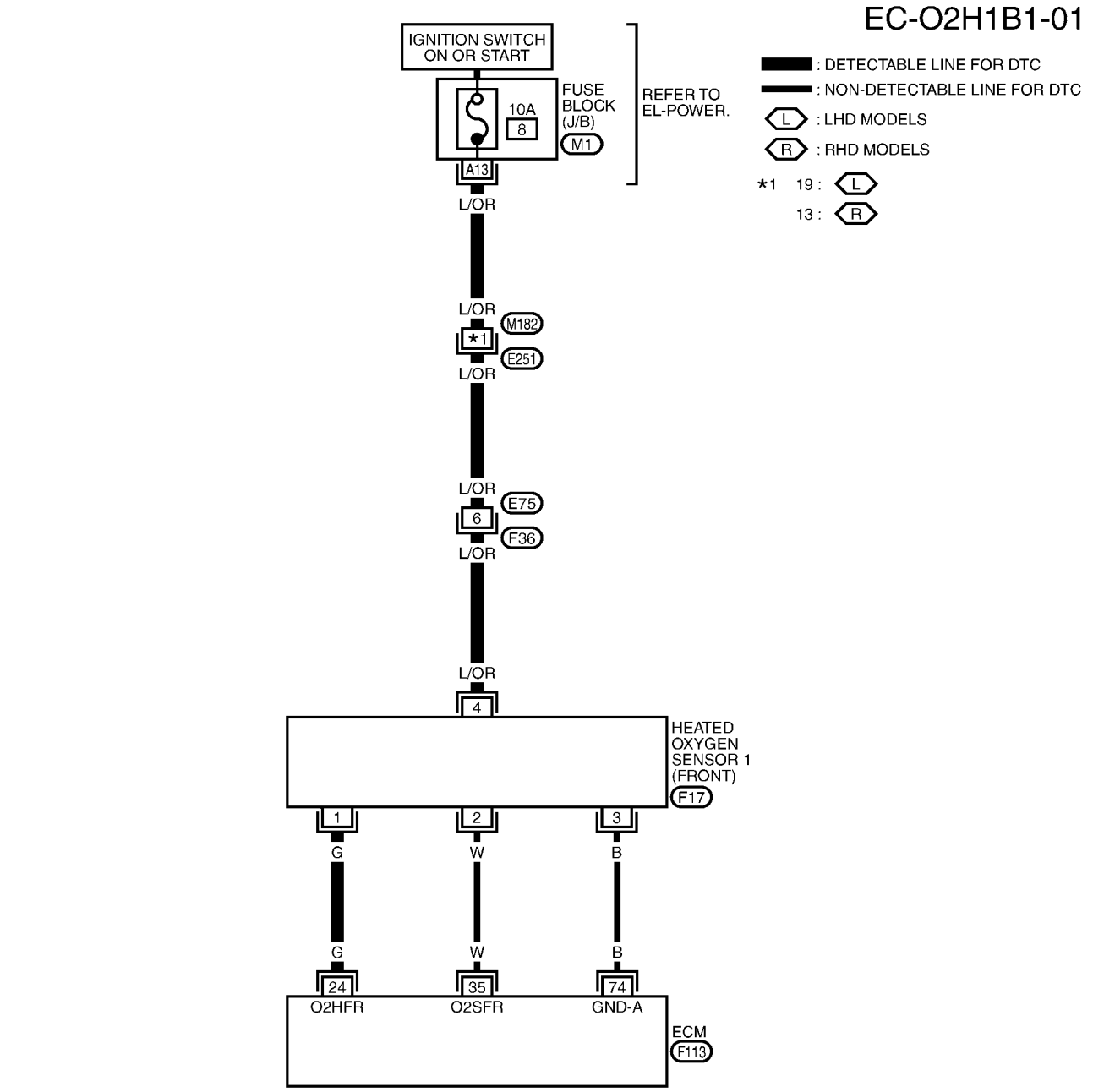
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and run it for at least 6 seconds at idle speed.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine and run it for at least 6 seconds at idle speed.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-125, "Diagnostic Procedure" .

- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

EBS00K4L

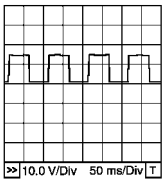


YEC282A

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)
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,200 rpm (A/T models) ● Engine speed is below 3,600 rpm (M/T models)	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,200 rpm (A/T models) ● Engine speed is above 3,600 rpm (M/T models)	BATTERY VOLTAGE (11 - 14V)

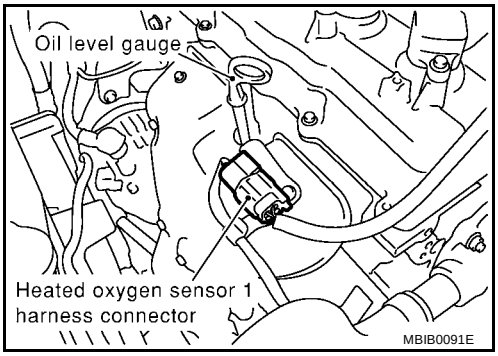
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00K4M

1. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch "ON".

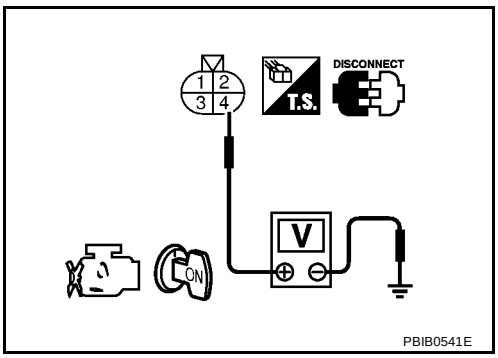


4. Check voltage between HO2S1 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M182, E251
- Harness connectors E75, F36
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

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

3. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 24 and HO2S1 terminal 1.
   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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-127, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

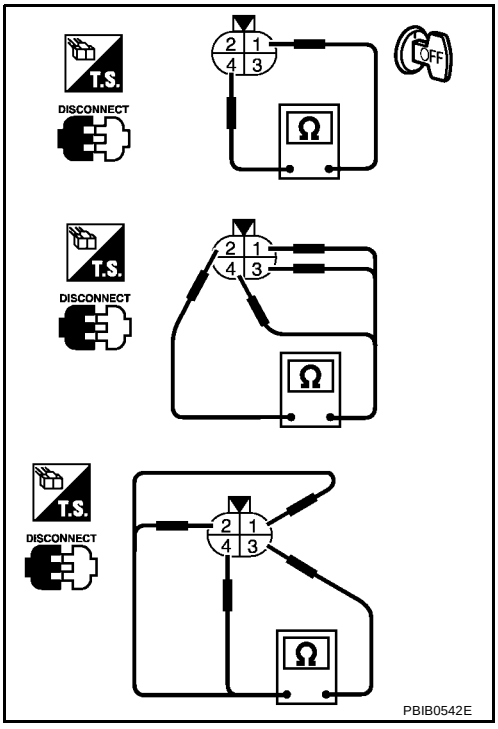
Component Inspection

EBS00K4N

HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
1 and 4	8 - 10 Ω at 20°C (68°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	



2. If NG, replace heated oxygen sensor 1.

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

EBS00K4O

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

DTC P0037, P0038 HO2S2 HEATER

PFP:226A0

Description

EBS00K4P

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,800	OFF
● Below 3,800 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00K4Q

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,800 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	ON
	● Engine speed: Above 3,800 rpm	OFF

On Board Diagnosis Logic

EBS00K4R

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) ● Heater oxygen sensor 2 heater
P0038 0038	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) ● Heater oxygen sensor 2 heater

DTC Confirmation Procedure

EBS00K4S

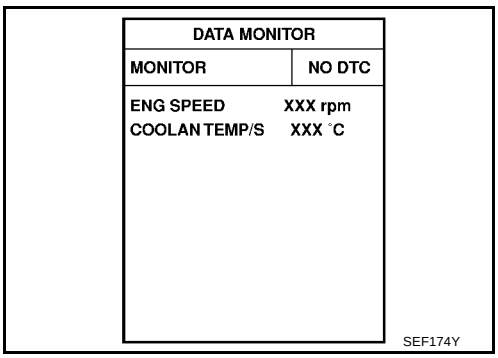
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

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 one minute under no load.
5. Let engine idle for one minute.
6. If 1st trip DTC is detected, go to EC-131, "Diagnostic Procedure" .



WITH GST

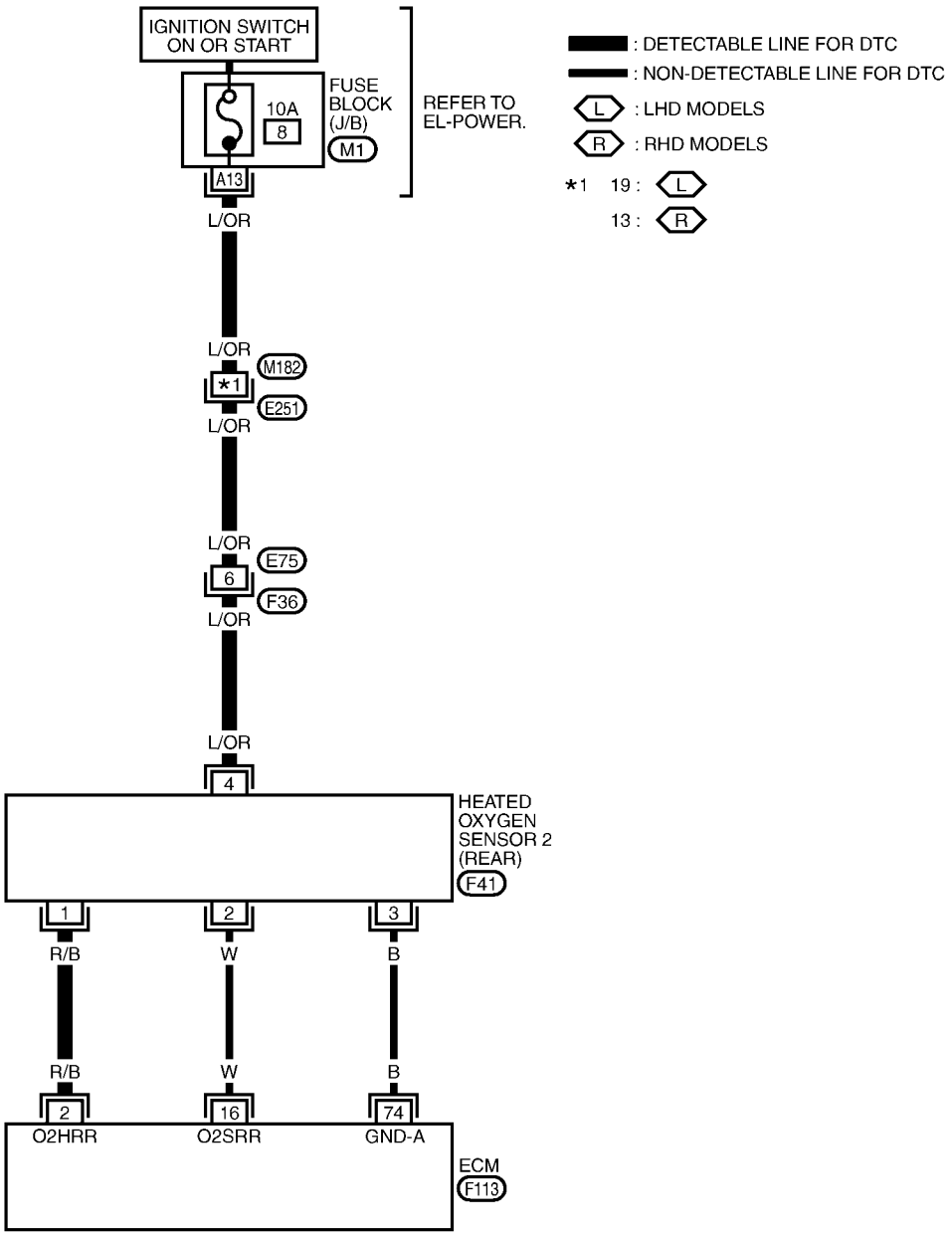
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Turn ignition switch ″OFF″and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for one minute.
8. Select “MODE 3” with GST.
9. If DTC is detected, go to EC-131, "Diagnostic Procedure" .

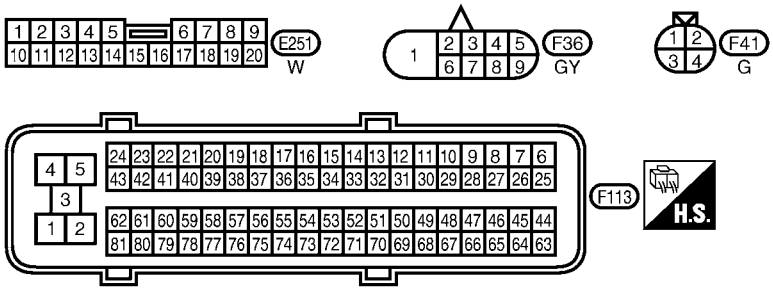
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

EBS00K4T

EC-O2H2B1-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC284A

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.

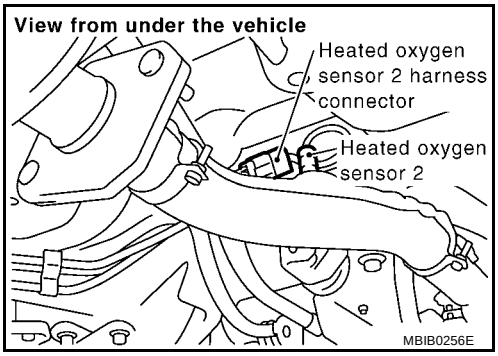
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed: Below 3,800 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,800 rpm.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00K4U

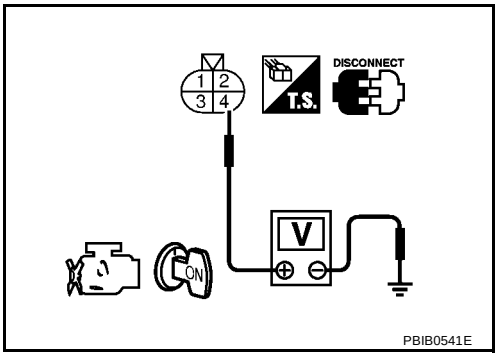
1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch "ON".



4. Check voltage between HO2S2 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M182, E251
- Harness connectors E75, F36
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

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

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S2 terminal 1.
   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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-133, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

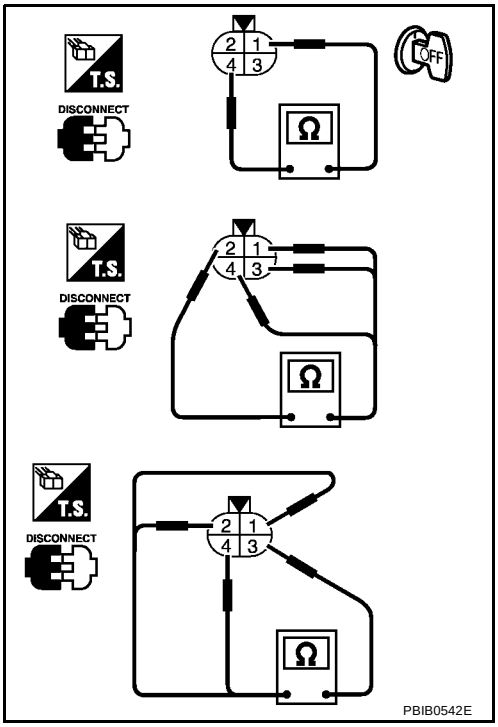
Component Inspection

EBS00K4V

HEATED OXYGEN SENSOR 2 HEATER

1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	



2. 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

EBS00K4W

HEATED OXYGEN SENSOR 2

Refer to FE-10.

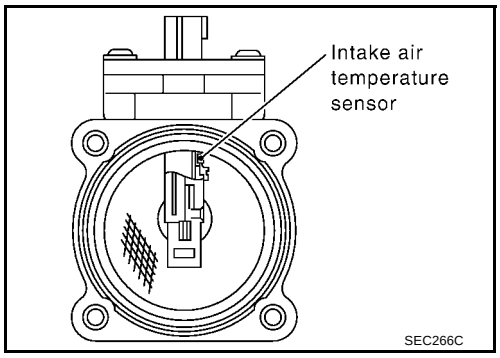
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

EBS00K4X

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K4Y

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

EBS00K4Z

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

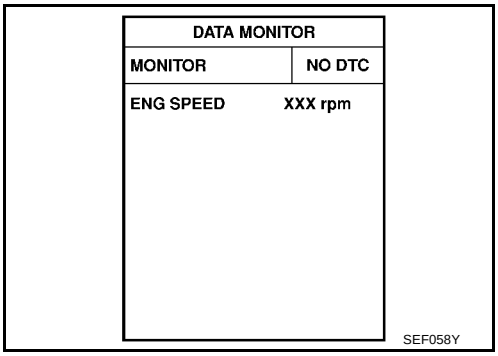
EBS00K50

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.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-137, "Diagnostic Procedure" .



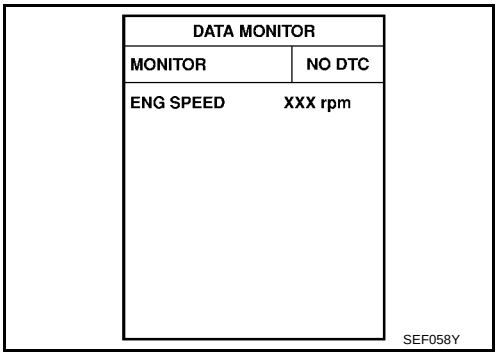
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-137, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-137, "Diagnostic Procedure" .



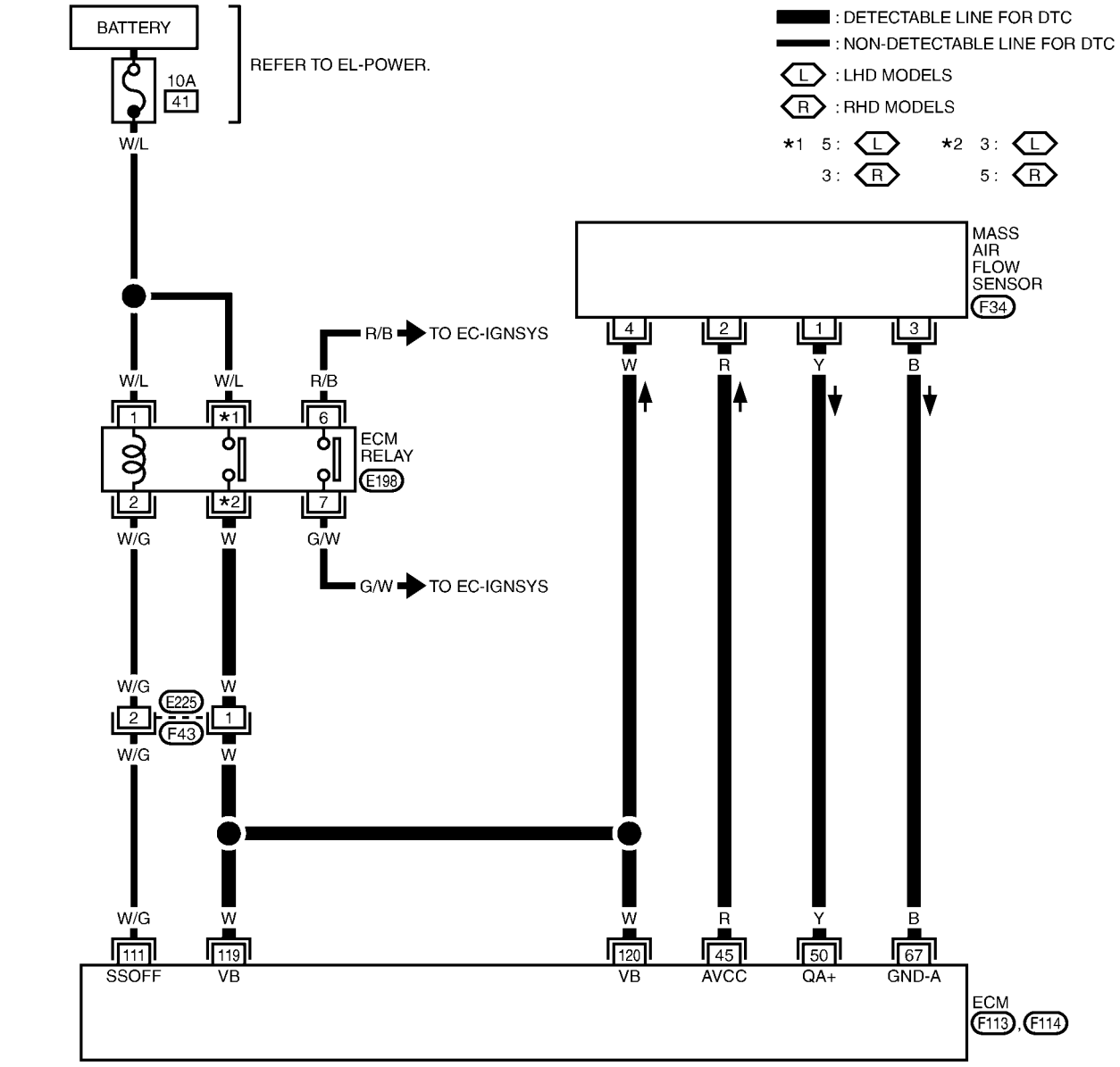
With GST

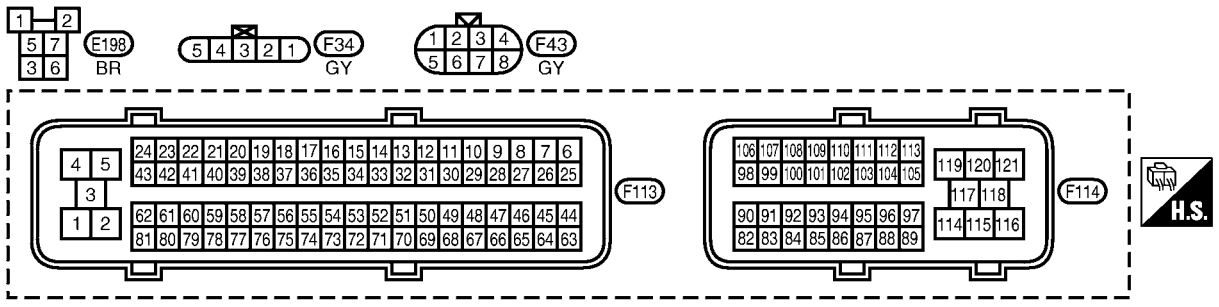
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

EBS00K51

EC-MAFS-01





YEC278A

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)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00K52

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

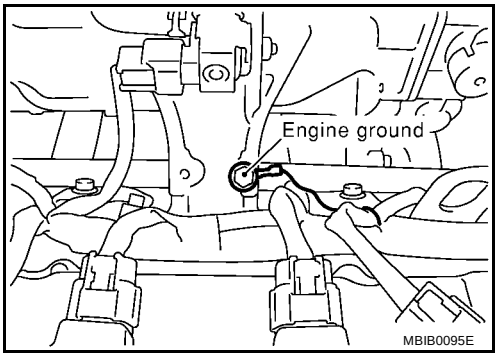
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

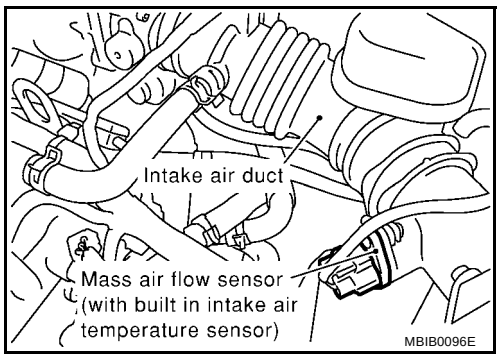
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



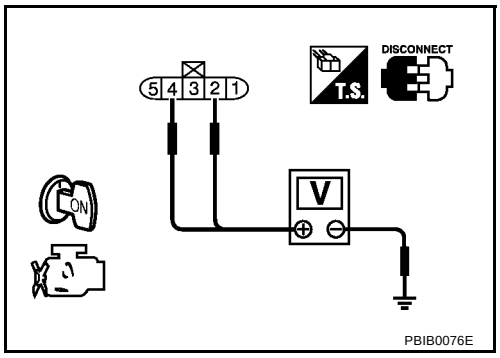
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

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

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67.
   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 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 50. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-139, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

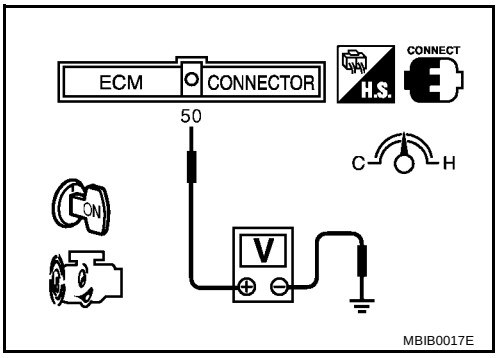
EBS00K53

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

EBS00K54

MASS AIR FLOW SENSOR

Refer to EM-14, "AIR CLEANER AND AIR DUCT" .

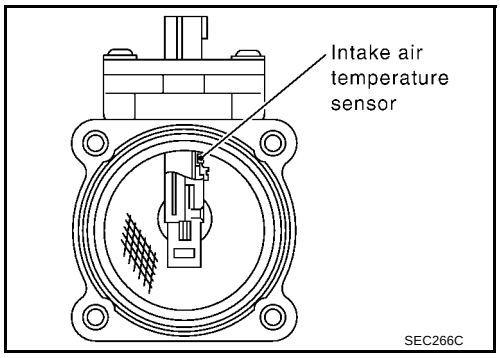
DTC P0112, P0113 IAT SENSOR

PFP:22630

Component Description

EBS00K55

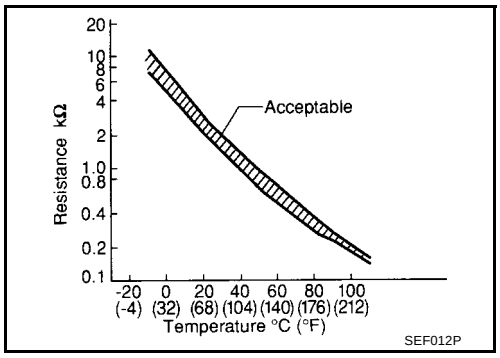
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) 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.

On Board Diagnosis Logic

EBS00K56

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

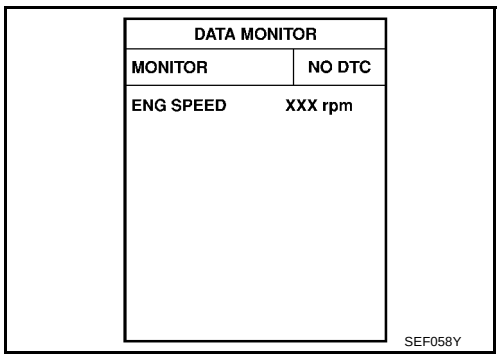
DTC Confirmation Procedure

EBS00K57

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”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-142, "Diagnostic Procedure" .



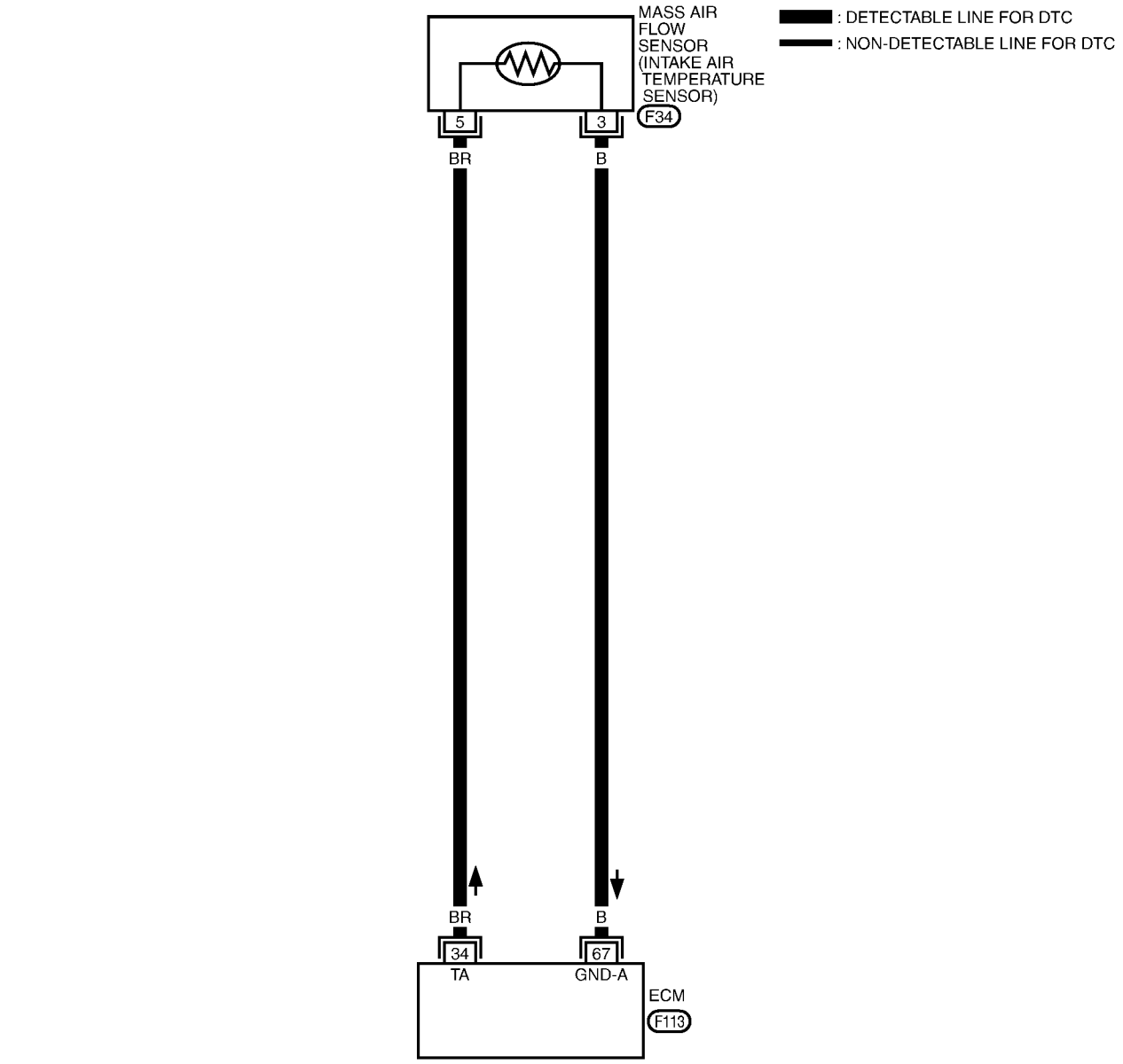
WITH GST

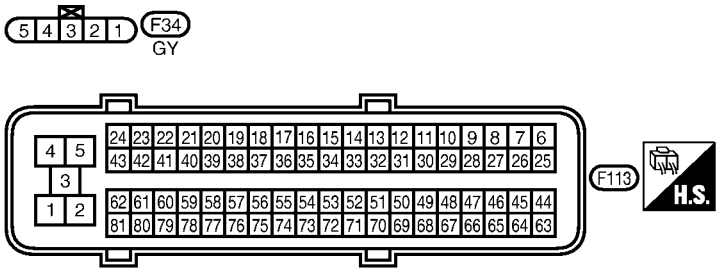
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K58

EC-IATS-01





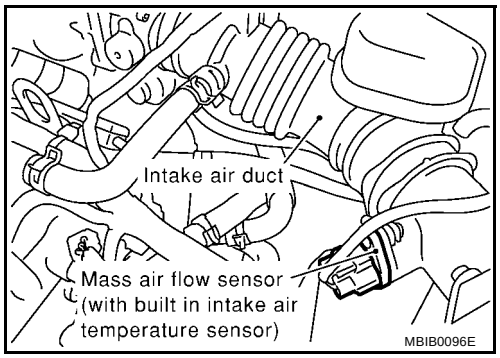
YEC279A

Diagnostic Procedure

EBS00K59

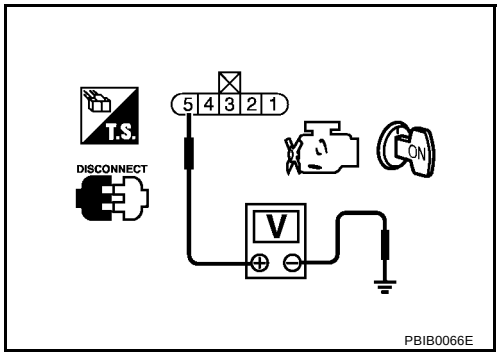
1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67. 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 INTAKE AIR TEMPERATURE SENSOR

Refer to EC-143, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

4. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

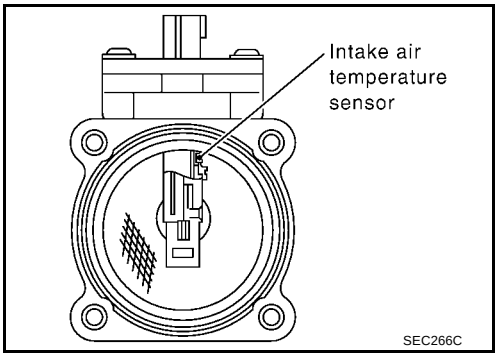
EBS00K5A

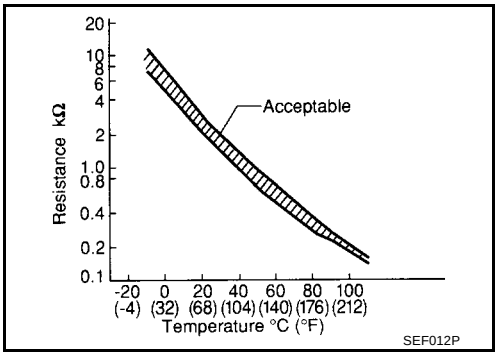
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

EBS00K5B

MASS AIR FLOW SENSOR

Refer to EM-14, "AIR CLEANER AND AIR DUCT" .

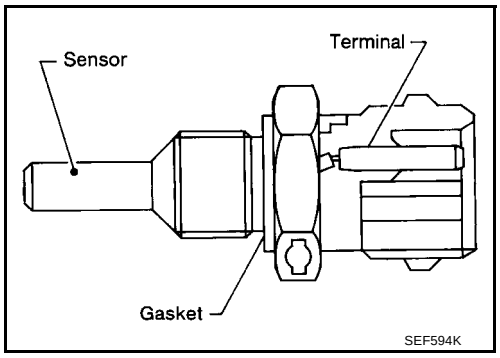
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

EBS00K5C

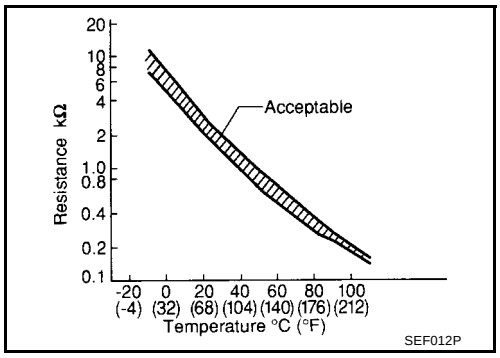
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) 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.

On Board Diagnosis Logic

EBS00K5D

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

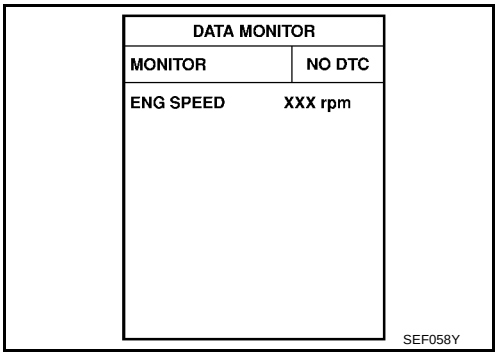
DTC Confirmation Procedure

EBS00K5E

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”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-147, "Diagnostic Procedure" .



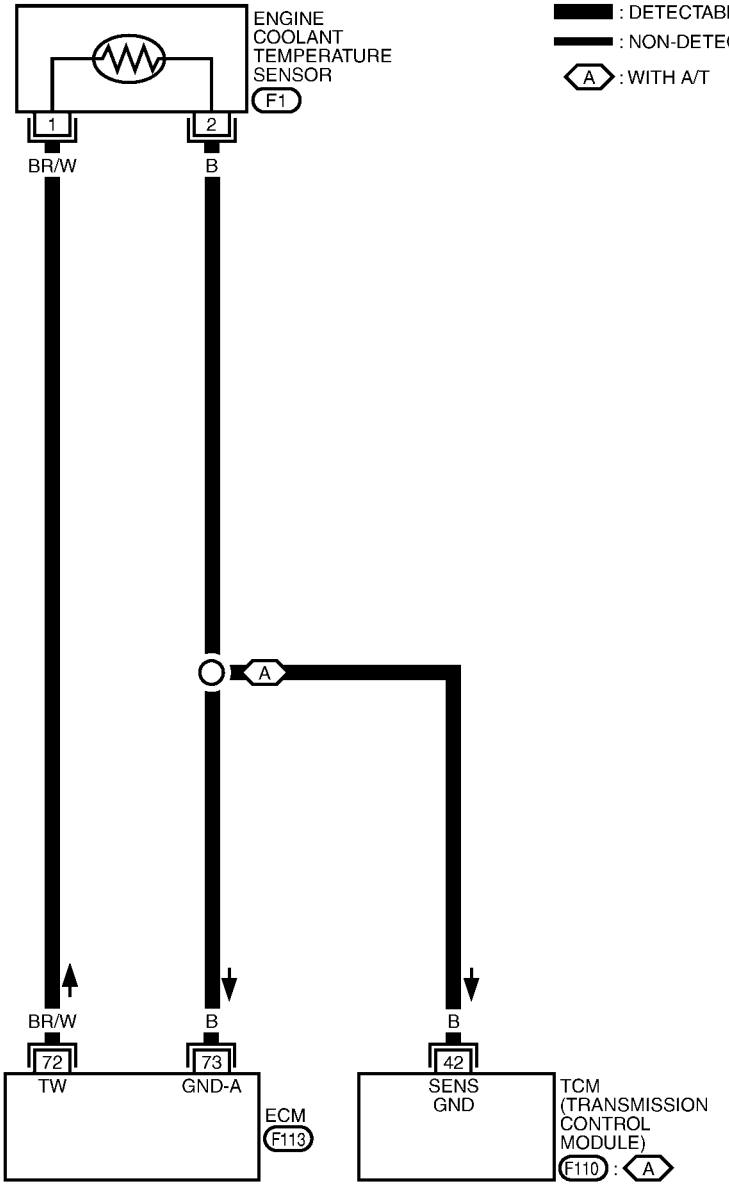
WITH GST

Follow the procedure “WITH CONSULT-II” above.

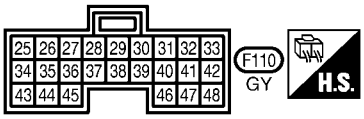
Wiring Diagram

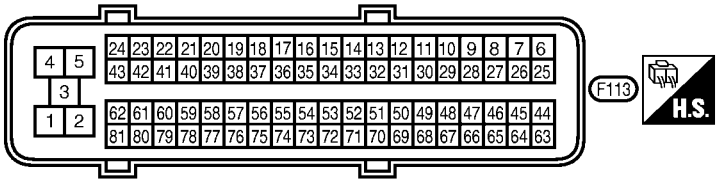
EBS00K5F

EC-ECTS-01









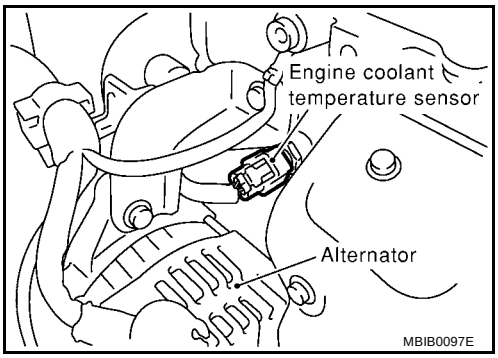
YEC280A

Diagnostic Procedure

EBS00K5G

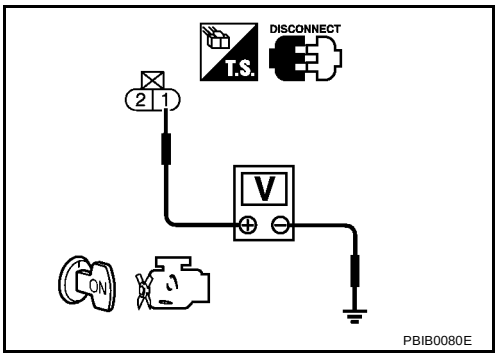
1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between engine coolant temperature sensor and ECM
- Harness for open or short between engine coolant temperature sensor and TCM (A/T models only)

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

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-148, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

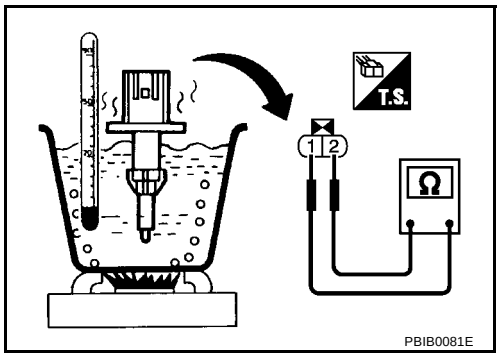
>> **INSPECTION END**

Component Inspection

EBS00K5H

ENGINE COOLANT TEMPERATURE SENSOR

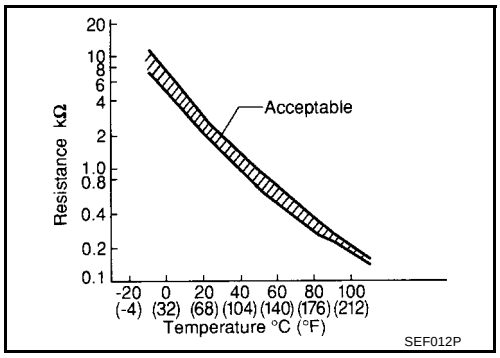
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

EBS00LQW

ENGINE COOLANT TEMPERATURE SENSOR

Refer to LC-15.

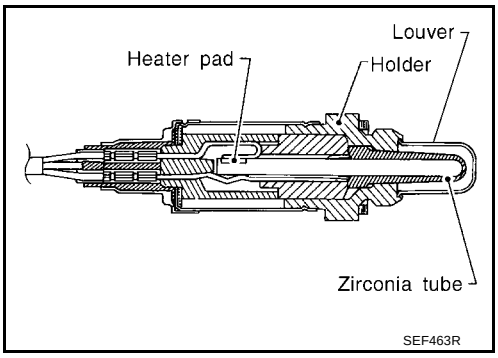
DTC P0132 HO2S1

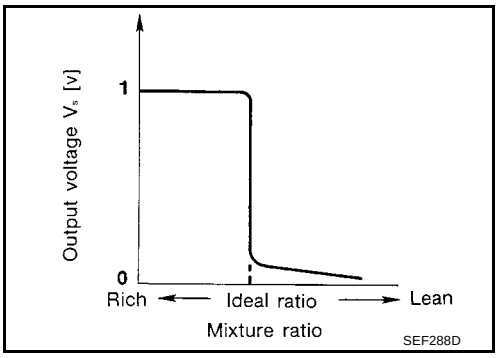
PFP:22690

Component Description

EBS00K5J

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00K5K

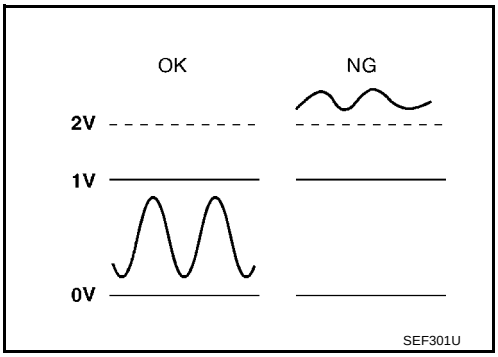
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00K5L

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132	Heated oxygen sensor 1 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 1

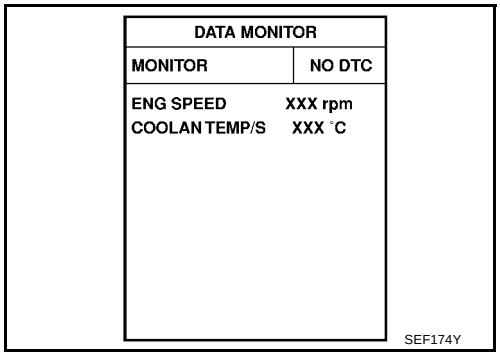
DTC Confirmation Procedure

EBS00K5M

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. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-152, "Diagnostic Procedure" .



WITH GST

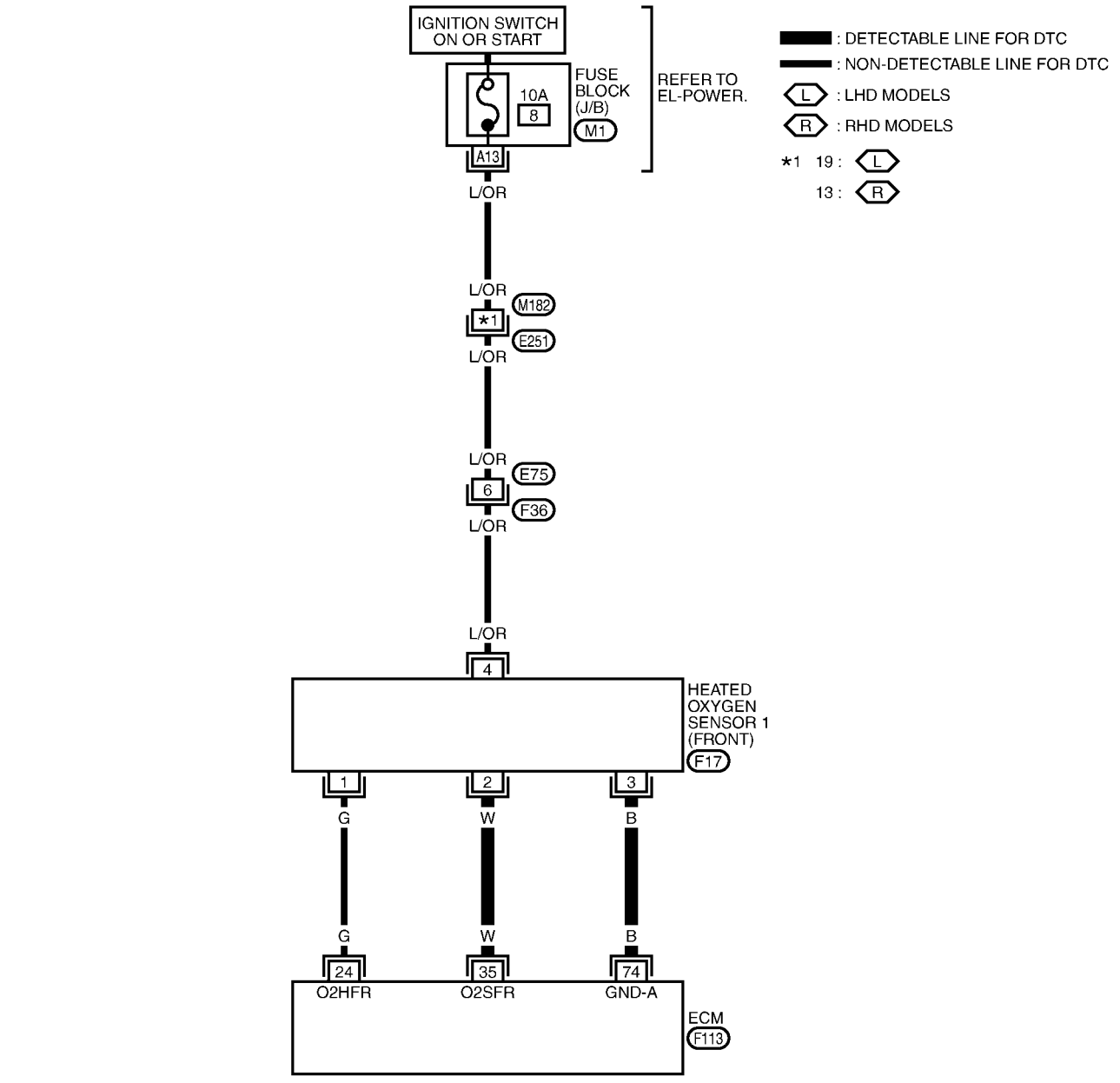
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Restart engine and let it idle for 2 minutes.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-152, "Diagnostic Procedure" .

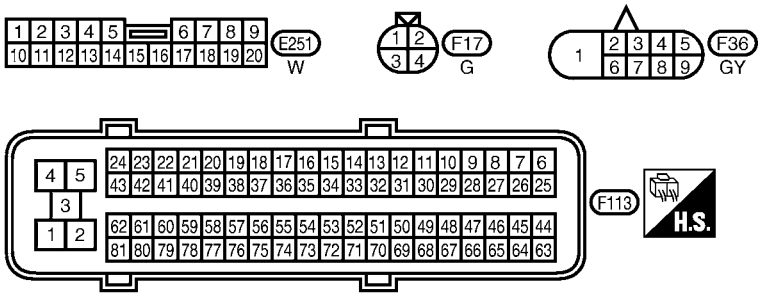
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

EBS00K5N

EC-O2S1B1-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC281A

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)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

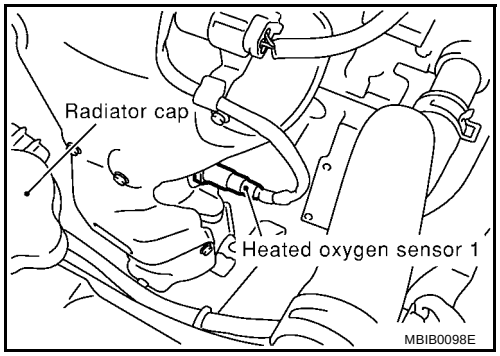
EBS00K5O

1. RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

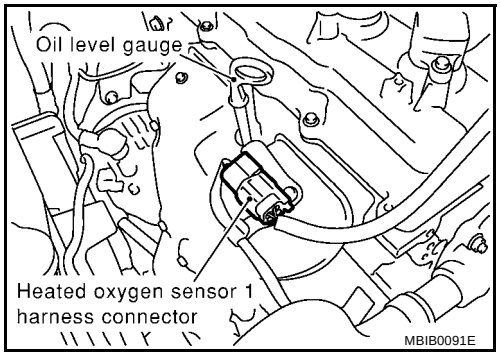
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

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 HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

   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 HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 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 1

Refer to EC-153, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

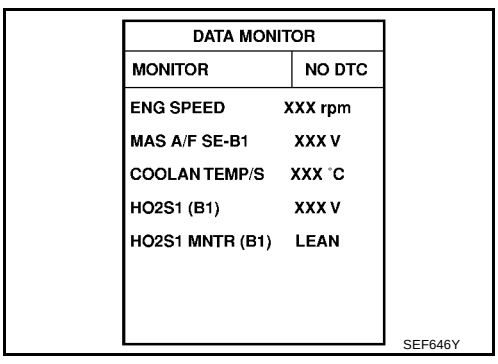
Component Inspection

EBS00K5P

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



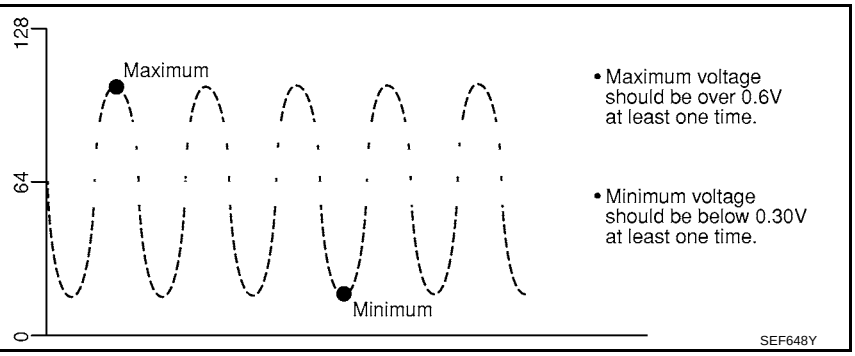
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L				

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

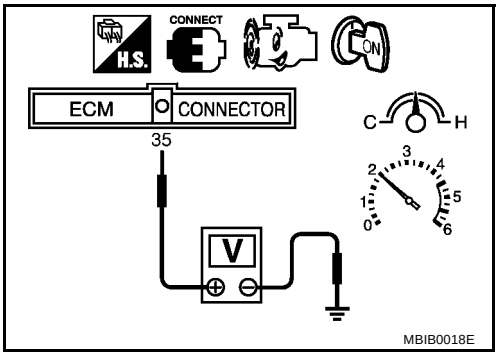


CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



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

EBS00K5Q

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

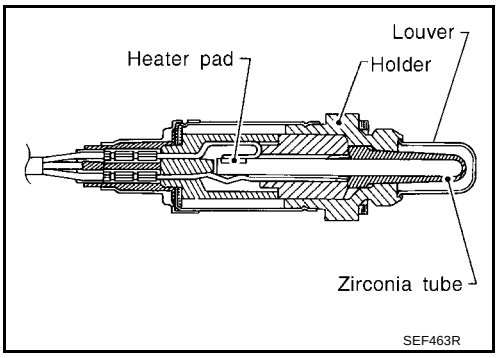
DTC P0133 HO2S1

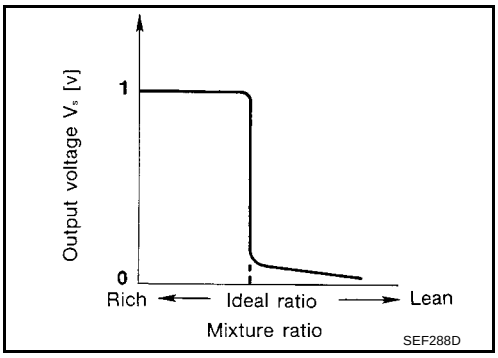
PFP:22690

Component Description

EBS00K5R

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00K5S

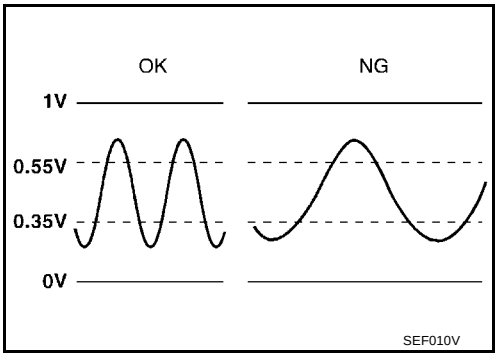
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00K5T

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133	Heated oxygen sensor 1 circuit slow response	The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV valve ● Mass air flow sensor

DTC Confirmation Procedure

EBS00K5U

CAUTION:

Always drive vehicle at a safe speed.

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.

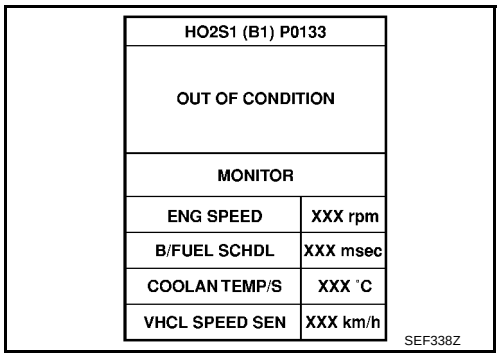
TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

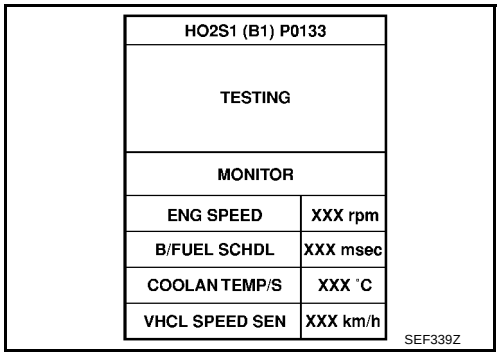
1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "HO2S1 (B1) P0133" of "HO2S1" in "DTC WORK SUPPORT" mode with CONSULT-II.
4. Touch "START".
5. Start engine and let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm (M/T models) or 3,200 rpm (A/T models) after this step. If the engine speed limit is exceeded, return to step 5.



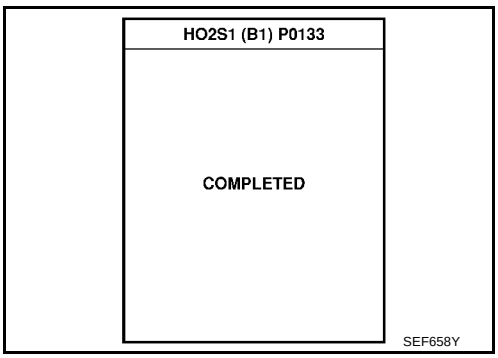
6. When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 20 to 50 seconds.)

ENG SPEED	2,100 - 3,100 rpm
Vehicle speed	More than 80 km/h (50 MPH)
B/FUEL SCHDL	3.8 - 7.6 msec (M/T models) 3.8 - 8.2 msec (A/T models)
Selector lever	Suitable position



If "TESTING" is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-159, "Diagnostic Procedure" .



Overall Function Check

EBS00K5V

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

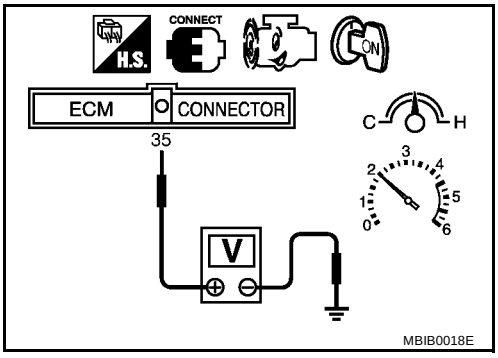
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

– The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.

1 time: **0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**

2 times: **0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**

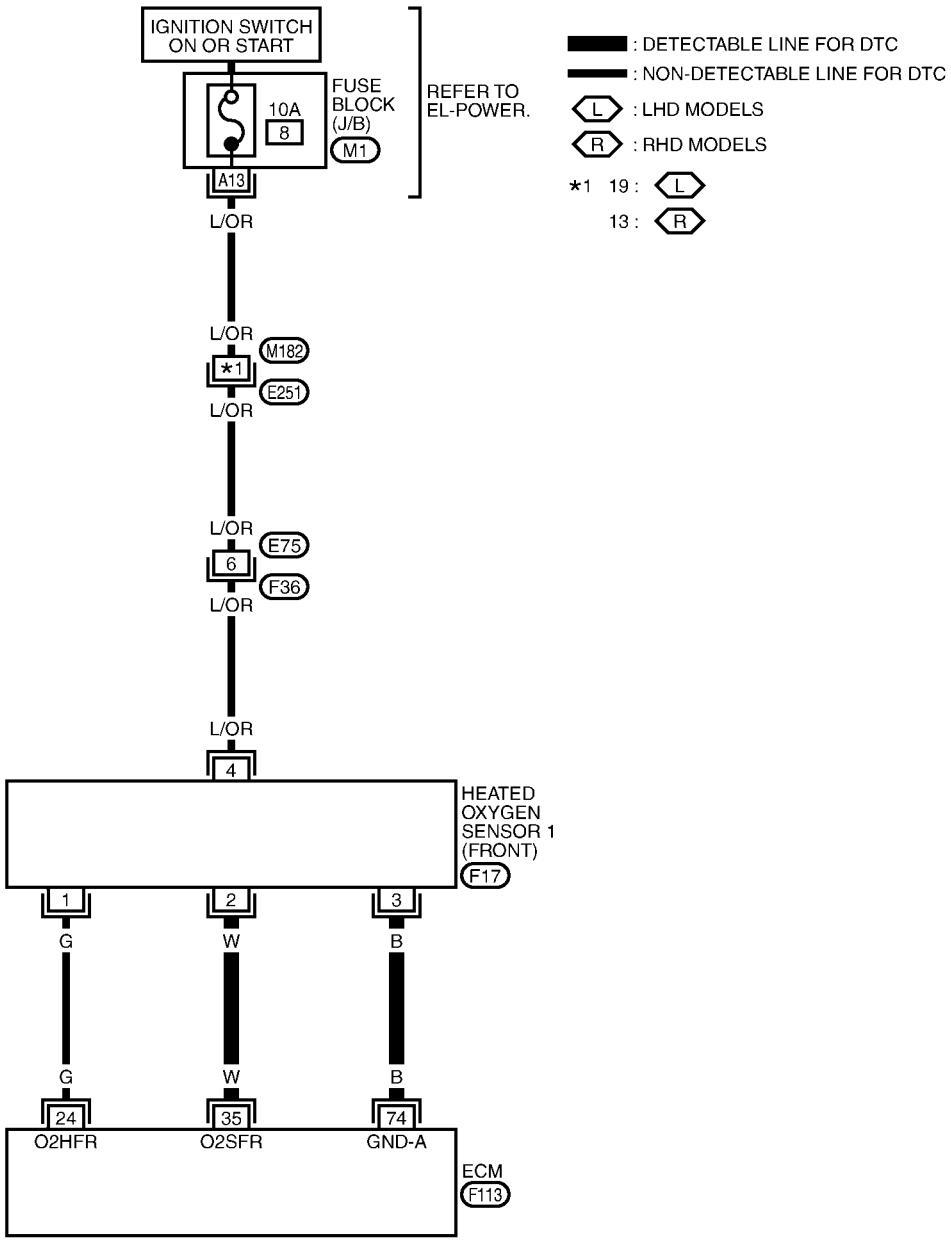
4. If NG, go to EC-159, "Diagnostic Procedure" .

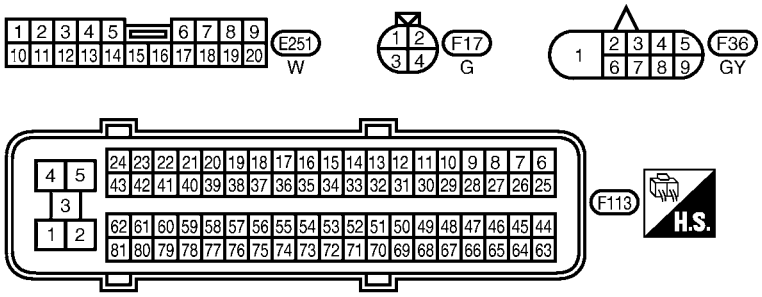


Wiring Diagram

EBS00K5W

EC-O2S1B1-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC281A

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)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

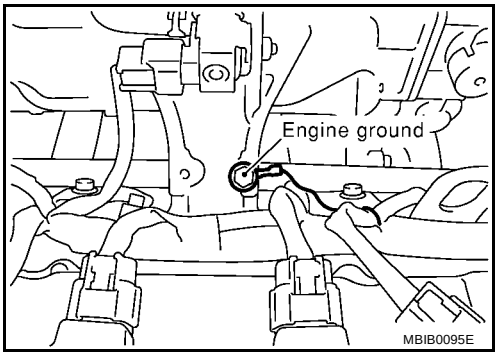
Diagnostic Procedure

EBS00K5X

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

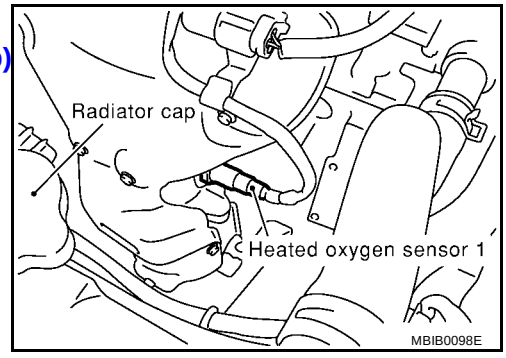


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

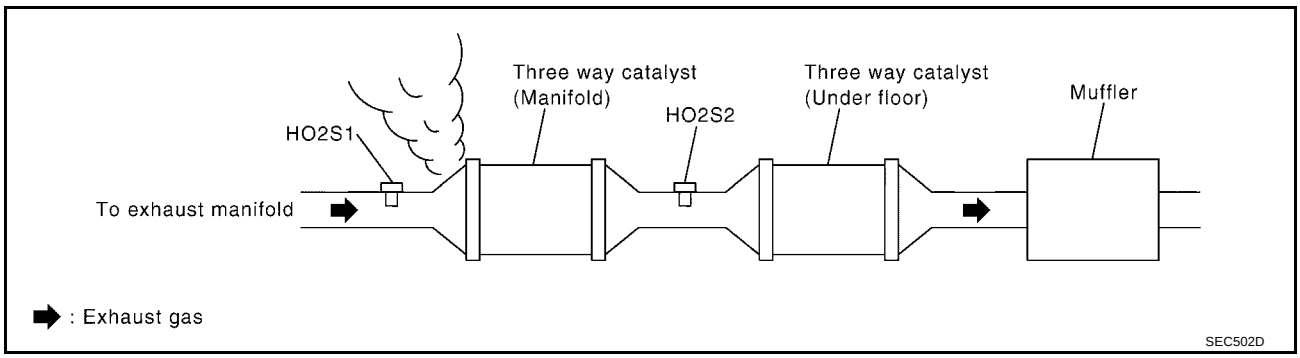
Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 3.



3. CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

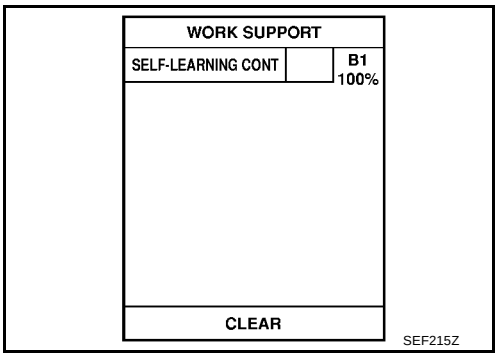
OK or NG

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

5. CLEAR THE SELF-LEARNING DATA

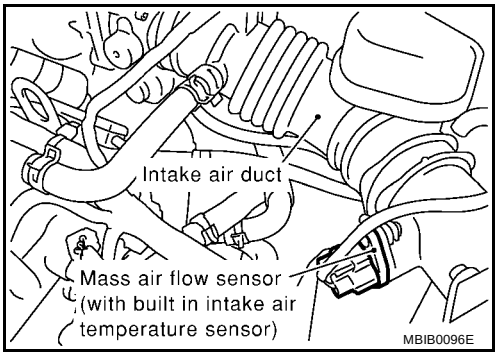
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or DTC P0172 (Refer to EC-186 or EC-193).
No >> GO TO 6.

6. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

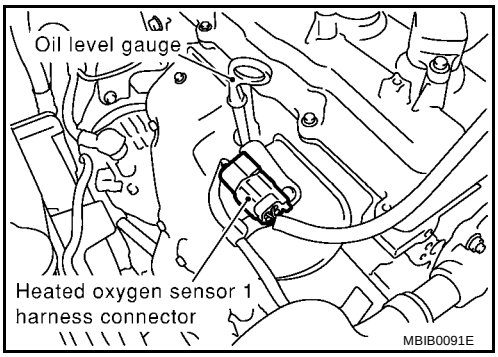
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

   Continuity should exist.

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

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



7. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-127, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace malfunctioning heated oxygen sensor 1.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-139, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK PCV VALVE

Refer to EC-402, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace PCV valve.

11. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-162, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace heated oxygen sensor 1.

12. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00K5Y

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.

3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

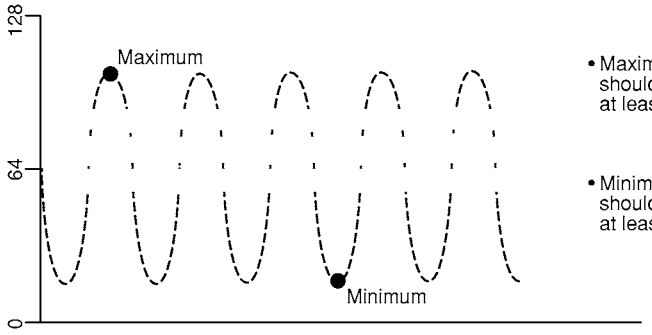
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



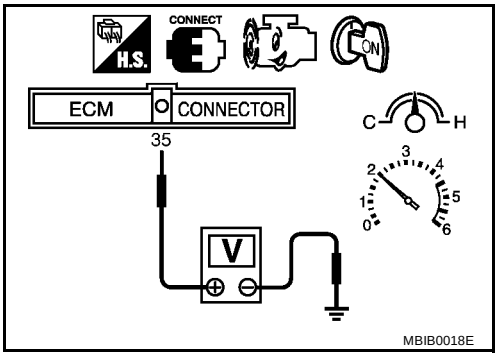
SEF648Y

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 normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



MBIB0018E

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

EBS00K5Z

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

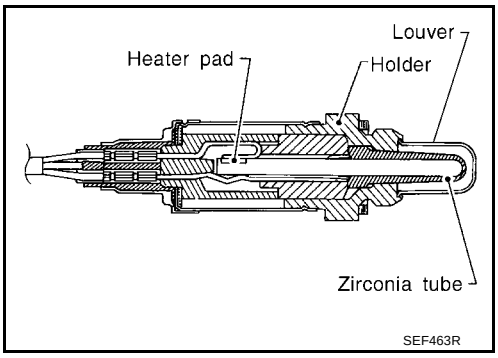
DTC P0134 HO2S1

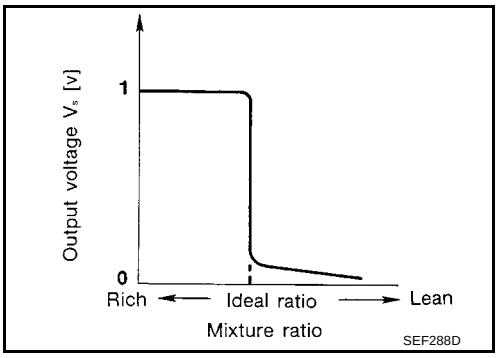
PFP:22690

Component Description

EBS00K60

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00K61

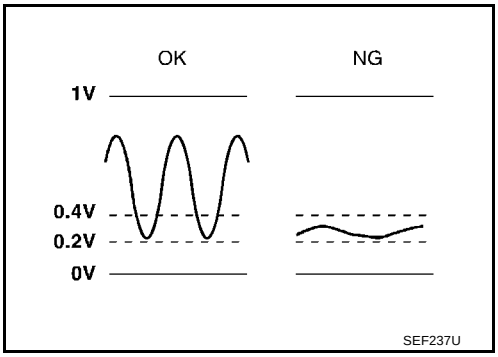
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00K62

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

DTC Confirmation Procedure

EBS00K63

CAUTION:
Always drive vehicle at a safe speed.

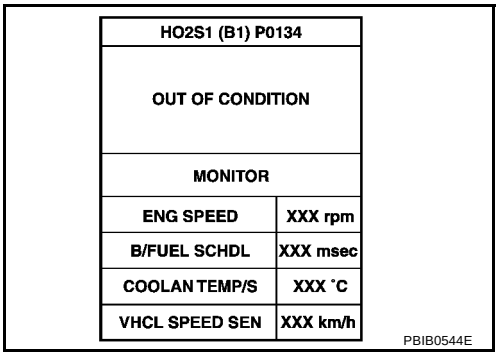
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

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

WITH CONSULT-II

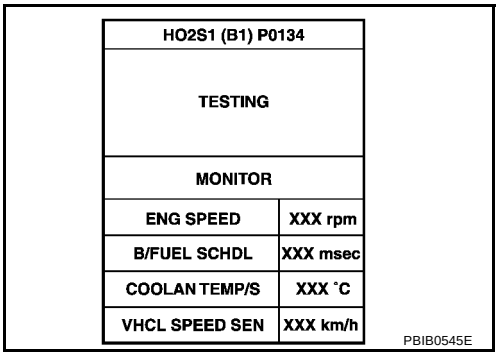
1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 (B1) P0134” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
3. Touch “START”.
4. Let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm (M/T models) or 3,200 rpm (A/T models) after this step. If the engine speed limit is exceeded, return to step 4.



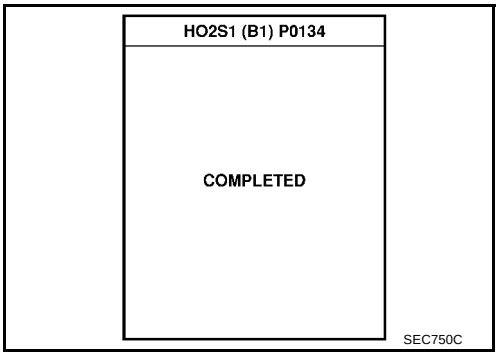
5. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,700 - 4,000 rpm
Vehicle speed	More than 64 km/h (40 MPH)
B/FUEL SCHDL	3.0 - 9.5 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-169, "Diagnostic Procedure" .



Overall Function Check

EBS00K64

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

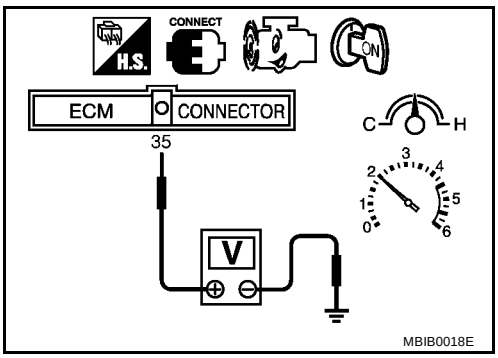
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage does not remain in the range of 0.2 to 0.4V.

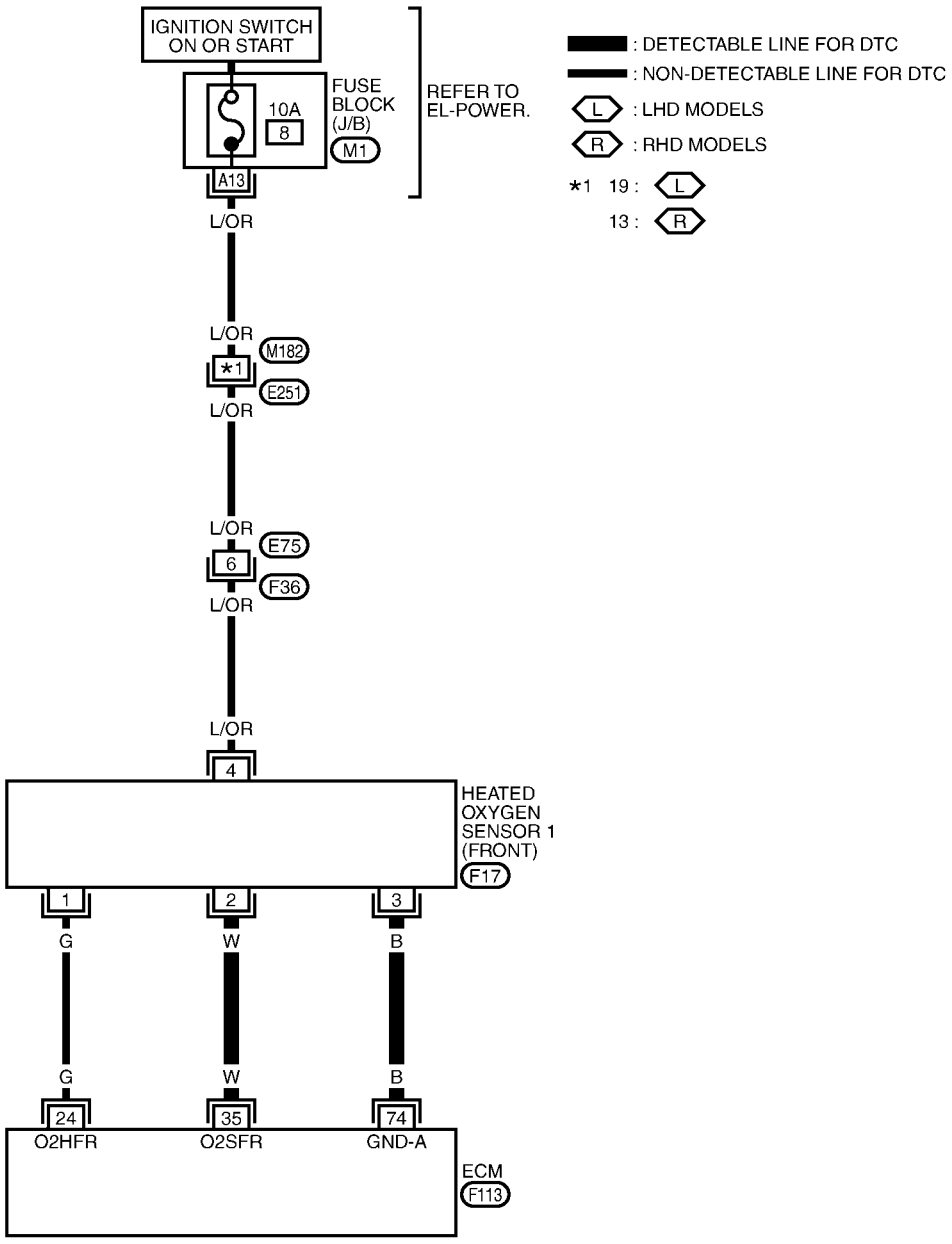
4. If NG, go to EC-169, "Diagnostic Procedure" .

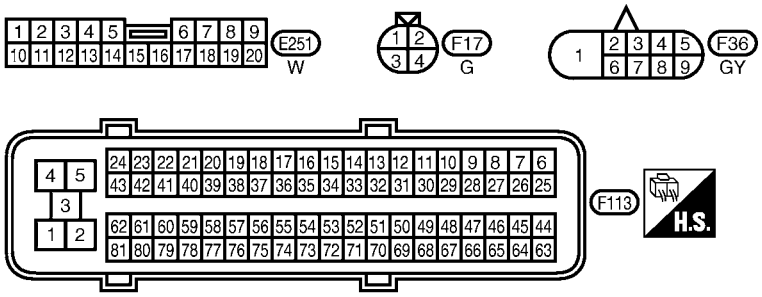


Wiring Diagram

EBS00K65

EC-O2S1B1-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC281A

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)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

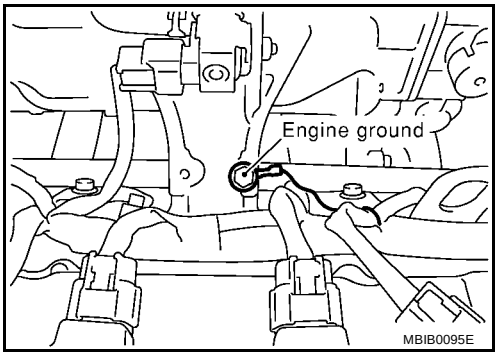
Diagnostic Procedure

EBS00K66

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

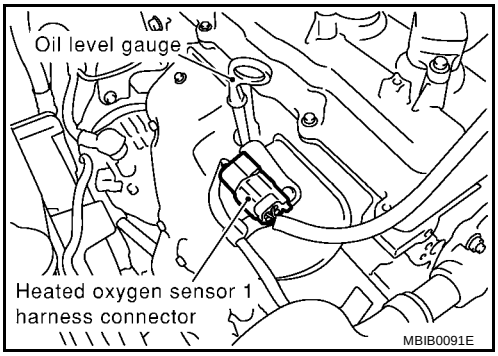
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

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 HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

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 HEATED OXYGEN SENSOR 1

Refer to EC-170, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00K67

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

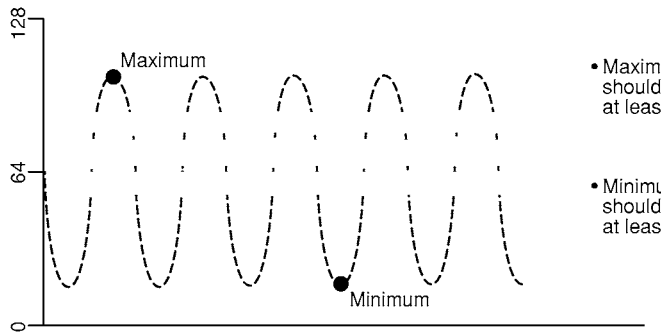
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



CAUTION:

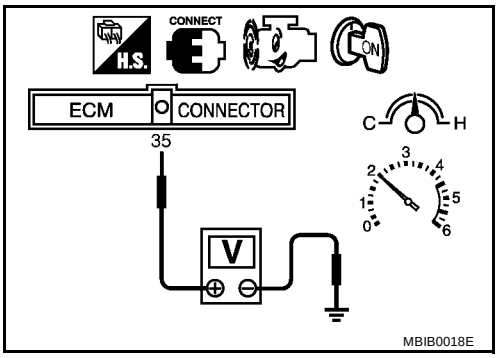
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **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 normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



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

EBS00K68

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

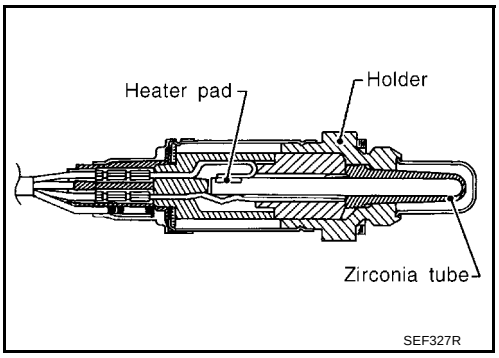
DTC P0138 HO2S2

PFP:226A0

Component Description

EBS00K69

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen 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

EBS00K6A

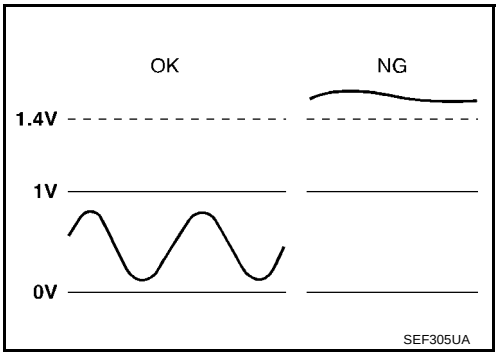
Specification data are reference values.

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

On Board Diagnosis Logic

EBS00K6B

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) 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	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

DTC Confirmation Procedure

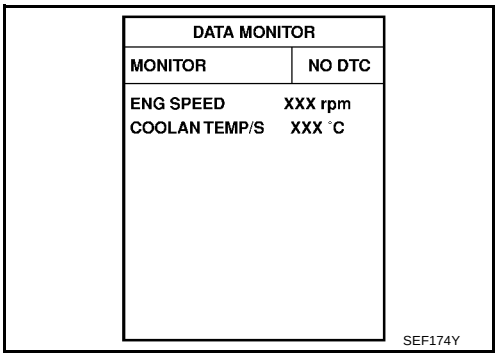
EBS00K6C

CAUTION:
Always drive vehicle at a safe speed.

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 at between 3,500 and 4,000 rpm for least one minute under no load.
5. Let engine idle for two minutes.
6. If 1st trip DTC is detected, go to EC-175, "Diagnostic Procedure" .



WITH GST

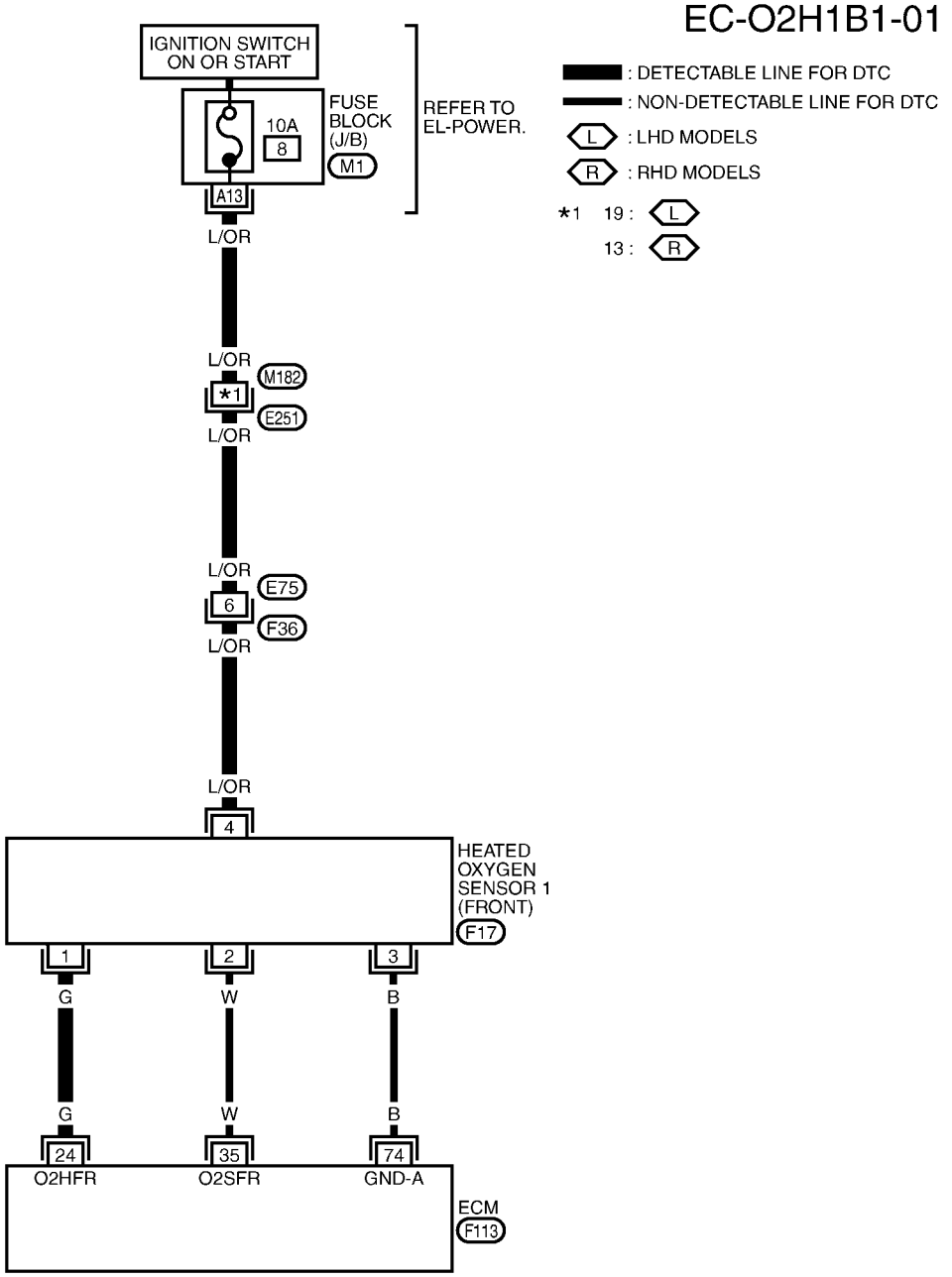
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for two minutes.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for two minutes.
8. Select “Mode 3” with GST.
9. If NG, go to EC-175, "Diagnostic Procedure" .

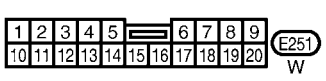
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

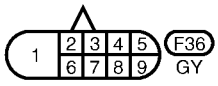
EBS00K6D

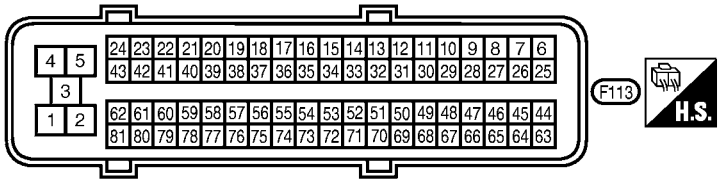
EC-O2H1B1-01











REFER TO THE FOLLOWING.

M1 -FUSE BLOCK-JUNCTION BOX (J/B)

YEC282A

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)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 3,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

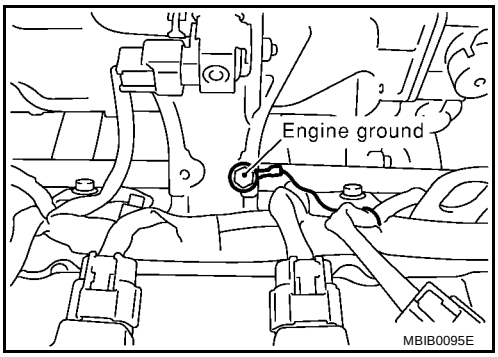
Diagnostic Procedure

EBS00K6E

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



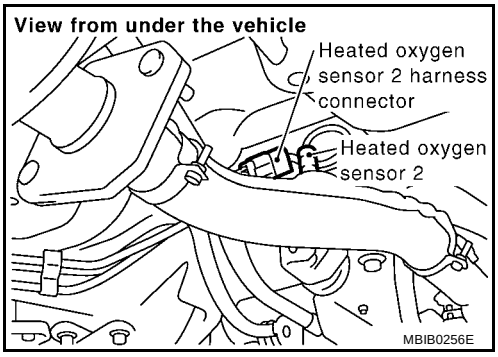
2. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 2 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   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 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   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 connector.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-176, "Component Inspection" .

OK or NG

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

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00K6F

HEATED OXYGEN SENSOR 2

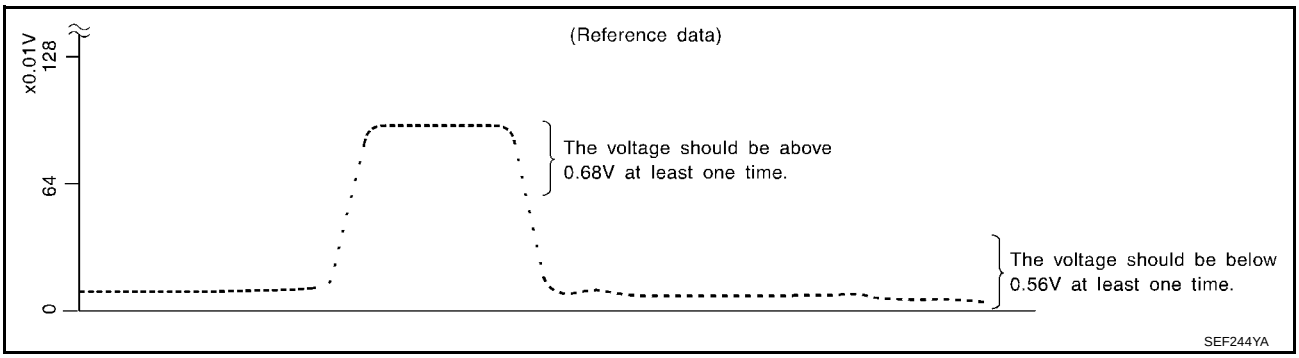
With CONSULT-II

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 one minute under no load.
4. Let engine idle for one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

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



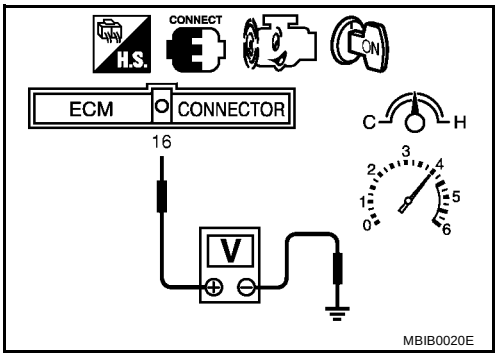
“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

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 one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T) 3rd gear position (M/T).
   The voltage should be below 0.56V 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

EBS00K6G

HEATED OXYGEN SENSOR 2

Refer to FE-10.

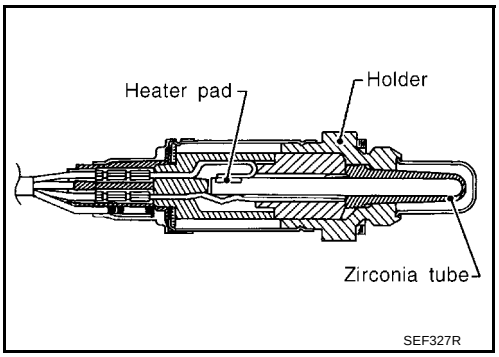
DTC P0139 HO2S2

PFP:226A0

Component Description

EBS00K6H

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen 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

EBS00K6I

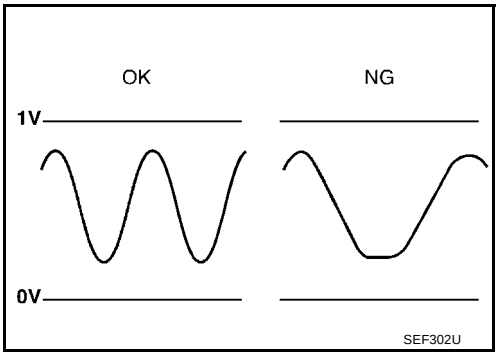
Specification data are reference values.

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

On Board Diagnosis Logic

EBS00K6J

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00K6K

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
- **"COMPLETED" will appear on CONSULT-II screen when all tests "COND1", "COND2" and "COND3" are completed.**
- 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:
Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".

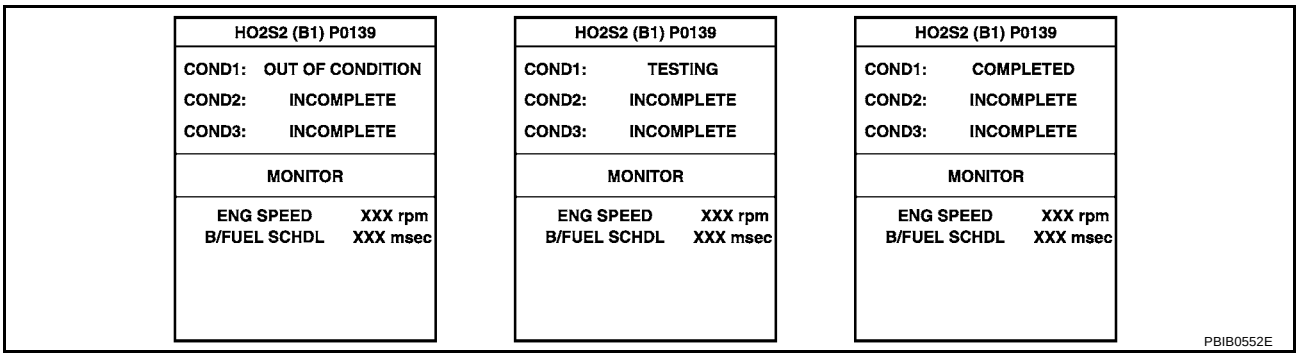
WITH CONSULT-II

Procedure for COND1

For the best results, perform ″DTC WORK SUPPORT″ at a temperature of 0 to 30°C (32 to 86°F)

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 one minute under no load.
4. Let engine idle for one minute.
5. Select "HO2S2 (B1) P0139" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-II.
6. Touch "START".
7. Let engine idle for at least 30 seconds.
8. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3".
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
9. When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105 °C
Selector level	Suitable position

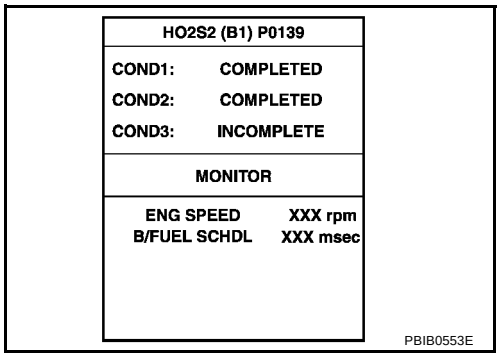


NOTE:
- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT-II screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".**

Procedure for COND2

1. While driving, release accelerator pedal completely with ″OD″ OFF (A/T models only) from the above condition [step 9] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED”. (It will take approximately 4 seconds.)

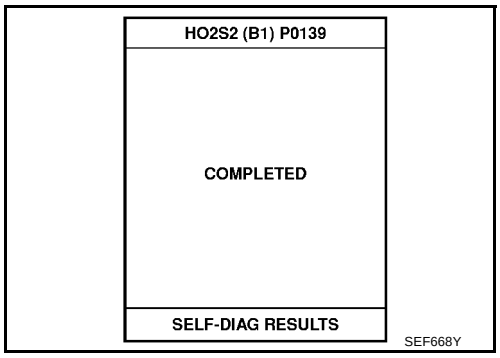
NOTE:
If “COMPLETED” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-182, "Diagnostic Procedure" .
   If ″CAN NOT BE DIAGNOSED″ is displayed, perform the following.

a. Turn ignition switch ″OFF″ and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch ″ON″ and select ″COOLANTEMP/S″ in ″DATA MONITOR″ mode with CONSULT-II.
c. Start engine and warm it up while monitoring ″COOLANTEMP/S″ indication on CONSULT-II.
d. When ″COOLANTEMP/S″ indication reaches to 70°C (158°F), go to ″Procedure for COND 1″ step 3.



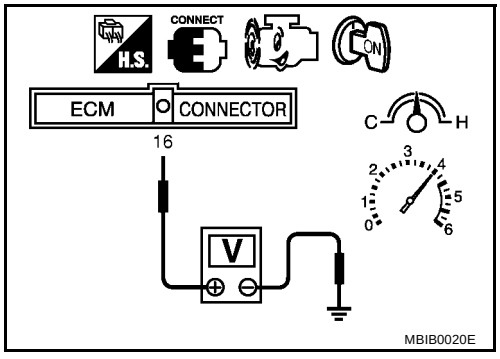
Overall Function Check

EBS00K6L

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

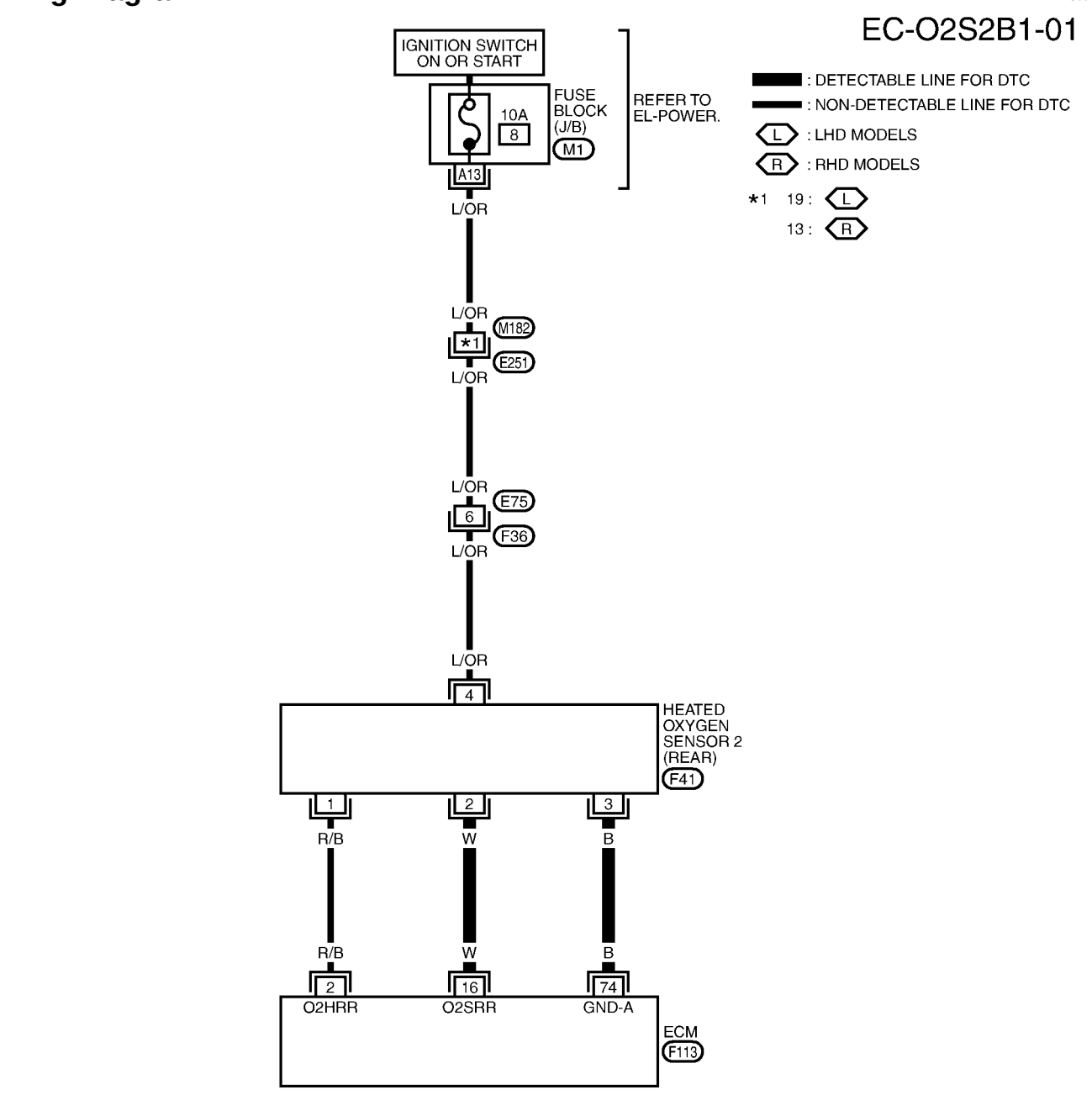
WITH GST

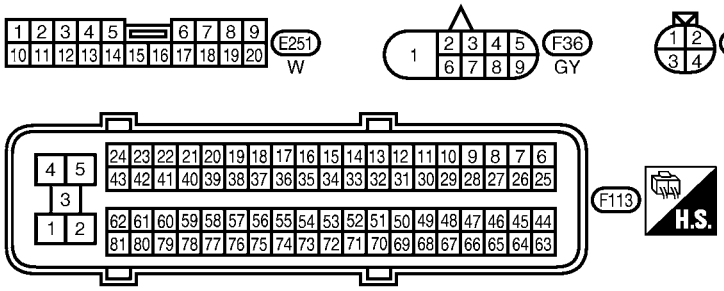
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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.)
   A change of voltage should be more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in ″D″ position with ″OD″ OFF (A/T), 3rd gear position (M/T).
   The voltage should change at more than 0.06V for 1 second during this procedure.
8. If NG, go to EC-182, "Diagnostic Procedure" .



Wiring Diagram

EBS00K6M





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC283A

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)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 3,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

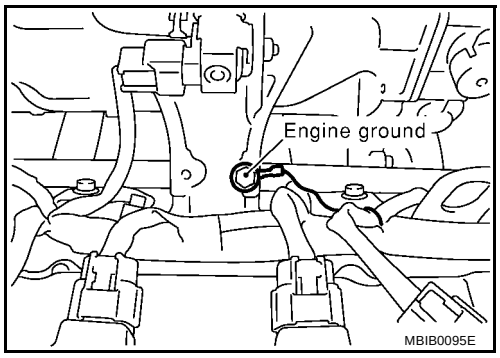
Diagnostic Procedure

EBS00K6N

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

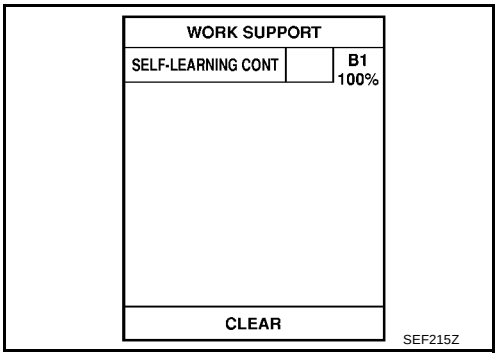
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

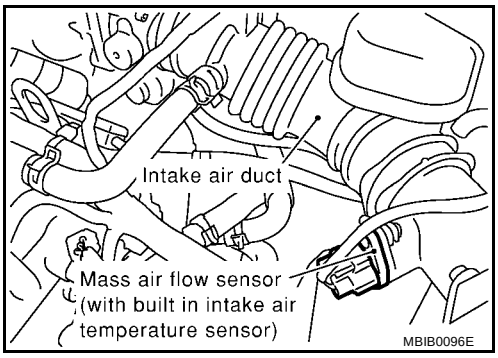
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-186 or EC-193 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

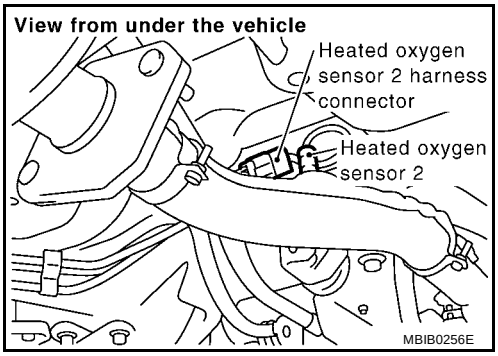
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and 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 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-184, "Component Inspection" .

OK or NG

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

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00K6O

HEATED OXYGEN SENSOR 2

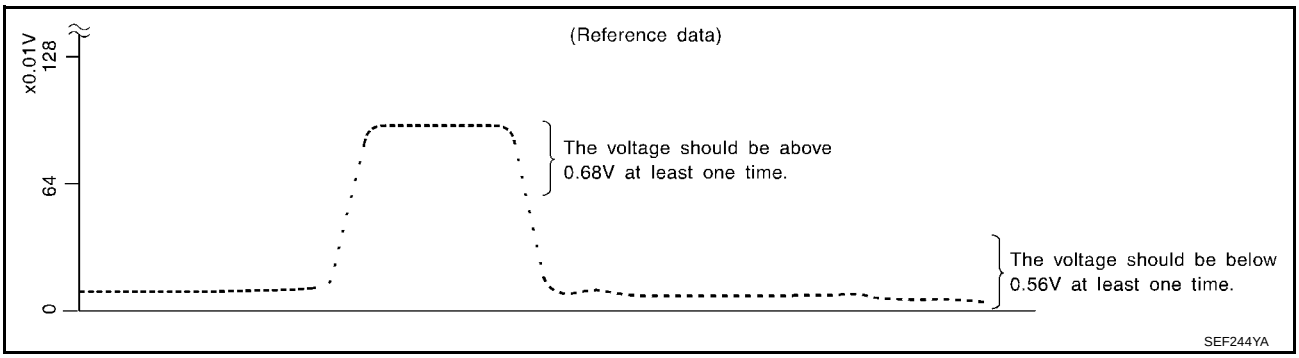
With CONSULT-II

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 one minute under no load.
4. Let engine idle for one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

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



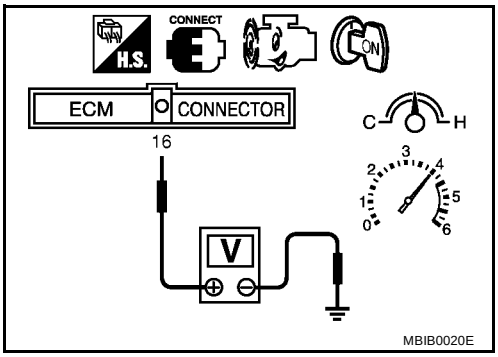
“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

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 one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.56V 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

EBS00K6P

HEATED OXYGEN SENSOR 2

Refer to FE-10.

DTC P0171 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

EBS00K6Q

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171	Fuel injection system too lean	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor ● Incorrect PCV hose connection

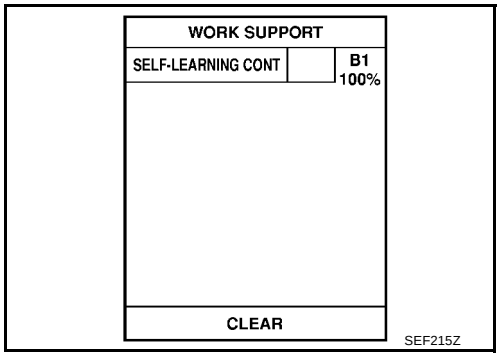
DTC Confirmation Procedure

EBS00K6R

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.

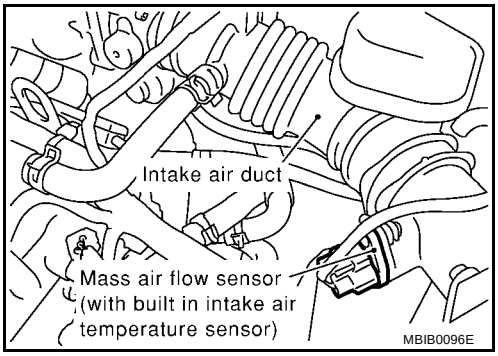
WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-189, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-189, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



WITH GST

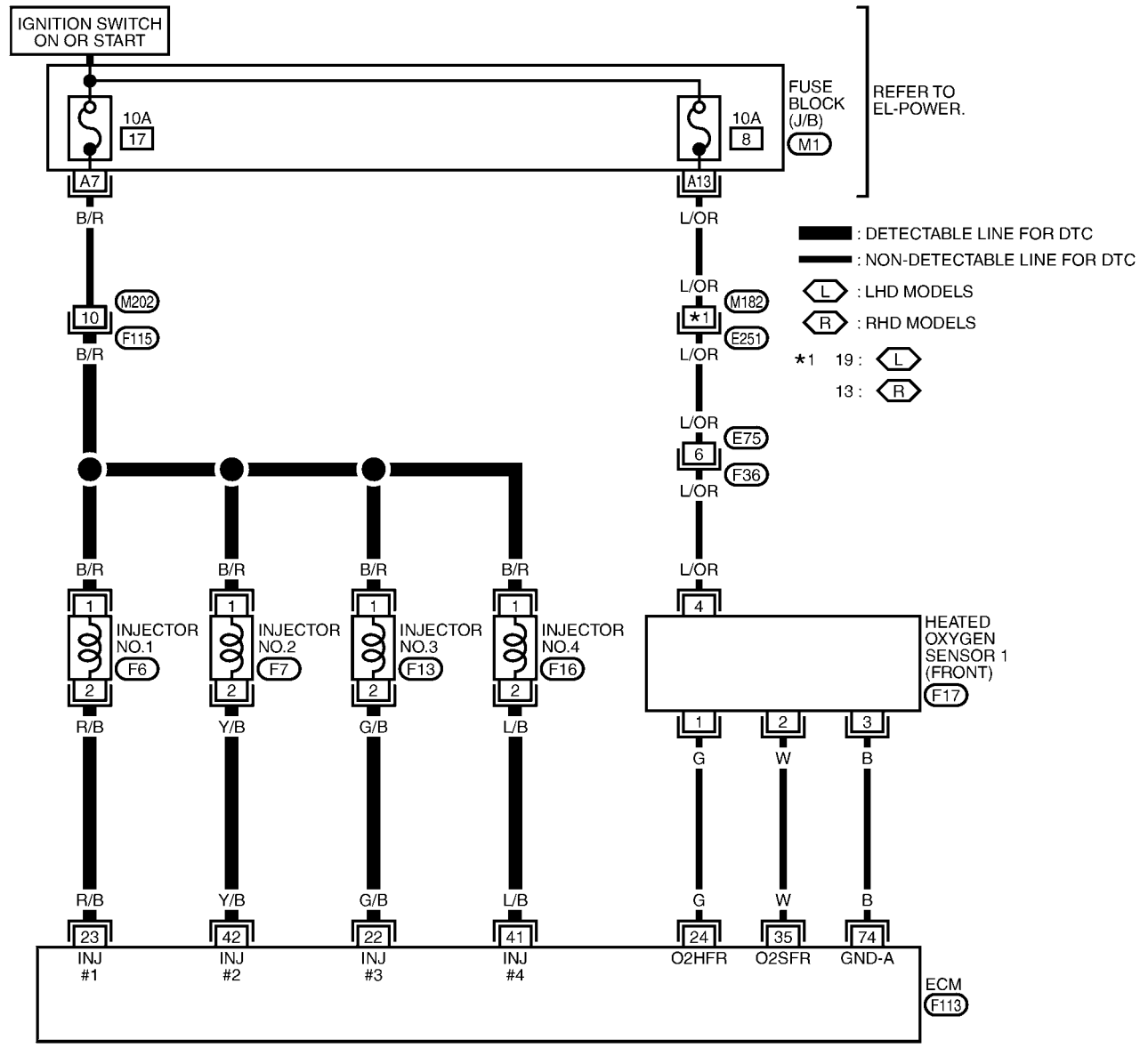
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-189, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-189, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

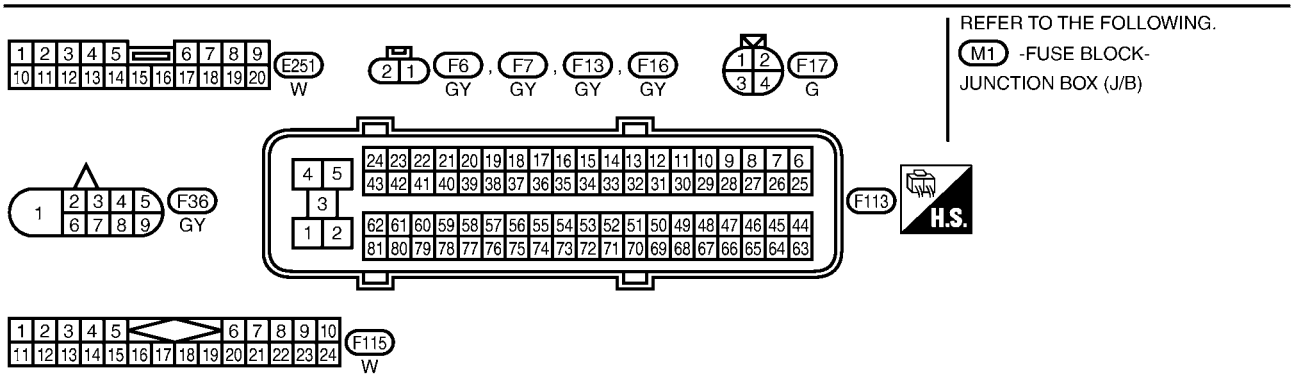


Wiring Diagram

EBS00K6S

EC-FUEL-01





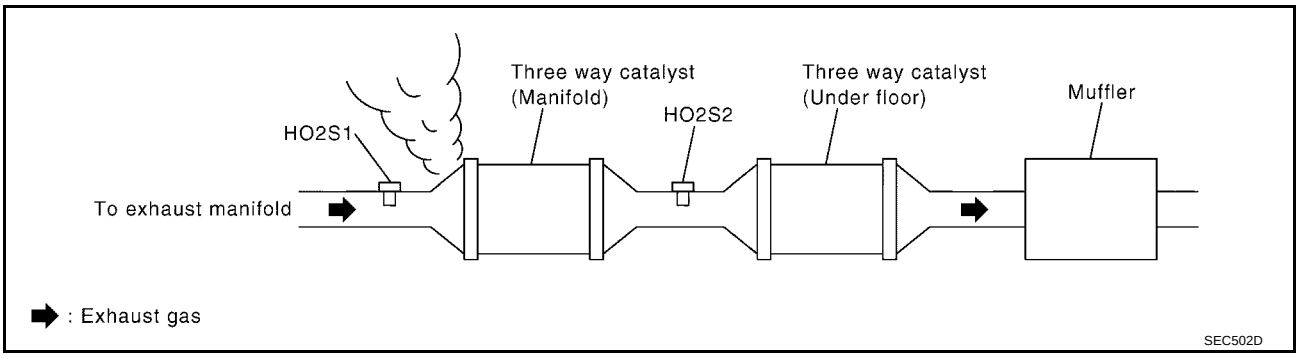
YEC285A

Diagnostic Procedure

EBS00K6T

1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

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

2. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

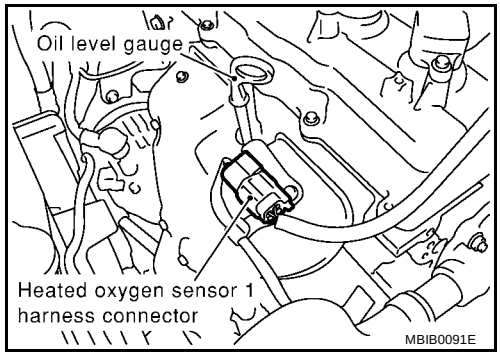
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2, ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminals 35 or HO2S1 terminals 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. 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 FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-34, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-34, "FUEL PRESSURE CHECK" .

At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

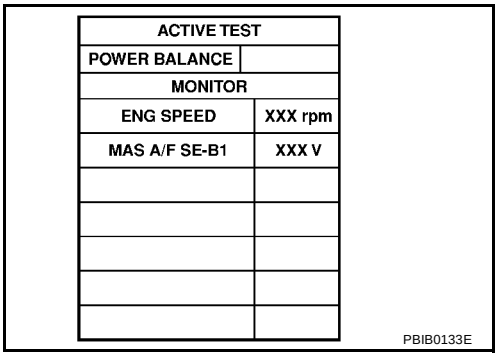
OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-134, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

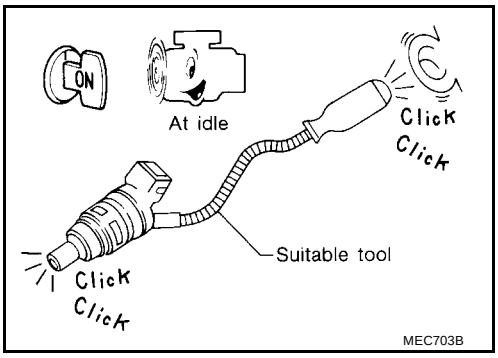
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



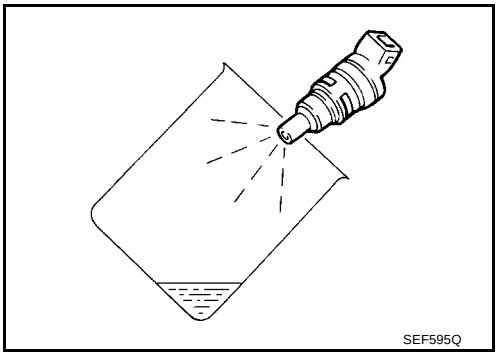
OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-375, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Disconnect injector harness connectors.
4. Remove injector gallery assembly. Refer to EM-26, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

Fuel should be sprayed evenly for each injector.



OK or NG

OK >> GO TO 8.
NG >> Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0172 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

EBS00K6U

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172	Fuel injection system too rich	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

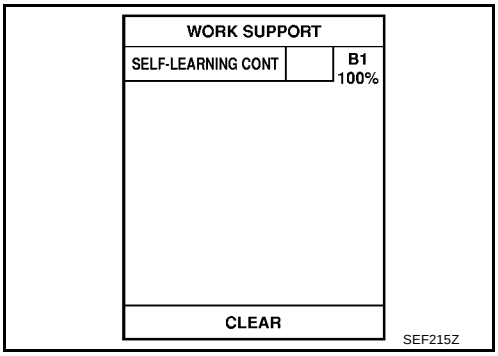
DTC Confirmation Procedure

EBS00K6V

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.

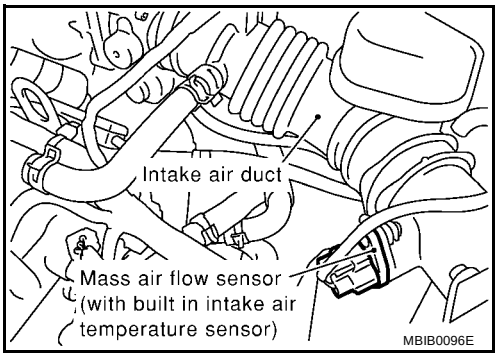
WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-196, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal.
   If engine starts, go to EC-196, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.



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 harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-196, "Diagnostic Procedure" .

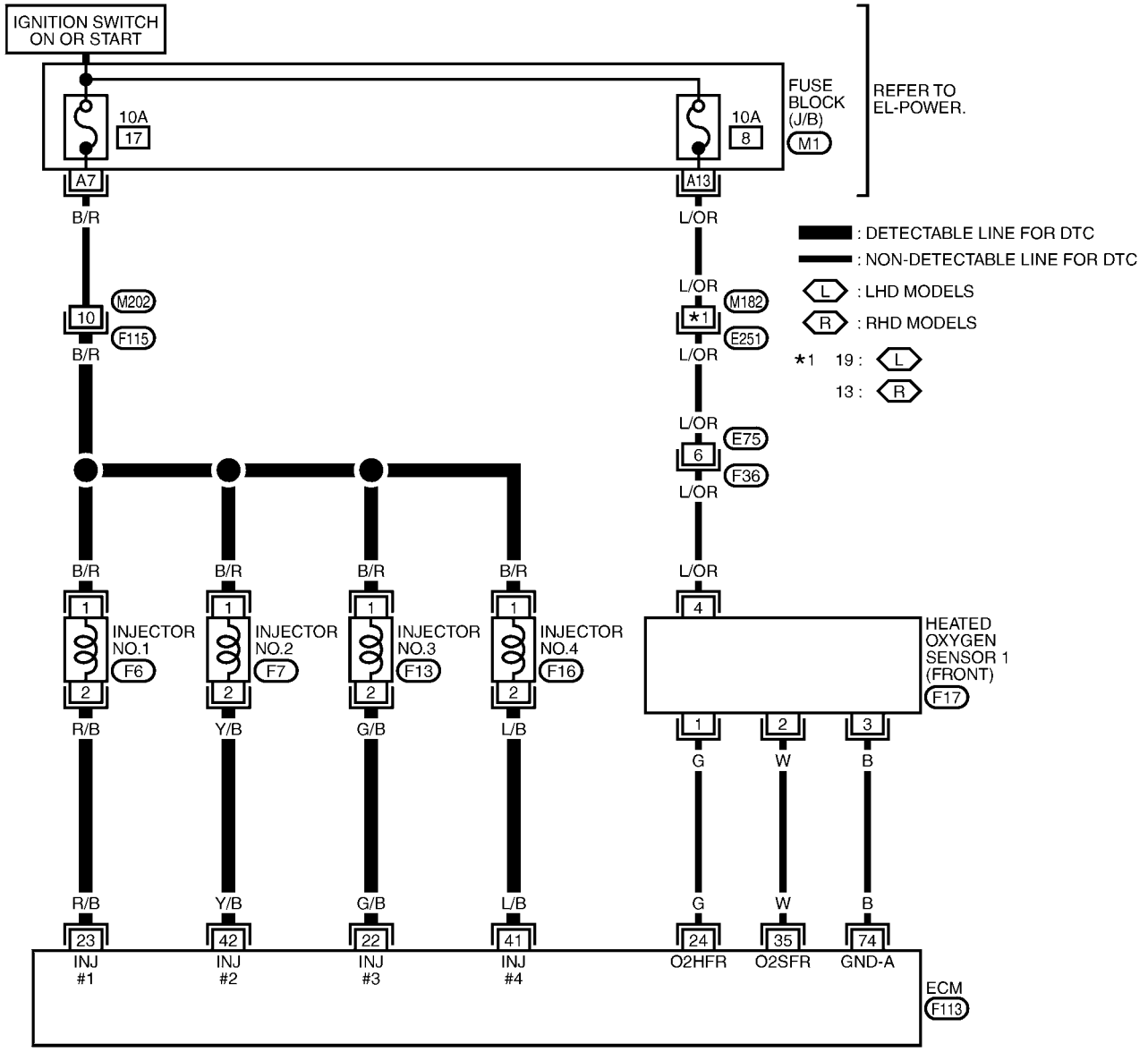


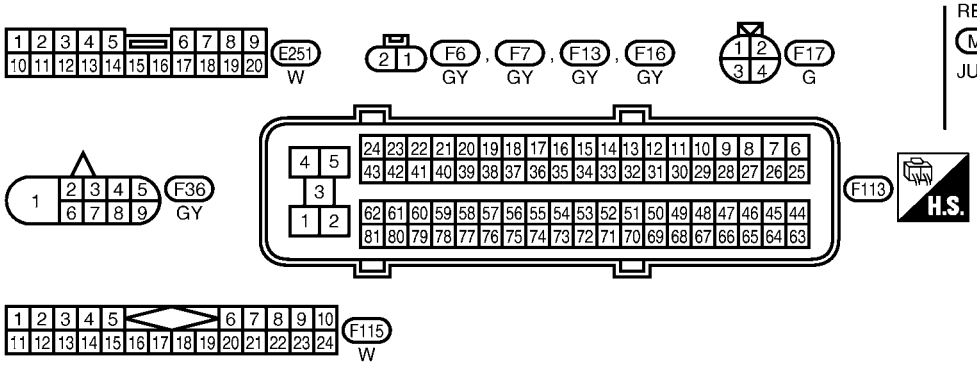
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-196, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

Wiring Diagram

EBS00K6W

EC-FUEL-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

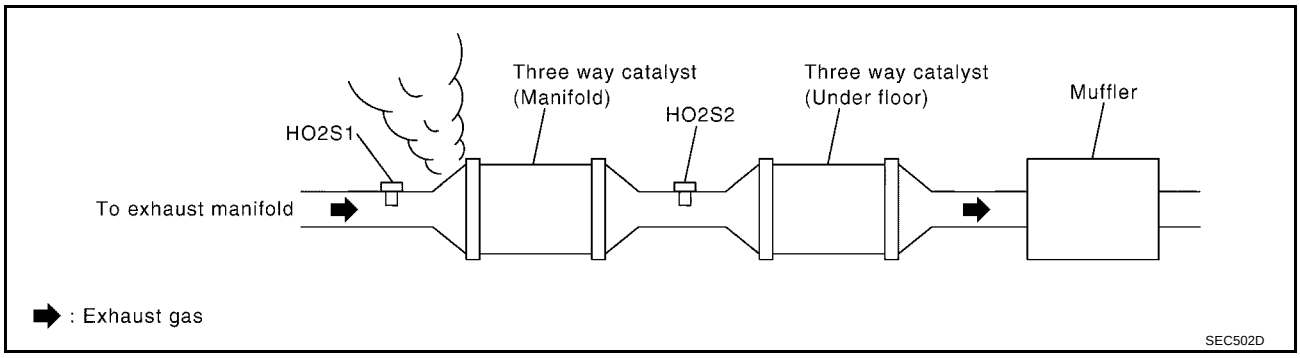
YEC285A

Diagnostic Procedure

EBS00K6X

1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

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

2. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

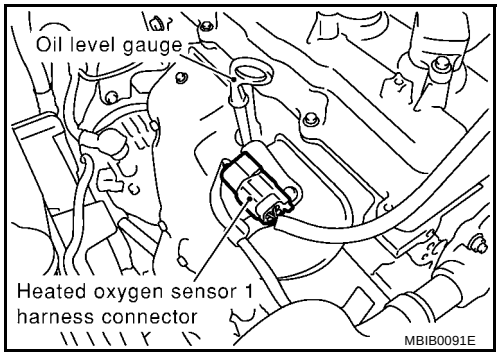
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2, ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminals 35 or HO2S1 terminals 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. 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 FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-34, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-34, "FUEL PRESSURE CHECK" .

   At idling: 350 kPa (3.5 bar, 3.57 kg/cm2, 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

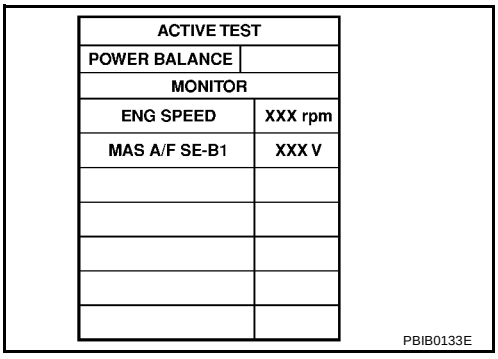
OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-134, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

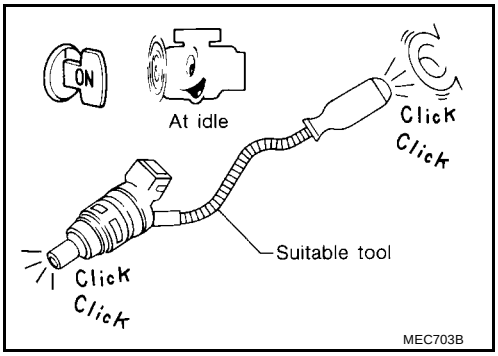
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-375, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Remove injector assembly. Refer to EM-26, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect injector harness connectors.
   The injector harness connectors should remain connected.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

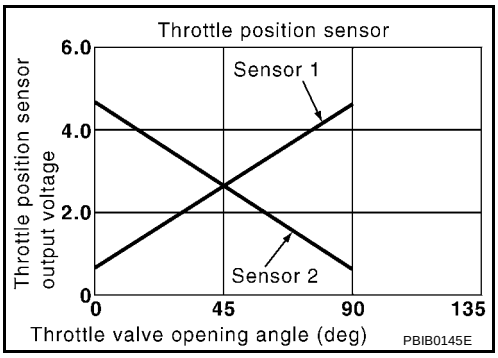
DTC P0221 TP SENSOR

PFP:16119

Component Description

EBS00K6Y

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K6Z

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T models) 1st (M/T models)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs form ECM terminal voltage signal/

On Board Diagnosis Logic

EBS00K70

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0221 0221	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

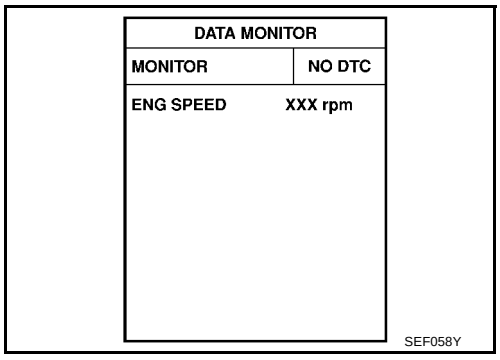
DTC Confirmation Procedure

EBS00K71

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-202, "Diagnostic Procedure" .



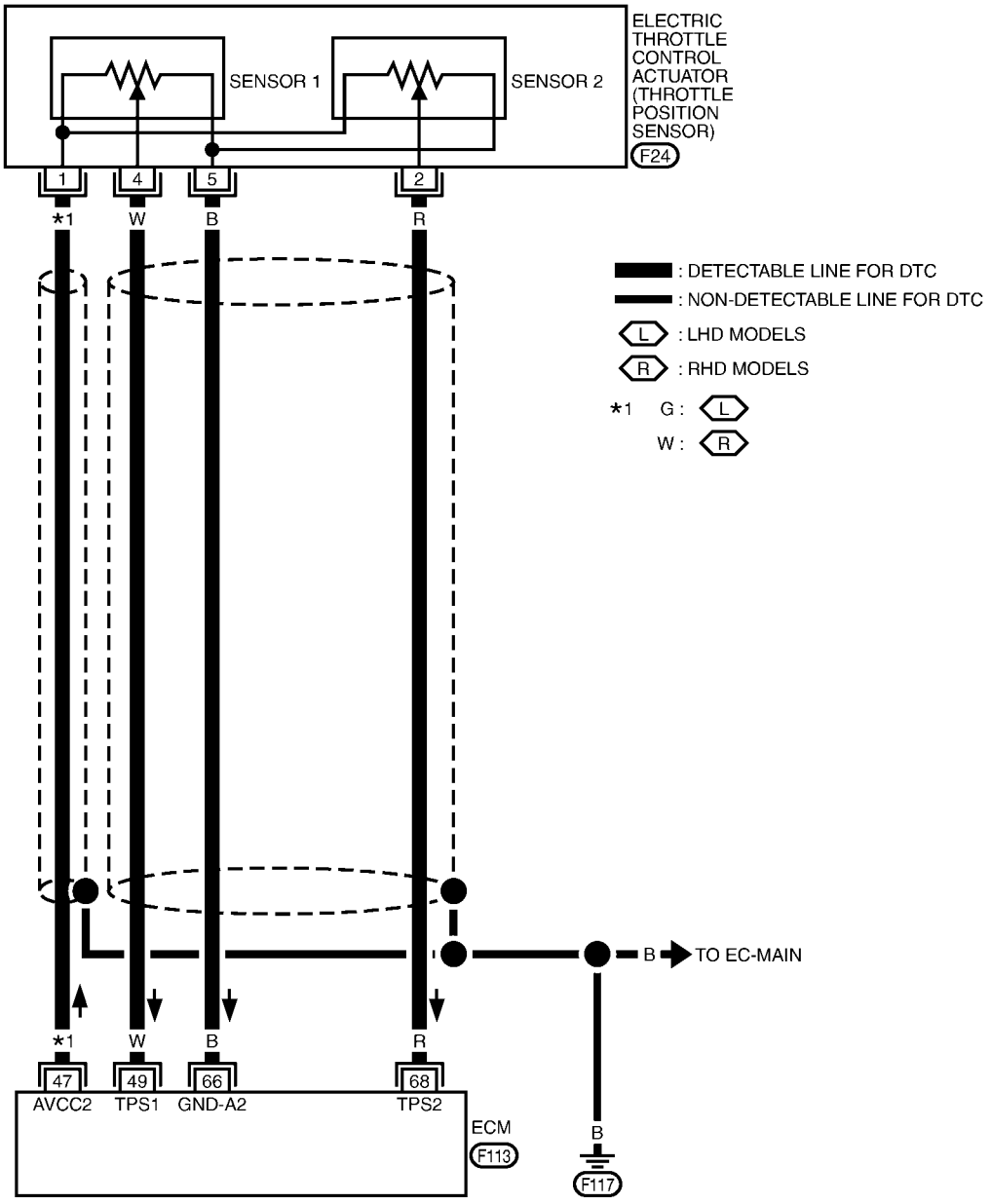
WITH GST

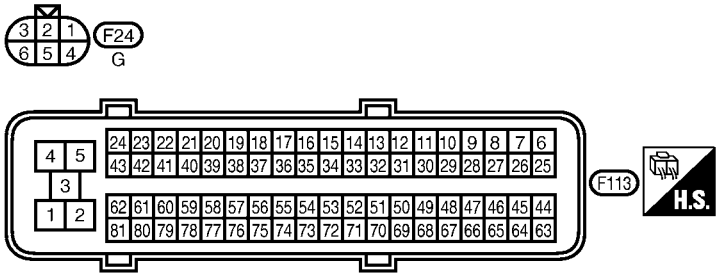
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K72

EC-TPS3-01





YEC286A

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)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	More than 0.36V

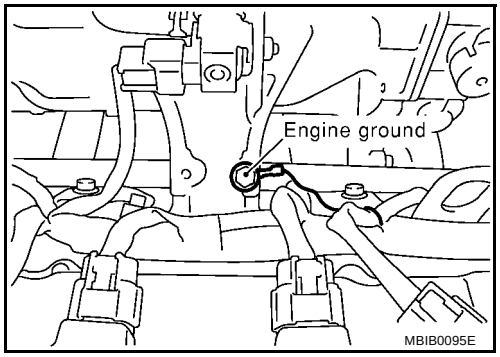
Diagnostic Procedure

EBS00K73

1. RETIGHTEN GROUND SCREWS

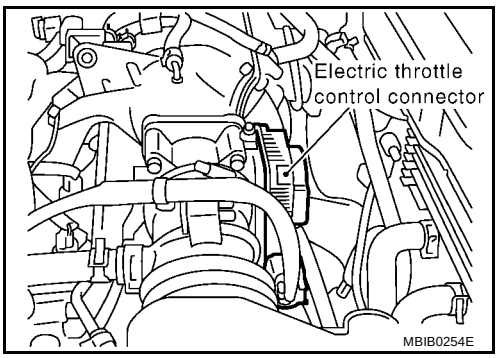
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



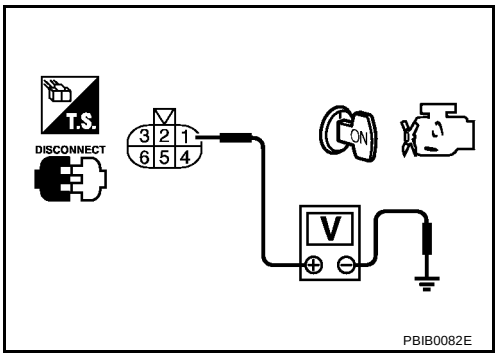
2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

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

3. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4, ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-204, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

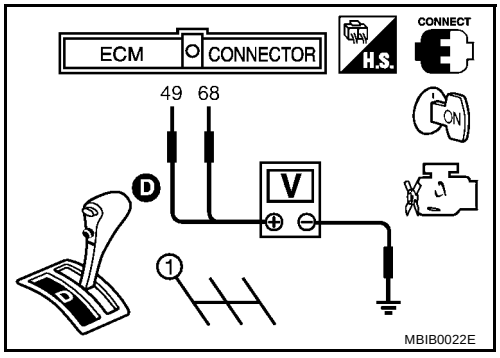
Component Inspection

EBS00K74

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-31, "Throttle Valve Closed Position Learning" .
8. Perform EC-31, "Idle Air Volume Learning" .

Removal and Installation

EBS00K75

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

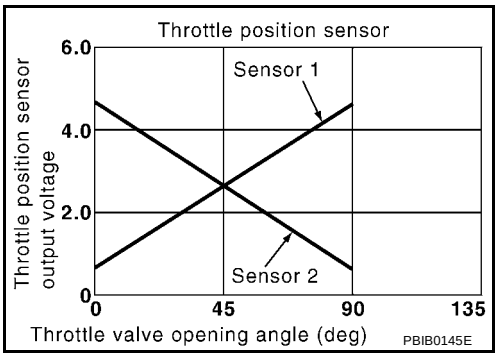
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

EBS00K76

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K77

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T models) 1st (M/T models)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal s converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00K78

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

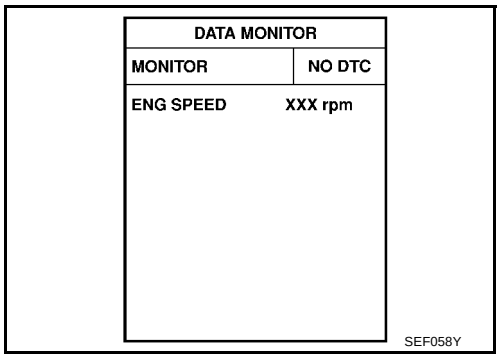
DTC Confirmation Procedure

EBS00K79

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-208, "Diagnostic Procedure" .



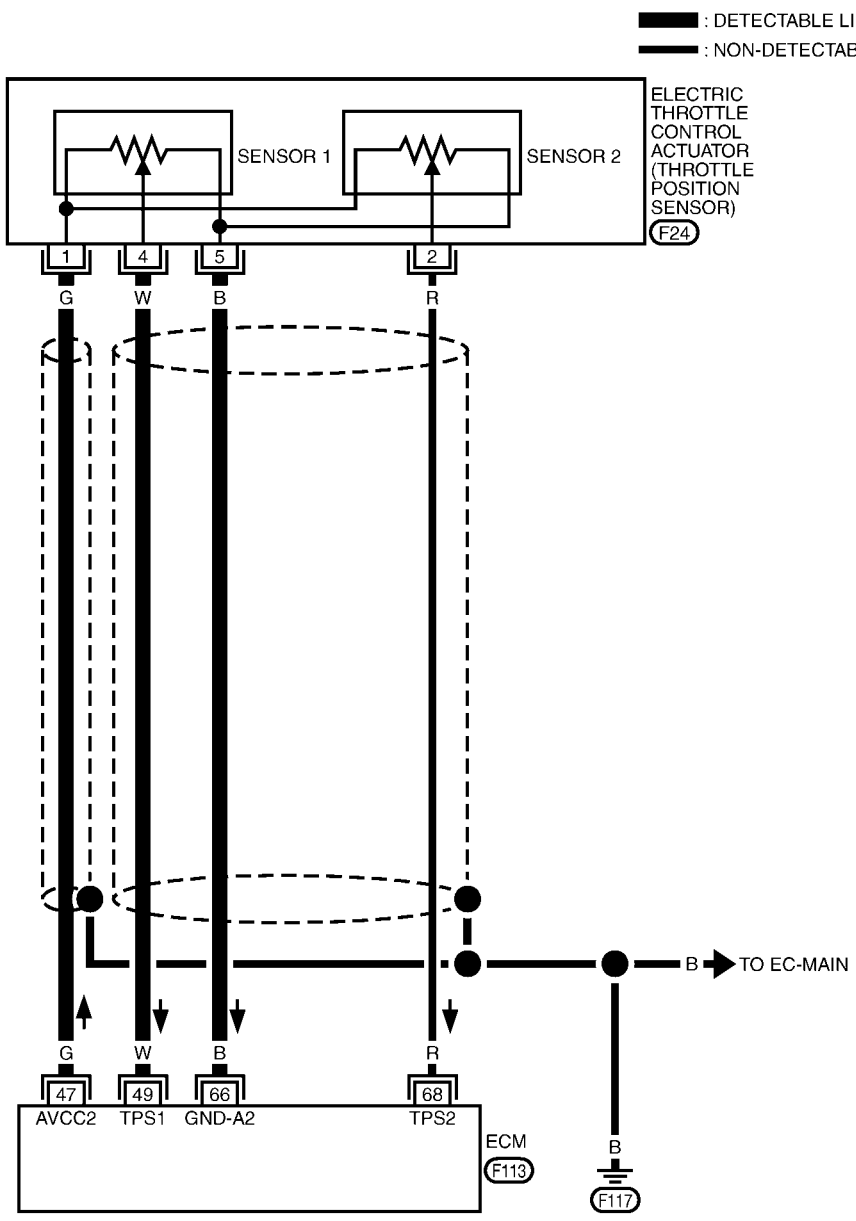
WITH GST

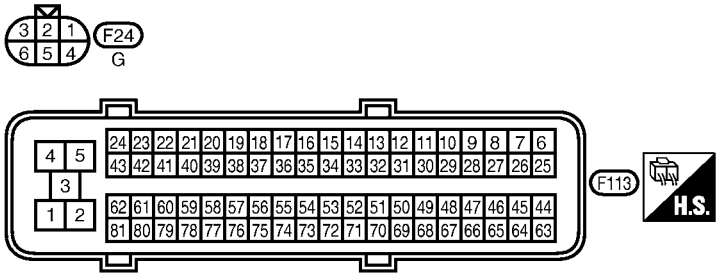
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K7A

EC-TPS1-01





YEC287A

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)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	More than 0.36V

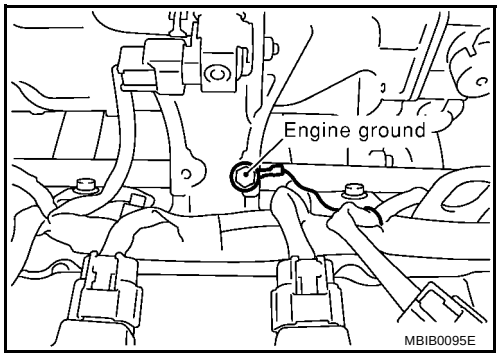
Diagnostic Procedure

EBS00K7B

1. RETIGHTEN GROUND SCREWS

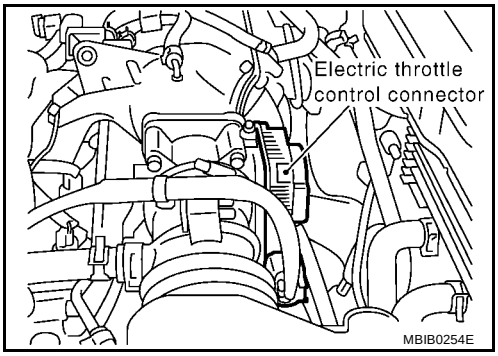
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



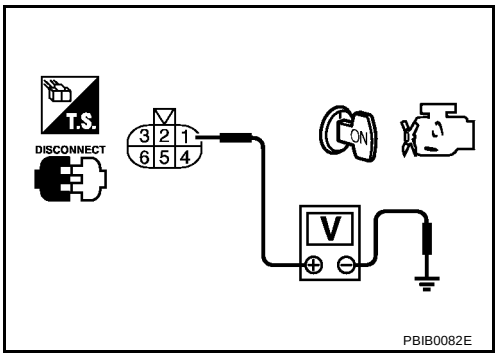
2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



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 THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-210, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

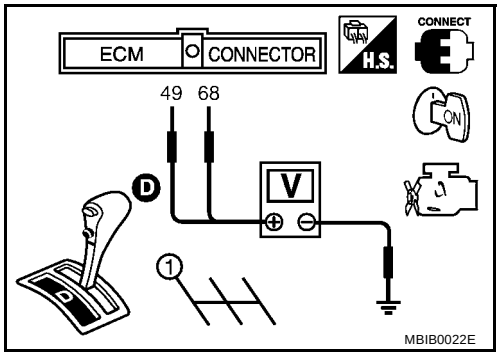
Component Inspection

EBS00K7C

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-31, "Throttle Valve Closed Position Learning" .
8. Perform EC-31, "Idle Air Volume Learning" .

Removal and Installation

EBS00K7D

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

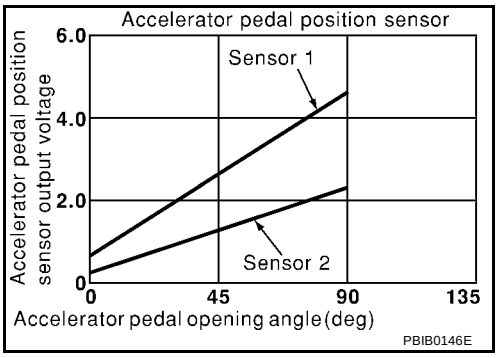
DTC P0226 APP SENSOR

PFP:18002

Component Description

EBS00K7E

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K7F

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00K7G

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0226 0226	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

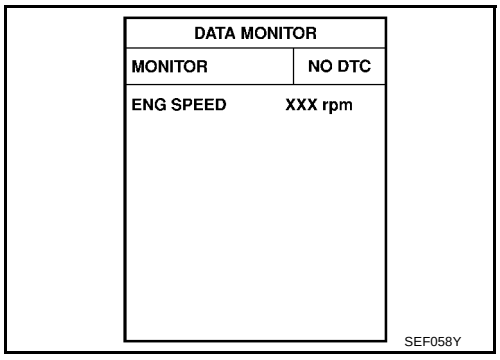
DTC Confirmation Procedure

EBS00K7H

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-214, "Diagnostic Procedure" .



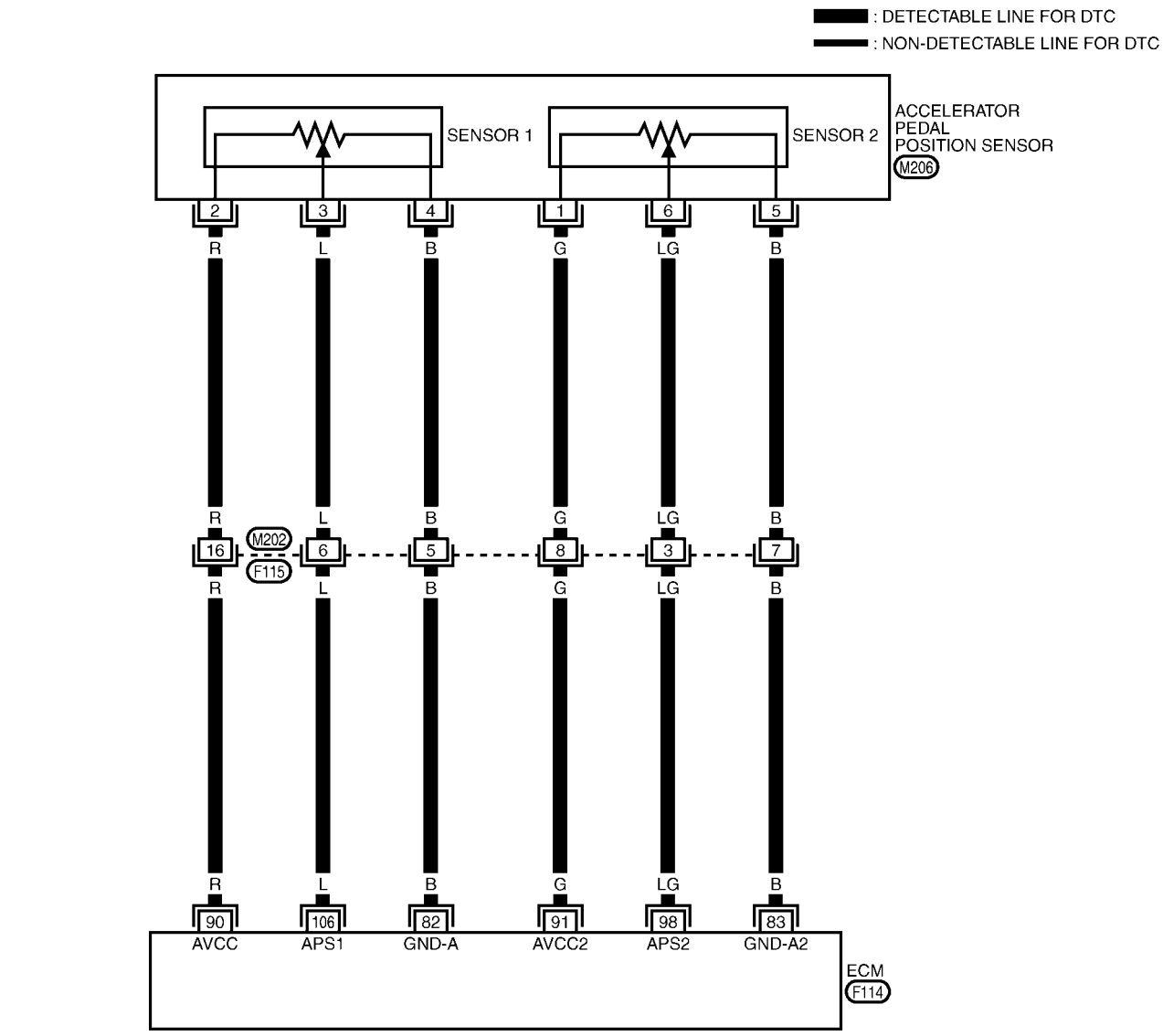
WITH GST

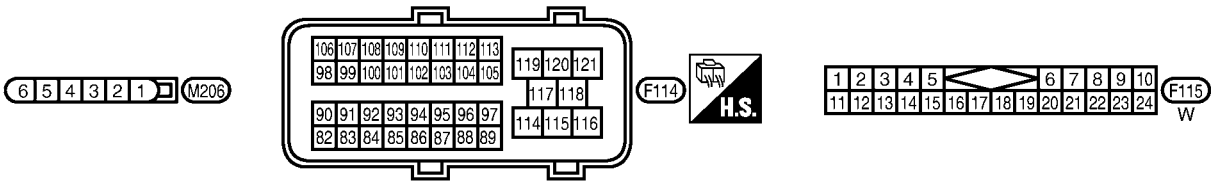
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K7I

EC-APPS3-01





YEC288A

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)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.175 - 0.335V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.35 - 0.67V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 3.9V

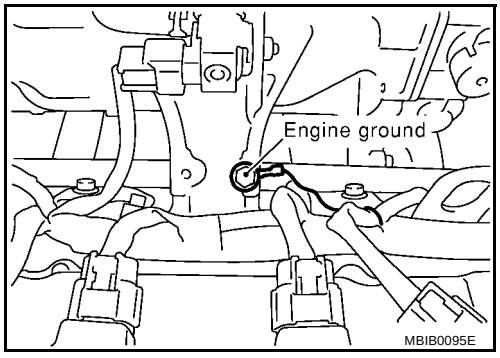
Diagnostic Procedure

EBS00K7J

1. RETIGHTEN GROUND SCREWS

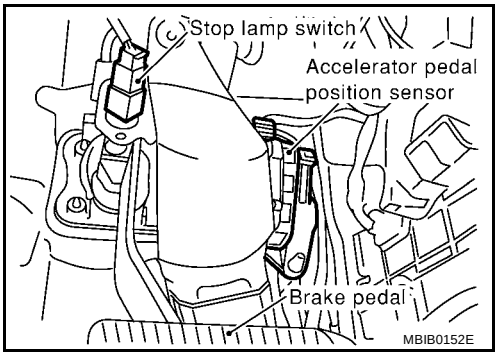
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



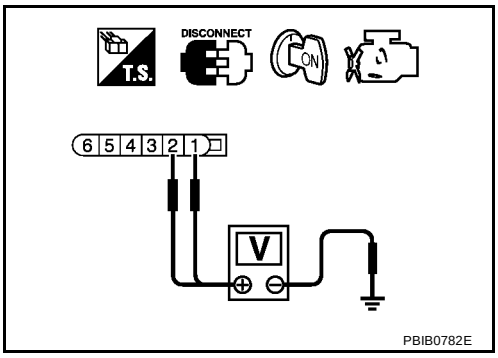
2. CHECK APP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminals 1, 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

4. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4, ECM terminal 83 and APP sensor terminal 5.
   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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

   Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

8. CHECK APP SENSOR

Refer to EC-216, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-31, "Accelerator Pedal Released Position Learning" .
3. Perform EC-31, "Throttle Valve Closed Position Learning" .
4. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

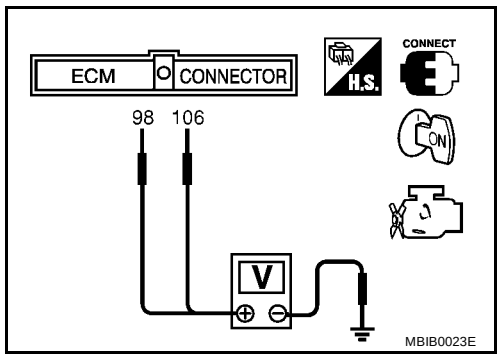
EBS00K7K

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.

3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-31, "Accelerator Pedal Released Position Learning" .
6. Perform EC-31, "Throttle Valve Closed Position Learning" .
7. Perform EC-31, "Idle Air Volume Learning" .

Removal and Installation

EBS00K7L

ACCELERATOR PEDAL

Refer to FE-3.

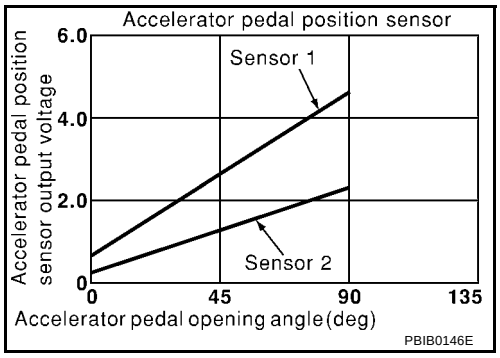
DTC P0227, P0228 APP SENSOR

PFP:18002

Component Description

EBS00K7M

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K7N

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00K7O

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0227 0227	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P0228 0228	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

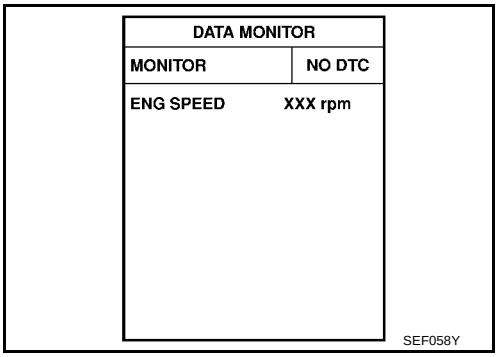
DTC Confirmation Procedure

EBS00K7P

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-221, "Diagnostic Procedure" .



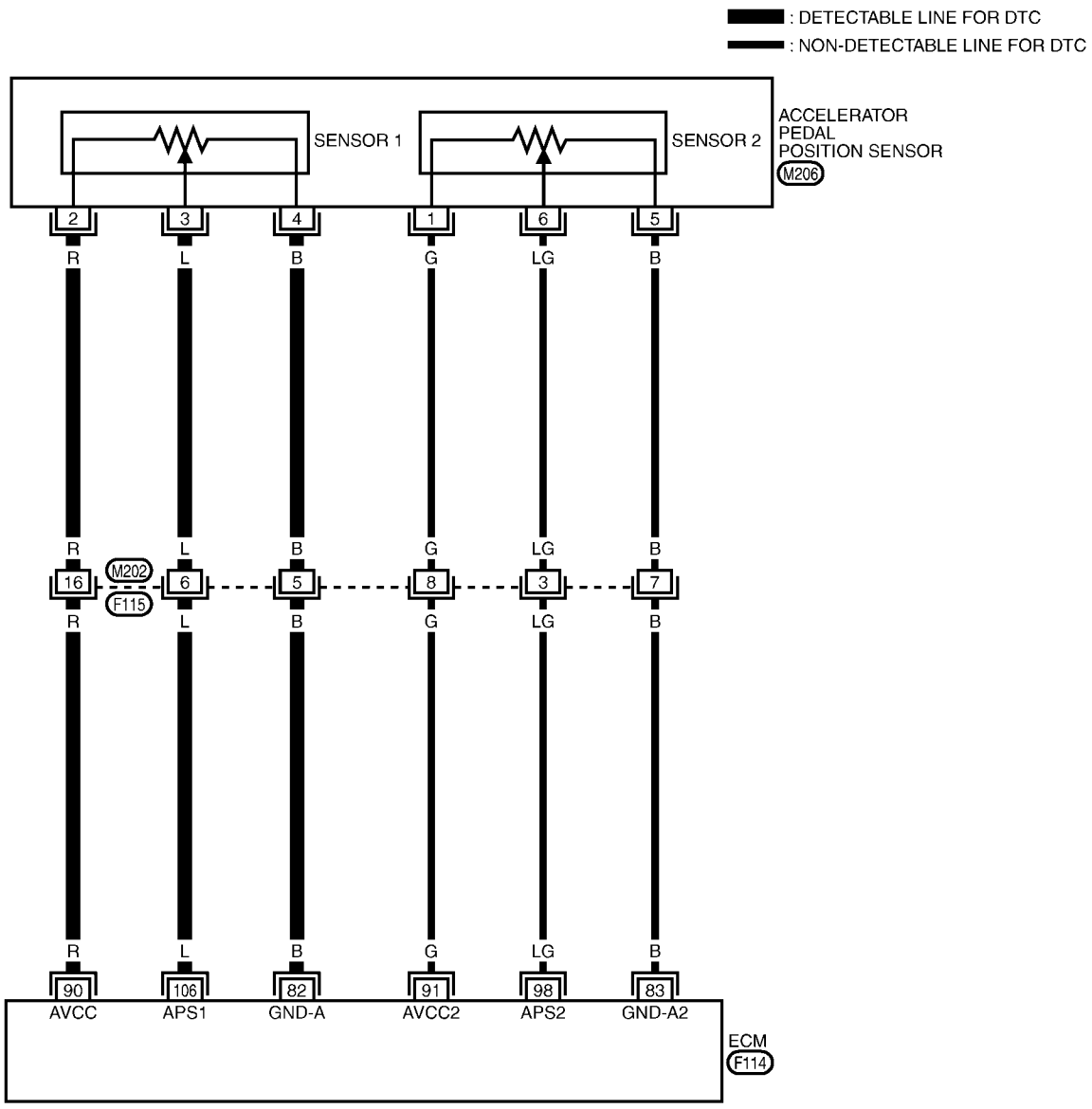
WITH GST

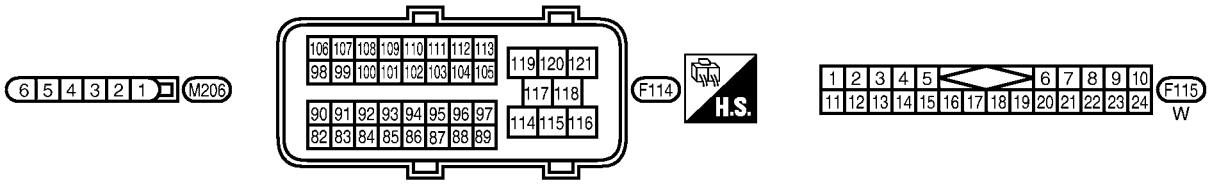
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K7Q

EC-APPS1-01





YEC289A

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)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.175 - 0.335V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.35 - 0.67V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 3.9V

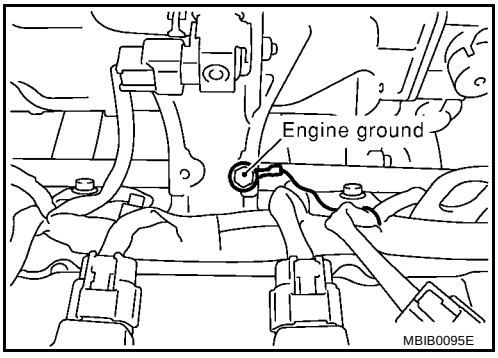
Diagnostic Procedure

EBS00K7R

1. RETIGHTEN GROUND SCREWS

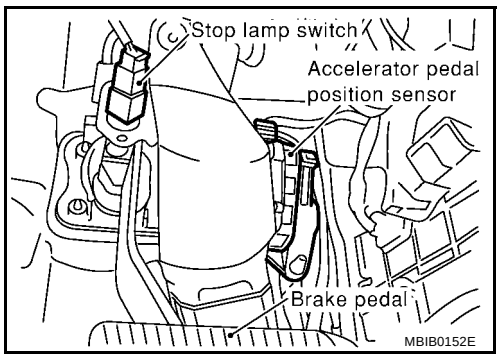
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



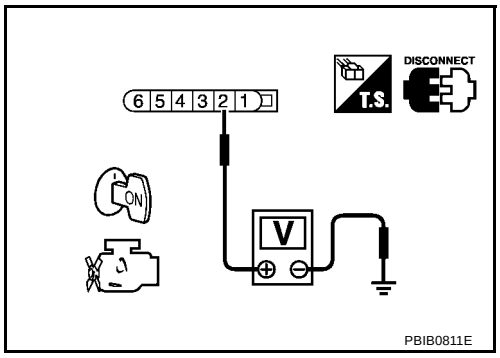
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4. 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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

8. CHECK APP SENSOR

Refer to EC-223, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-31, "Accelerator Pedal Released Position Learning" .
3. Perform EC-31, "Throttle Valve Closed Position Learning" .
4. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

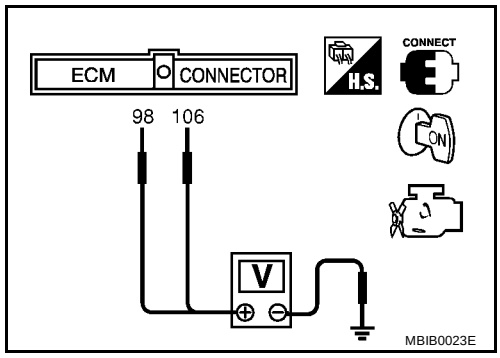
Component Inspection

EBS00K7S

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-31, "Accelerator Pedal Released Position Learning" .
6. Perform EC-31, "Throttle Valve Closed Position Learning" .
7. Perform EC-31, "Idle Air Volume Learning" .

Removal and Installation

EBS00K7T

ACCELERATOR PEDAL

Refer to FE-3.

DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

PFP:00000

On Board Diagnosis Logic

EBS00K7U

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MI will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor (POS) signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MI will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will remain on.
   If another misfire condition occurs that can damage the TWC, the MI will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MI will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● The injector circuit is open or shorted ● Fuel injectors ● Intake air leak ● The ignition signal circuit is open or shorted ● Lack of fuel ● Drive plate or flywheel ● Heated oxygen sensor 1 ● Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	

DTC Confirmation Procedure

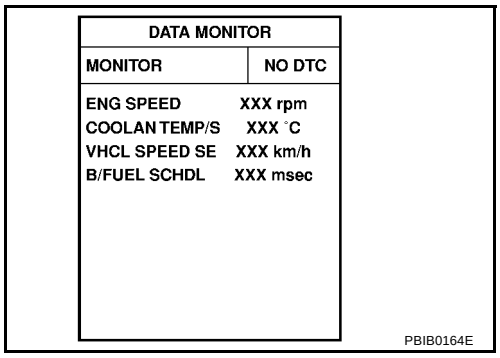
EBS00K7V

CAUTION:
Always drive vehicle at a safe speed.

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 normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
   NOTE:
   Refer to the freeze frame data for the test driving conditions.
5. If 1st trip DTC is detected, go to EC-226, "Diagnostic Procedure"
   .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00K7W

1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

OK or NG

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

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. PERFORM POWER BALANCE TEST

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

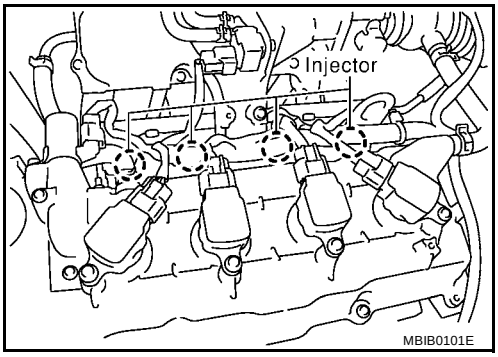
PBIB0133E

Without CONSULT-II

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes or No

Yes >> GO TO 4.
No >> GO TO 7.



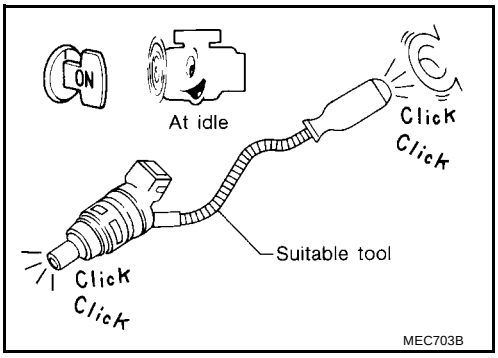
MBIB0101E

4. CHECK INJECTOR

Does each injector make an operating sound at idle?

Yes or No

Yes >> GO TO 5.
No >> Check injector(s) and circuit(s). Refer to EC-375, "INJECTOR CIRCUIT" .



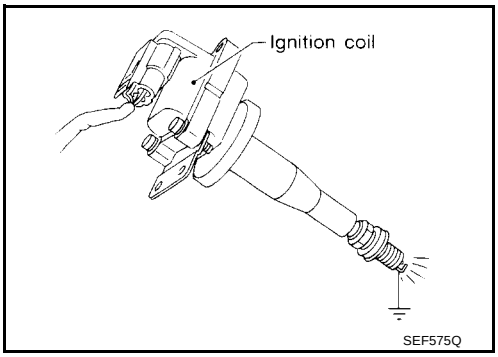
MEC703B

5. CHECK IGNITION SPARK

1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

OK or NG

OK >> GO TO 6.
NG >> Check ignition coil, power transistor and their circuits. Refer to EC-365, "IGNITION SIGNAL" .



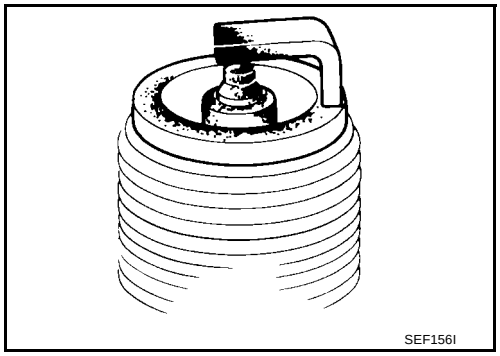
SEF575Q

6. CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.

OK or NG

OK >> GO TO 7.
NG >> Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-7.



7. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-57, "CHECKING COMPRESSION PRESSURE" .

QG15DE engine

Standard:	**1,372 kPa (13.720 bar, 13.99 kg/cm^2 , 198.9 psi)/350 rpm**
Minimum:	**1,176 kPa (11.759 bar, 11.99 kg/cm^2 , 170.5 psi)/350 rpm**
Difference between each cylinder:	**98 kPa (0.98 bar, 1.0 kg/cm^2 , 14 psi)/350 rpm**

QG18DE engine

Standard:	**1,324 kPa (13.24 bar, 13.5 kg/cm^2 , 192 psi)/350 rpm**
Minimum:	**1,128 kPa (11.28 bar, 11.5 kg/cm^2 , 164 psi)/350 rpm**
Difference between each cylinder:	**98 kPa (0.98 bar, 1.0 kg/cm^2 , 14 psi)/350 rpm**

OK or NG

OK >> GO TO 8.
NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

8. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-34, "FUEL PRESSURE RELEASE" .
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-34, "FUEL PRESSURE CHECK" .

At idle: Approx. 350 kPa (3.5 bar, 3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 9.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

9. CHECK IGNITION TIMING

Check the following items. Refer to EC-65, "Basic Inspection" .

Items	Specifications	
Target idle speed	A/T	800 ± 50 rpm (in “P” or “N” position)
	M/T	700 ± 50 rpm
Ignition timing	A/T	10 ± 5° BTDC (in “P” or “N” position)
	M/T	8 ± 5° BTDC

OK or NG

OK >> GO TO 10.
NG >> Follow the “Basic Inspection”.

10. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-153, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. CHECK MASS AIR FLOW SENSOR

With CONSULT-II
Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

With GST
Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 12.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-134, "DTC P0102, P0103 MAF SENSOR" .

12. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-70, "Symptom Matrix Chart" .

OK or NG

OK >> GO TO 13.
NG >> Repair or replace.

13. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

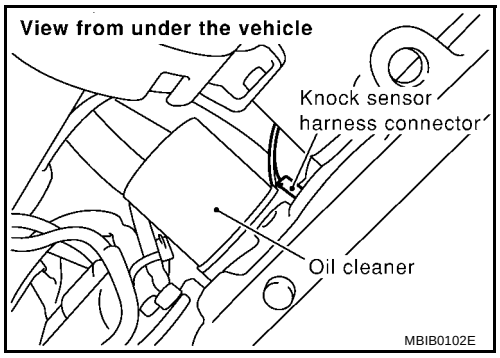
DTC P0327, P0328 KS

PFP:22060

Component Description

EBS00K7X

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

EBS00K7Y

The MI will not light up for these self-diagnoses.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

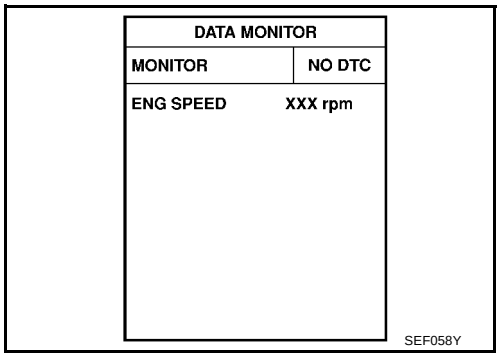
EBS00K7Z

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-232, "Diagnostic Procedure" .



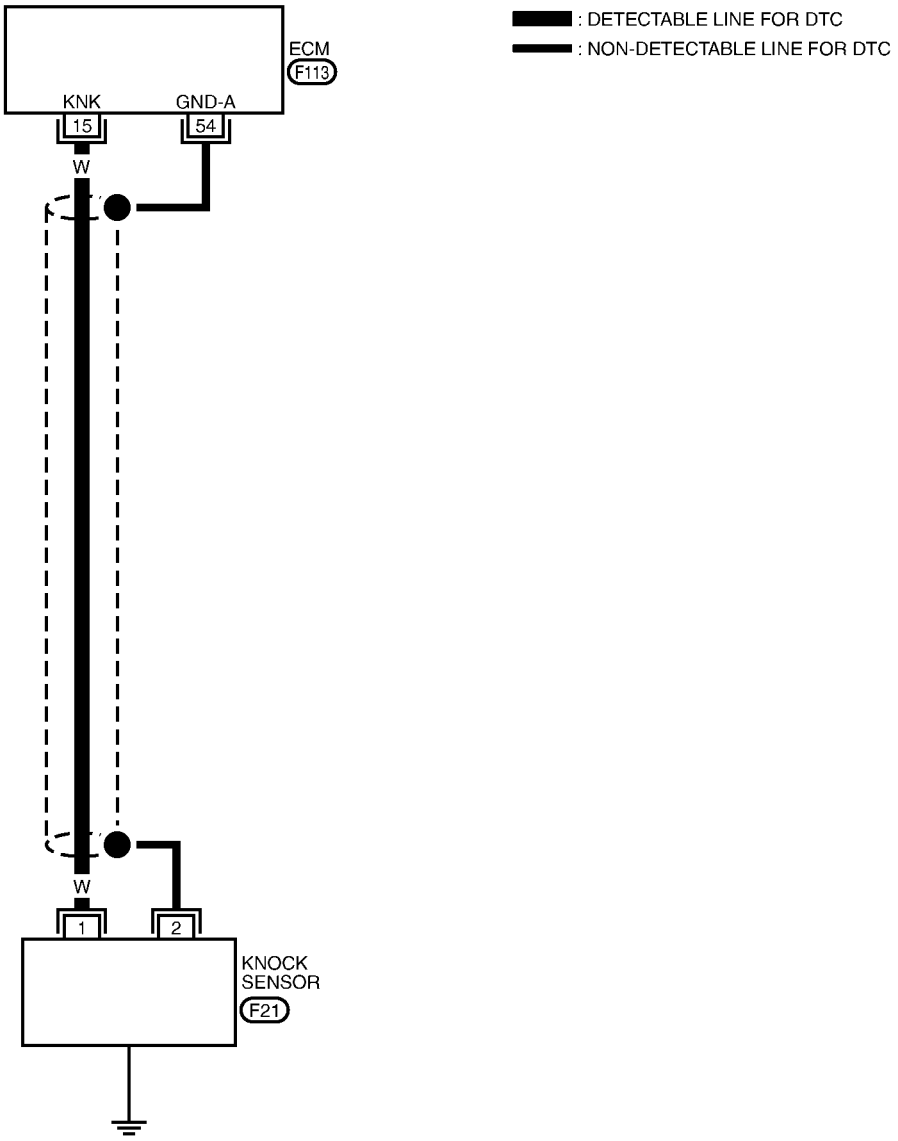
WITH GST

Follow the procedure “WITH CONSULT-II” above.

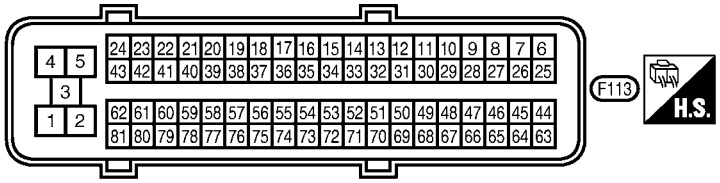
Wiring Diagram

EBS00K80

EC-KS-01







YEC290A

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)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
54	—	Sensor ground (Knock sensor shield circuit)	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00K81

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]
4. Also check harness for short to ground and short to power.

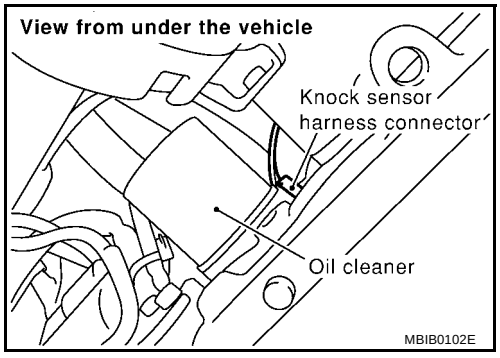
OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
3. 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 KNOCK SENSOR

Refer to EC-233, "Component Inspection" .

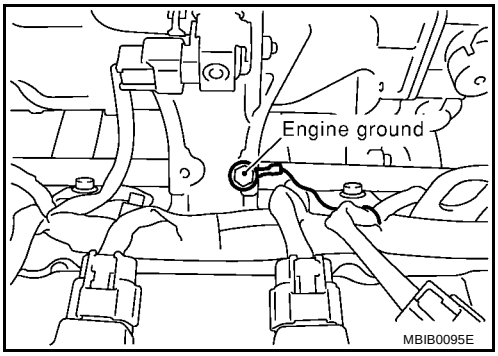
OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 5.



5. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00K82

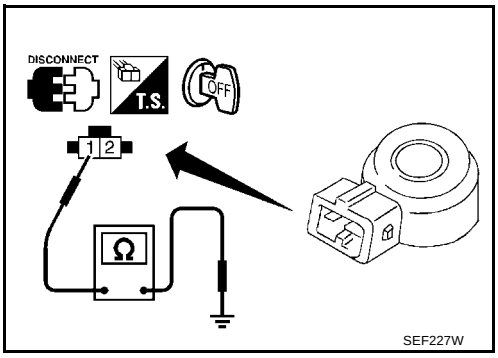
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



Removal and Installation

EBS00K83

KNOCK SENSOR

Refer to EM-70, "CYLINDER BLOCK" .

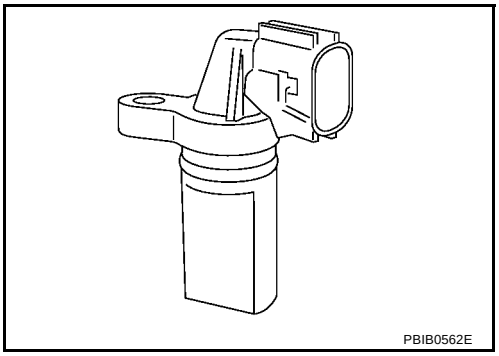
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

EBS00K84

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

EBS00K85

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

EBS00K86

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Signal plate

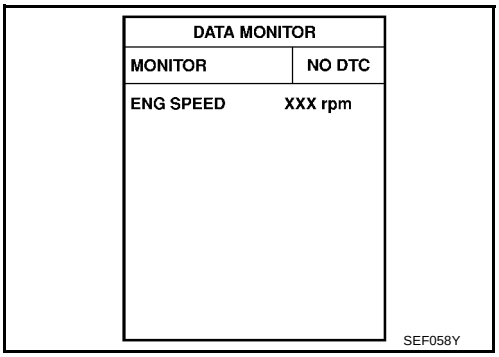
DTC Confirmation Procedure

EBS00K87

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 10.5V with ignition switch ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-236, "Diagnostic Procedure" .



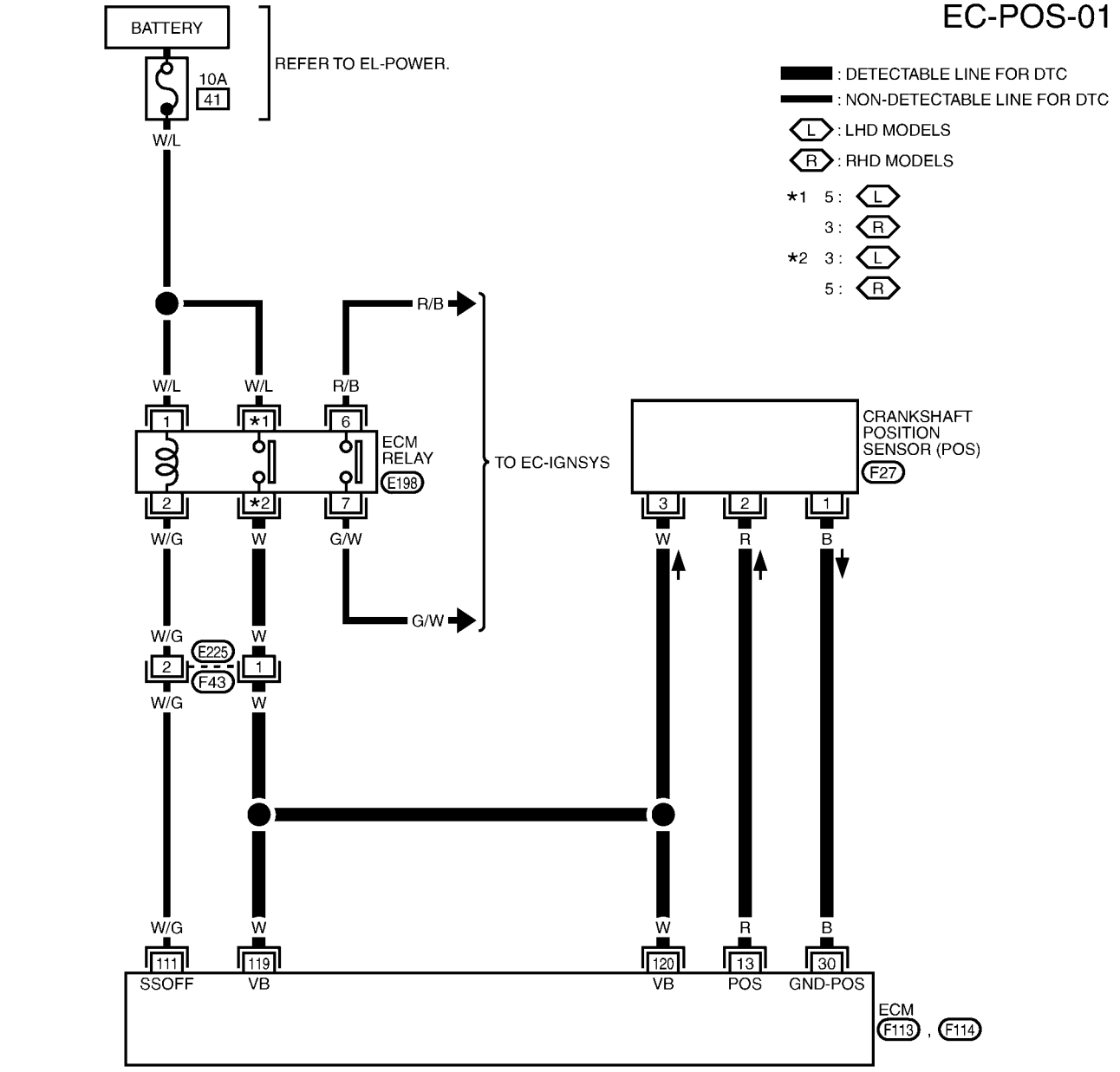
SEF058Y

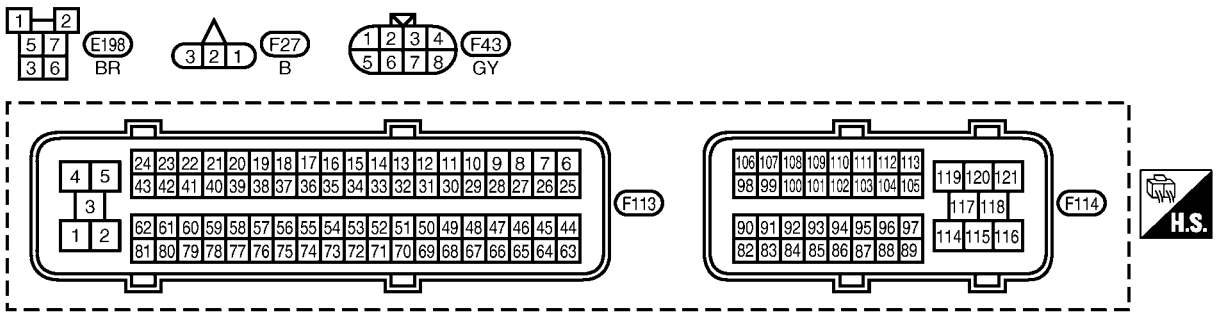
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K88



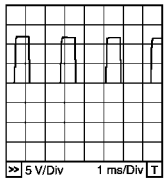
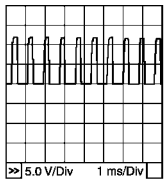


YEC291A

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)
13	W	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 3V★  PBIB0528E
30	B	Crankshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V

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

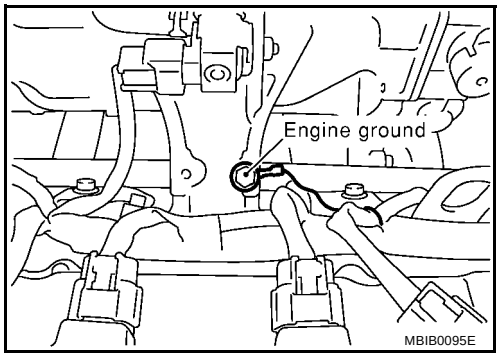
Diagnostic Procedure

EBS00K89

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

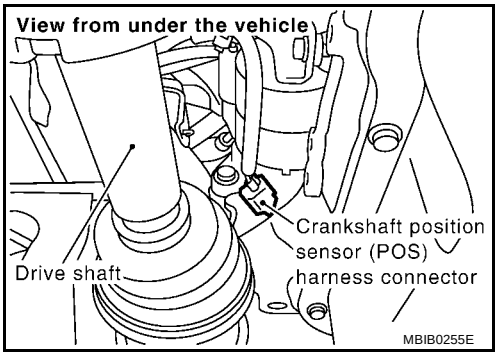
>> GO TO 2.



MBIB0095E

2. CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch “ON”.



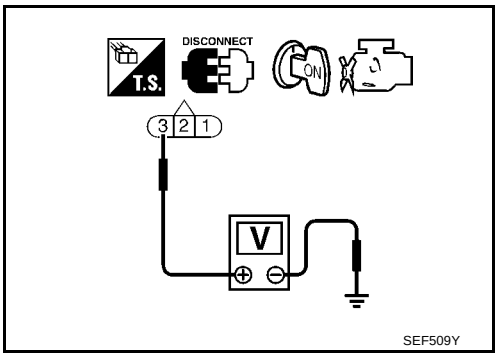
3. Check voltage between CKP sensor (POS) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

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

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

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

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 30 and CKP sensor (POS) terminal 1 Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-238, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 8.
NG >> Replace the signal plate.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

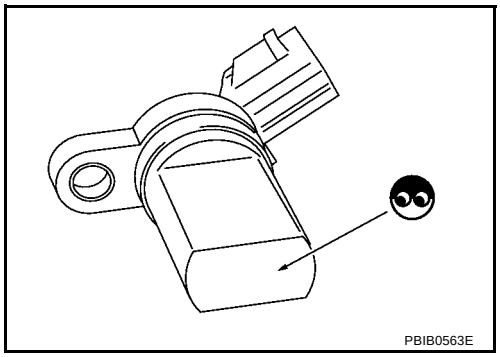
>> **INSPECTION END**

Component Inspection

EBS00K8A

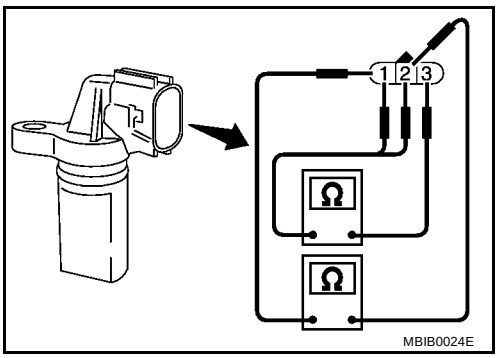
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



6. If NG, replace crankshaft position sensor (POS).

EBS00K8B

Removal and Installation

CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-70, "CYLINDER BLOCK" .

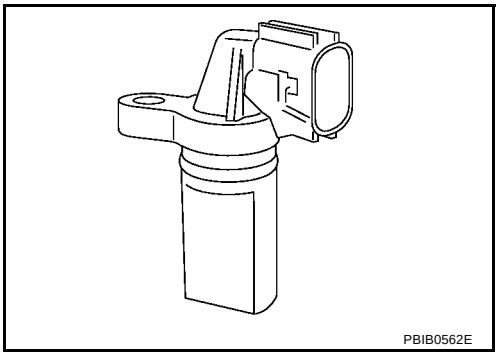
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

EBS00K8C

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

EBS00K8D

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-13.) ● Starting system circuit (Refer to SC-13.) ● Dead (Weak) battery

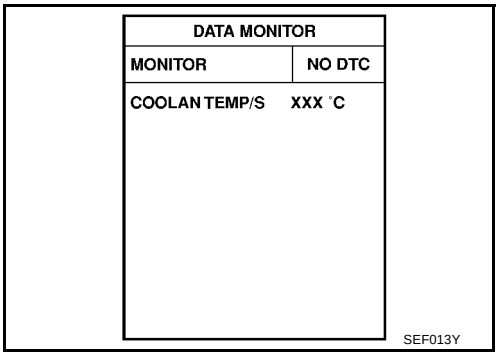
DTC Confirmation Procedure

EBS00K8E

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 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-242, "Diagnostic Procedure"
   .
   If 1st trip DTC is not detected, go to next step.
5. Maintain engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-242, "Diagnostic Procedure"
   .



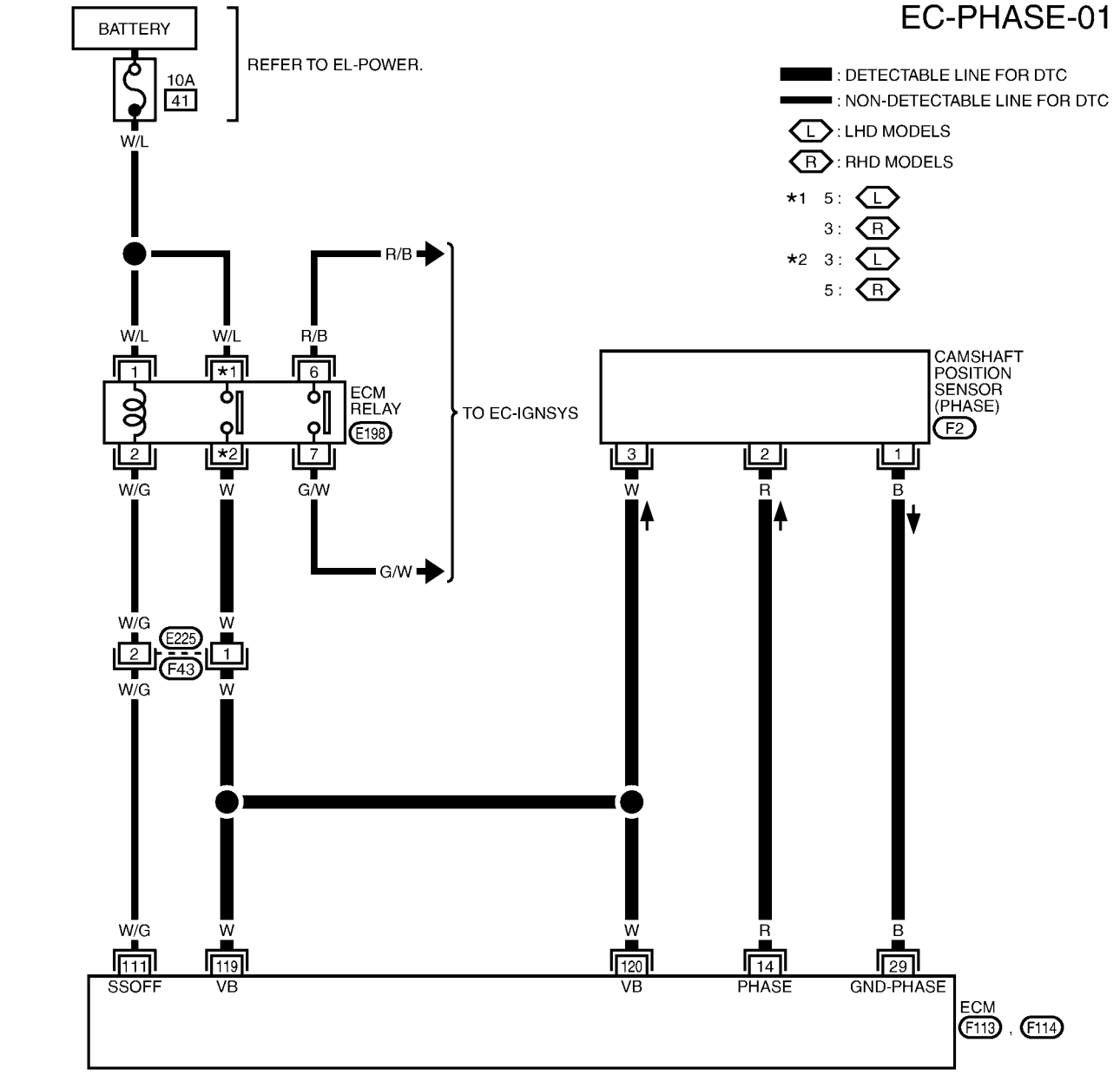
SEF013Y

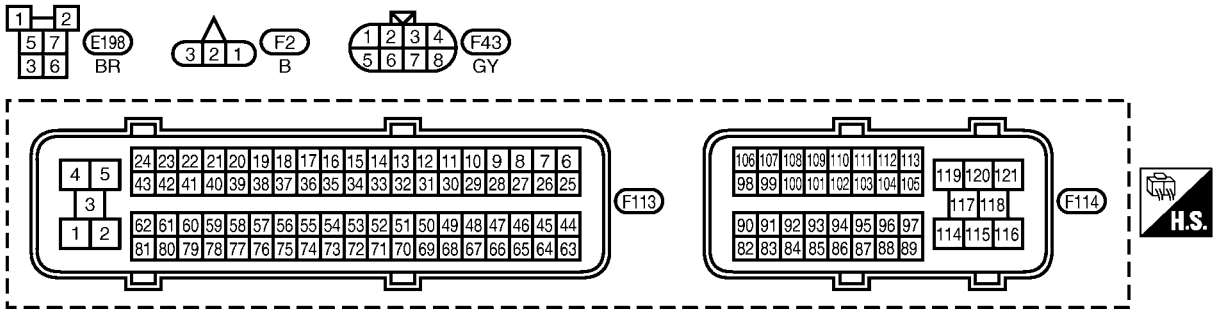
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K8F



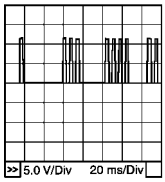
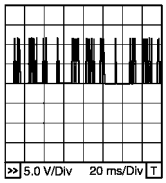


YEC292A

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)
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V

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

Diagnostic Procedure

EBS00K8G

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

Yes or No

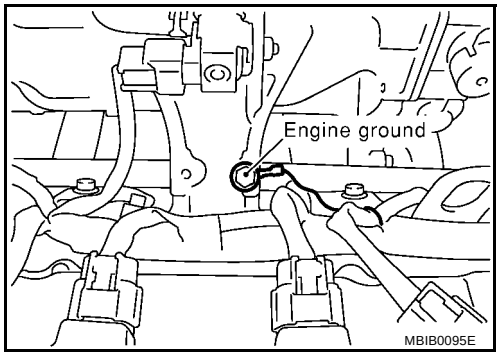
Yes >> GO TO 2.

No >> Check starting system. (Refer to SC-13.)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

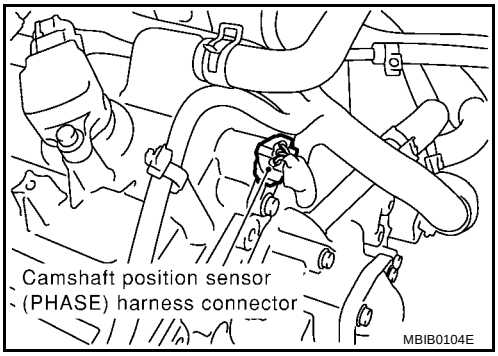
>> GO TO 3.



MBIB0095E

3. CHECK CMP SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



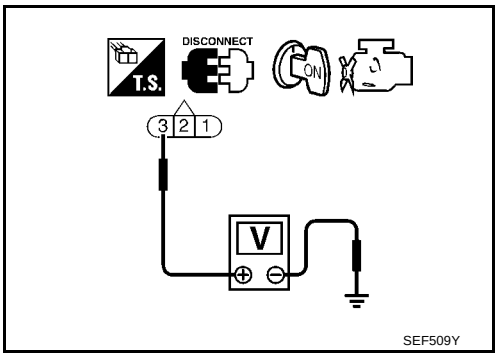
3. Check voltage between CMP sensor (PHASE) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

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

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

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

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and CMP sensor (PHASE) terminal 1.

Continuity should exist.

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

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 14 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-244, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

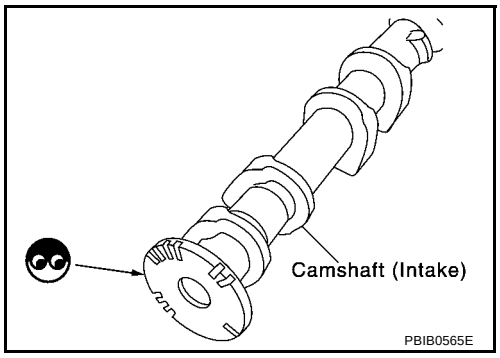
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

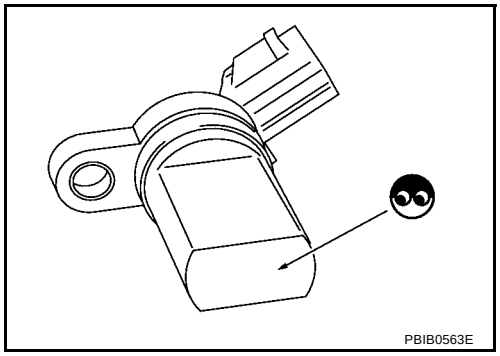
>> **INSPECTION END**

Component Inspection

EBS00K8H

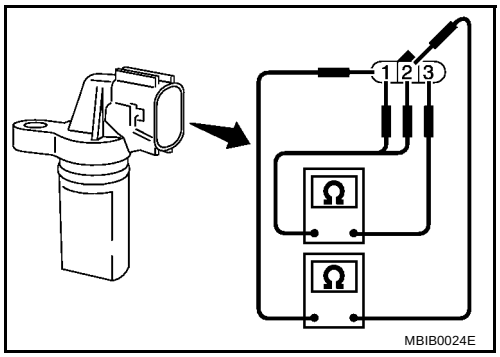
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



Removal and Installation

EBS00K8I

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-29, "ROCKER COVER" .

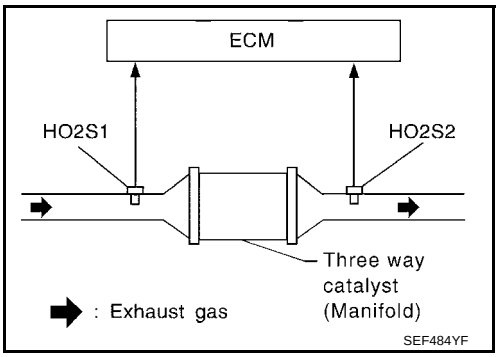
DTC P0420 THREE WAY CATALYST FUNCTION

PFP:20905

On Board Diagnosis Logic

EBS00K8J

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 and 2.
A three way catalyst (Manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst (Manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	● Three way catalyst (Manifold) does not operate properly. ● Three way catalyst (Manifold) does not have enough oxygen storage capacity.	● Three way catalyst (Manifold) ● Exhaust tube ● Intake air leaks ● Fuel injectors ● Fuel injector leaks ● Spark plug ● Improper ignition timing

DTC Confirmation Procedure

EBS00K8K

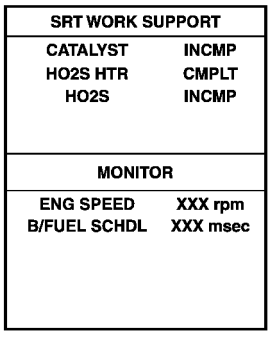
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

TESTING CONDITION:

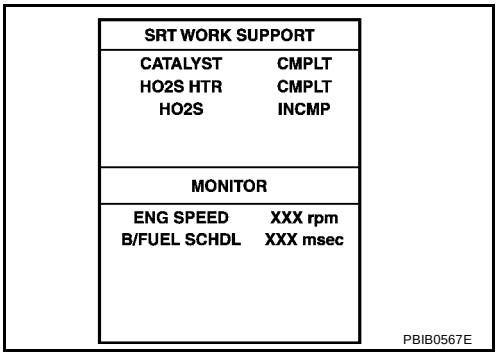
- **Open engine hood before conducting the following procedure.**
- **Do not hold engine speed for more than the specified minutes below.**

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 one minute under no load.
4. Let engine idle for one minute.
5. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
6. Rev engine up to 2,500 to 3,500 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
   If “INCMP” of “CATALYST” changed to “COMPLT”, go to step 9
7. Wait 5 seconds at idle.



8. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).
   If not “CMPLT”, perform the following.

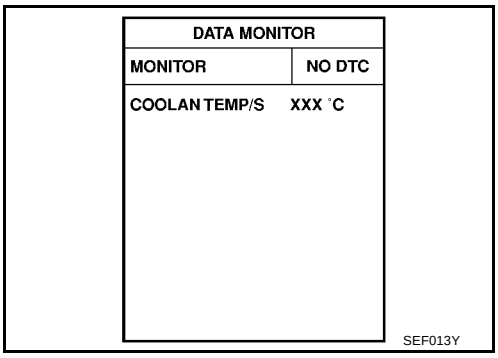
a. Turn ignition switch ″OFF″ and leave the vehicle in a cool place (soak the vehicle).



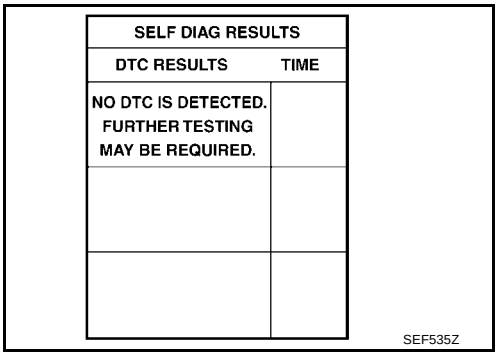
b. Turn ignition switch ″ON″ and select ″COOLANTEMP/S″ in ″DATA MONITOR″ mode with CONSULT-II.

c. Start engine and warm it up while monitoring ″COOLANTEMP/S″ indication on CONSULT-II.

d. When ″COOLANTEMP/S″ indication reaches to 70°C (158°F), go to step 3.



9. Select “SELF-DIAG RESULTS” mode with CONSULT-II.
10. Confirm that the 1st trip DTC is not detected.
    If the 1st trip DTC is detected, go to EC-248, "Diagnostic Procedure" .



Overall Function Check

EBS00K8L

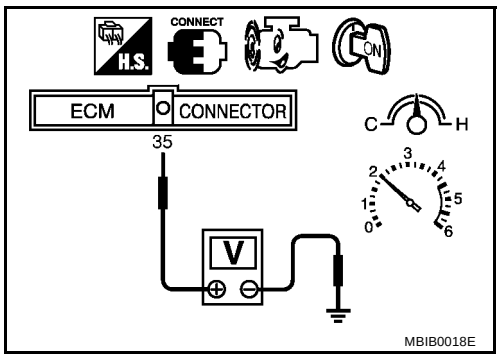
Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a DTC might not be confirmed.

CAUTION:
Always drive vehicle at a safe speed.

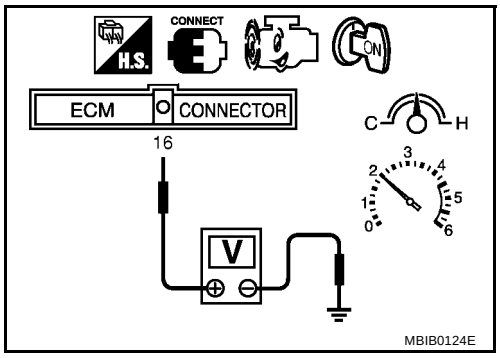
WITH GST

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 one minute under no load.
4. Let engine idle for one minute.

5. Set voltmeters probes between ECM terminal 35 (HO2S1 signal) and engine ground, and ECM terminal 16 (HO2S2 signal) and engine ground.
6. Keep engine speed at 2,000 rpm constant under no load.



7. Make sure that the voltage switching frequency (high & low) between ECM terminal 16 and engine ground is very less than that of ECM terminal 35 and engine ground.
   Switching frequency ratio = A/B
   A: Heated oxygen sensor 2 voltage switching frequency
   B: Heated oxygen sensor 1 voltage switching frequency
   This ratio should be less than 0.75.
   If the ratio is greater than above, it means three way catalyst does not operate properly. Go to EC-248, "Diagnostic Procedure" .



NOTE:
If the voltage at terminal 35 does not switch periodically more than 5 times within 10 seconds at step 7, perform trouble diagnosis for “DTC P0133” first. (See EC-155 .)

Diagnostic Procedure

EBS00K8M

1. CHECK EXHAUST SYSTEM

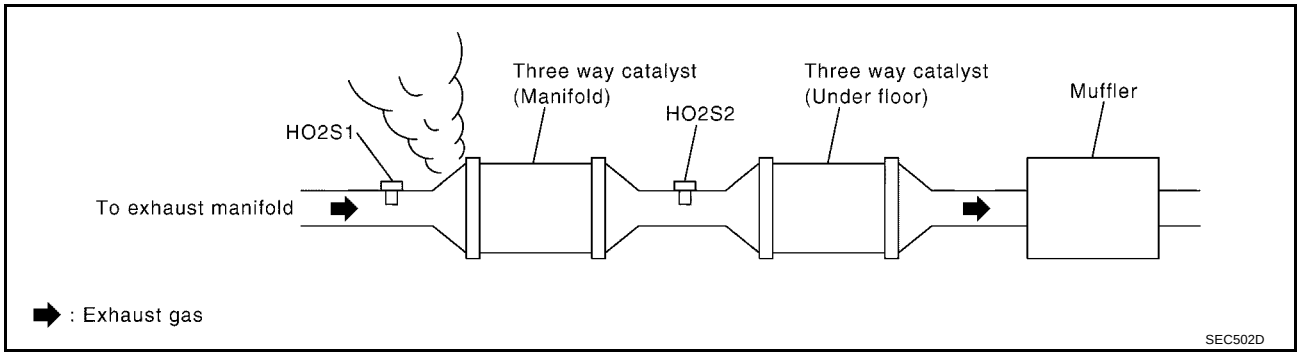
Visually check exhaust tubes and muffler for dent.

OK or NG

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

2. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst (manifold).



OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check the following items. Refer to EC-65, "Basic Inspection" .

Items	Specifications
Ignition timing	M/T: 8° ± 5° BTDC
	A/T: 10° ± 5° BTDC (in “P” or “N” position)
Target idle speed	M/T: 700 ± 50 rpm
	A/T: 800 ± 50 rpm (in “P” or “N” position)

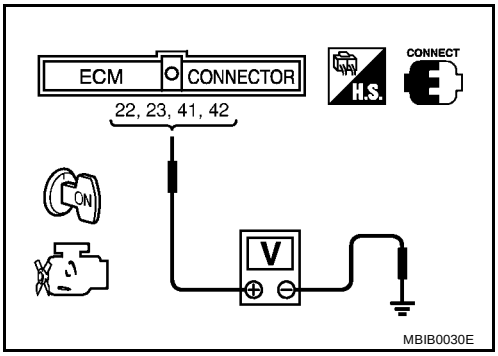
OK or NG

OK >> GO TO 5.
NG >> Follow the “Basic Inspection”.

5. CHECK INJECTORS

1. Refer to Wiring Diagram for Injectors, EC-376 .
2. Stop engine and then turn ignition switch “ON”.
3. Check voltage between ECM terminals 22, 23, 41, 42 and ground with CONSULT-II or tester.

Battery voltage should exist.

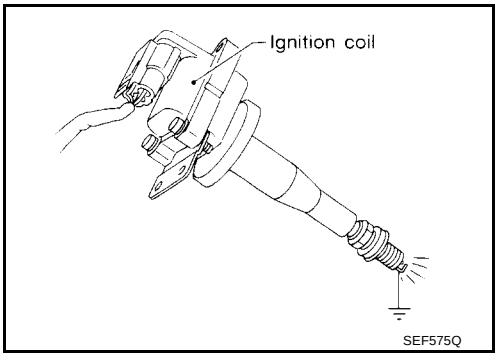


OK or NG

OK >> GO TO 6.
NG >> Perform EC-377, "Diagnostic Procedure" .

6. CHECK IGNITION SPARK

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known-good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



OK or NG

OK >> GO TO 7.
NG >> Check ignition coil with power transistor and their circuit. Refer to EC-365, "IGNITION SIGNAL" .

7. CHECK INJECTOR

1. Turn ignition switch “OFF”.
2. Remove injector assembly.
   Refer to EM-26, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Turn ignition switch “ON”.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injector(s) from which fuel is dripping.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Trouble is fixed.>>**INSPECTION END**
Trouble is not fixed.>>Replace three way catalyst (Manifold).

DTC P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

EBS00K8N

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*1	Vehicle speed		

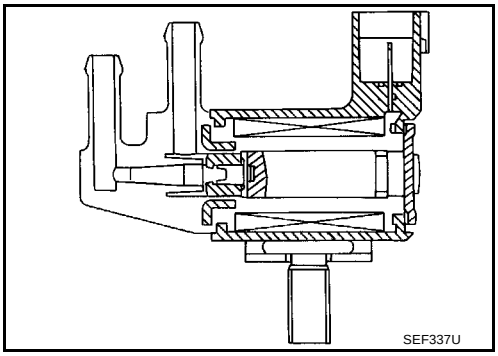
*1: This signal is sent to the ECM through CAN communication line.

*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K8O

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%

On Board Diagnosis Logic

EBS00K8P

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	● Harness or connectors (The solenoid valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

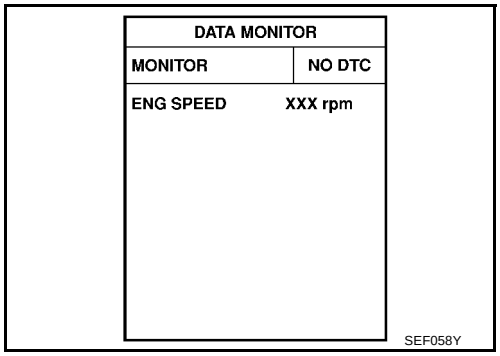
EBS00K8Q

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 battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 13 seconds.
4. If 1st trip DTC is detected, go to EC-254, "Diagnostic Procedure"
.

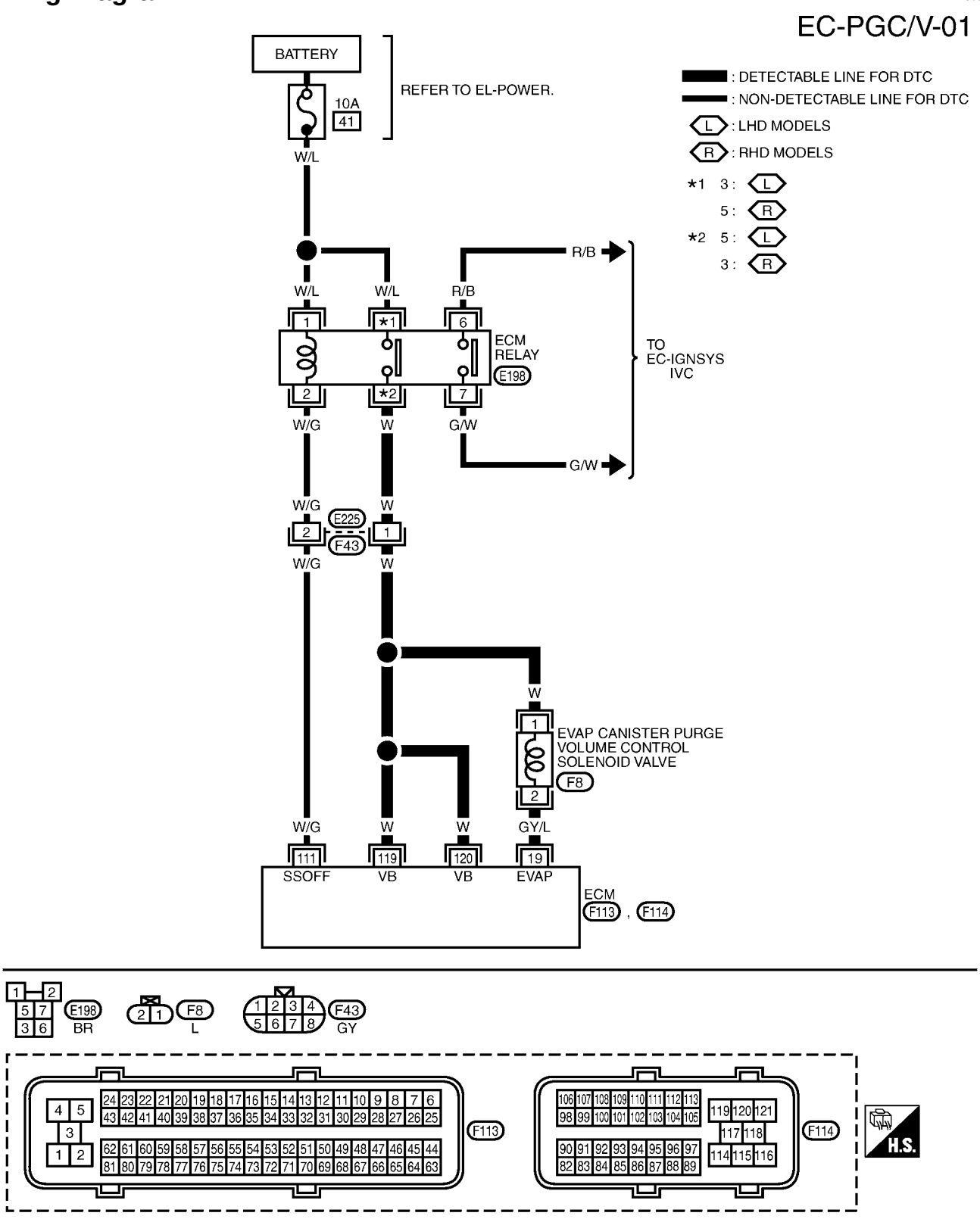


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K8R

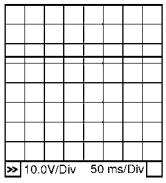
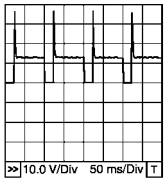


YEC293A

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)
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	Approximately 10V★  PBIB0520E

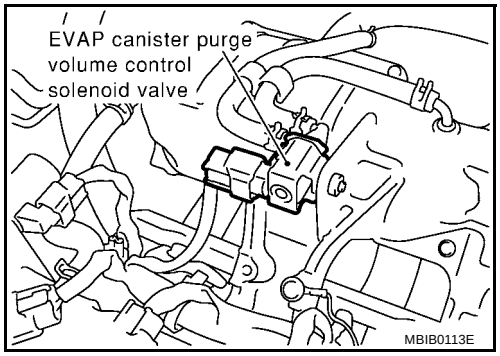
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00K8S

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

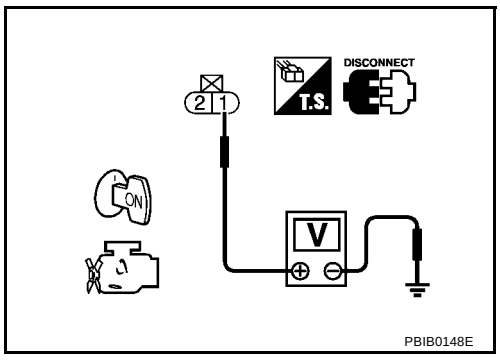
1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



MBIB0113E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



PBIB0148E

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay

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

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 19 and EVAP canister purge volume control solenoid valve terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

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

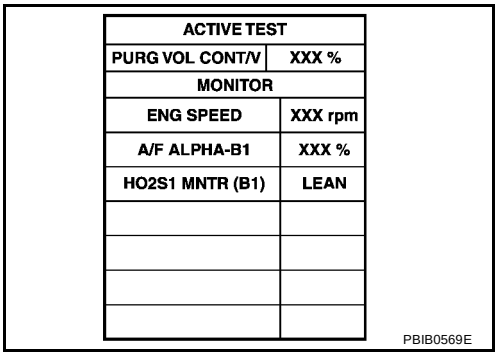
OK or NG

OK (With CONSULT-II)>>GO TO 4.
OK (Without CONSULT-II)>>GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-256, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

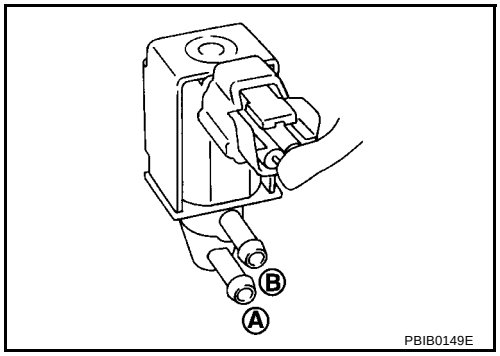
EBS00K8T

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

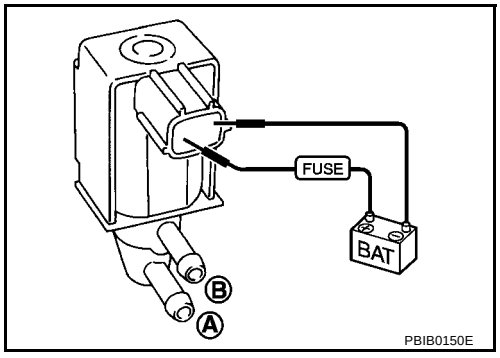
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



Removal and Installation

EBS00K8U

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-16, "INTAKE MANIFOLD" .

DTC P0500 VSS

PFP:32702

Description

EBS00K8V

NOTE:
If DTC P0500 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-116, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
The vehicle speed signal is sent from vehicle speed sensor (models without ABS) or ABS actuator and electric unit (control unit) (models with ABS) to combination meter. The combination meter then sends a signal to the ECM through CAN communication line.

On Board Diagnosis Logic

EBS00K8W

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The vehicle speed sensor circuit is open or shorted) ● Harness or connectors (The CAN communication line is open or shorted.) ● Vehicle speed sensor (models without ABS) ● ABS actuator and electric unit (control unit) (models with ABS) ● Combination meter

DTC Confirmation Procedure

EBS00K8X

CAUTION:
Always drive vehicle at a safe speed.

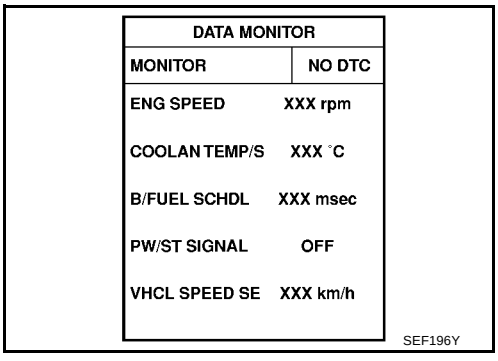
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-259, "Diagnostic Procedure" .
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	More than 2,400 rpm (QG15DE models) More then 2,100 rpm (QG18DE A/T models) More then 2,700 rpm (QG18DE M/T models)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	More than 4.6 msec (QG15DE models) More than 5.2 msec (QG18DE A/T models) More than 4.3 msec (QG18DE M/T models
Selector lever	Suitable position
PW/ST SIGNAL	OFF



6. If 1st trip DTC is detected, go to EC-259, "Diagnostic Procedure" .

Overall Function Check

EBS00K8Y

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed signal in “MODE 1” with GST.
   The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-259, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00K8Z

1. CHECK DTC WITH VEHICLE SPEED SONSOR (MODELS WITHOUT ABS) OR ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) (MODELS WITH ABS)

Refer to EL-123 (models without ABS) or EL-124 (models with ABS).

OK or NG

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

2. CHECK COMBINATION METER

Check combination meter function.
Refer to EL-112.

>> **INSPECTION END**

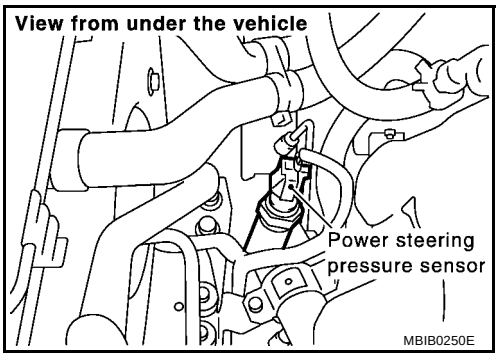
DTC P0550 PSP SENSOR

PFP:49763

Component Description

EBS00K90

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K91

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

On Board Diagnosis Logic

EBS00K92

The MI will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Power steering pressure sensor

DTC Confirmation Procedure

EBS00K93

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”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-262, "Diagnostic Procedure" .

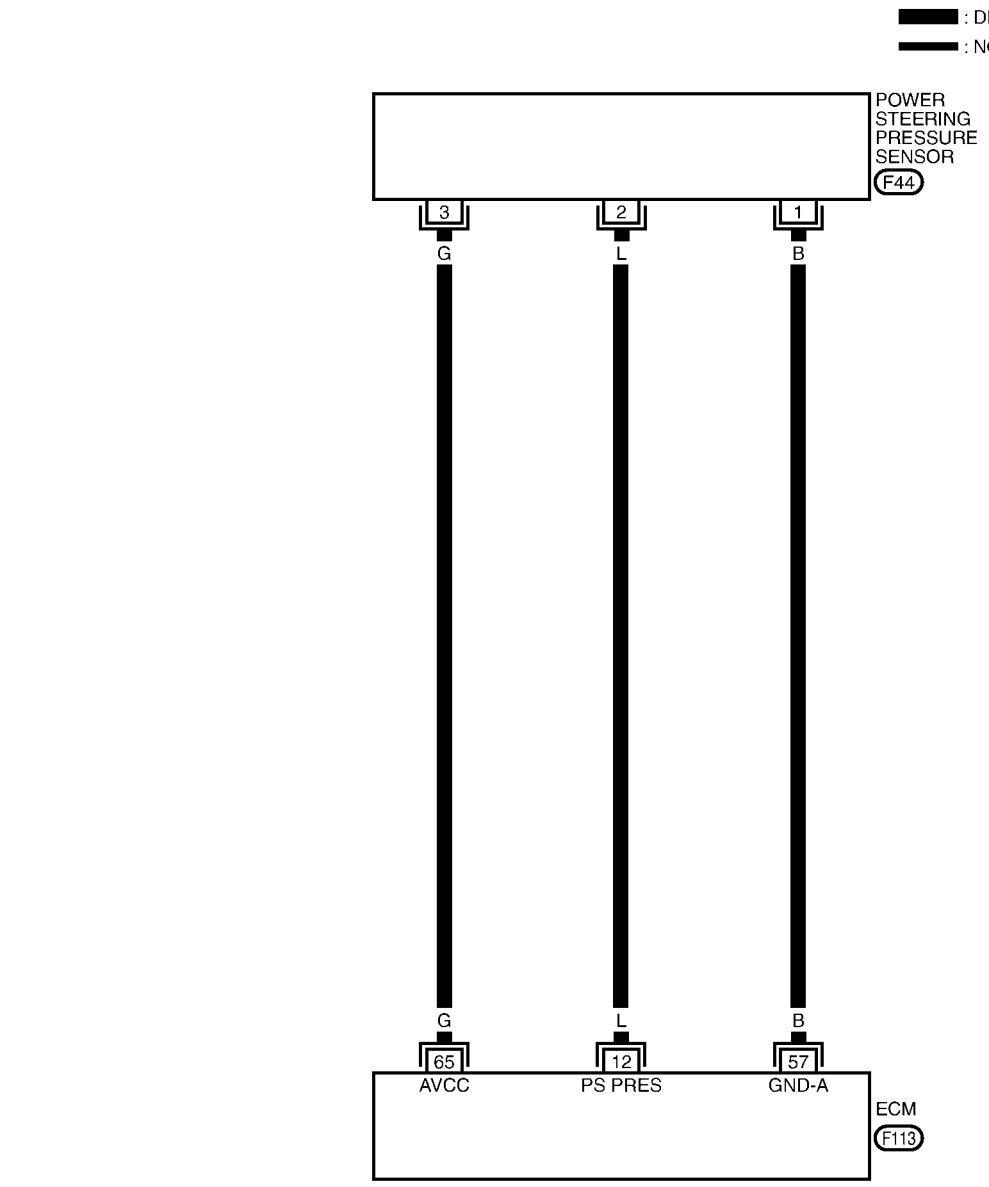
WITH GST

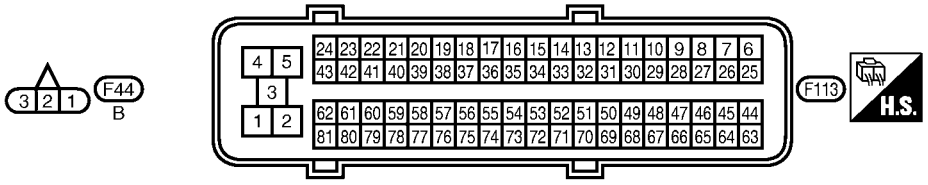
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K94

EC-PS/SEN-01





YEC294A

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)
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8V
57	B	Sensor ground (Power steering pressure sensor)	**[Engine is running]** ● Idle speed	Approximately 0V
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V

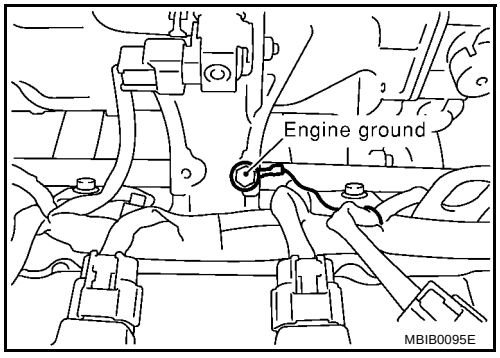
Diagnostic Procedure

EBS00K95

1. RETIGHTEN GROUND SCREWS

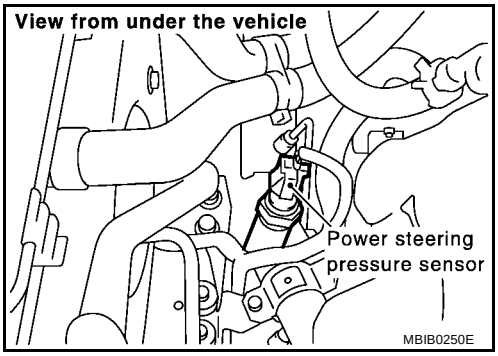
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



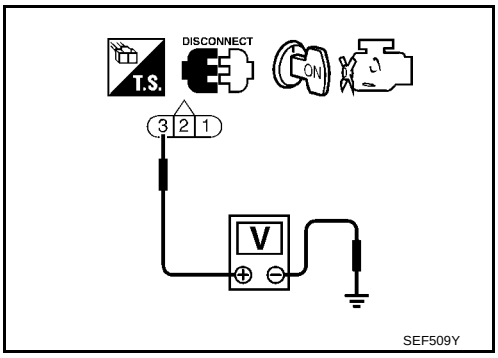
2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between PSP sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



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 PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and PSP sensor terminal 1. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK PSP SENSOR

Refer to EC-264, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace PSP sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

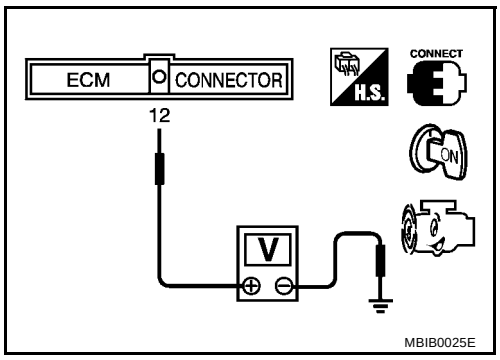
Component Inspection

EBS00K96

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned fully.	0.5 - 4.0V
Steering wheel is not being turned.	0.4 - 0.8V



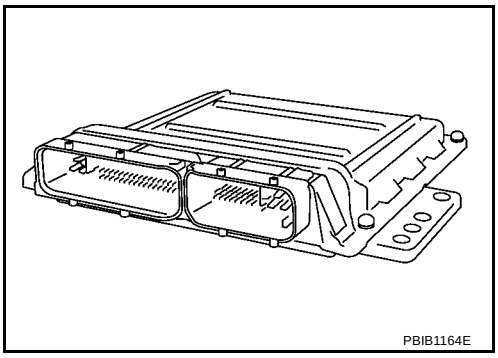
DTC P0605 ECM

PFP:23710

Component Description

EBS00K97

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


PBIB1164E

On Board Diagnosis Logic

EBS00K98

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00K99

Perform “PROCEDURE FOR MALFUNCTION A” first. If the DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no malfunction on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

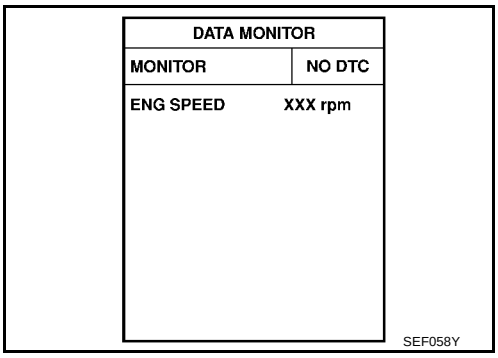
NOTE:

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

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st DTC is detected, go to EC-266, "Diagnostic Procedure" .



SEF058Y

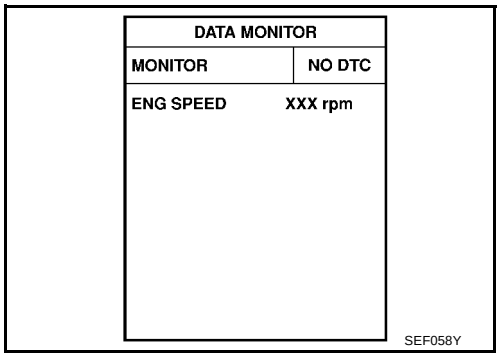
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-266, "Diagnostic Procedure" .



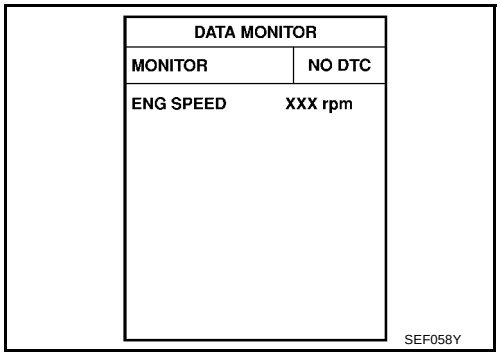
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 procedure, 32 times.
5. If 1st trip DTC is detected, go to EC-266, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

EBS00K9A

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-265 .
5. Is the 1st trip DTC P0605 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-265 .
5. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-49, "NATS (Nissan Anti-theft System)" .
3. Perform EC-31, "Accelerator Pedal Released Position Learning" .
4. Perform EC-31, "Throttle Valve Closed Position Learning" .
5. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

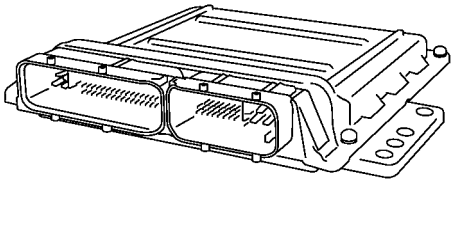
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

EBS00K9B

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air fuel-ratio feedback compensation value memory, the idle air volume learning value memory, etc.


PBIB1164E

On Board Diagnosis Logic

EBS00K9C

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back-up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

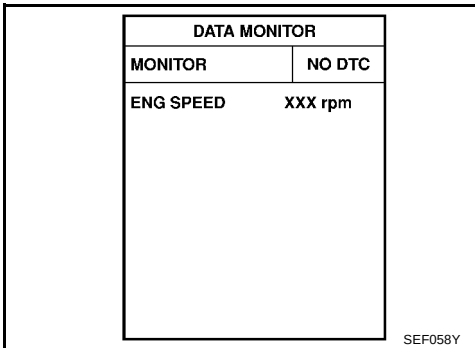
DTC Confirmation Procedure

EBS00K9D

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 wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-270, "Diagnostic Procedure"
.



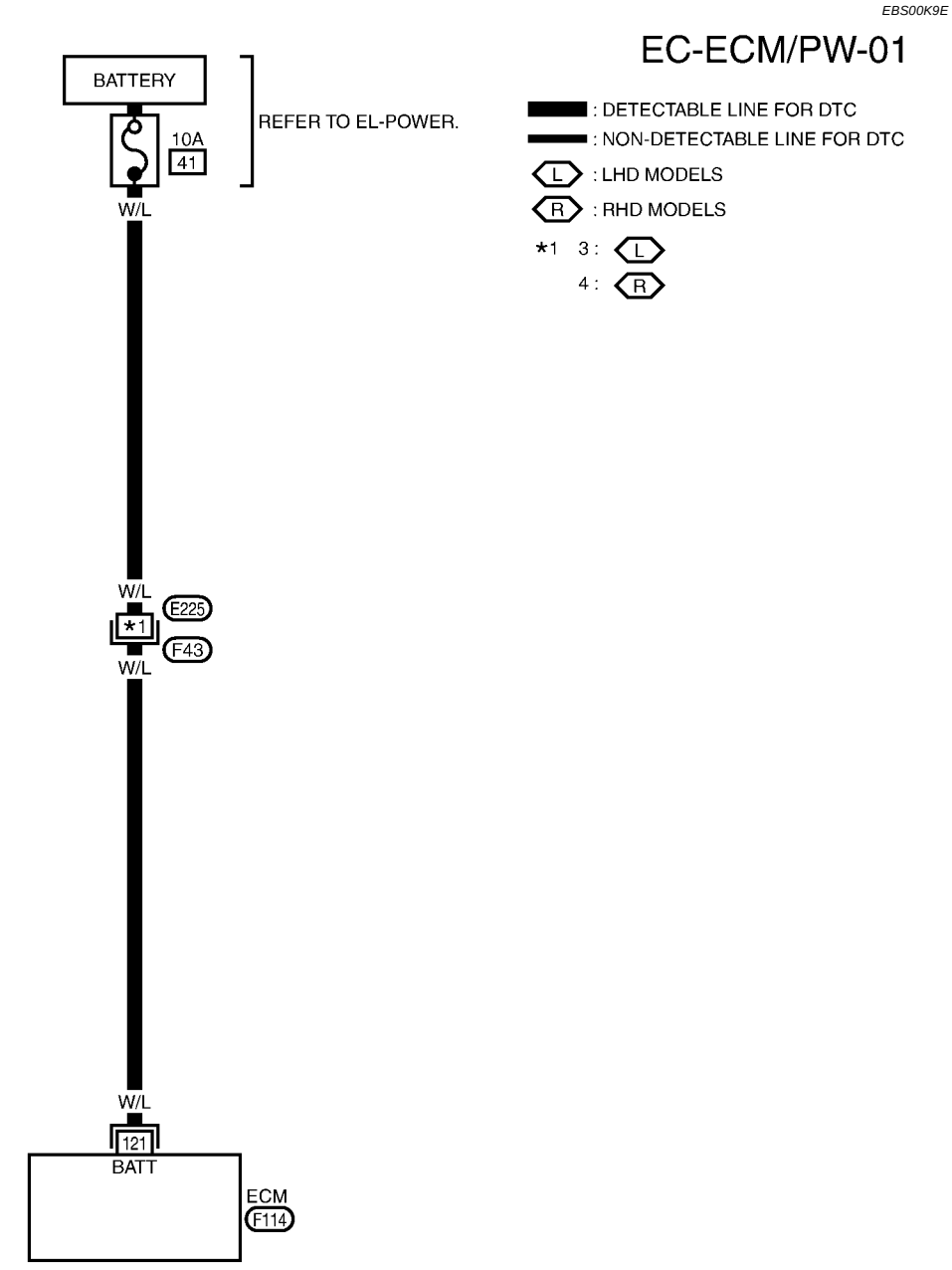
SEF058Y

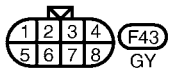
WITH GST

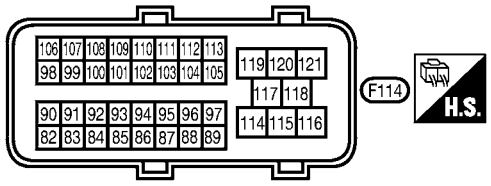
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K9E







YEC295A

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)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

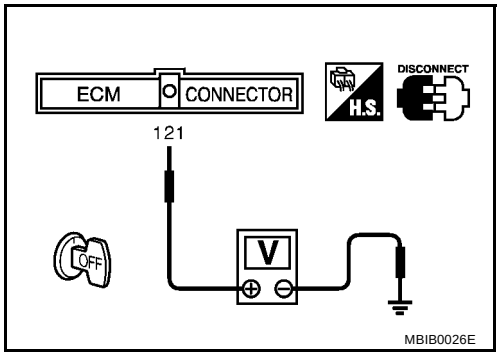
Diagnostic Procedure

EBS00K9F

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- 10A fuse
- Harness for open or short between ECM and battery

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

3. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

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

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-268 .
5. Is the 1st trip DTC P1065 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-268 .
5. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-49, "NATS (Nissan Anti-theft System)" .
3. Perform EC-31, "Accelerator Pedal Released Position Learning" .
4. Perform EC-31, "Throttle Valve Closed Position Learning" .
5. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

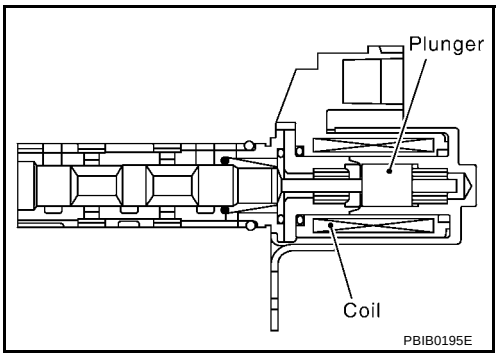
DTC P1111 IVT CONTROL SOLENOID VALVE

PFP:23796

Component Description

EBS00K9G

Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
The shorter pulse width retards valve angle.
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

EBS00K9H

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%

On Board Diagnosis Logic

EBS00K9I

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111 1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	● Harness or connectors (Solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

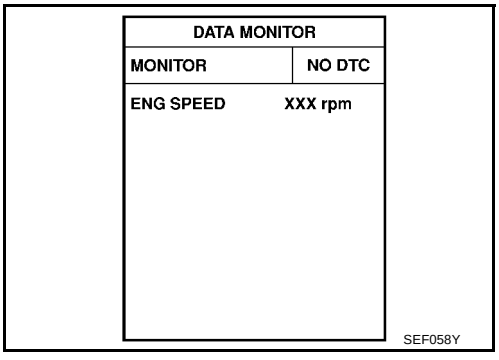
DTC Confirmation Procedure

EBS00K9J

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”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If 1st trip DTC is detected, go to EC-274, "Diagnostic Procedure" .

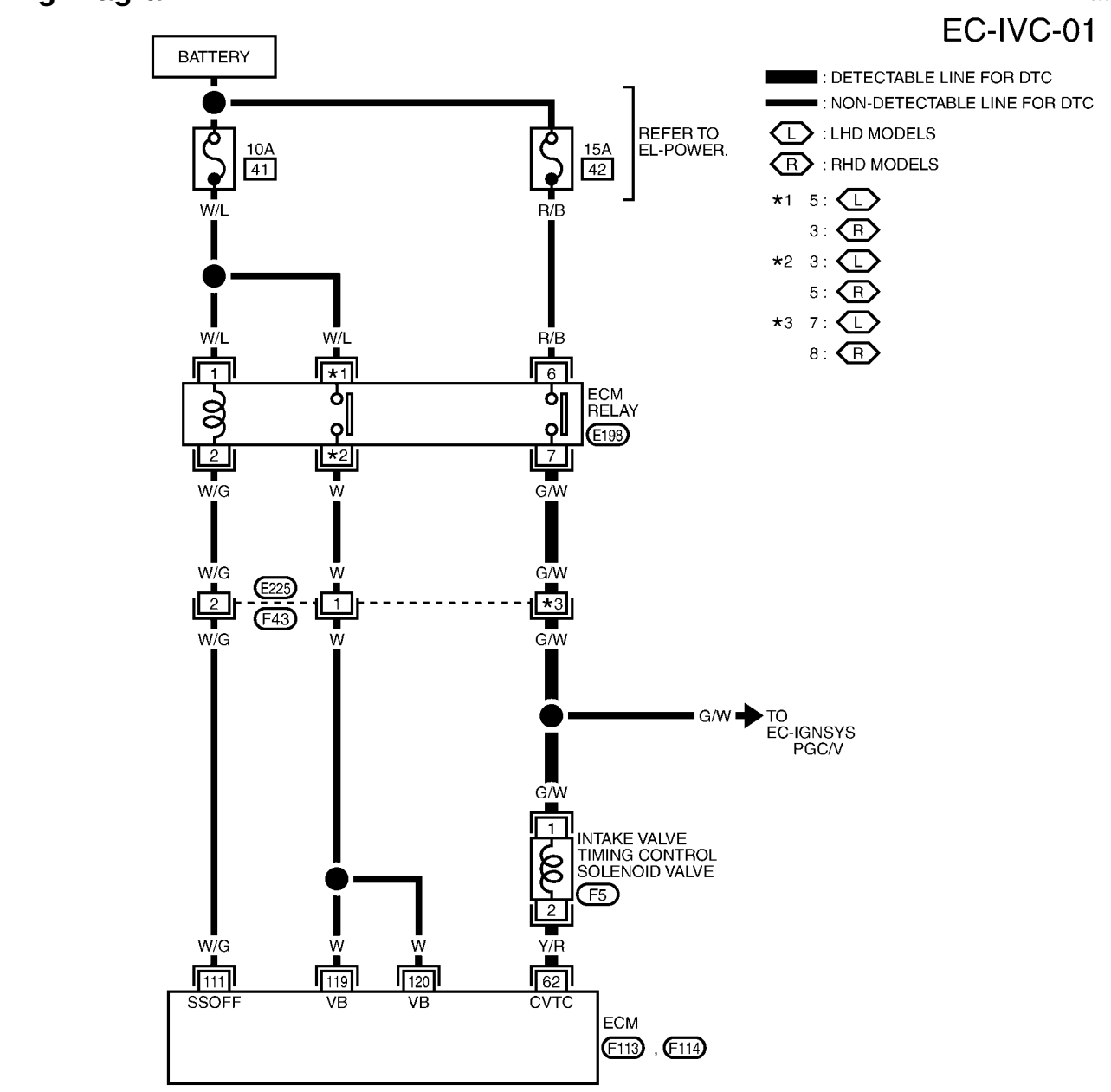


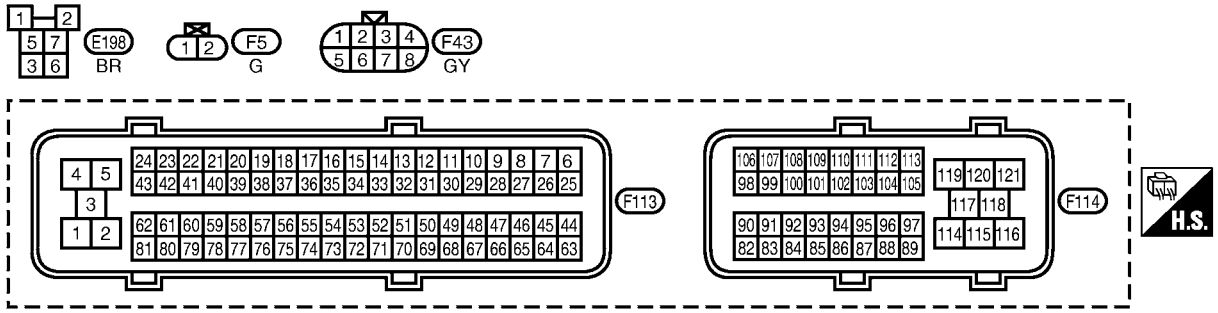
WITH GST

Following the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K9K



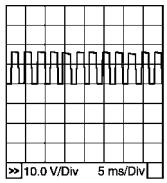


YEC296A

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)
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly.	Approximately 7 - 10V★  PBIB0532E

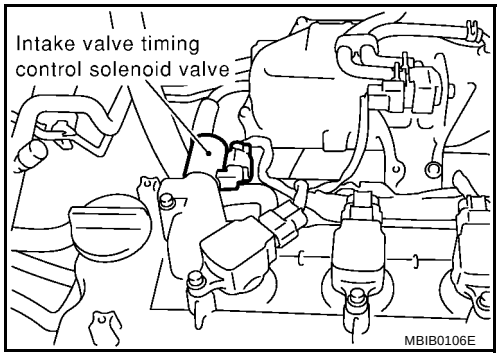
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00K9L

1. CHECK IVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

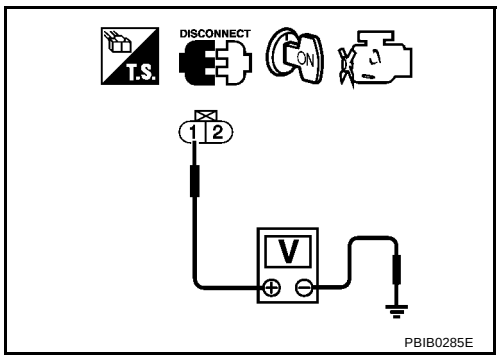
1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



MBIB0106E

4. Check voltage between intake valve timing control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



PBIB0285E

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTION PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between intake valve timing control solenoid valve and ECM relay

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

3. CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 62 and intake valve timing control solenoid valve terminal 2. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-275, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace intake valve timing control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

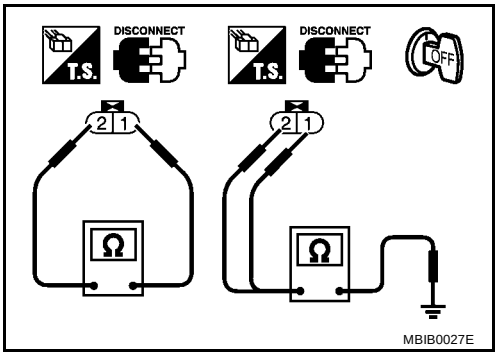
Component Inspection

EBS00K9M

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2 under the following conditions.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

EBS00K9N

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-47, "TIMING CHAIN" .

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

EBS00K9O

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00K9P

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters fail-safe mode and MI lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters fail-safe mode and the MI lights up

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

EBS00K9Q

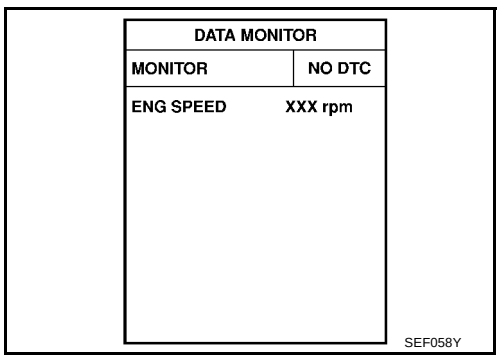
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
- If there is no malfunction on “PROCEDURE FOR MALFUNCTION A AND B”, perform “PROCEDURE FOR MALFUNCTION C”.
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-277, "Diagnostic Procedure"
.



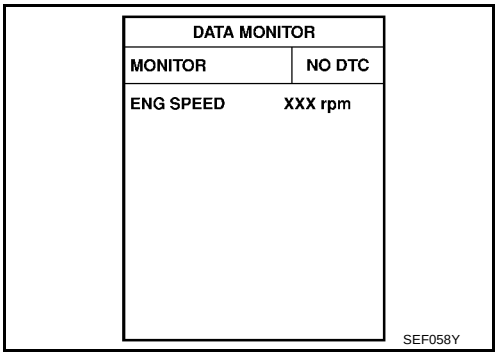
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-277, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

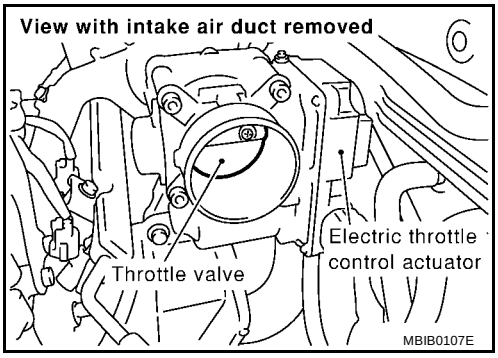
EBS00K9R

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

EBS00K9S

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

EBS00K9T

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-276 or EC-285 .

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00K9U

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted.) ● Harness or connectors (Throttle control motor relay circuit is open or shorted.) ● Electric throttle control actuator ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

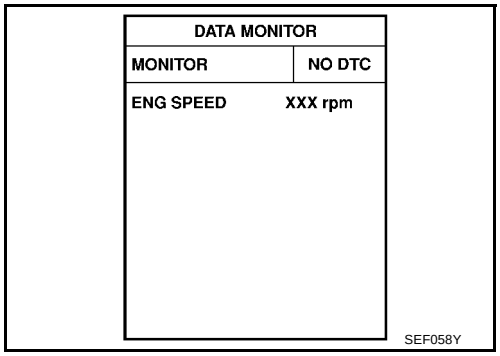
DTC Confirmation Procedure

EBS00K9V

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 wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-280, "Diagnostic Procedure" .



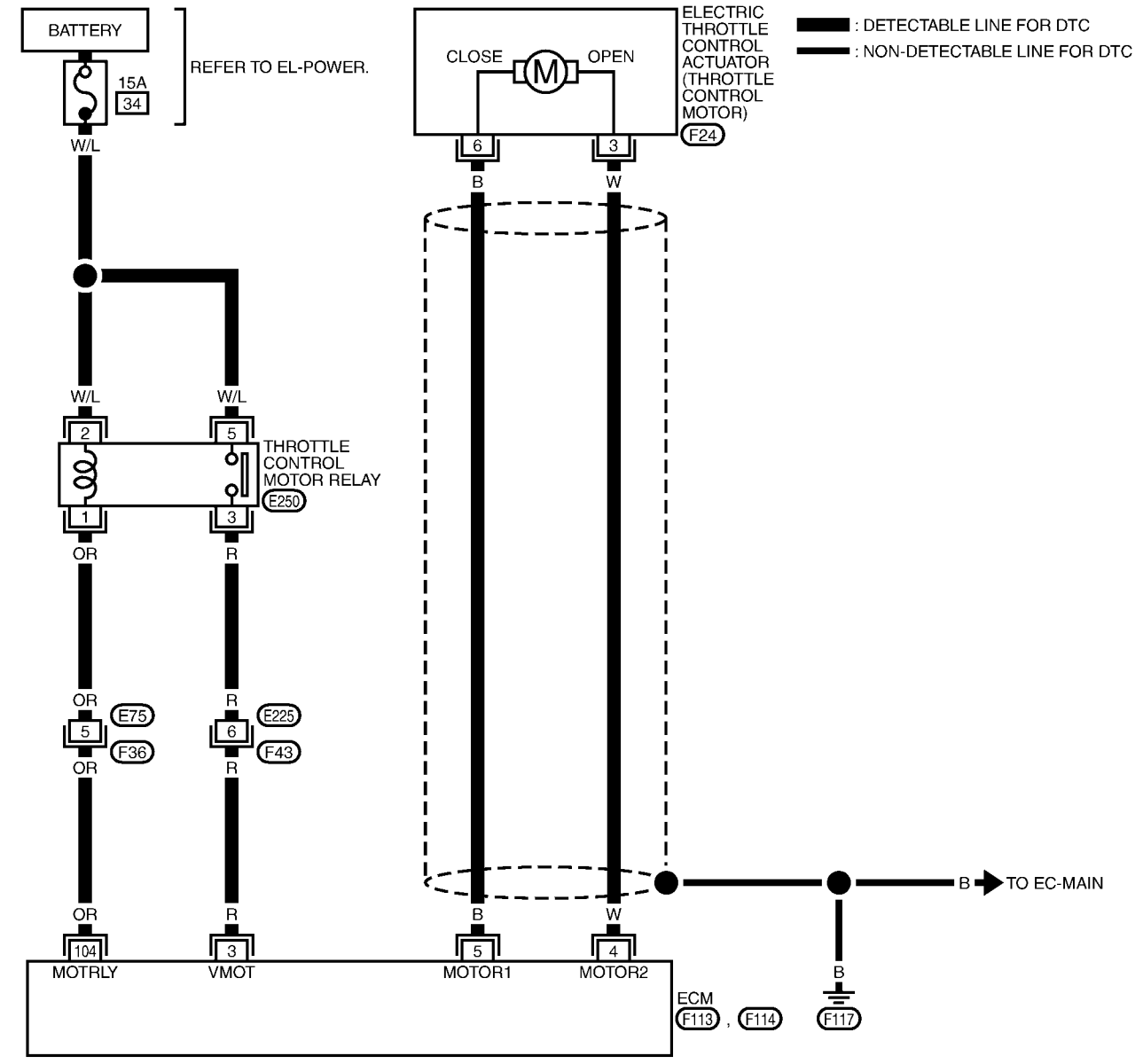
WITH GST

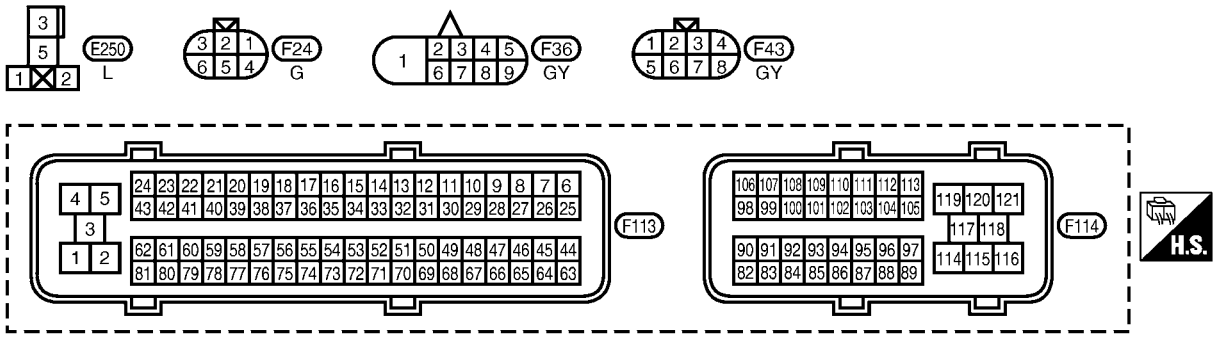
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00K9W

EC-ETC1-01



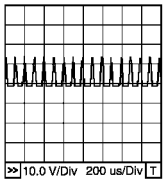
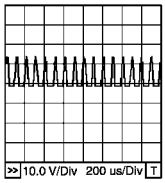


YEC297A

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)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	W (LHD models) BR (RHD models)	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is releasing.	0 - 14V★  PBIB0534E
5	B (LHD models) Y (RHD models)	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is depressing.	0 - 14V★  PBIB0533E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

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

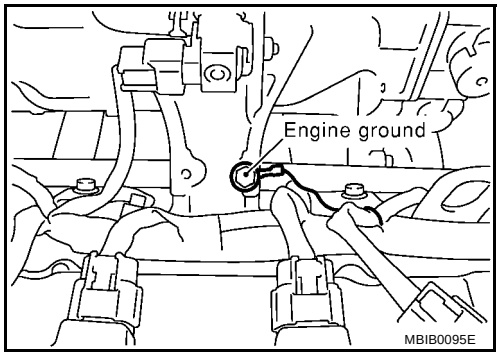
Diagnostic Procedure

EBS00K9X

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.

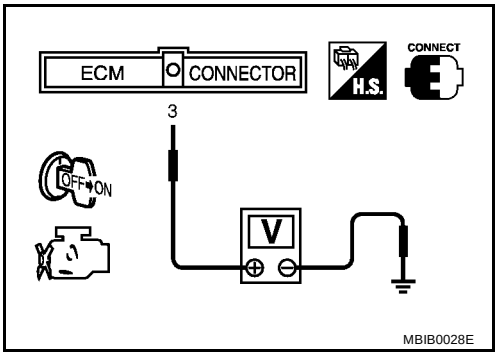


MBIB0095E

2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

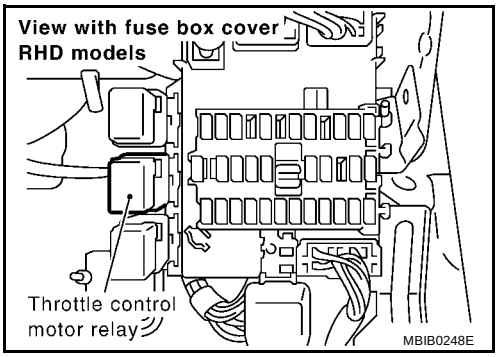


OK or NG

OK >> GO TO 10.
NG >> GO TO 3.

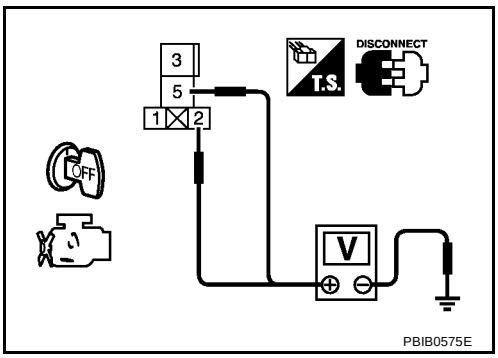
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

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

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between ECM and throttle control motor relay

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

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and throttle control motor relay

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

9. CHECK THROTTLE CONTROL MOTOR RELAY

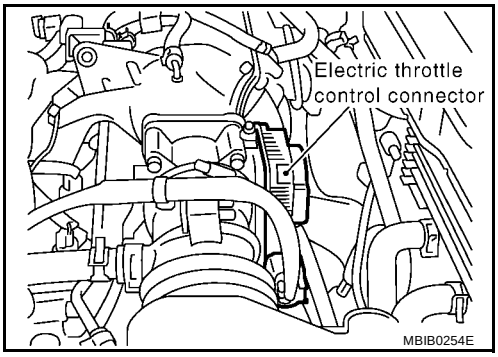
Refer to EC-284, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace throttle control motor relay.

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

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

OK or NG

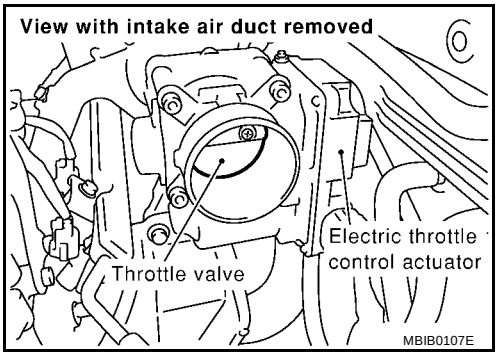
OK >> GO TO 11.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-284, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

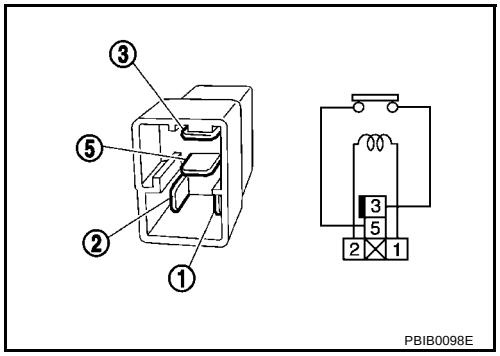
EBS00K9Y

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



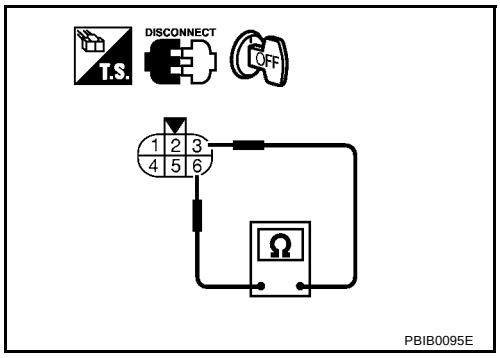
PBIB0098E

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-31, "Throttle Valve Closed Position Learning" .
5. Perform EC-31, "Idle Air Volume Learning" .



PBIB0095E

Removal and Installation

EBS00K9Z

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

EBS00KA0

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

EBS00KA1

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

EBS00KA2

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted.) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	● Harness or connectors (Throttle control motor relay circuit is open.) ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00KA3

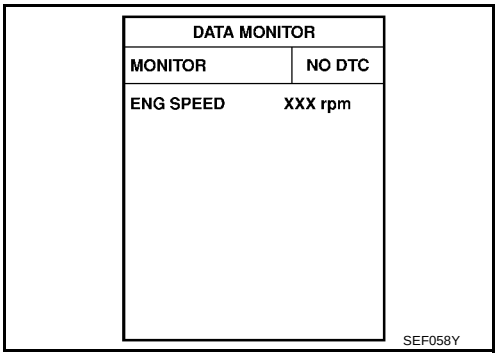
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-288, "Diagnostic Procedure" .



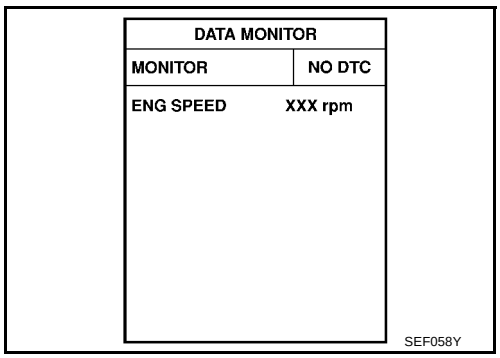
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-288, "Diagnostic Procedure" .

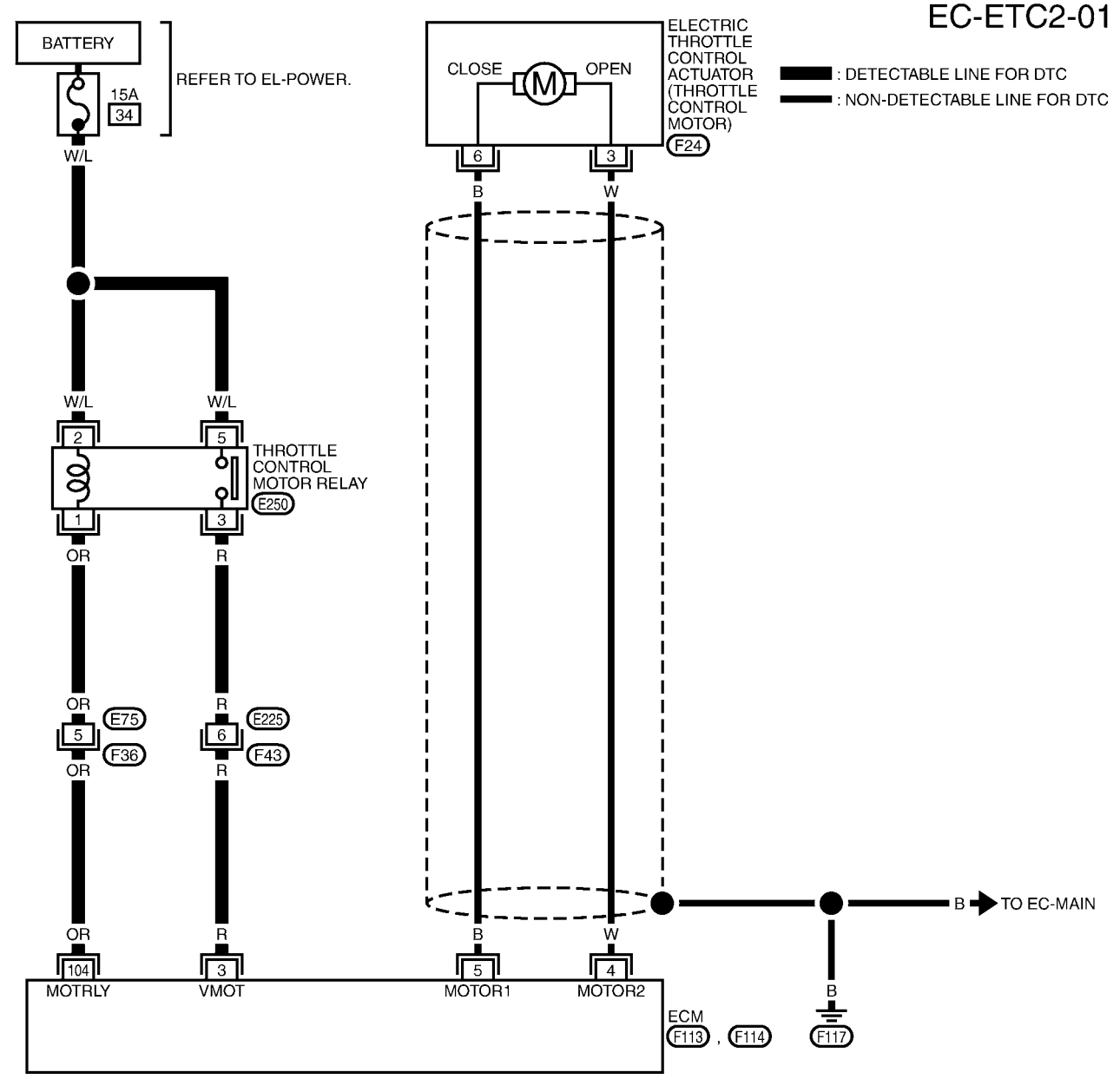


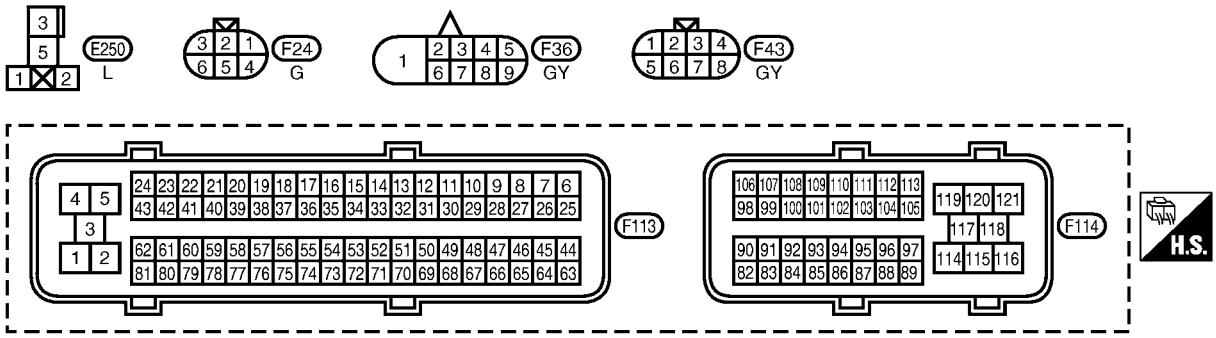
With GST

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

EBS00KA4





YEC298A

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.

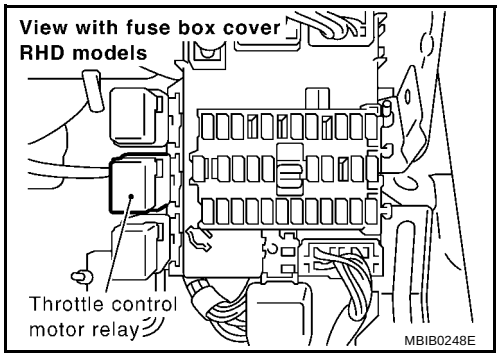
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

Diagnostic Procedure

EBS00KA5

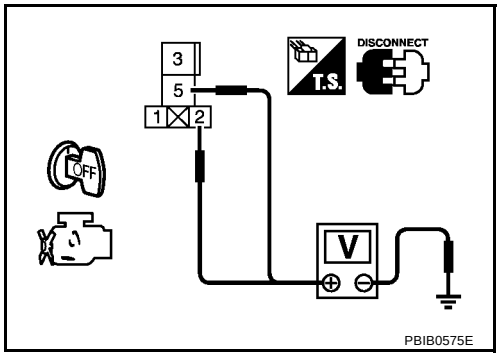
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

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

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between ECM and throttle control motor relay

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

5. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and throttle control motor relay

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

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-289, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace throttle control motor relay.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KA6

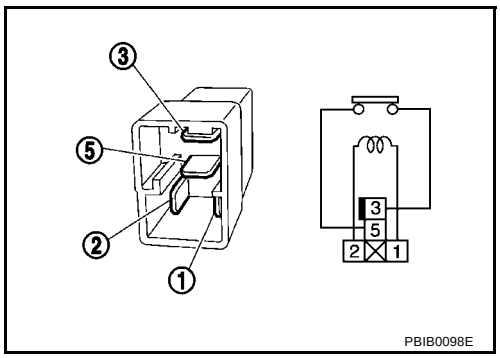
THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.

2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

EBS00KA7

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00KA8

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

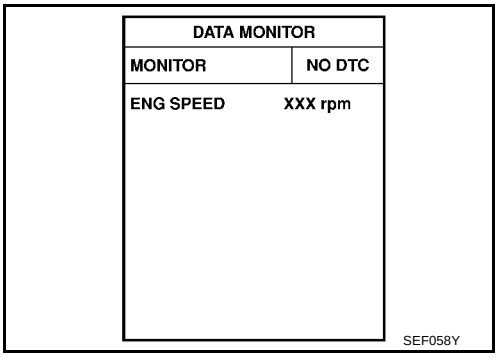
DTC Confirmation Procedure

EBS00KA9

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 wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-293, "Diagnostic Procedure" .



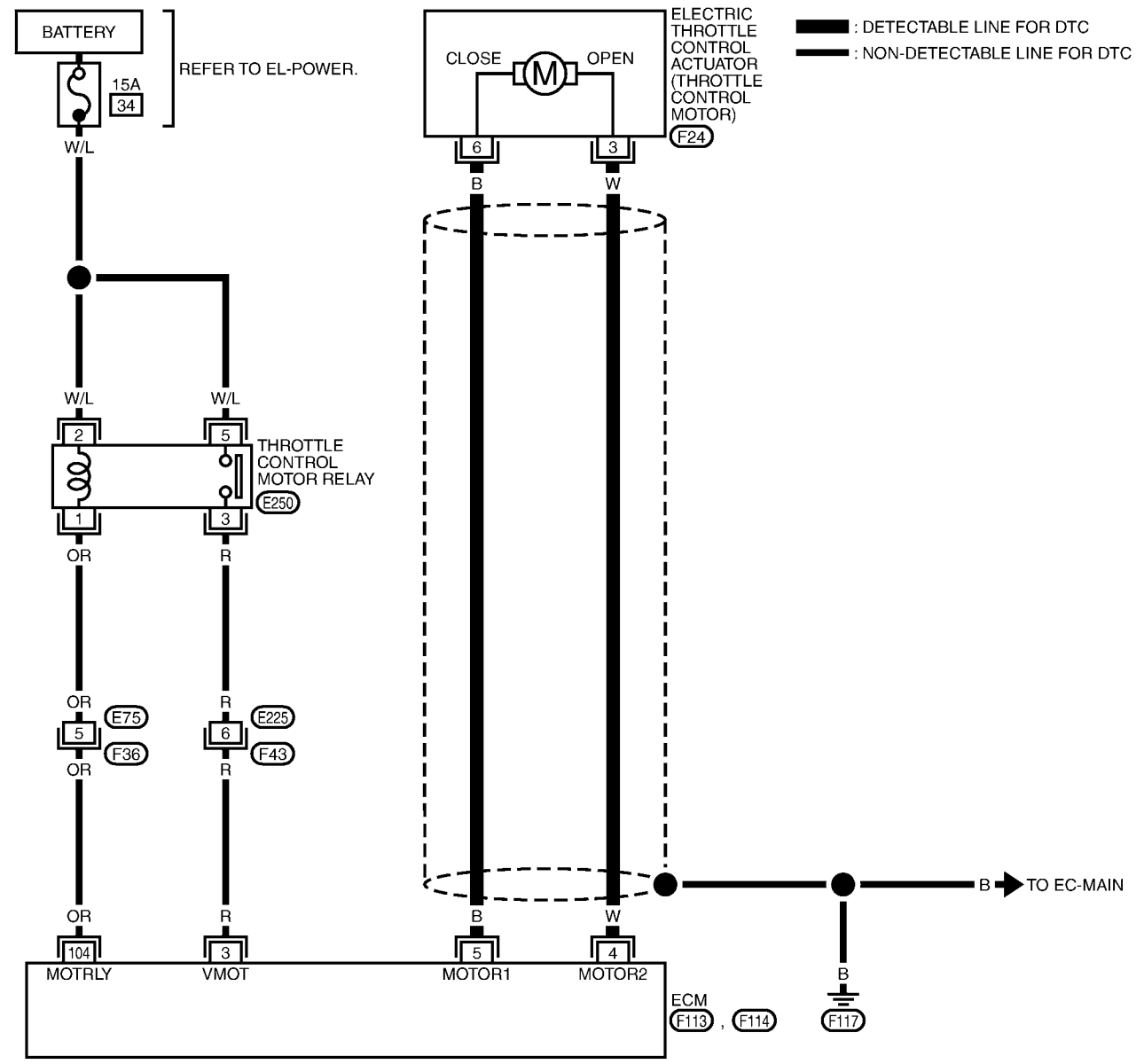
WITH GST

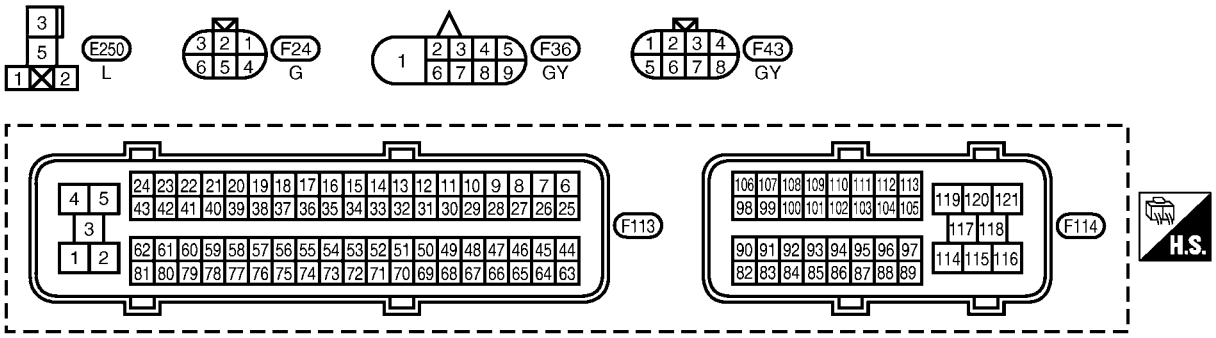
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00KAA

EC-ETC3-01



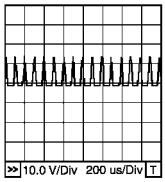
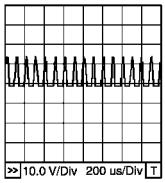


YEC299A

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)
4	W (LHD models) BR RHD models)	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is releasing.	0 - 14V★  PBIB0534E
5	B (LHD models) Y (RHD models)	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is depressing.	0 - 14V★  PBIB0533E

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

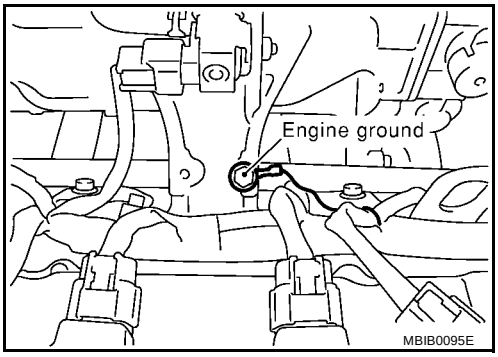
Diagnostic Procedure

EBS00KAB

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

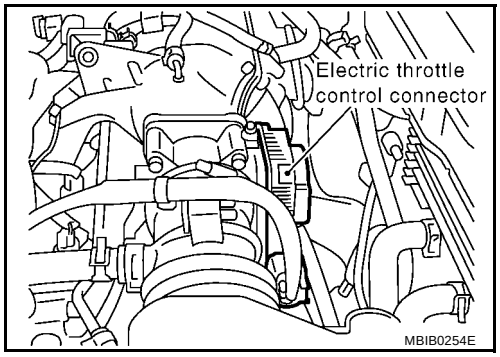
>> GO TO 2.



MBIB0095E

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. 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 THROTTLE CONTROL MOTOR

Refer to EC-294, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

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

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

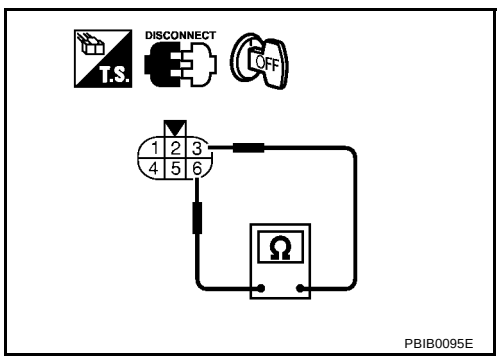
Component Inspection

EBS00KAC

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-31, "Throttle Valve Closed Position Learning" .
5. Perform EC-31, "Idle Air Volume Learning" .

Removal and Installation

EBS00KAD

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

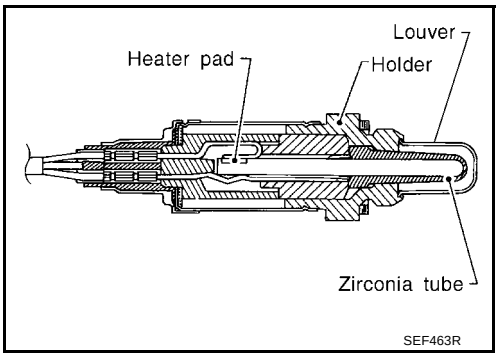
DTC P1143 HO2S1

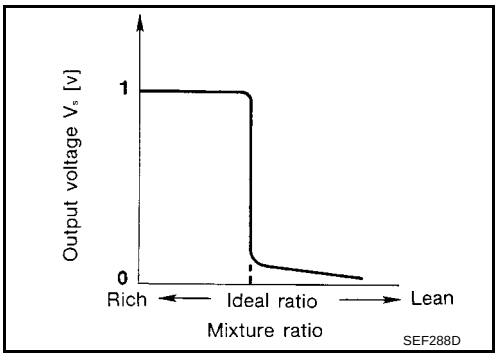
PFP:22690

Component Description

EBS00KAE

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00KAF

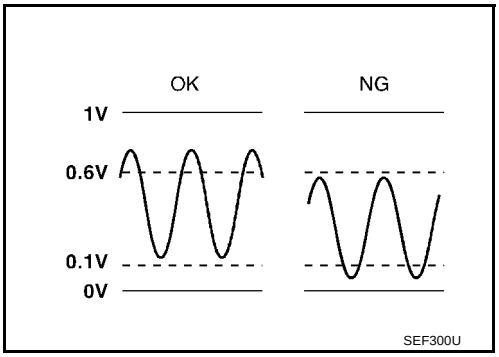
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00KAG

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1143 1143	Heated oxygen sensor 1 lean shift monitoring	The maximum and minimum voltage from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00KAH

CAUTION:
Always drive vehicle at a safe speed.

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.

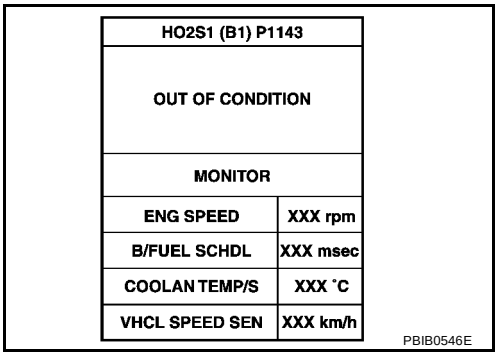
TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

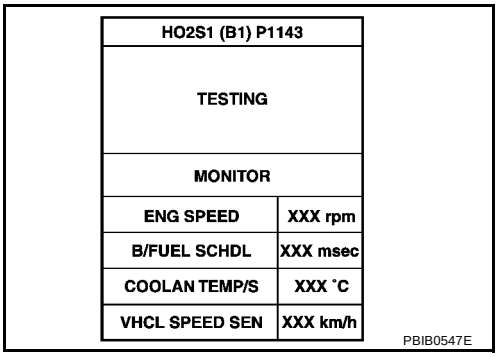
1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm (M/T models) or 3,200 rpm (A/T models) after this step. If the engine speed limit is exceeded, return to step 5.



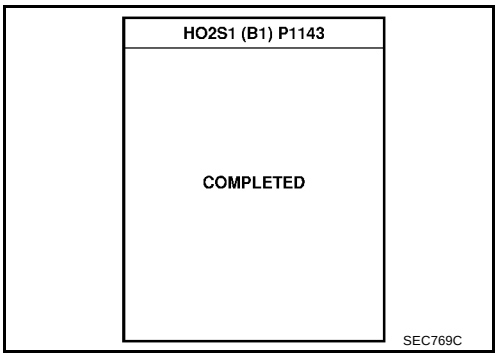
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,200 - 2,600 rpm (A/T models) 1,700 - 2,600 rpm (M/T models)
Vehicle speed	50 - 100 km/h (30 - 62 MPH)
B/FUEL SCHDL	3.0 - 5.2 msec
Selector lever	Suitable position



If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-298, "Diagnostic Procedure" .



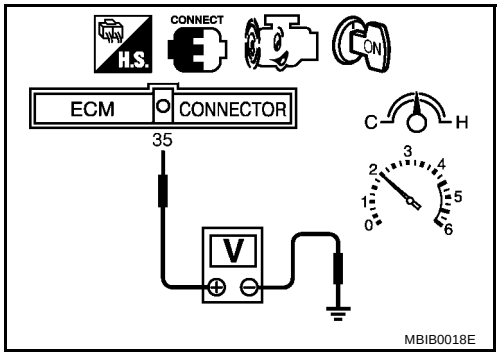
Overall Function Check

EBS00KAI

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is over 0.1V at least one time.
4. If NG, go to EC-298, "Diagnostic Procedure" .



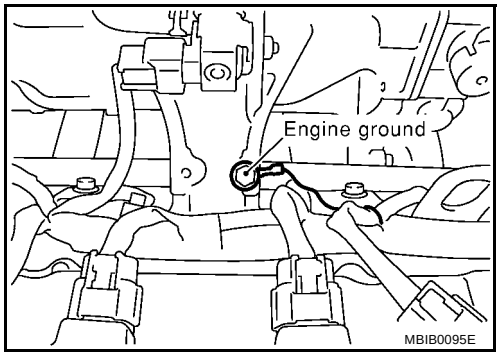
Diagnostic Procedure

EBS00KAJ

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

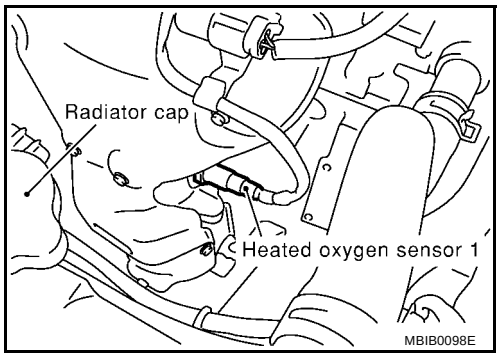


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

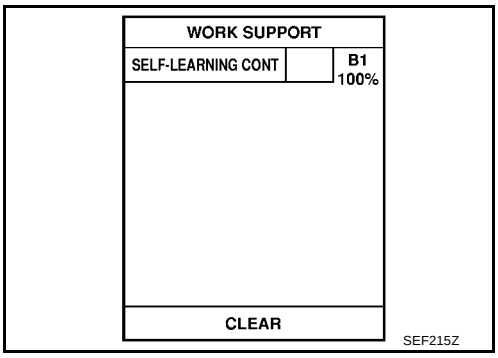
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

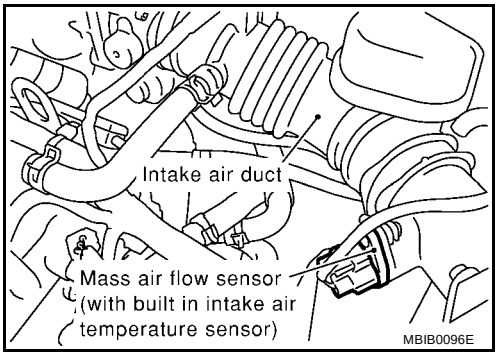
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-186 .
No >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-127, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-300, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-151, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

EBS00KAK

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

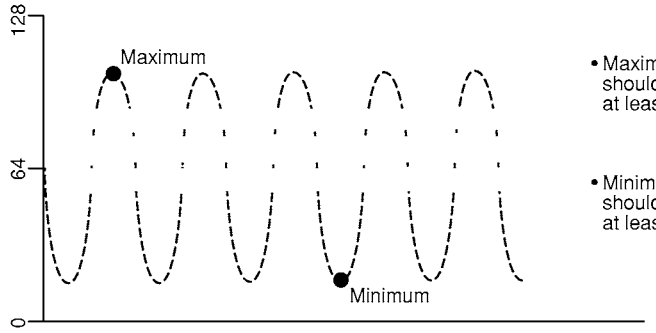
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

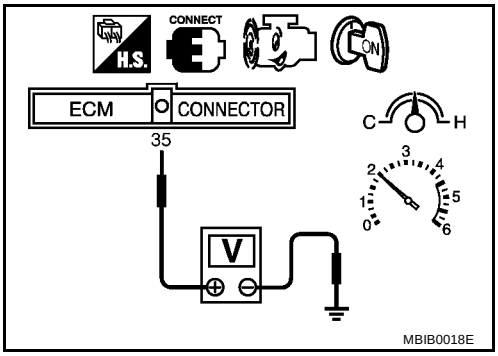
CAUTION:

- **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 normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



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

EBS00KAL

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

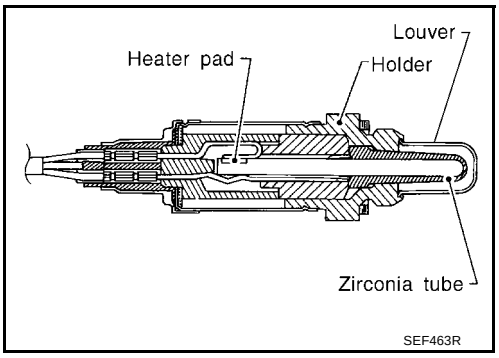
DTC P1144 HO2S1

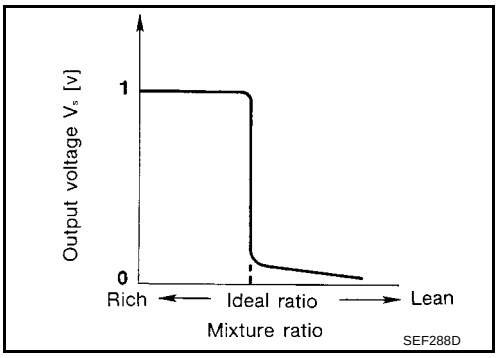
PFP:22690

Component Description

EBS00KAM

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00KAN

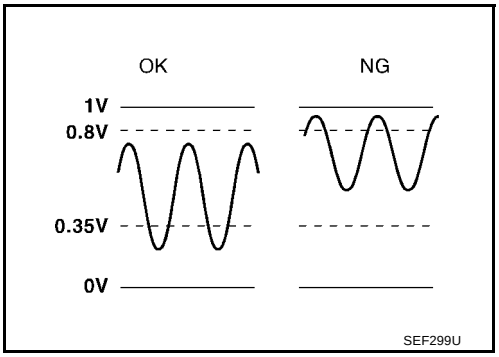
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00KAO

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144 1144	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors

DTC Confirmation Procedure

EBS00KAP

CAUTION:
Always drive vehicle at a safe speed.

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.

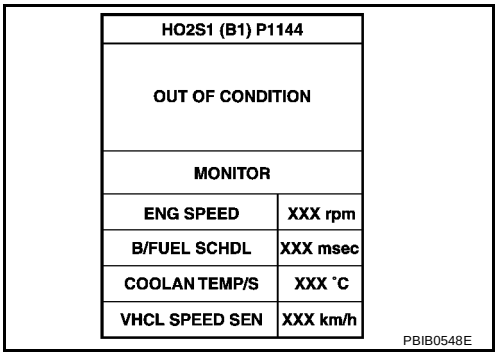
TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

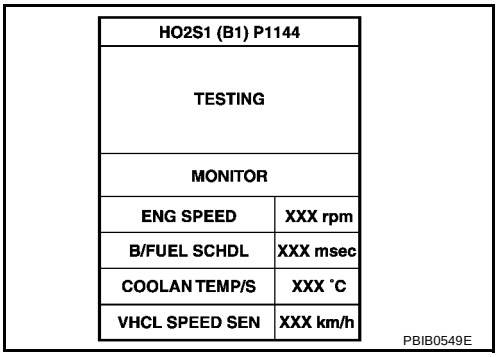
1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 5 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1144” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm (M/T models) or 3,200 rpm (A/T models) after this step. If the engine speed limit is exceeded, return to step 5.



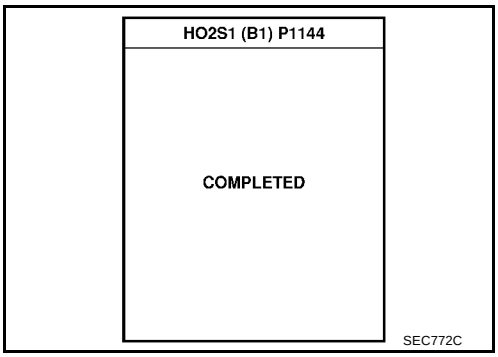
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,200 - 2,600 rpm (A/T models) 1,700 - 2,600 rpm (M/T models)
Vehicle speed	50 - 100 km/h (30 - 62 MPH)
B/FUEL SCHDL	3.0 - 5.2 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-304, "Diagnostic Procedure" .



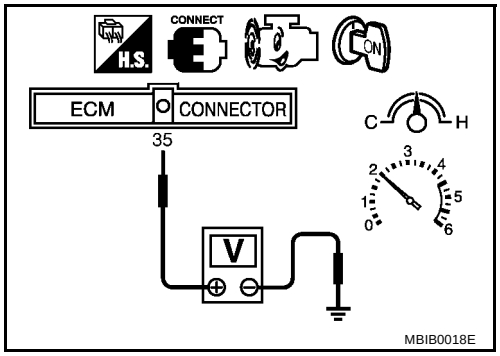
Overall Function Check

EBS00KAQ

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is below 0.8V at at least one time.
   - The minimum voltage is below 0.35V at least one time.
4. If NG, go to EC-304, "Diagnostic Procedure" .



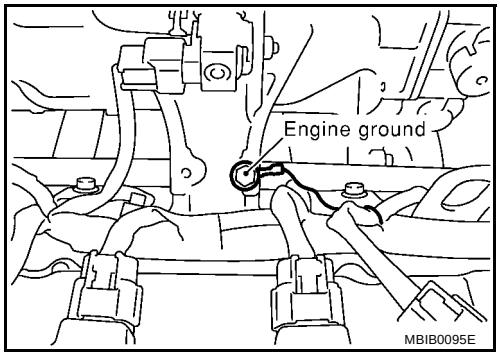
Diagnostic Procedure

EBS00KAR

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

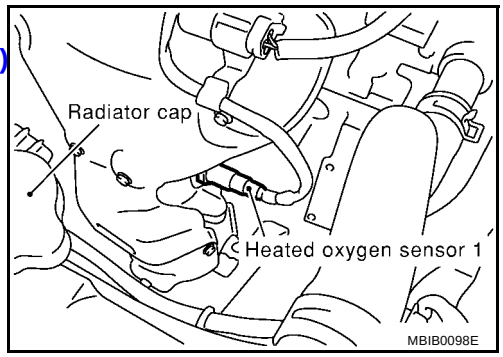


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

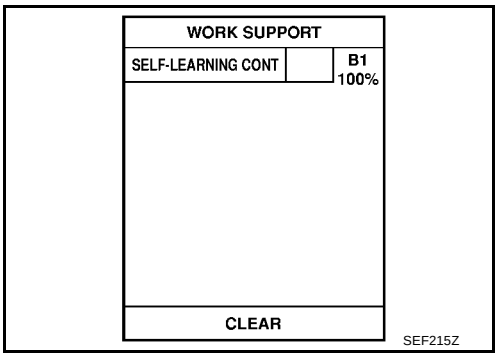
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

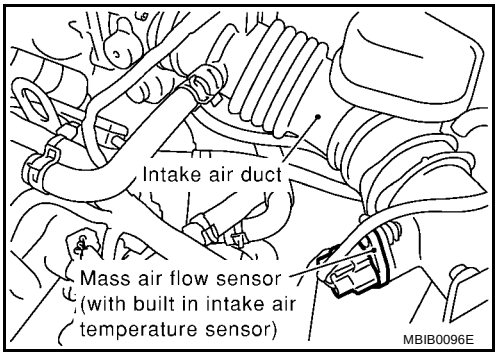
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



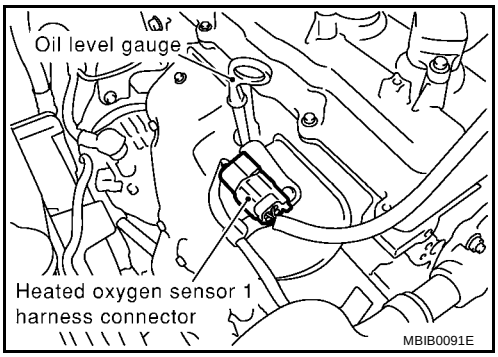
Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-193 .
No >> GO TO 4.

4. CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. 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 1 HEATER

Refer to EC-127, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-306, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-151, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

EBS00KAS

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

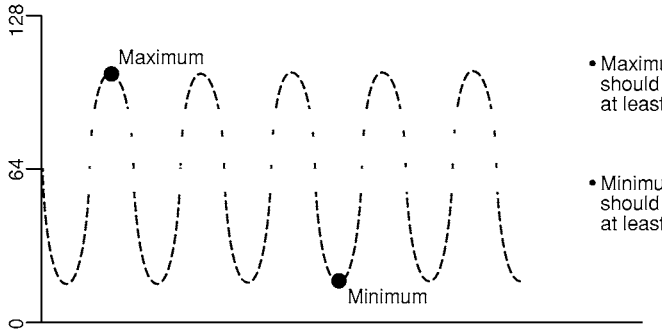
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

CAUTION:

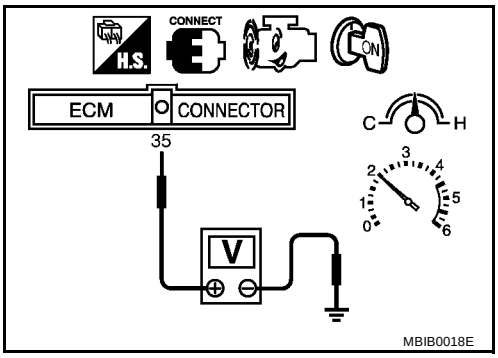
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **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 normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at at least one time.
   - The minimum voltage is below 0.3V at at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



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

EBS00KAT

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

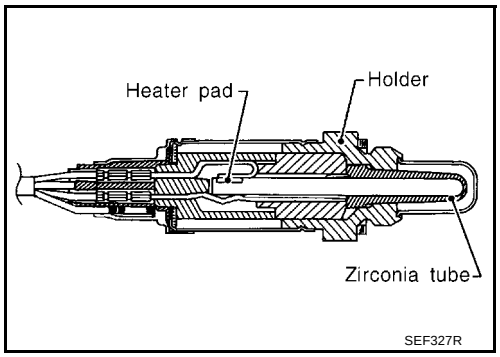
DTC P1146 HO2S2

PFP:226A0

Component Description

EBS00KAU

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen 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

EBS00KAV

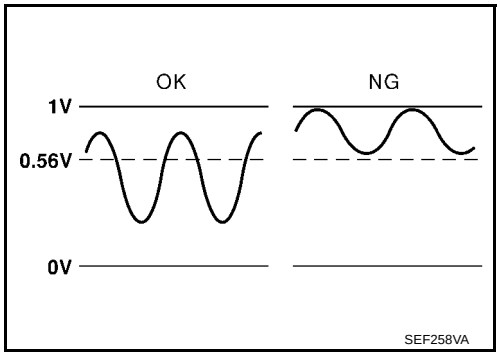
Specification data are reference values.

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

On Board Diagnosis Logic

EBS00KAW

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146 1146	Heated oxygen sensor 2 minimum voltage monitoring	The minimum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors

DTC Confirmation Procedure

EBS00KAX

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**

- 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:
Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in “Procedure for COND1”

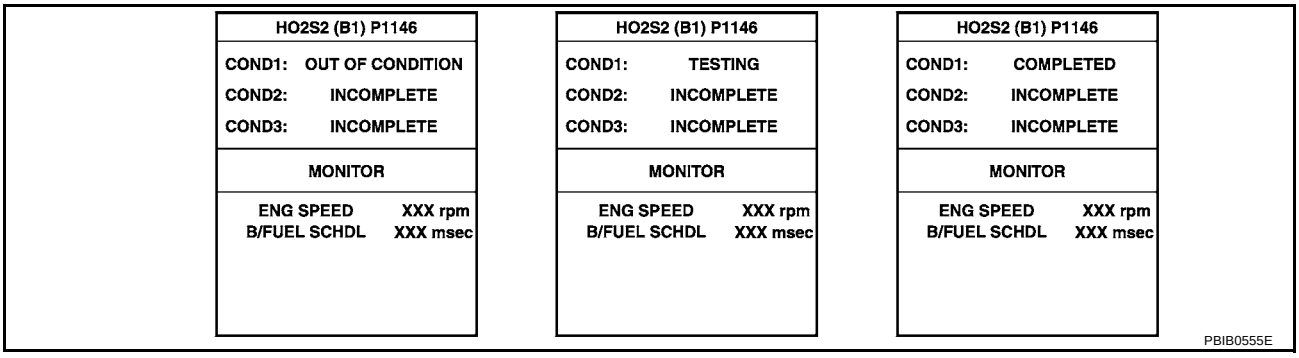
WITH CONSULT-II

Procedure for COND1

For the best results, perform ″DTC WORK SUPPORT″ at a temperature of 0 to 30°C (32 to 86°F).

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 one minute under no load.
4. Let engine idle for one minute.
5. Select “HO2S2 (B1) P1146” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
6. Touch START”.
7. Let it idle for at least 30 seconds.
8. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If “COMPLETED” appears on CONSULT-II screen, go to step 2 in Procedure for COND3”.
   If “COMPLETED” does not appear on CONSULT-II screen, go to the following step.
9. When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector lever	Suitable position

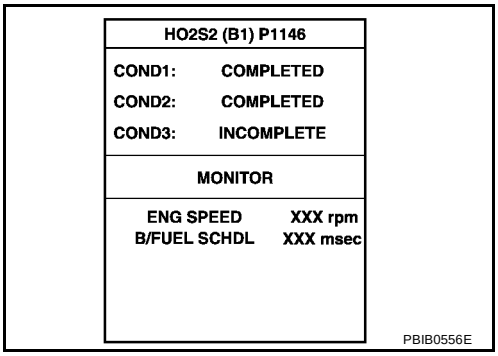


NOTE:
- **If “TESTING” is not displayed after 5 minutes, retry from step 2 in “Procedure for COND1”.**
- **If “COMPLETED” already appears at “COND2” on CONSULT-II screen before “Procedure for COND2” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND2”.**

Procedure for COND2

1. While driving, release accelerator pedal completed with “OD” OFF (A/T models only) from the above condition [step 9] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED” (It will take approximately 4 seconds.)

   NOTE:
   If “COMPLETE” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

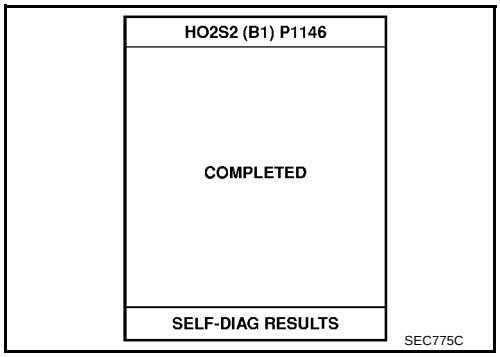
1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-312, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).

b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II

c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.

d. When ″COOLANTEMP/S″ indication reaches to 70°C (158°F), go to ″Procedure for COND 1″ step 3.



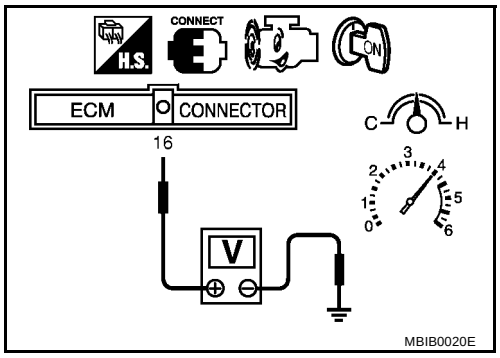
Overall Function Check

EBS00KAY

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

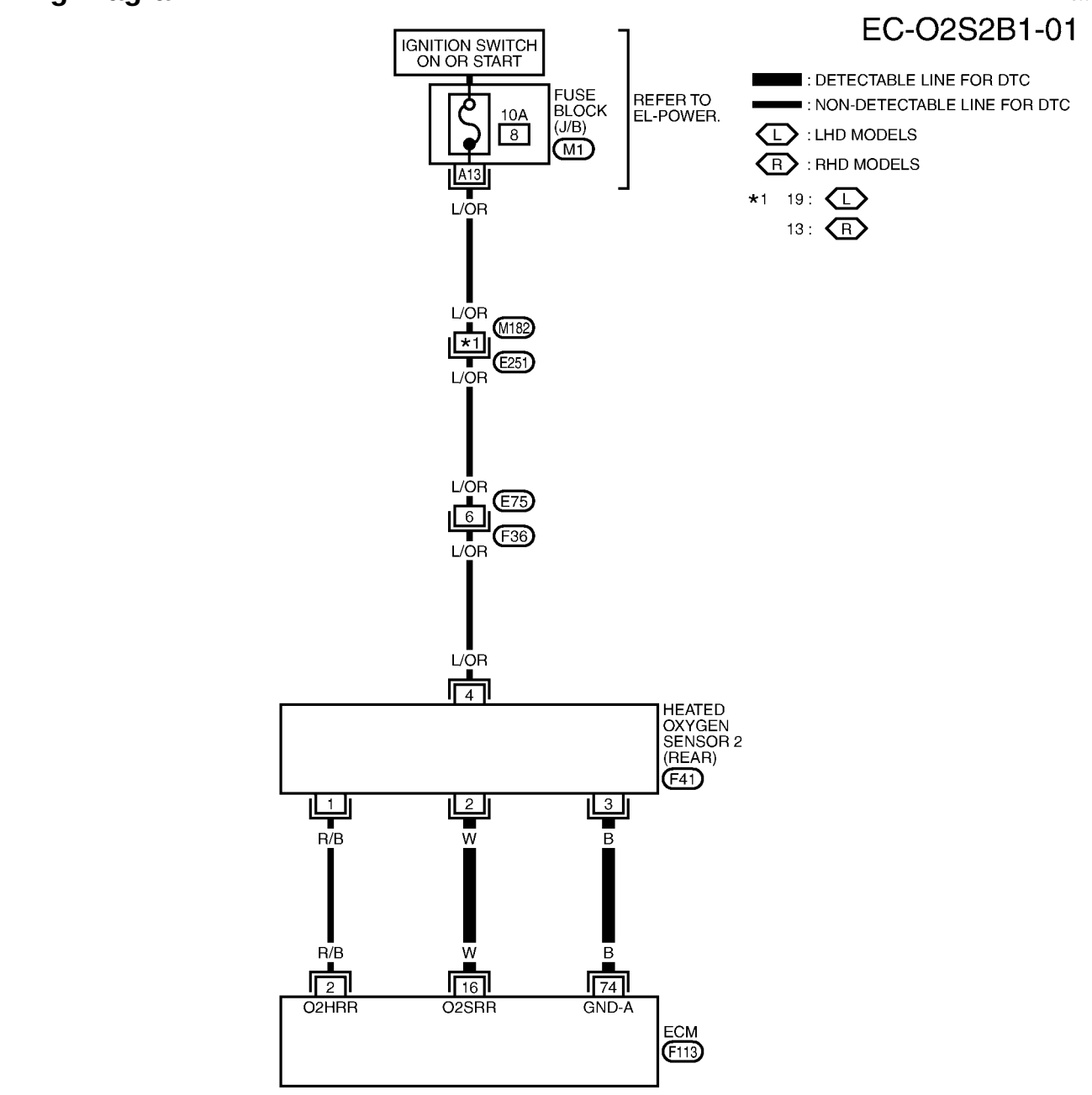
WITH GST

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 one minute under no load.
4. Let engine idle one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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 below 0.56V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.56V at least once during this procedure.
8. If NG, go to EC-312, "Diagnostic Procedure" .



Wiring Diagram

EBS00KAZ



REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC283A

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)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 3,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

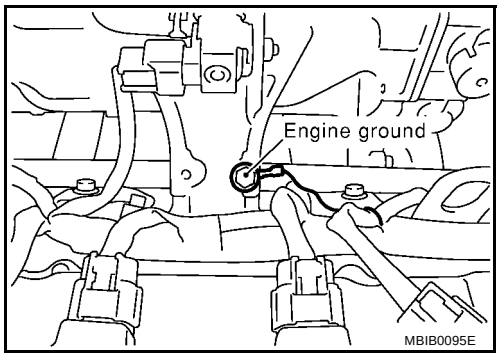
Diagnostic Procedure

EBS00KB0

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

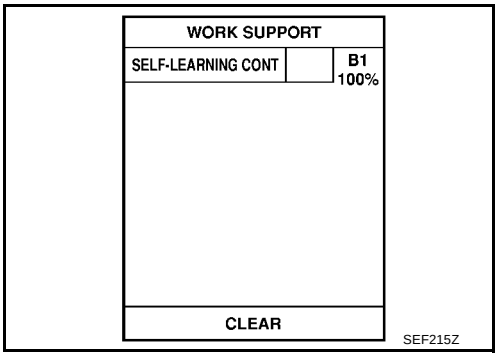
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

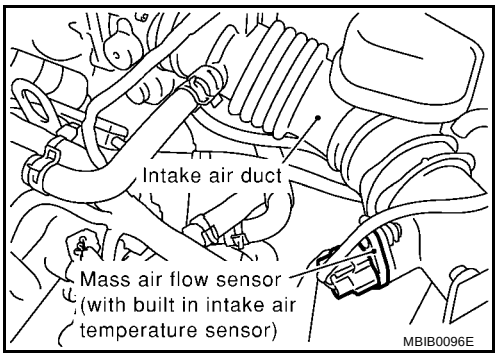
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-193 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

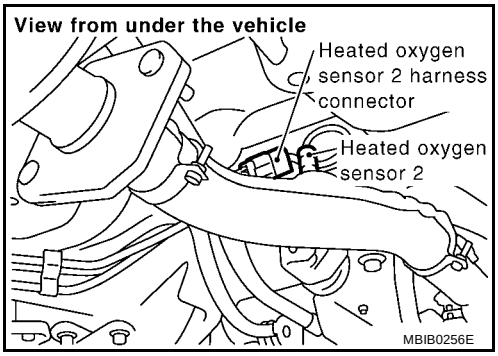
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and 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 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-314, "Component Inspection" .

OK or NG

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

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KB1

HEATED OXYGEN SENSOR 2

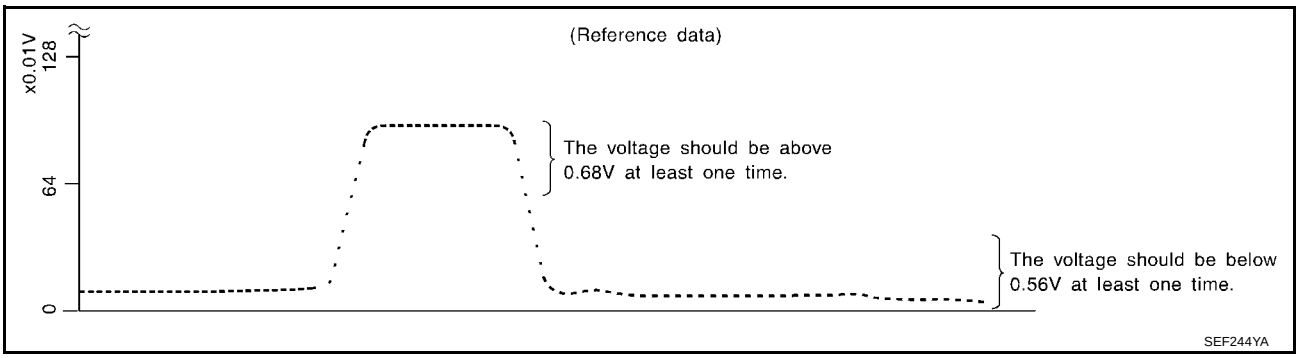
With CONSULT-II

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 one minute under no load.
4. Let engine idle and wait until 2 minutes have passed from starting the engine.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

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



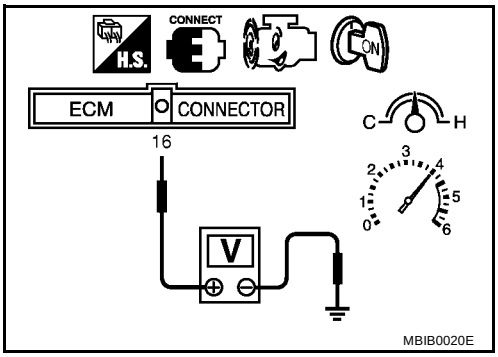
“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

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 one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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 0.68V at least once during this procedure.
   If the voltage is above 0.68V 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 with “OD” OFF (A/T) 3rd gear position (M/T).
   The voltage should be below 0.56V 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

EBS00KB2

HEATED OXYGEN SENSOR 2

Refer to FE-10.

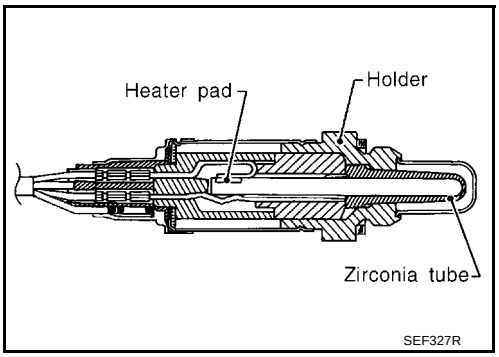
DTC P1147 HO2S2

PFP:226A0

Component Description

EBS00KB3

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen 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

EBS00KB4

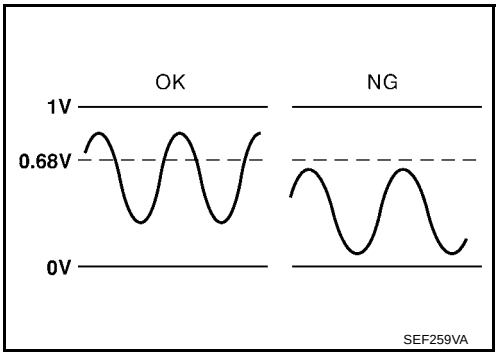
Specification data are reference values.

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

On Board Diagnosis Logic

EBS00KB5

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



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147 1147	Heated oxygen sensor 2 maximum voltage monitoring	The maximum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00KB6

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
- **"COMPLETED" will appear on CONSULT-II screen when all tests "COND1", "COND2" and "COND3" are completed.**
- 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:
Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in "Procedure for COND1"

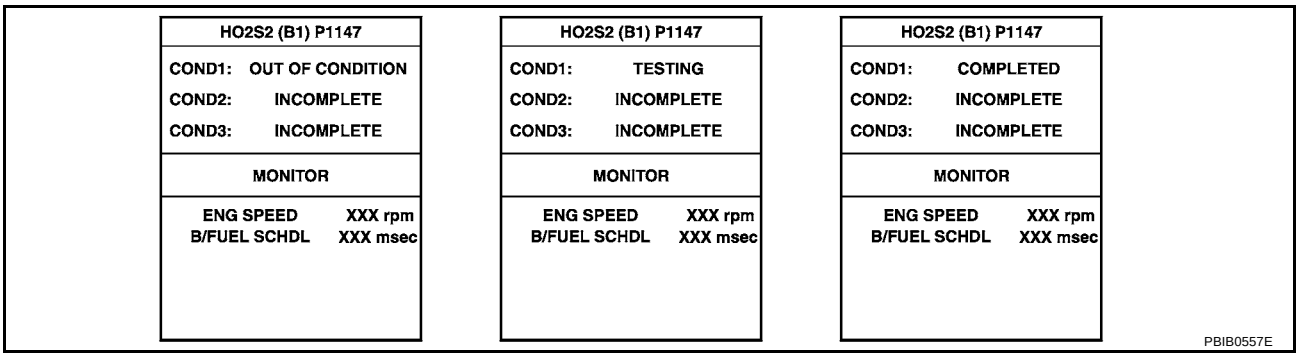
WITH CONSULT-II

Procedure for COND1

For the best results, perform ″DTC WORK SUPPORT″ at a temperature of 0 to 30°C (32 to 86°F).

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 one minute under no load.
4. Let engine idle for one minute.
5. Select "HO2S2 (B1) P1147" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-II.
6. Touch "START".
7. Let it idle for at least 30 seconds.
8. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3".
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
9. When the following conditions are met, "TESTING" will be displayed at COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector lever	Suitable position

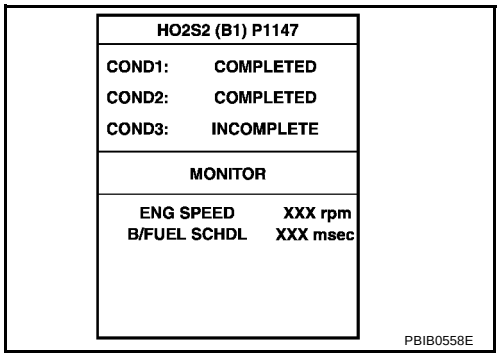


NOTE:
- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT-II screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".**

Procedure for COND2

1. While driving, release accelerator pedal completed with “OD” OFF (A/T models only) from the above condition [step 9] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED” (It will take approximately 4 seconds.)

   NOTE:
   If “COMPLETE” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

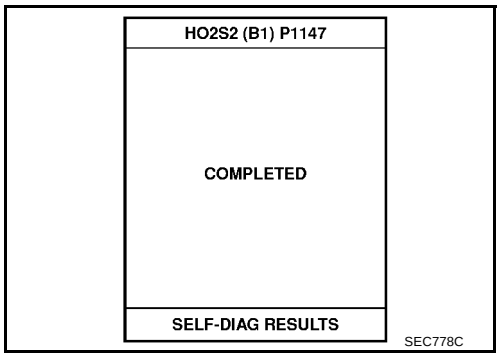
1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-320, "Diagnostic Procedure" .
   If ″CAN NOT BE DIAGNOSED″ is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).

b. Turn ignition switch “ON” and select “COOLANTEMP/S” in ″DATA MONITOR″ mode with CONSULT-II

c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.

d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to “Procedure for COND 1” step 3.



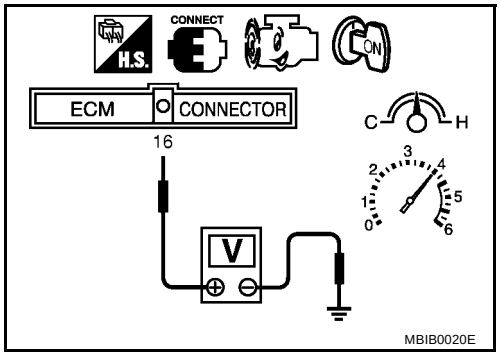
Overall Function Check

EBS00KB7

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

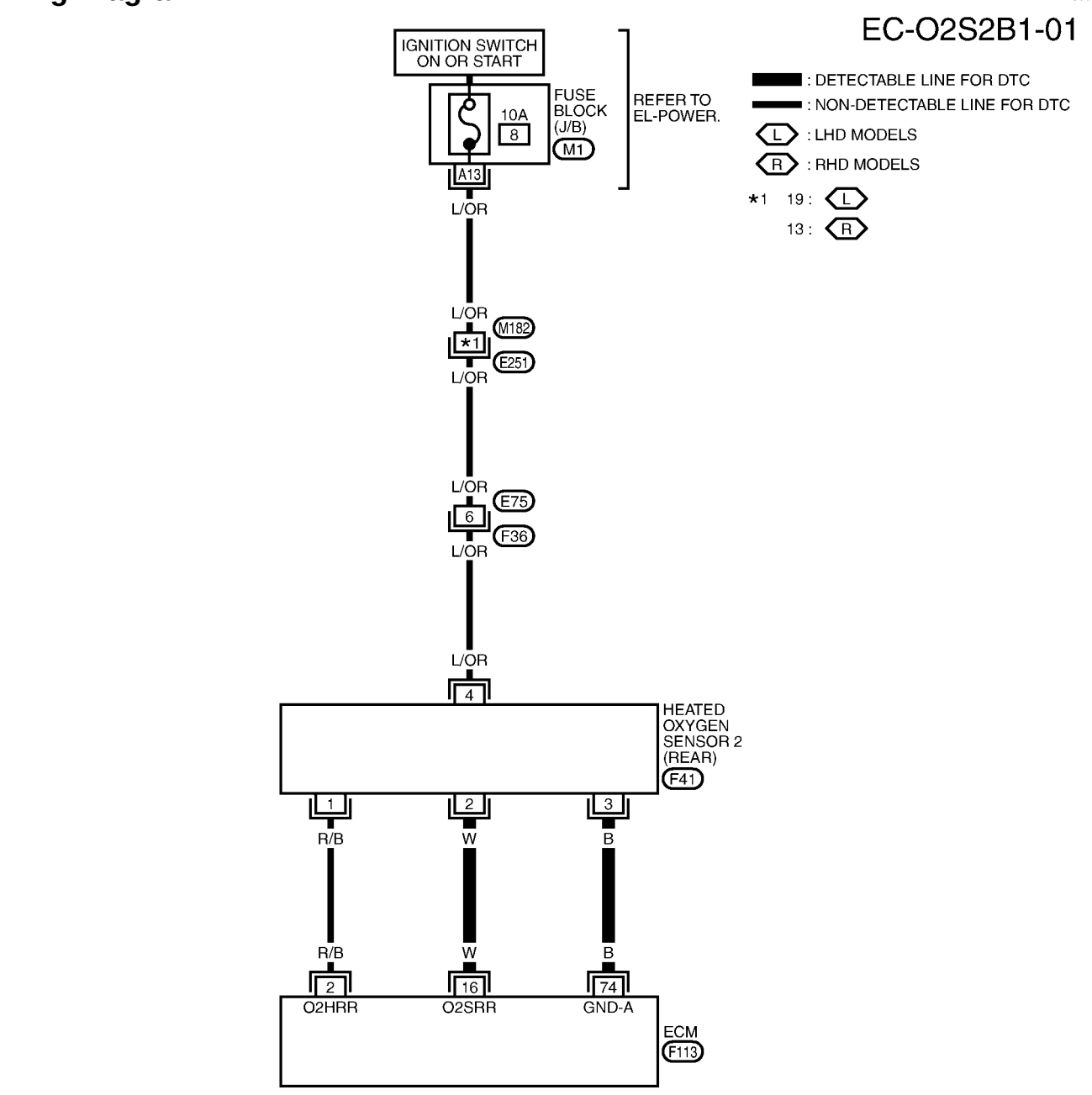
WITH GST

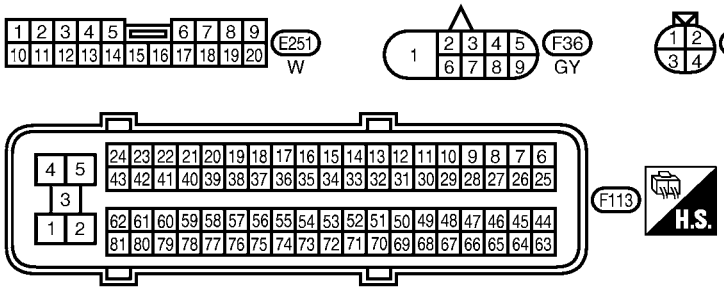
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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 0.68V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be above 0.68V at least once during this procedure.
8. If NG, go to EC-320, "Diagnostic Procedure" .



Wiring Diagram

EBS00KB8





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC283A

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)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

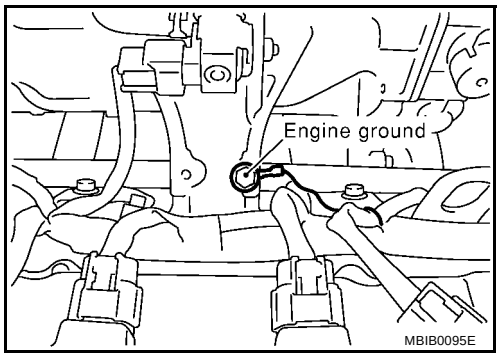
Diagnostic Procedure

EBS00KB9

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

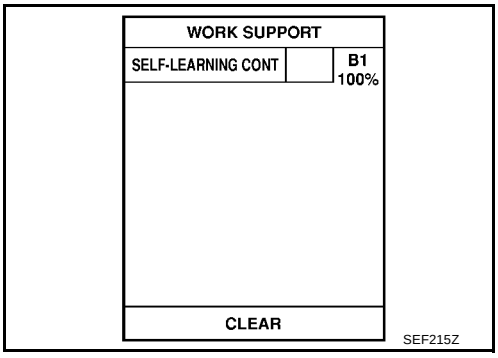
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

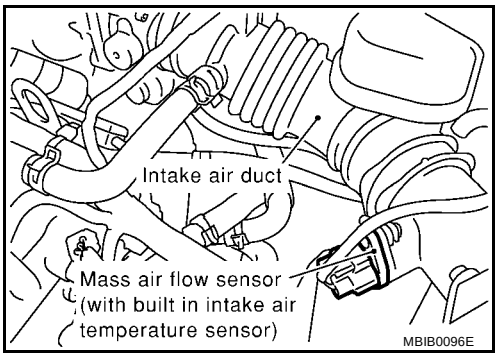
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-48, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-186 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

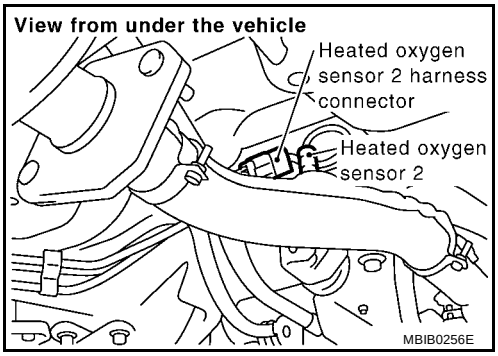
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and 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 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-322, "Component Inspection" .

OK or NG

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

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KBA

HEATED OXYGEN SENSOR 2

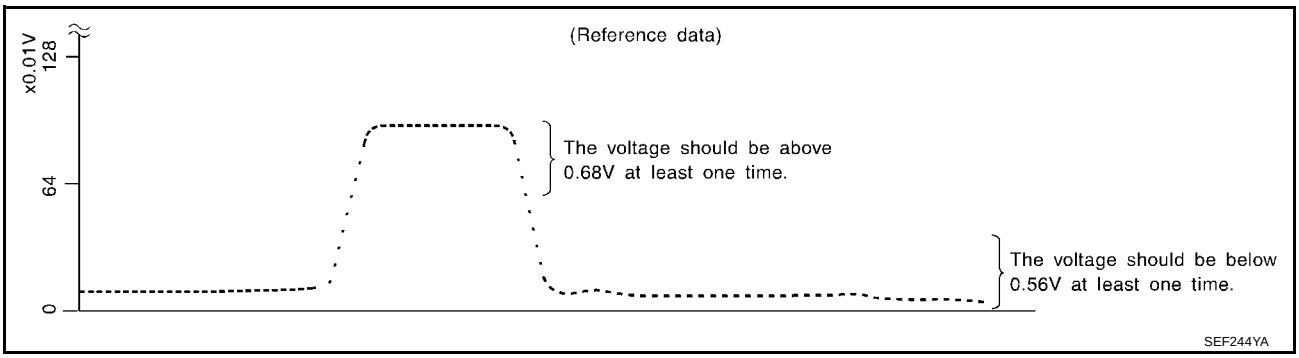
With CONSULT-II

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 one minute under no load.
4. Let engine idle one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

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



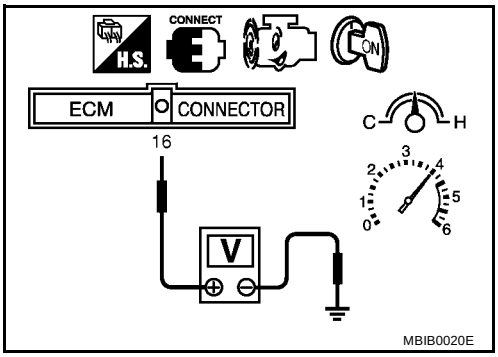
“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

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 one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T) 3rd gear position (M/T).
   The voltage should be below 0.56V 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

EBS00KBB

HEATED OXYGEN SENSOR 2

Refer to FE-10.

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

EBS00KBC

NOTE:
If DTC P1217 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-116, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

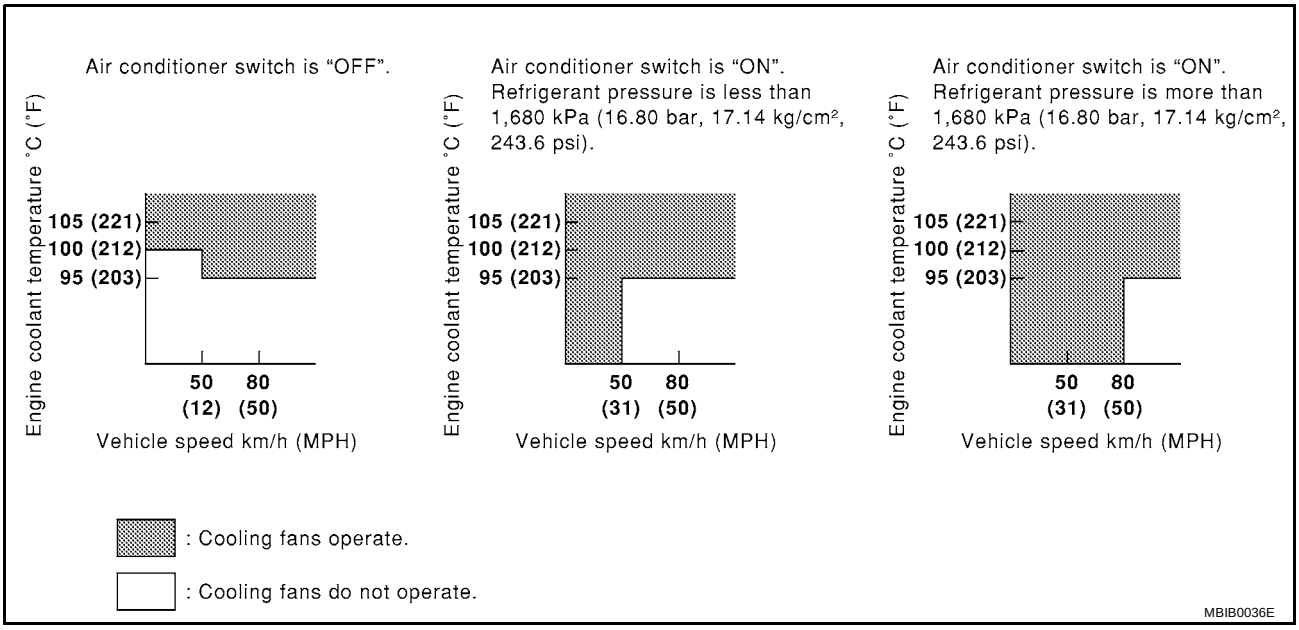
COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	Cooling fan control	Cooling fan relay(s)
Battery	Battery voltage*1		
Vehicle speed signal	Vehicle speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal*2		
Refrigerant pressure sensor	Refrigerant pressure		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: These signals are sent to the ECM through CAN communication line.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 2-step control [ON/OFF].
The ECM sends a cooling fan control signal to the smart entrance control unit through CAN communication line, and the smart entrance control unit controls cooling fan relays.

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

EBS00KBD

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

On Board Diagnosis Logic

EBS00KBE

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Harness or connectors (The CAN communication line is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-333, "Main 12 Causes of Overheating" .

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to LC-11. Also, replace the engine oil. Refer to LC-8.

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-21.**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

EBS00KBF

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

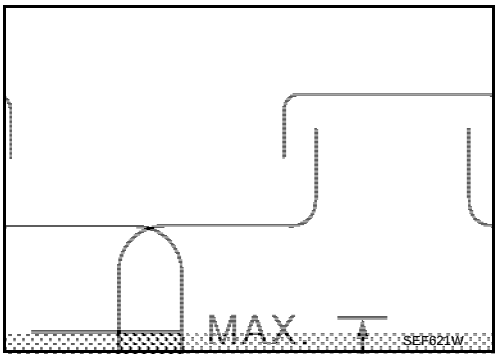
WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-328, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-328, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.



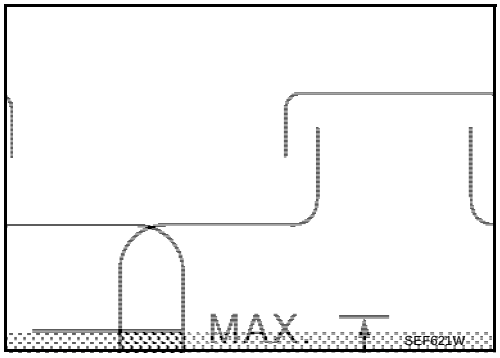
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-328, "Diagnostic Procedure" .

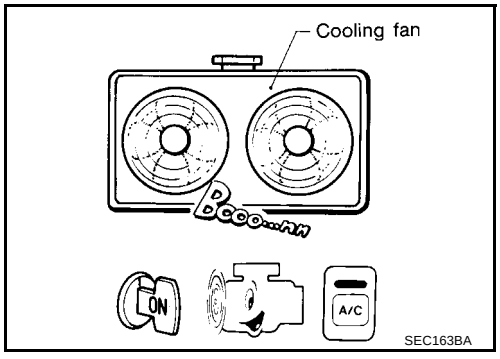
ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

MBIB0037E

WITH GST

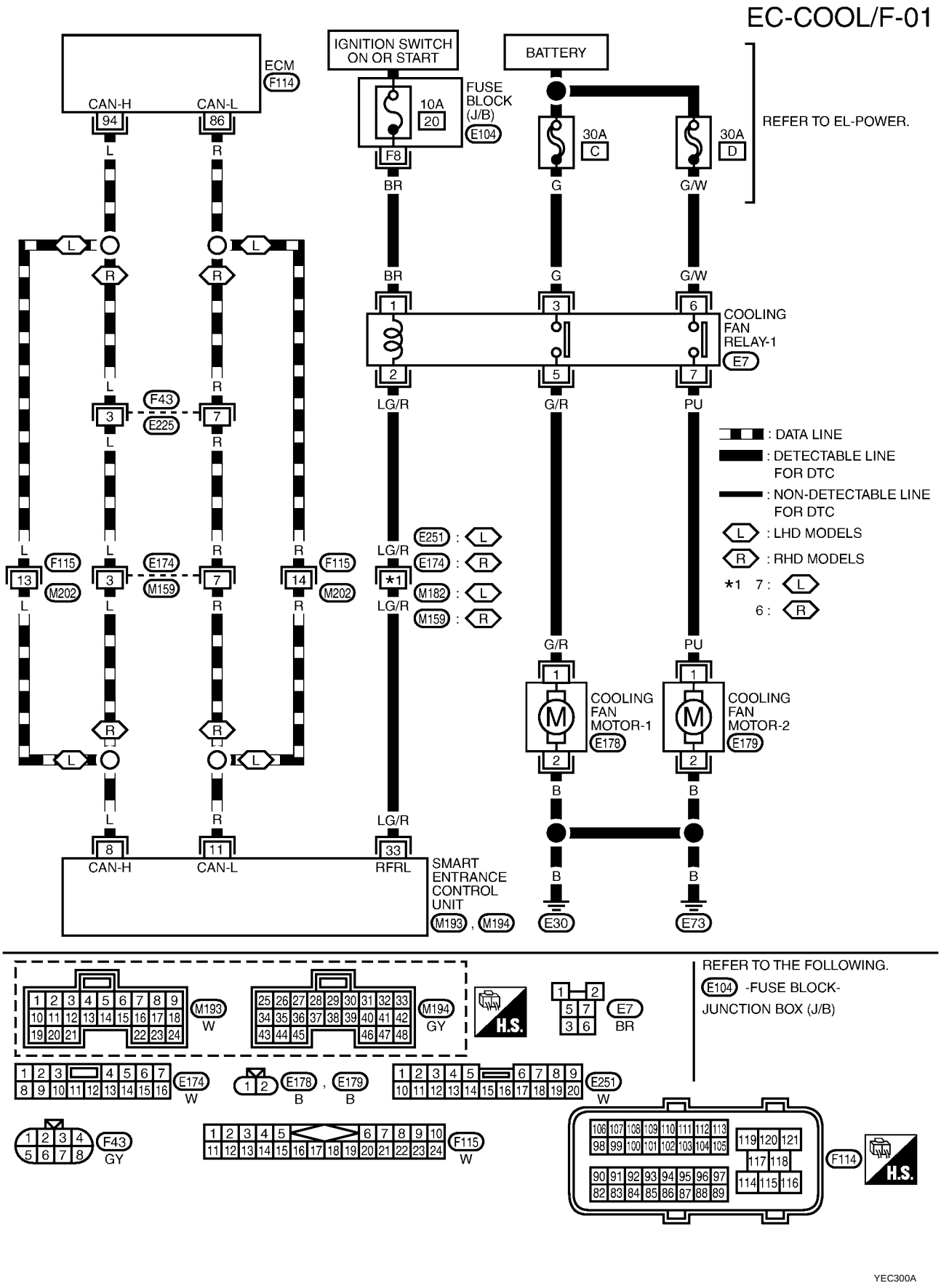
1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-328, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-328, "Diagnostic Procedure" .
3. Start engine.
   Be careful not to overheat engine.
4. Turn air conditioner switch “ON”.
5. Turn blower fan switch “ON”.
6. Make sure that cooling fans operate.
   If NG, go to EC-328, "Diagnostic Procedure" .





Wiring Diagram

EBS00KBG



YEC300A

Diagnostic Procedure

EBS00KBH

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK COOLING FAN OPERATION

With CONSULT-II

1. Start engine and let it idle.
2. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “ON” on the CONSULT-II screen.
3. Make sure that cooling fans-1 and -2 operate.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan control circuit. (Go to EC-331, "PROCEDURE A" .)

ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

MBIB0037E

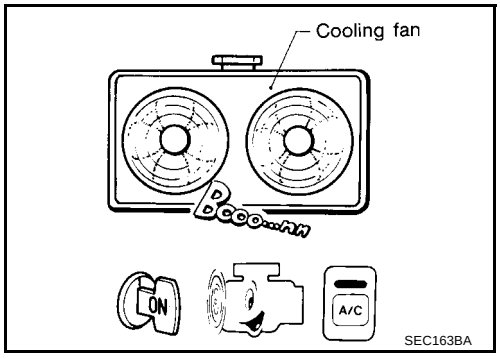
3. CHECK COOLING FAN OPERATION

Without CONSULT-II

1. Start engine and let it idle.
2. Turn air conditioner switch “ON”.
3. Turn blower fan switch “ON”.
4. Make sure that cooling fans-1 and -2 operate.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan control circuit. (Go to EC-331, "PROCEDURE A" .)

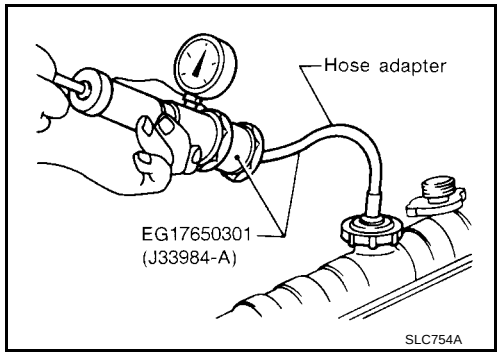


SEC163BA

4. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm^2 , 23 psi)



CAUTION:
Higher than the specified pressure may cause radiator damage. Pressure should not drop.

OK or NG

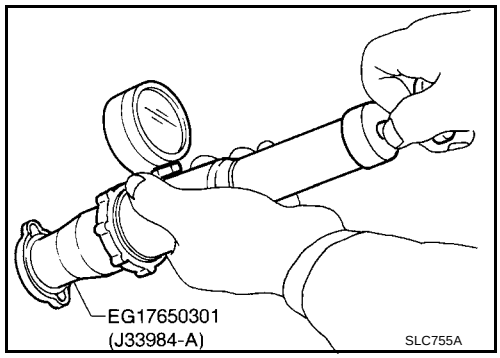
OK >> GO TO 5.
NG >> Check the following for leak

- Hose
- Radiator
- Water pump
  Refer to LC-14.

5. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure: 59 - 98 kPa (0.59 - 0.98 bar, 0,6 - 1.0 kg/cm^2 , 9 - 14 psi)



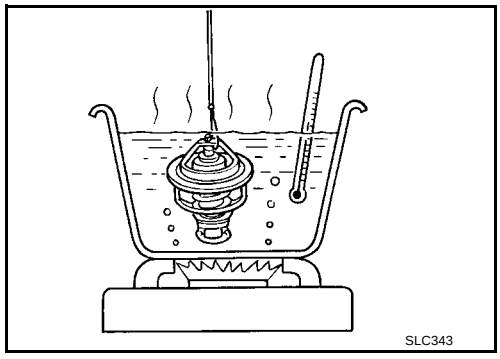
OK or NG

OK >> GO TO 6.
NG >> Replace radiator cap.

6. CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.

Valve opening temperature: 82°C (180°F) [standard]
Valve lift: More than 8 mm/95°C (0.31 in/203°F)



3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC-15.

OK or NG

OK >> GO TO 7.
NG >> Replace thermostat

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-148, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace engine coolant temperature sensor.

8. CHECK MAIN 12 CAUSES

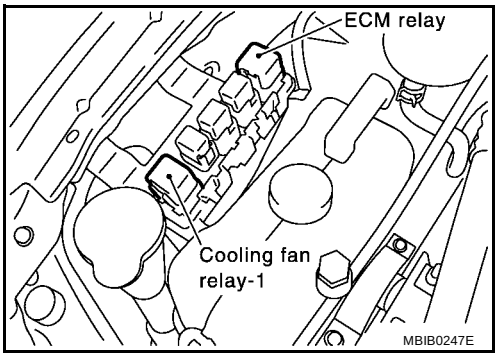
If the cause cannot be isolated, go to EC-333, "Main 12 Causes of Overheating" .

>> **INSPECTION END**

PROCEDURE A

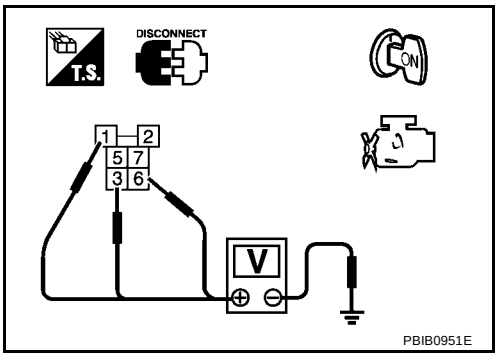
1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.



4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E106
- 10A fuse
- 30A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

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

3. CHECK COOLING FAN MOTORS CIRCUIT

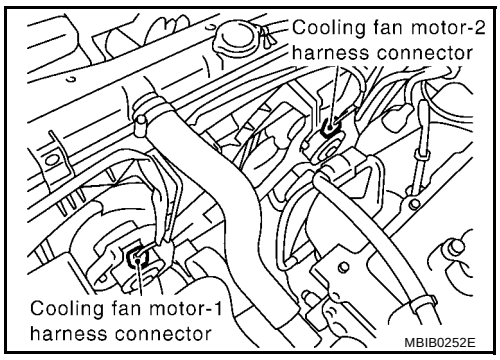
1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 2 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 2 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

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



OK or NG

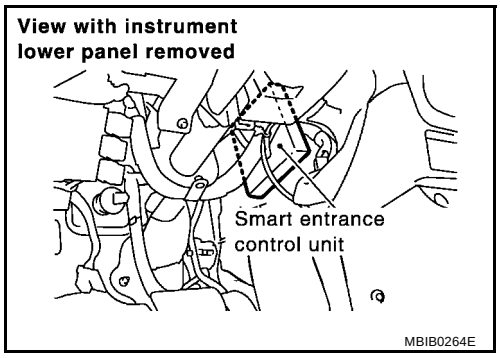
OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect smart entrance control unit.
2. Check harness continuity between smart entrance control unit terminal 33 and cooling fan relay-1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

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



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E251, M182 (LHD models)
- Harness connectors E174, M159 (RHD models)
- Harness for open or short between smart entrance control unit and cooling fan relay-1

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

6. CHECK COOLING FAN RELAY-1

Refer to EC-334, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS

Refer to EC-334, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK SMART ENTRANCE CONTROL UNIT

Refer to EL-368.

OK or NG

OK >> GO TO 9.
NG >> Replace smart entrance control unit.

9. CHECK INTERMITTENT INCIDENT

Perform EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

EBS00KBI

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-19.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-7.
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See LC-12.
ON*2	5	● Coolant leaks	● Visual	No leaks	See LC-11.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-15, and LC-16.
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-324).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-7.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See MA-7.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-57, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-70, "CYLINDER BLOCK" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.
For more information, refer to LC-23.

Component Inspection

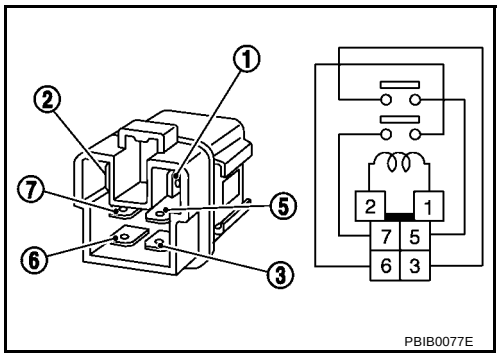
EBS00KBJ

COOLING FAN RELAY-1

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace cooling fan relay.



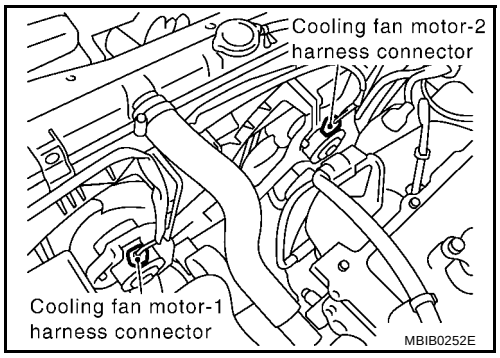
COOLING FAN MOTORS-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(–)
Cooling fan motor	1	2

Cooling fan motor should operate.

3. If NG, replace cooling fan motor.



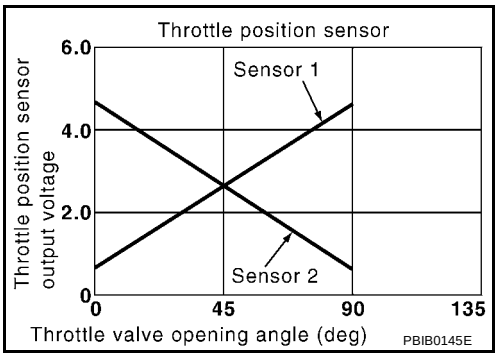
DTC P1223, P1224 TP SENSOR

PFP:16119

Component Description

EBS00KBK

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KBL

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00KBM

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1223 1223	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 2)
P1224 1224	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

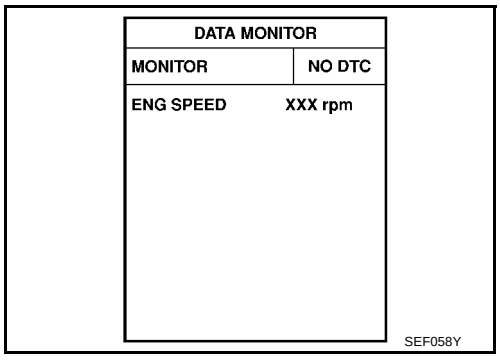
DTC Confirmation Procedure

EBS00KBN

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-338, "Diagnostic Procedure" .



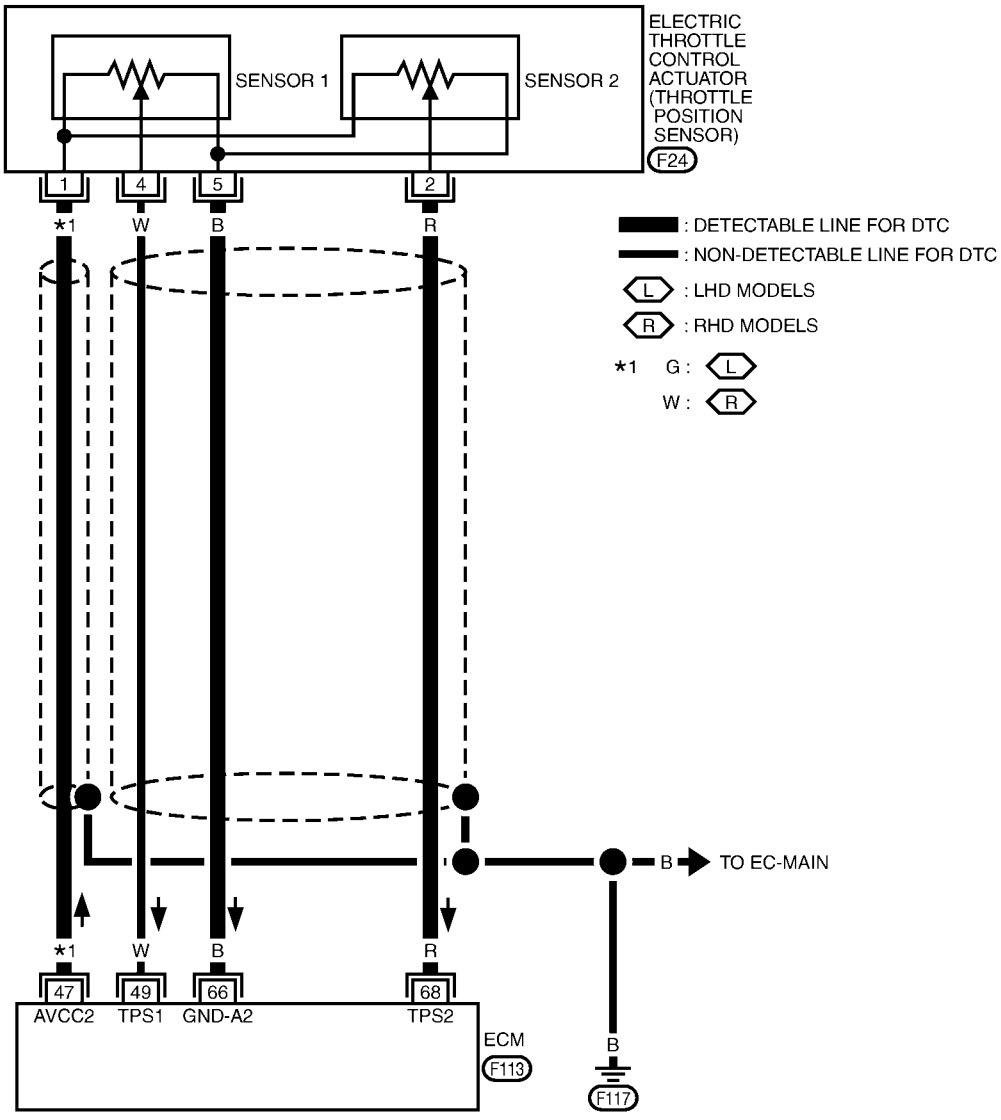
WITH GST

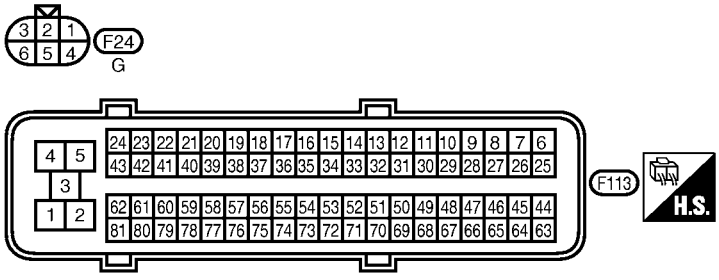
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00KBO

EC-TPS2-01





YEC301A

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)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	More than 0.36V

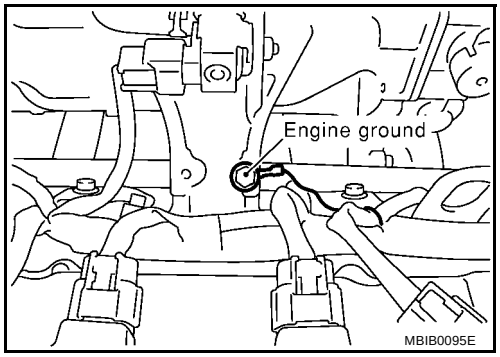
Diagnostic Procedure

EBS00KBP

1. RETIGHTEN GROUND SCREWS

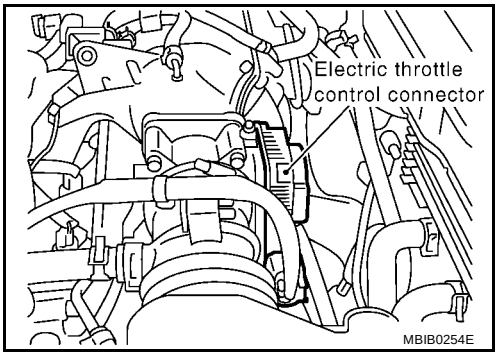
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



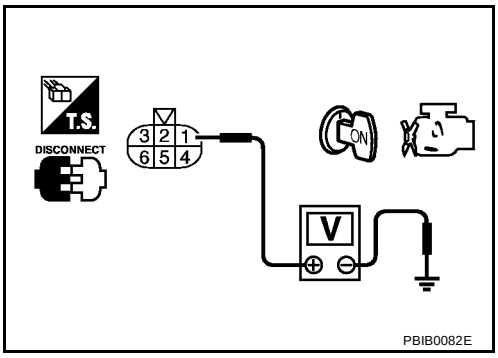
2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



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 THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-340, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

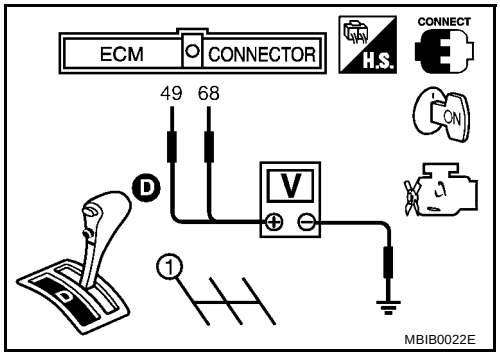
>> **INSPECTION END**

Component Inspection

EBS00KBQ

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-31, "Throttle Valve Closed Position Learning" .
8. Perform EC-31, "Idle Air Volume Learning" .

Removal and Installation

EBS00KBR

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

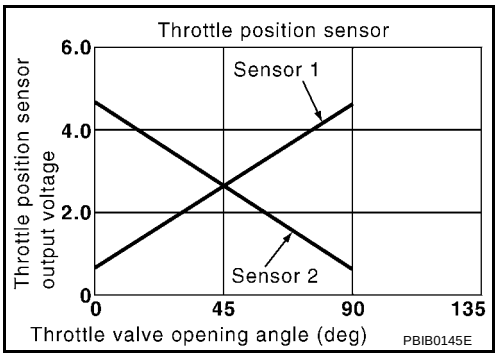
DTC P1225 TP SENSOR

PFP:16119

Component Description

EBS00KBS

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00KBT

The MI will not light up for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

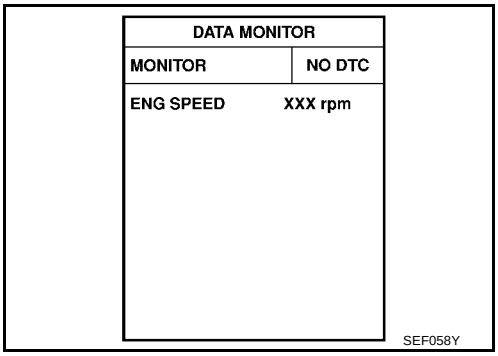
DTC Confirmation Procedure

EBS00KBU

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-342, "Diagnostic Procedure" .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

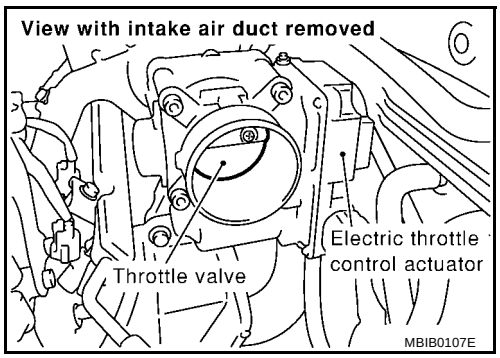
EBS00KBV

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

EBS00KBW

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

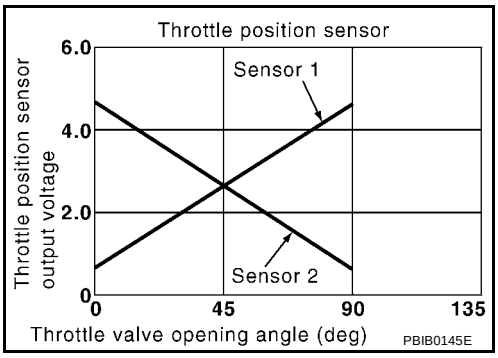
DTC P1226 TP SENSOR

PFP:16119

Component Description

EBS00KBX

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00KBY

The MI will not light up for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

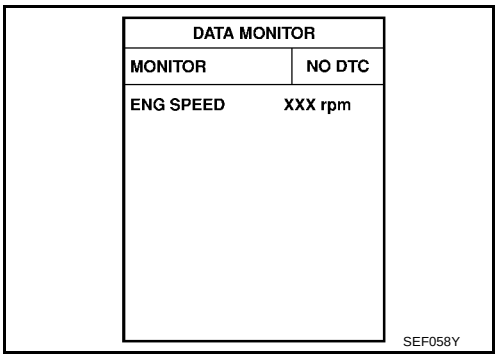
DTC Confirmation Procedure

EBS00KBZ

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-344, "Diagnostic Procedure"
.



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

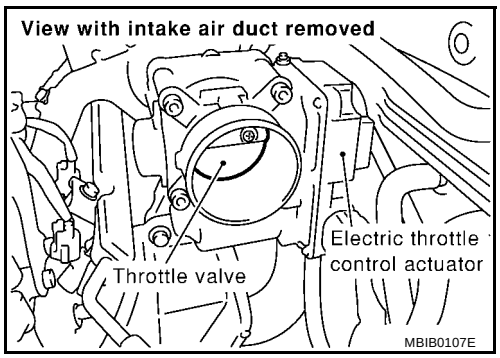
EBS00KC0

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

EBS00KC1

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

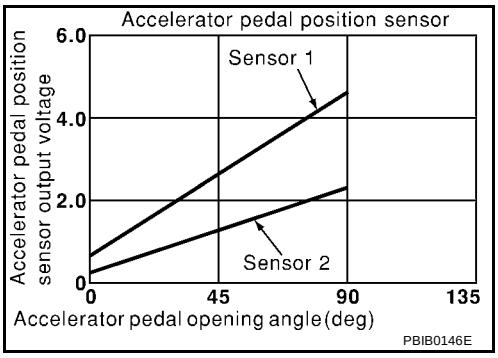
DTC P1227, P1228 APP SENSOR

PFP:18002

Component Description

EBS00KC2

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KC3

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00KC4

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1227 1227	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2)
P1228 1228	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

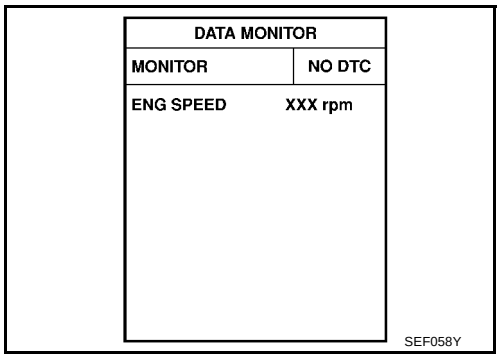
DTC Confirmation Procedure

EBS00KC5

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-348, "Diagnostic Procedure" .

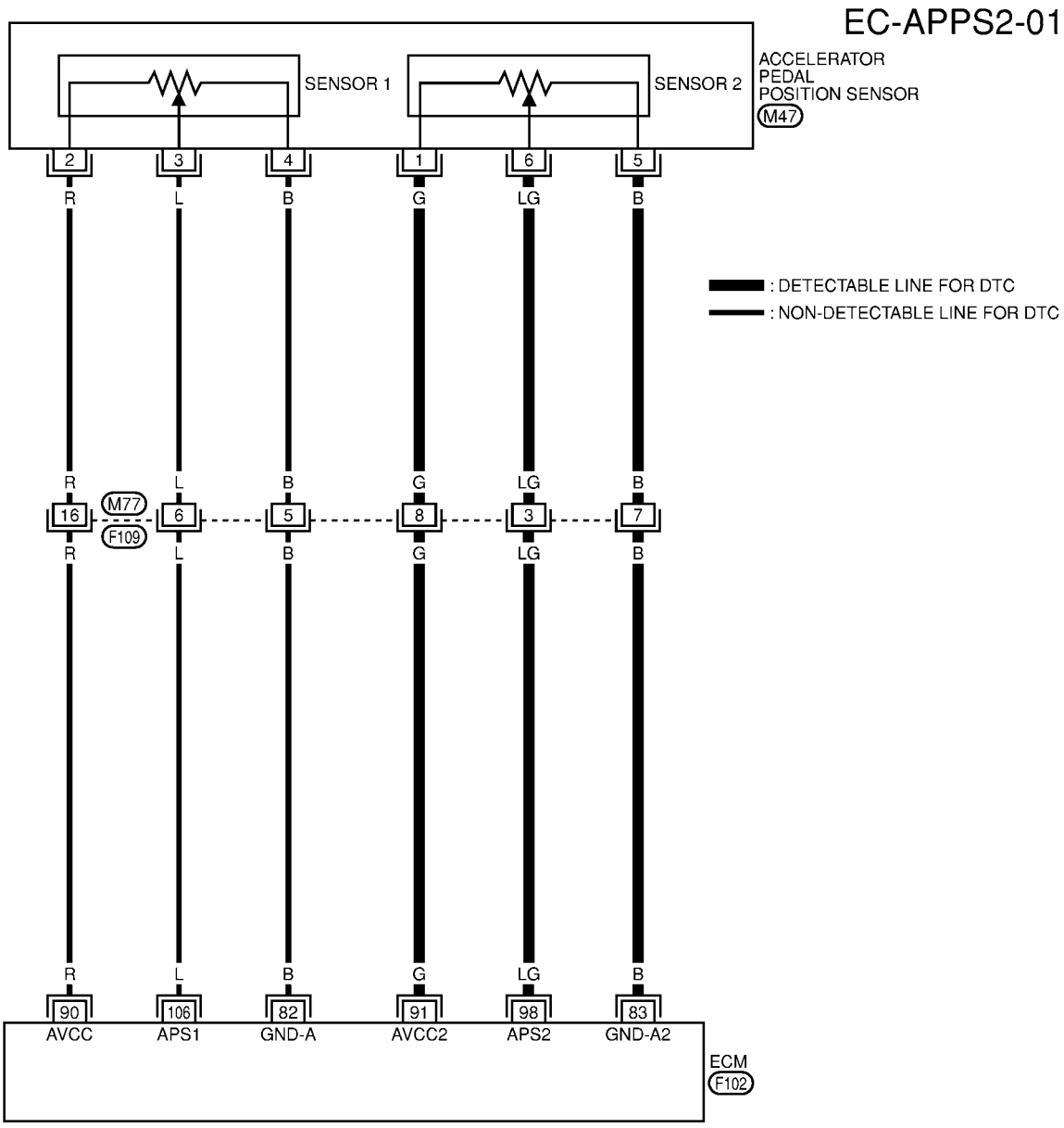


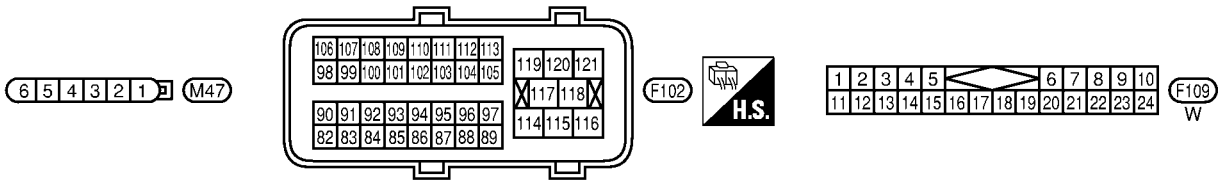
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00KC6





MBWA0237E

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)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.175 - 0.335V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.35 - 0.67V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 3.9V

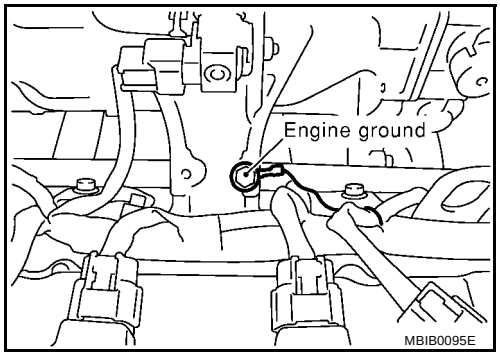
Diagnostic Procedure

EBS00KC7

1. RETIGHTEN GROUND SCREWS

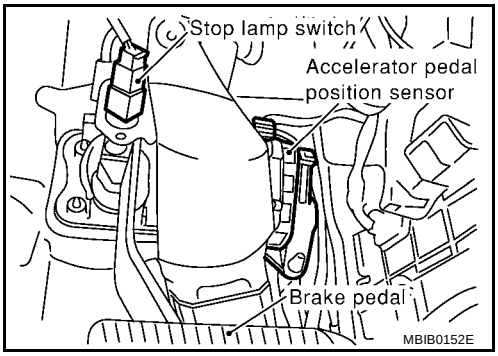
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



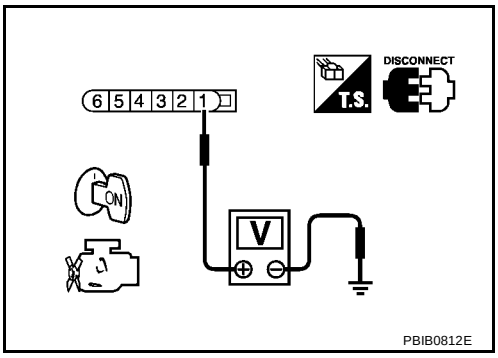
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

4. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 83 and APP sensor terminal 5. 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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

6. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

8. CHECK APP SENSOR

Refer to EC-350, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-31, "Accelerator Pedal Released Position Learning" .
3. Perform EC-31, "Throttle Valve Closed Position Learning" .
4. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

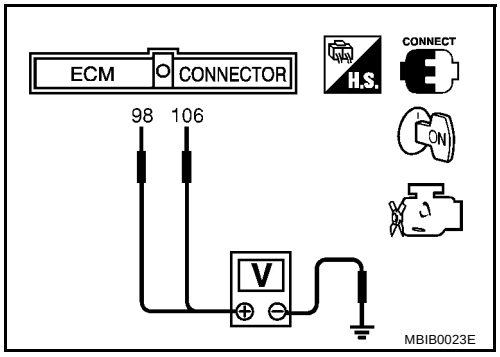
Component Inspection

EBS00KC8

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-31, "Accelerator Pedal Released Position Learning" .
6. Perform EC-31, "Throttle Valve Closed Position Learning" .
7. Perform EC-31, "Idle Air Volume Learning" .

Removal and Installation

EBS00KC9

ACCELERATOR PEDAL

Refer to FE-3.

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

EBS00KCA

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

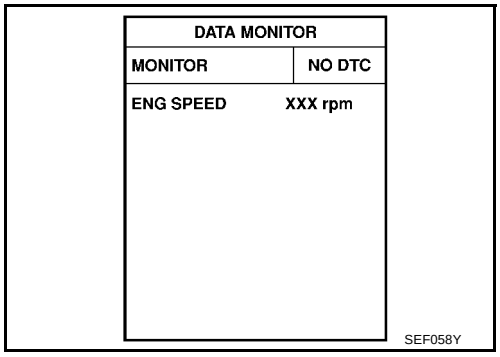
EBS00KCB

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 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-354, "Diagnostic Procedure" .



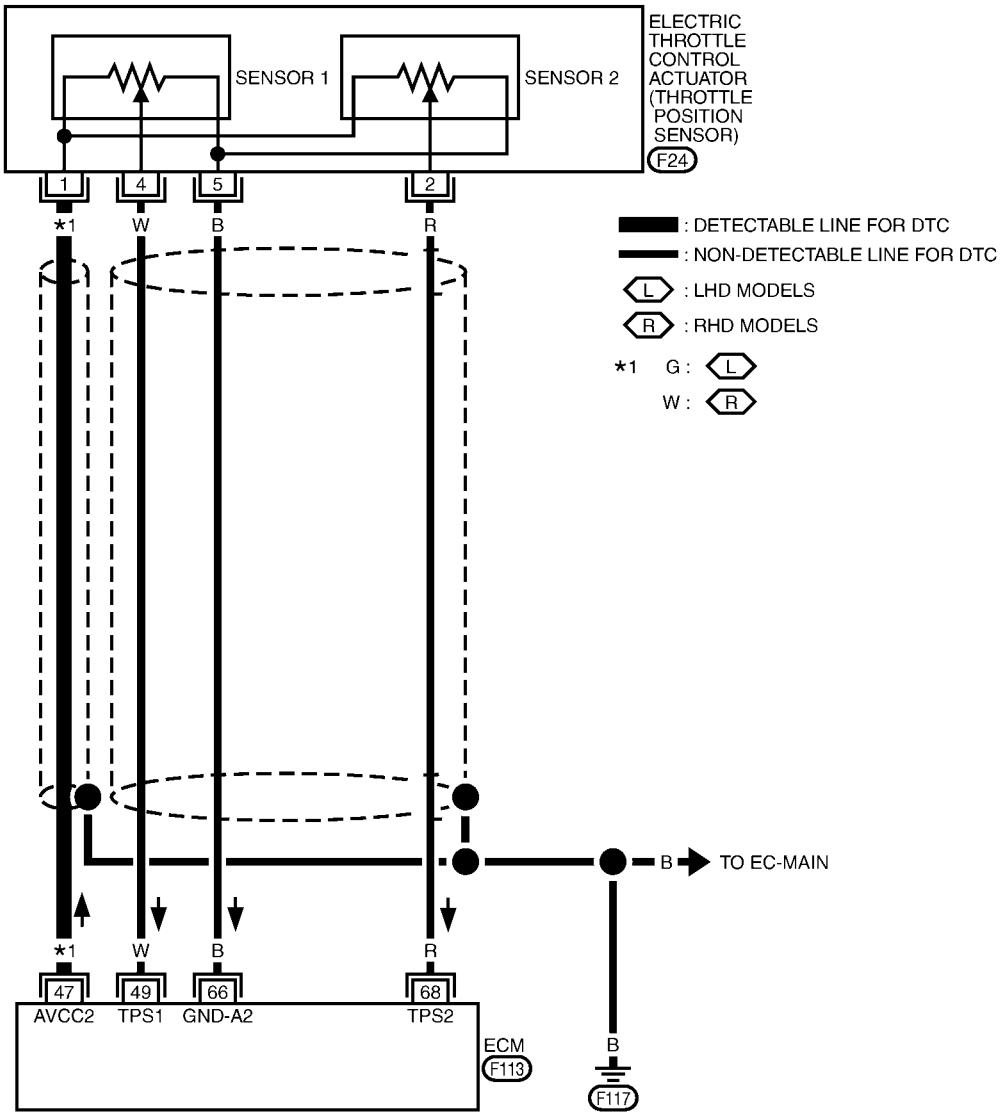
WITH GST

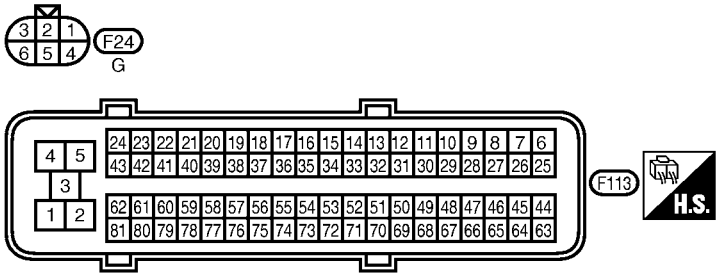
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00KCC

EC-SEN/PW-01





YEC303A

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)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V

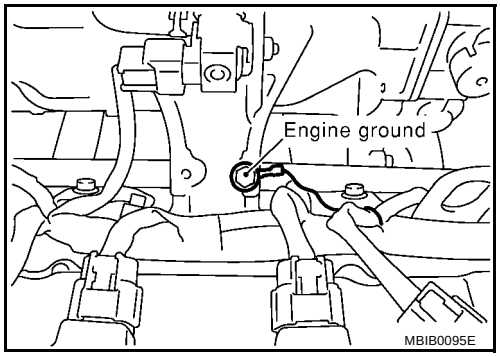
Diagnostic Procedure

EBS00KCD

1. RETIGHTEN GROUND SCREWS

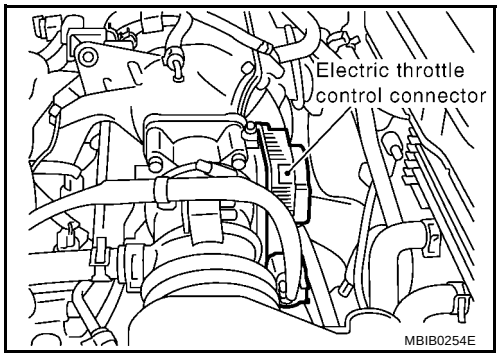
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch "ON".

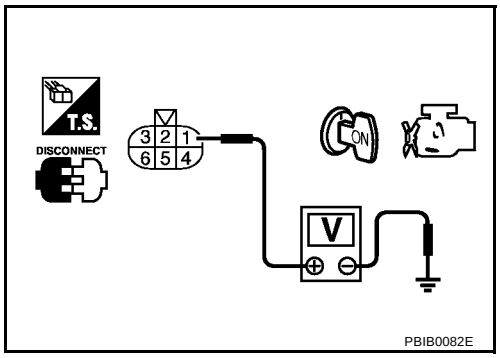


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground between ECM terminal 47 and electric throttle control actuator terminal 1.
- ECM pin terminal.

OK or NG

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

4. CHECK THROTTLE POSITION SENSOR

Refer to EC-204, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-31, "Throttle Valve Closed Position Learning" .
3. Perform EC-31, "Idle Air Volume Learning" .

>> **INSPECTION END**

6. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1706 PNP SWITCH

PFP:32006

Component Description

EBS00KCE

When the shift lever position is “P” (A/T models only) or “N”, park/neutral position (PNP) switch is “ON”. ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

EBS00KCF

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T models) Neutral (M/T models)	ON
		Shift lever: Except above	OFF

On Board Diagnosis Logic

EBS00KCG

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706 1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	● Harness or connectors (PNP switch circuit is open or shorted.) ● Park/neutral position (PNP) switch

DTC Confirmation Procedure

EBS00KCH

CAUTION:

Always drive vehicle at a safe speed.

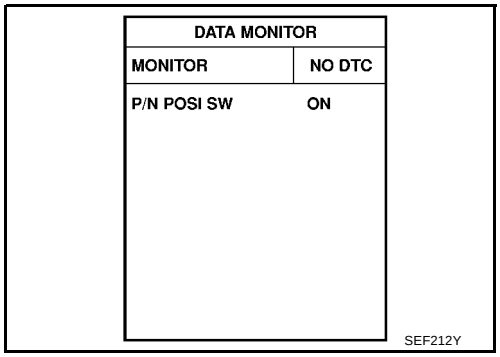
NOTE:

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

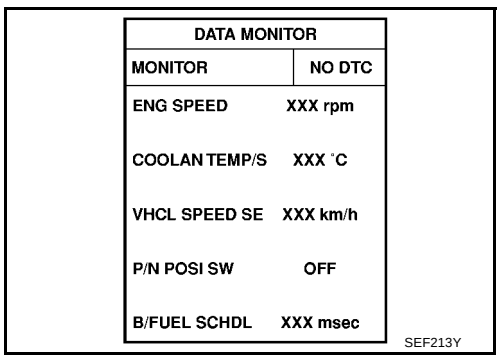
1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II. Then check the “P/N POSI SW” signal under the following conditions.

Position (Selector lever)	Known-good signal
“P” (A/T models only) and “N” position	ON
Except the above position	OFF



   If NG, go to EC-359, "Diagnostic Procedure" .
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and warm it up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,200 - 6,000 rpm (A/T models) 1,300 - 6,000 rpm (M/T models)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	More than 3.0 msec
VHCL SPEED SE	More than 46 km/h (30 MPH)
Selector lever	Suitable position



6. If 1st trip DTC is detected, go to EC-359, "Diagnostic Procedure" .

Overall Function Check

EBS00KCI

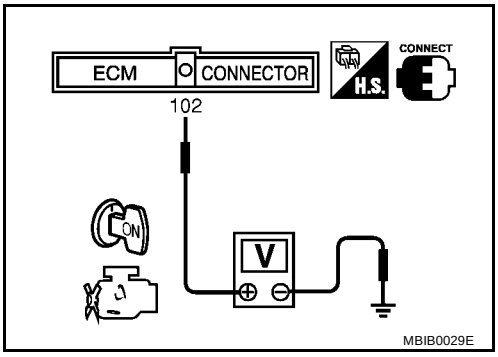
Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 102 (PNP switch signal) and body ground under the following conditions.

Condition (Gear position)	Voltage V (Known-good data)
“P” (A/T models only) and “N” position	Approximately 0
Except the above position	A/T models: Battery voltage M/T models: Approximately 5

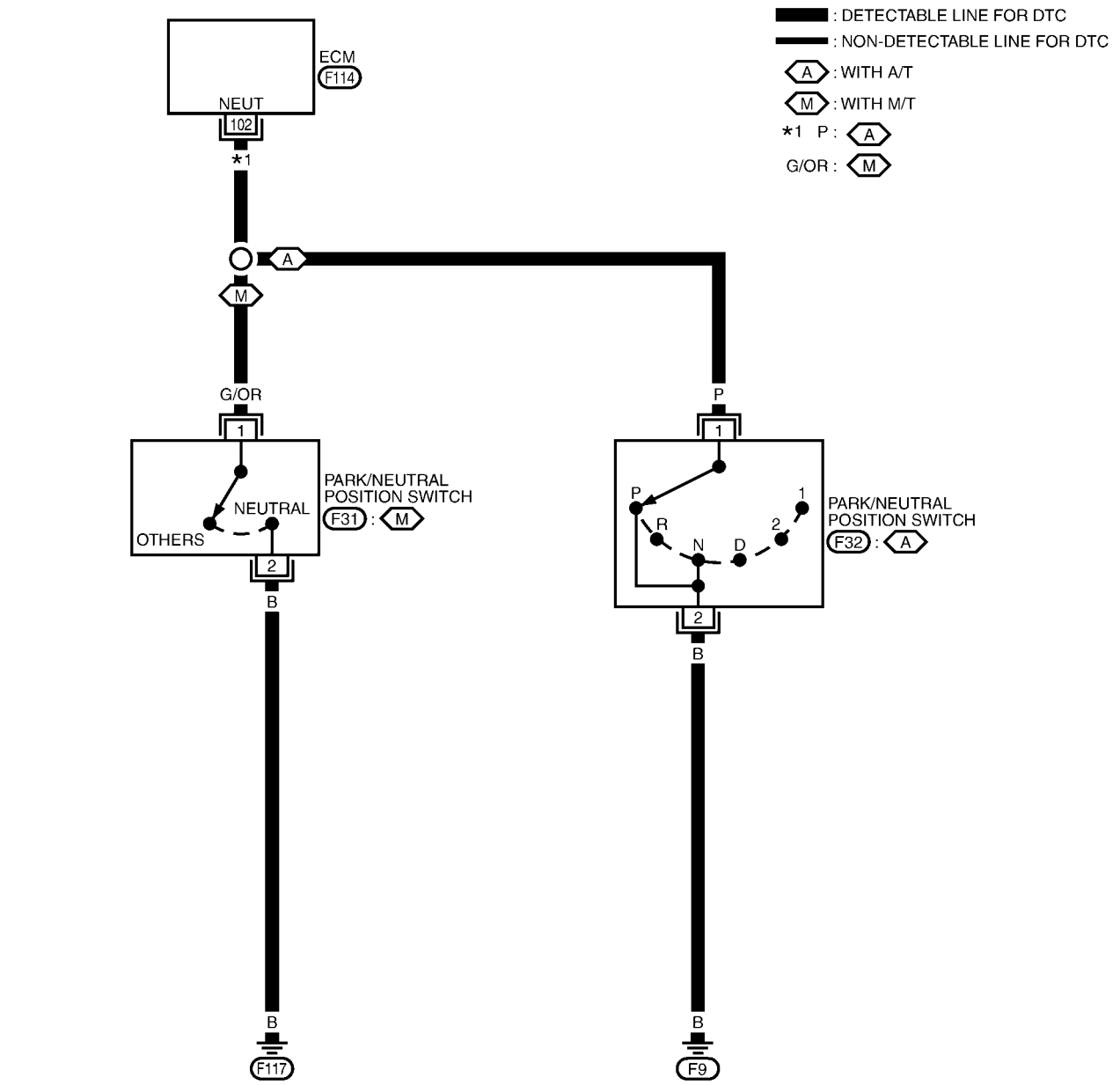
3. If NG, go to EC-359, "Diagnostic Procedure" .

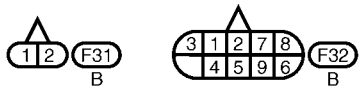


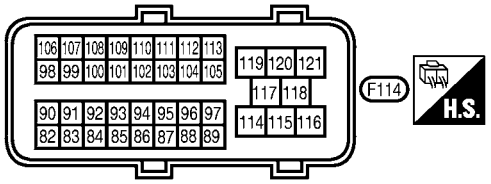
Wiring Diagram

EBS00KCJ

EC-PNP/SW-01







YEC304A

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)
102	P (A/T) G/OR (M/T)	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models). ● Shift lever position is "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

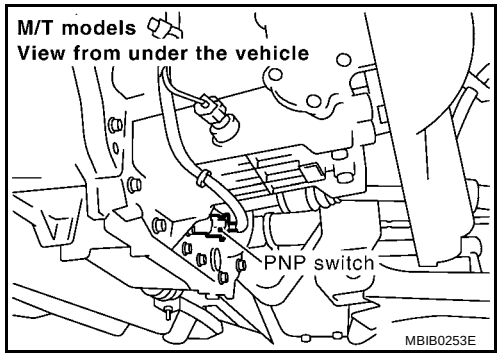
EBS00KCK

1. CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to power in harness or connectors.

2. CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and PNP switch terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. 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 PNP SWITCH

Refer to AT-111, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" (A/T models) or MT-21 (M/T models).

OK or NG

OK >> GO TO 4.
NG >> Replace PNP switch.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

EBS00KCL

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

EBS00KCM

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

EBS00KCN

The MI will not light up for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

FALI-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

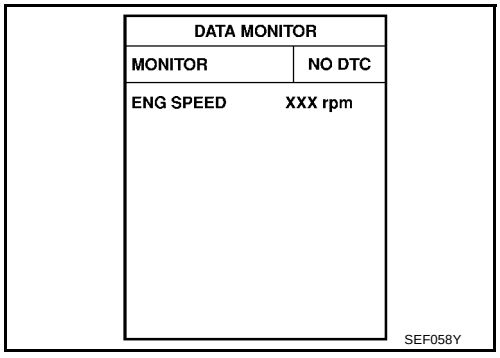
Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.	
	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

EBS00KCO

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-362, "Diagnostic Procedure"
   .



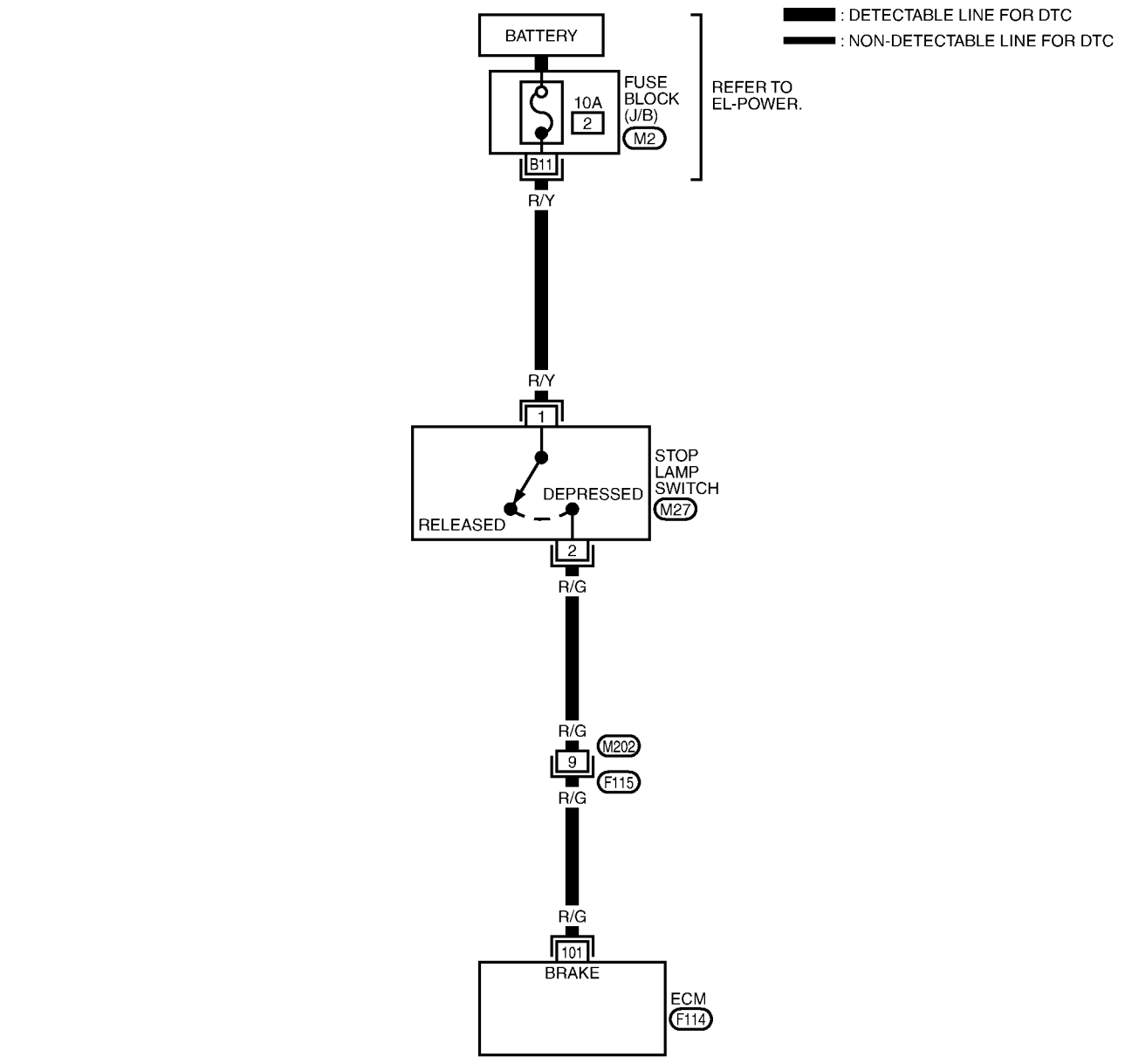
WITH GST

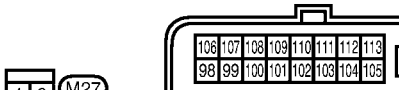
Follow the procedure “WITH CONSULT-II” above.

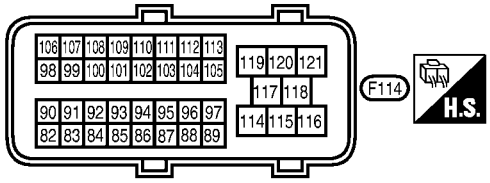
Wiring Diagram

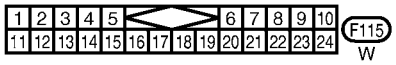
EBS00KCP

EC-BRK/SW-01









REFER TO THE FOLLOWING.
M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC305A

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)
101	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00KCQ

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the brake pedal.

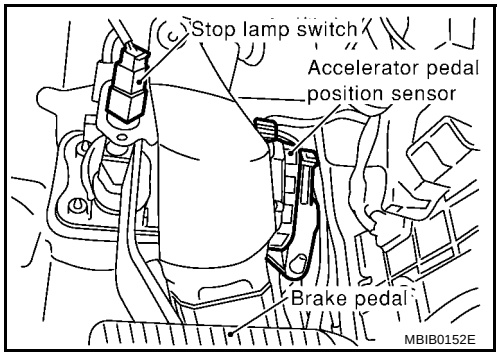
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

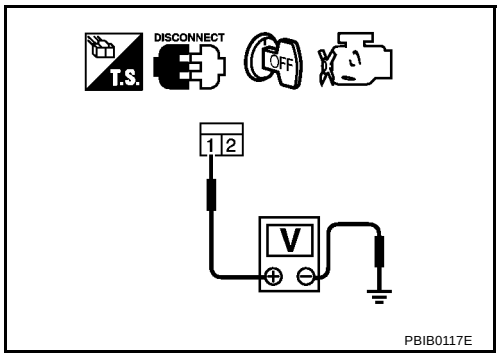
2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.



2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

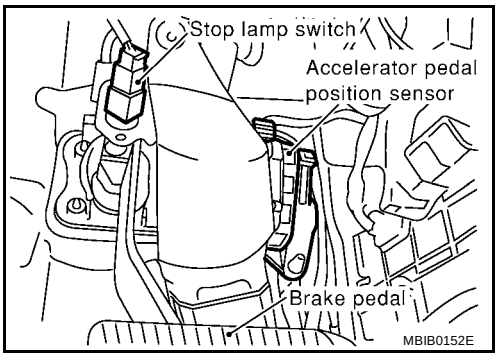
>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.
4. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

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



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and stop lamp switch

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

6. CHECK STOP LAMP SWITCH

Refer to EC-364, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

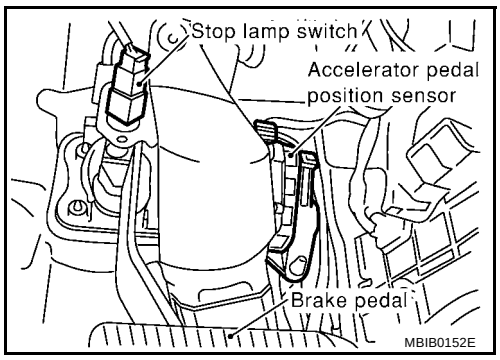
>> **INSPECTION END**

Component Inspection

EBS00KCR

STOP LAMP SWITCH

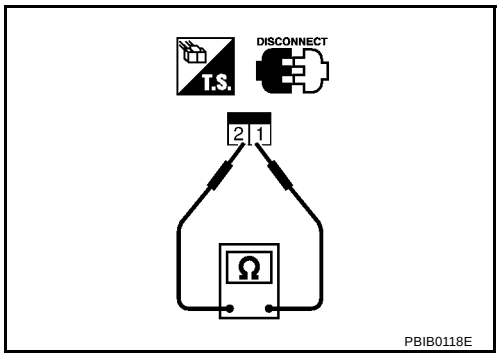
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

If NG, adjust brake pedal installation, refer to BR-12, and perform step 2 again.



IGNITION SIGNAL

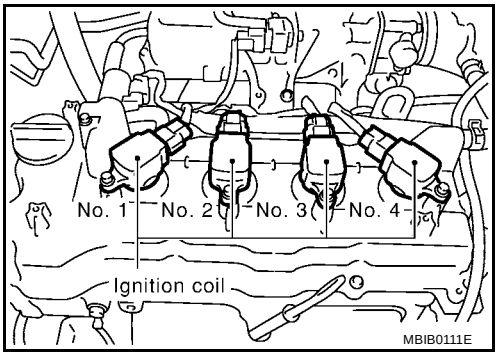
PFP:22448

Component Description

EBS00KCS

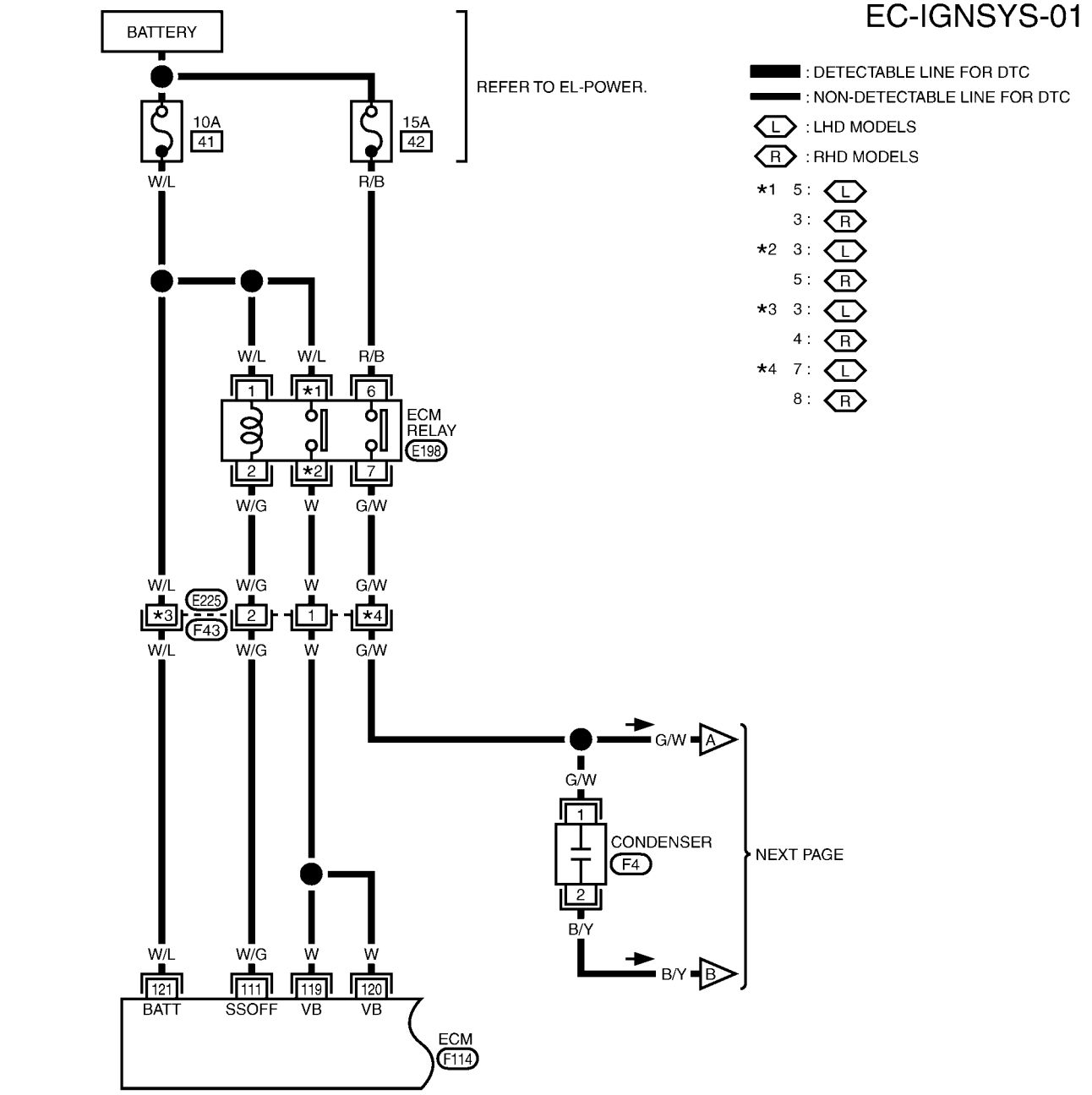
IGNITION COIL & POWER TRANSISTOR

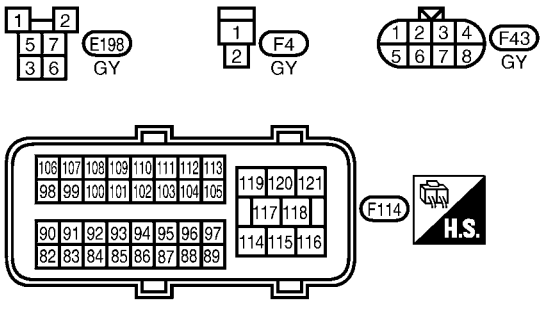
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.



Wiring Diagram

EBS00KCT





YEC306A

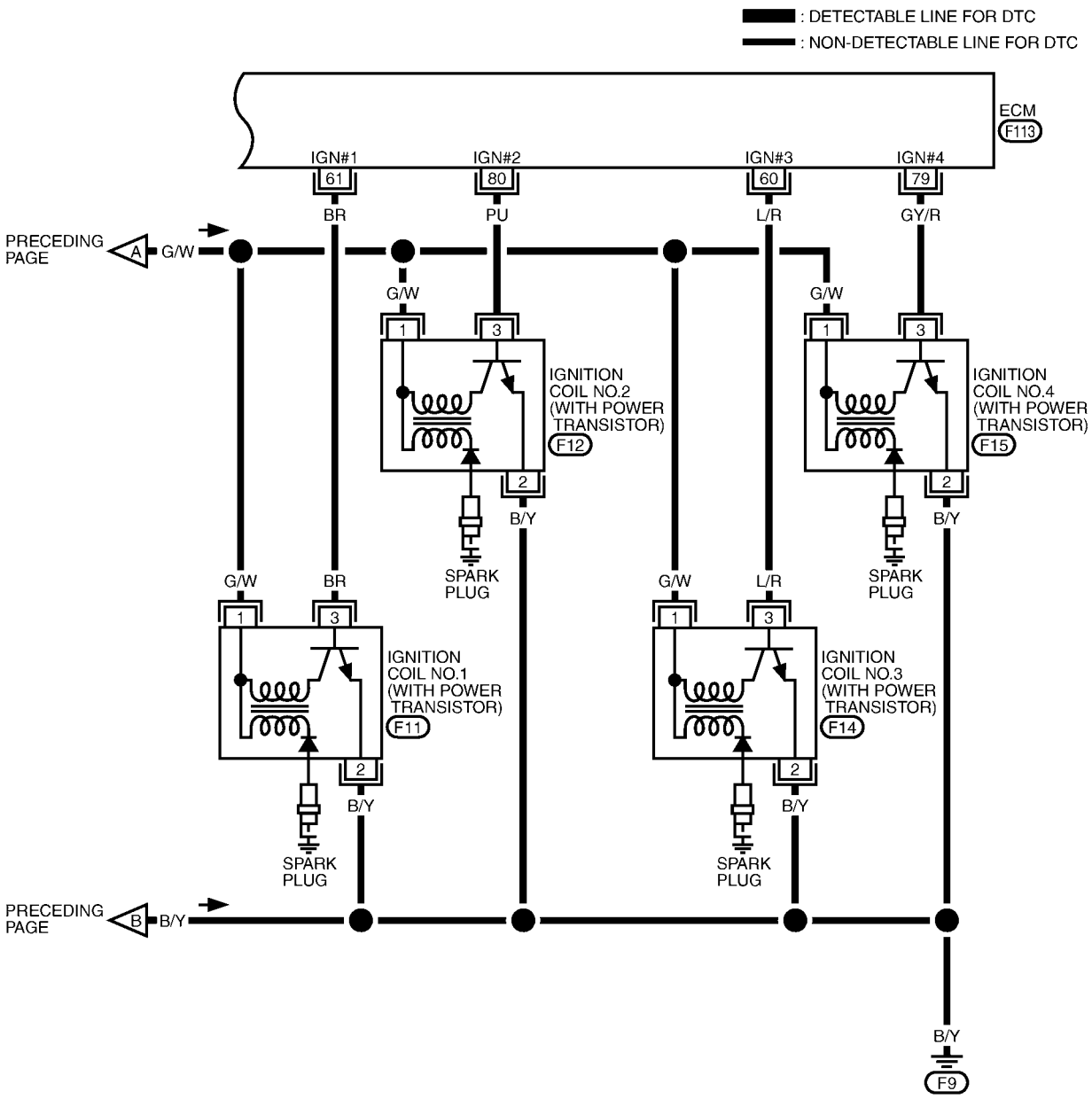
Specification data are reference values and are measured between each terminal and ground.

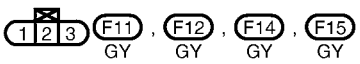
CAUTION:

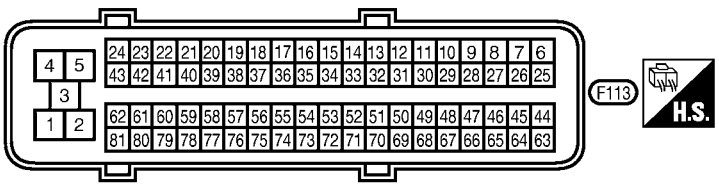
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF".	0 - 1.0V
			[Ignition switch "OFF"] ● More than a few seconds passed after turning ignition switch "OFF".	BATTERY VOLTAGE (11 - 14V)
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02



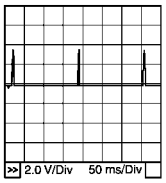
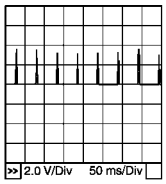




YEC307A

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)
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

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

Diagnostic Procedure

EBS00KCU

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.
Is engine running?

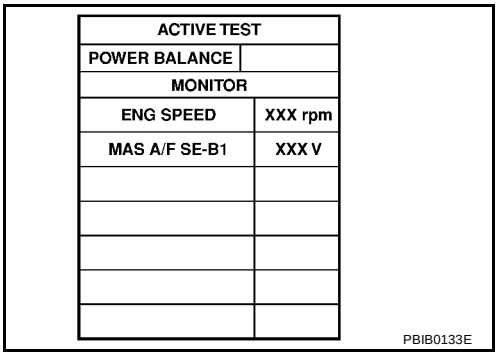
Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.



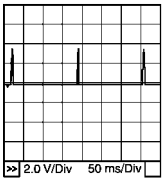
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

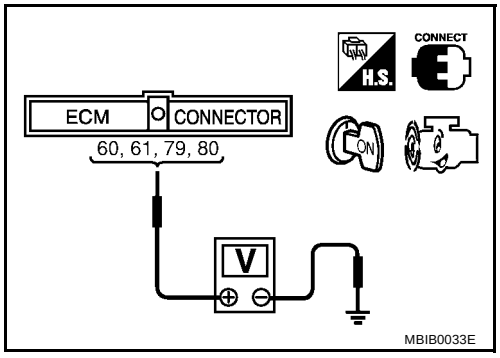
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 60, 61, 79, 80 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



MBIB0033E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

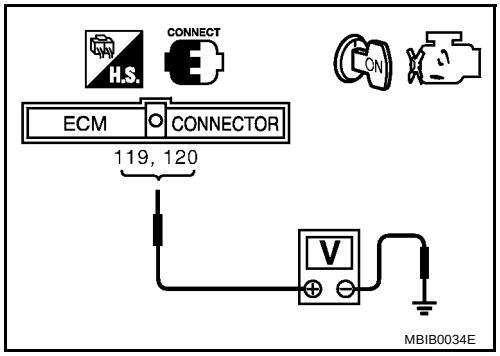
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-110, "POWER SUPPLY CIRCUIT FOR ECM"
.



MBIB0034E

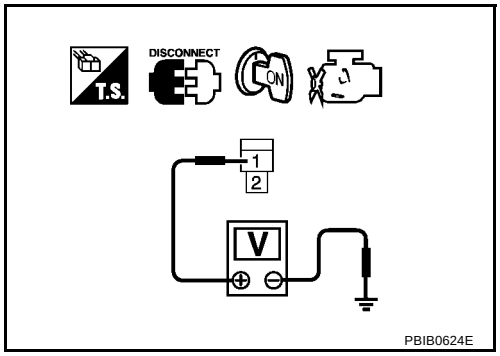
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.



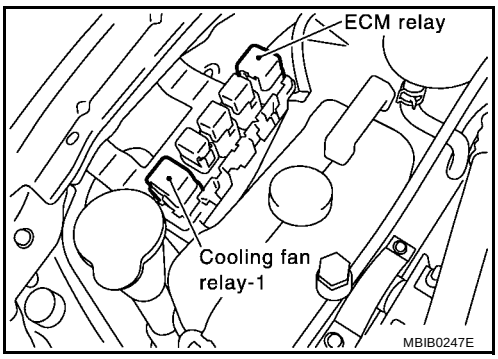
PBIB0624E

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1.
   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 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

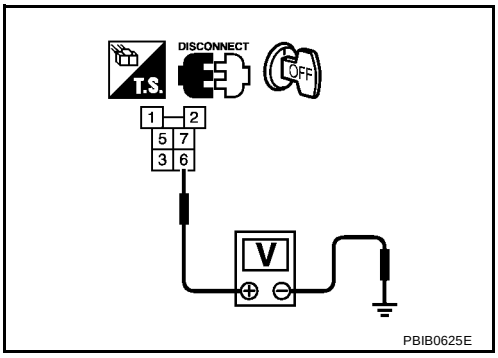
- Harness connectors E225, F43
- Harness for open or short between ECM relay and condenser

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

8. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between ECM relay and battery

>> Repair or replace harness or connectors.

10. CHECK ECM RELAY

Refer to EC-373, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace ECM relay.

11. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground.
   Refer to Wiring diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to power in harness or connector.

12. CHECK CONDENSER

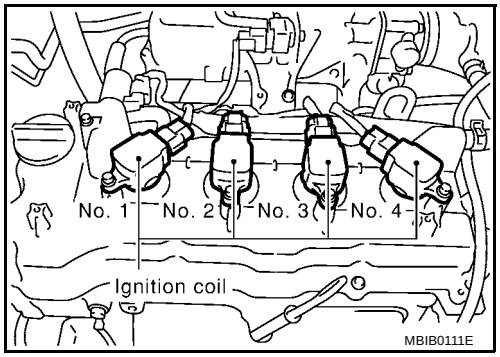
Refer to EC-373, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace condenser.

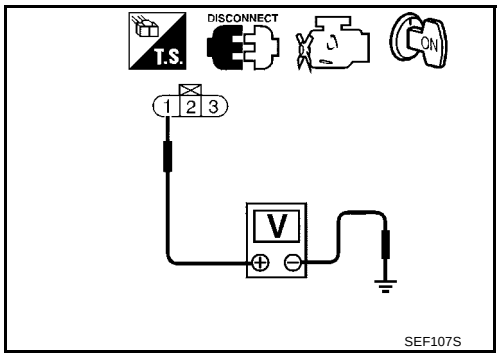
13. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.

   Voltage: Battery voltage



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ignition coil and ECM relay

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

15. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ignition coil terminal 2 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to power in harness or connectors.

16. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 60, 61, 79, 80 and ignition coil terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

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

OK or NG

OK >> GO TO 17.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-373, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace ignition coil with power transistor.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

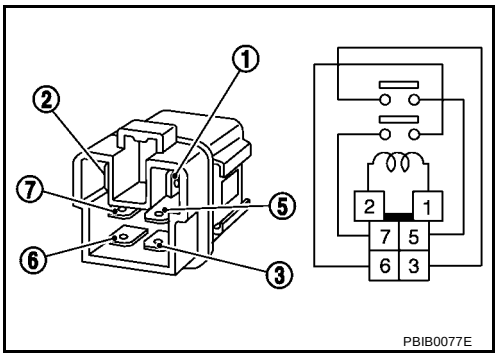
EBS00KCV

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.

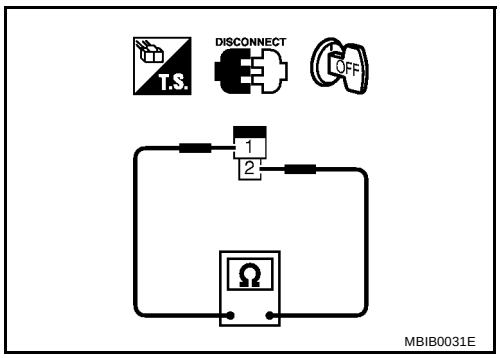


CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.

3. Check resistance between condenser terminals 1 and 2.

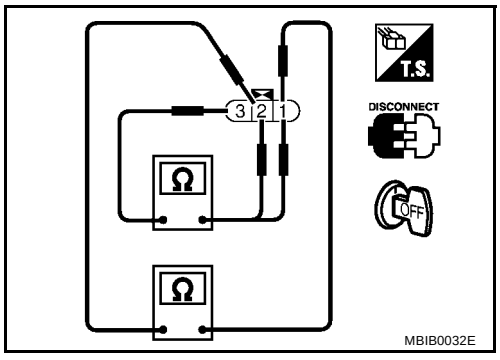
Resistance: Above 1 MΩ at 25°C (77°F)



IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
3 and 1	Except 0 or ∞
3 and 2	Except 0
1 and 2	



EBS00KCW

Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-24, "IGNITION COIL" .

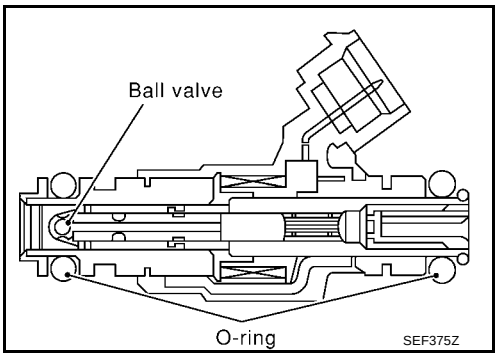
INJECTOR CIRCUIT

PFP:16600

Component Description

EBS00KCX

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KCY

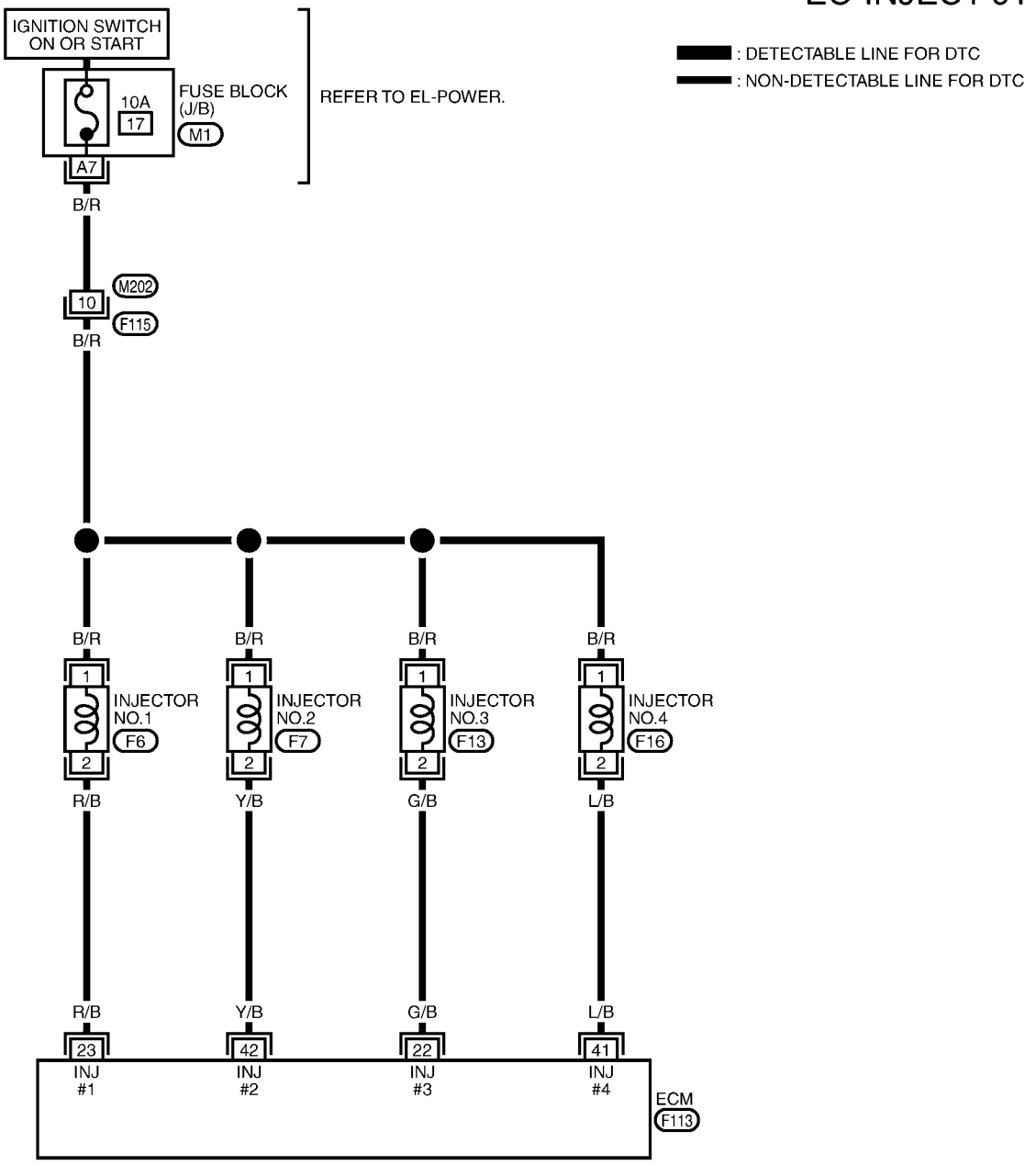
Specification data are reference values.

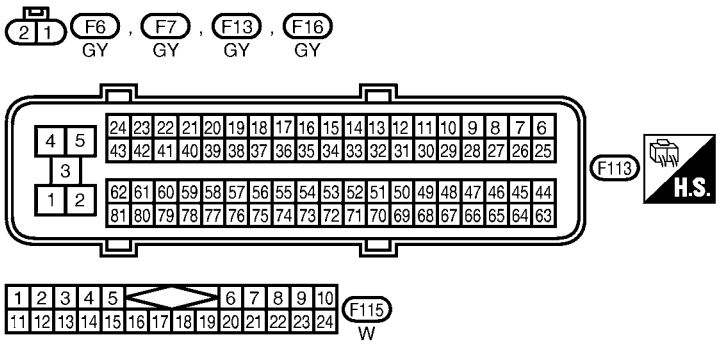
MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec

Wiring Diagram

EBS00KCZ

EC-INJECT-01





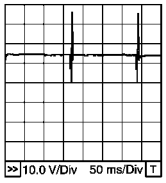
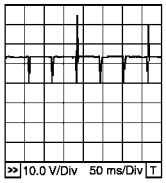
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC308A

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)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

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

Diagnostic Procedure

EBS00KD0

1. INSPECTION START

Turn ignition switch to “START”.

Is any cylinder ignited?

Yes or No

Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

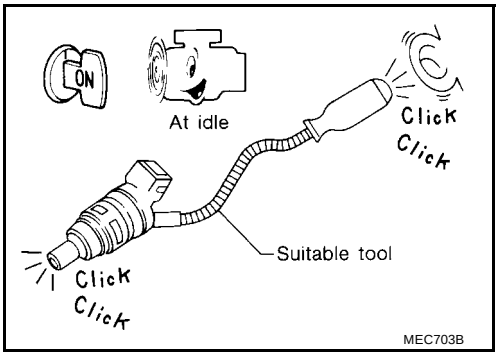
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



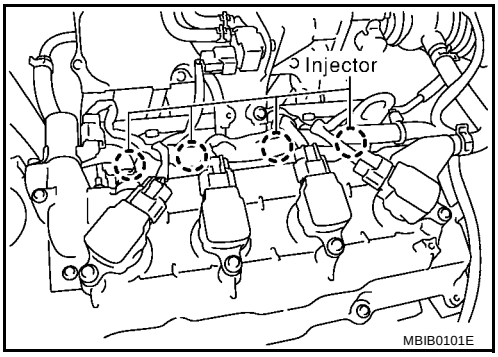
MEC703B

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.

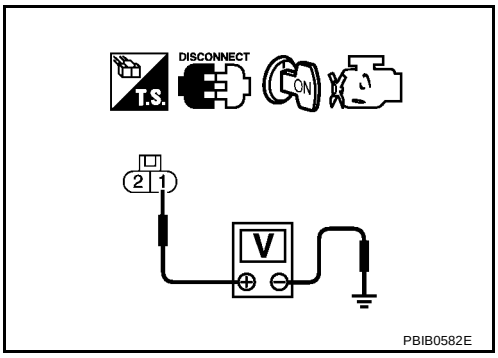


4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

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

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 22, 23, 41, 42. 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 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK INJECTOR

Refer to EC-380, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace injector.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

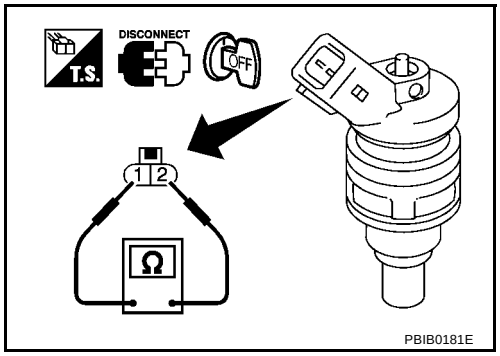
Component Inspection

EBS00KD1

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 13.5 - 17.5Ω [at 20°C (68°F)]



Removal and Installation

EBS00KD2

INJECTOR

Refer to EM-26, "FUEL INJECTOR AND FUEL TUBE" .

FUEL PUMP CIRCUIT

PFP:17042

Description

EBS00KD3

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

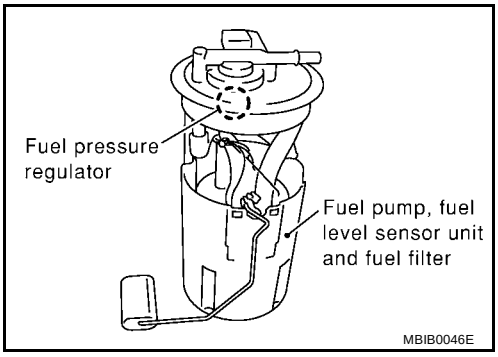
*: The ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

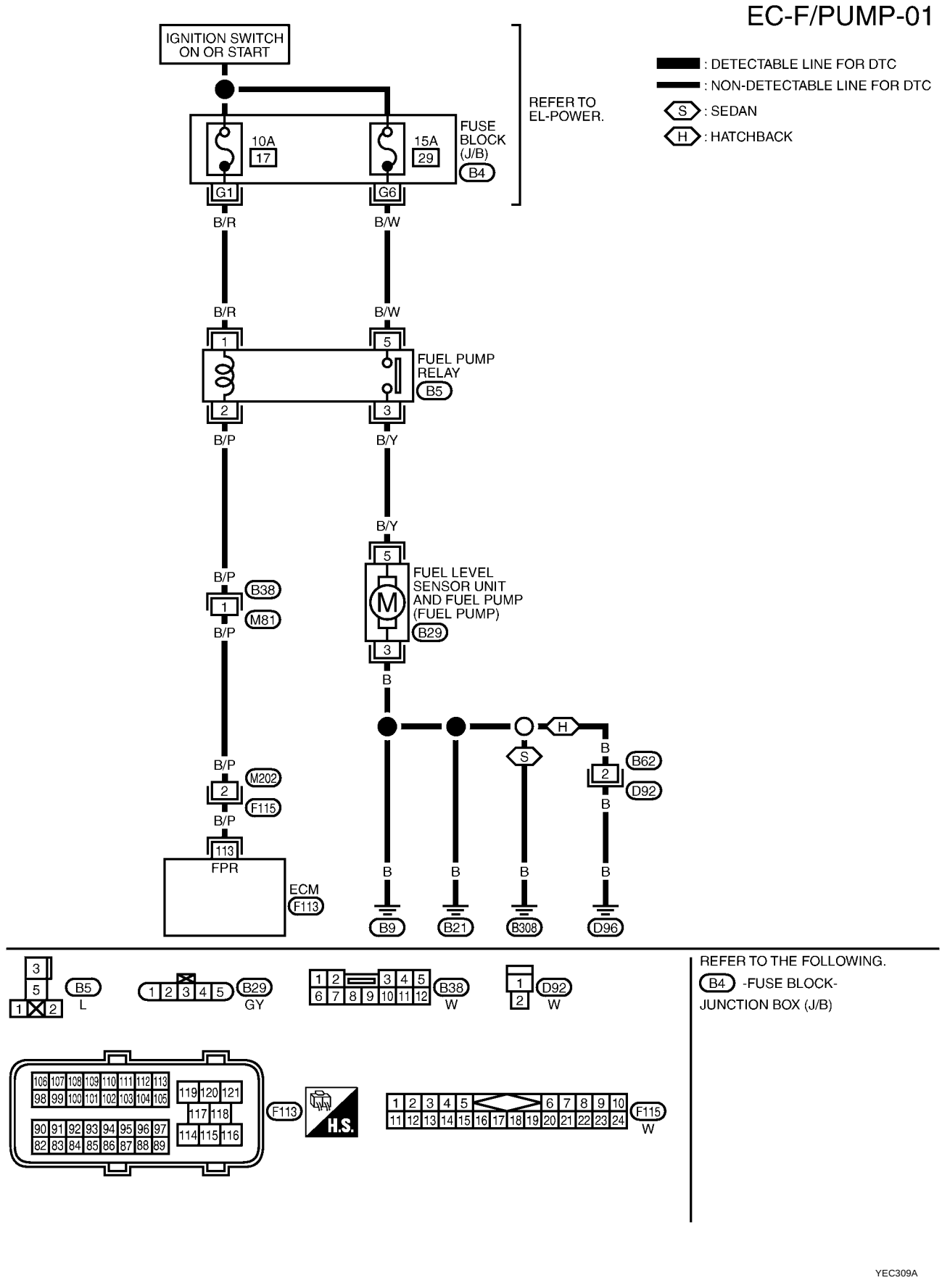
EBS00KD4

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

EBS00KD5



YEC309A

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.

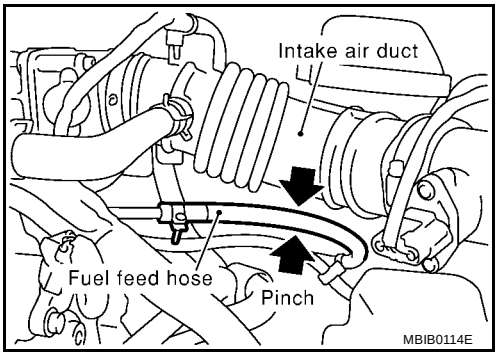
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON". **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00KD6

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned "ON".

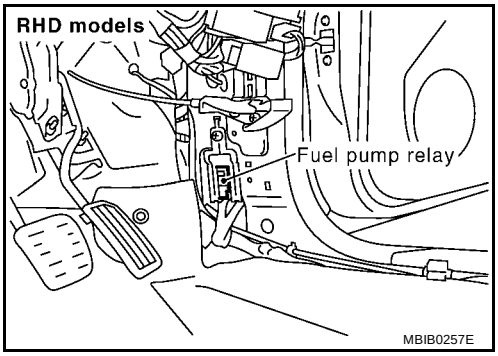


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

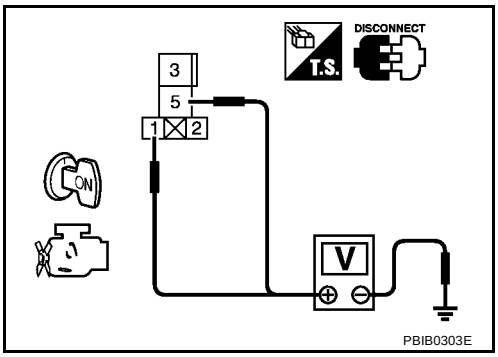
2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

   Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B4
- 10A fuse
- 15A fuse
- Harness for open or short between fuel pump relay and fuse

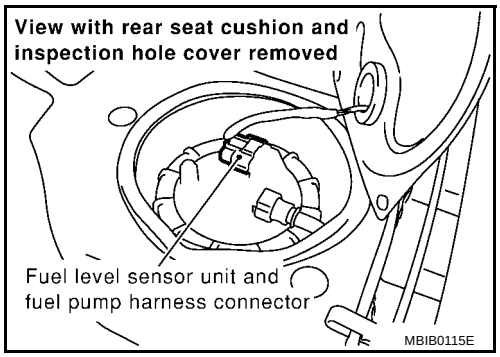
>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel level sensor unit and fuel pump terminal 5, fuel level sensor unit and fuel pump terminal 3 and body ground.
   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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B61, D91 (Hatchback models with power door lock)
- Harness connectors B62, D92 (Hatchback models without power door lock)
- Harness for open or short between fuel level sensor unit and fuel pump and fuel pump relay
- Harness for open or short between fuel level sensor unit and fuel pump and body ground

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

6. CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 113 and fuel pump relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness connectors B38, M81
- Harness for open or short between ECM and fuel pump relay

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

8. CHECK FUEL PUMP RELAY

Refer to EC-385, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel pump relay.

9. CHECK FUEL PUMP

Refer to EC-385, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace fuel pump.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

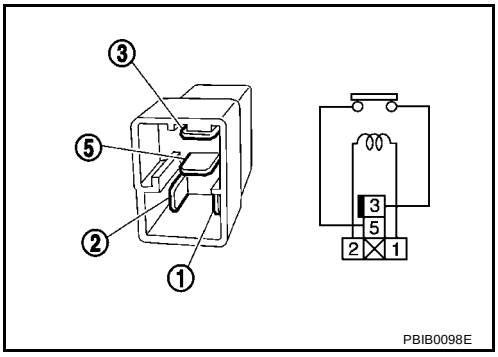
Component Inspection

EBS00KD7

FUEL PUMP RELAY

Check continuity between terminals 3 and 4, 3 and 5 under the following conditions.

Conditions	Terminals	Continuity
12V direct current supply between terminals 1 and 2	3 and 4	No
	3 and 5	Yes
No current supply	3 and 4	Yes
	3 and 5	No

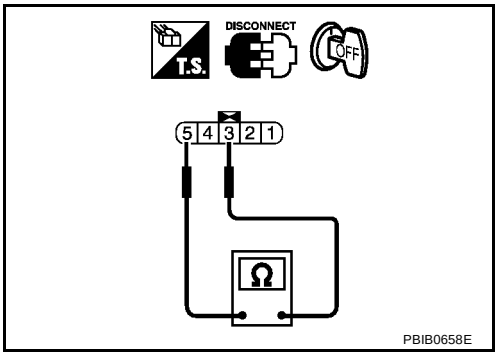


PBIB0098E

FUEL PUMP

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between fuel level sensor unit and fuel pump terminals 3 and 5.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]



PBIB0658E

Removal and Installation

EBS00KD8

FUEL PUMP

Refer to FE-8.

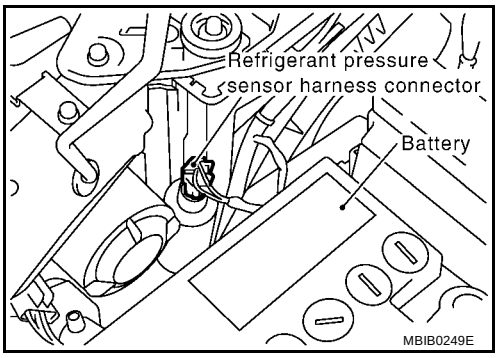
REFRIGERANT PRESSURE SENSOR

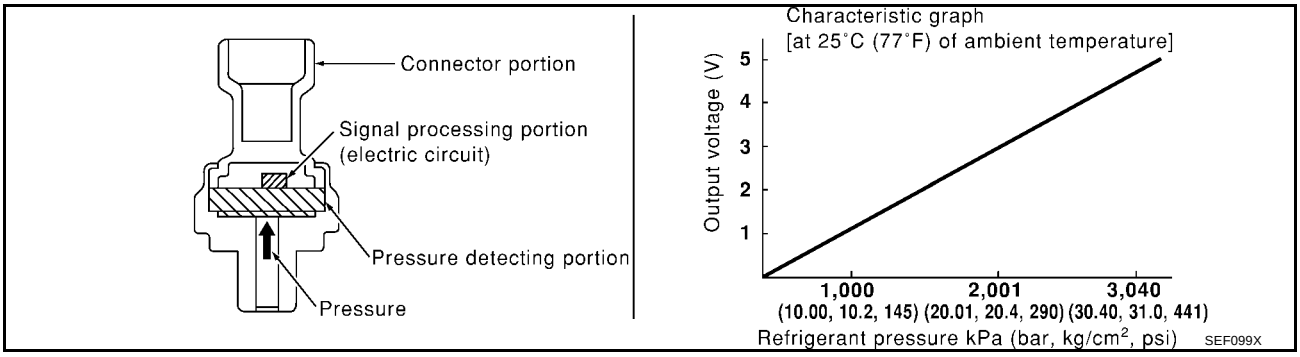
PFP:92136

Component Description

EBS00KD9

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



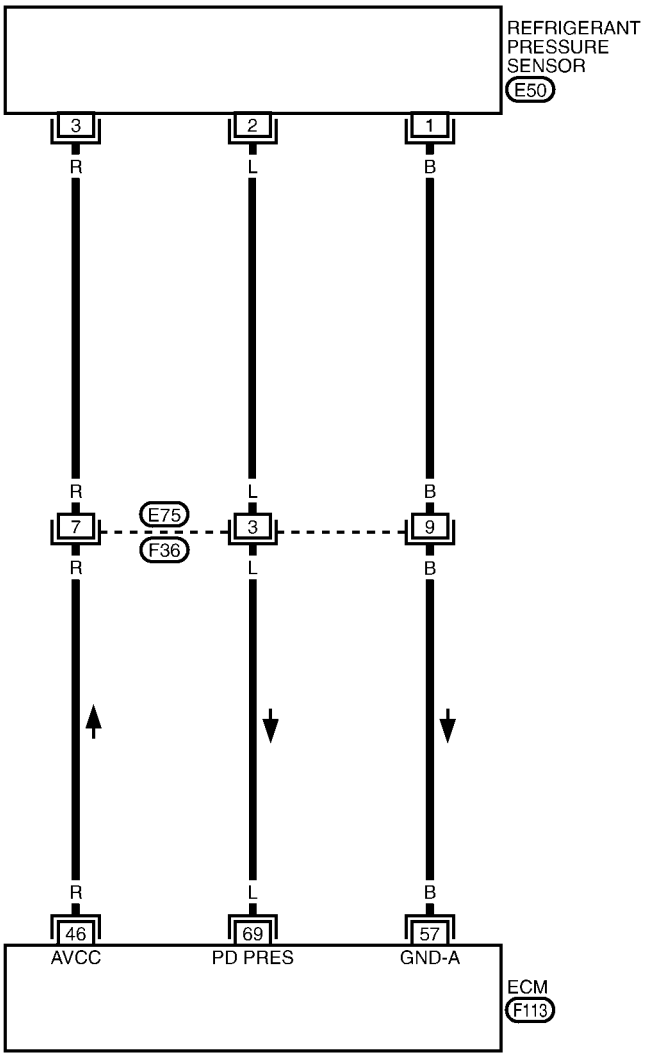


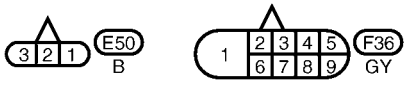
Wiring Diagram

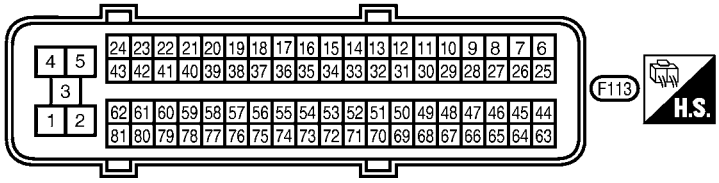
EBS00KDA

EC-RP/SEN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC







YEC310A

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)
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
57	B	Sensor ground (Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

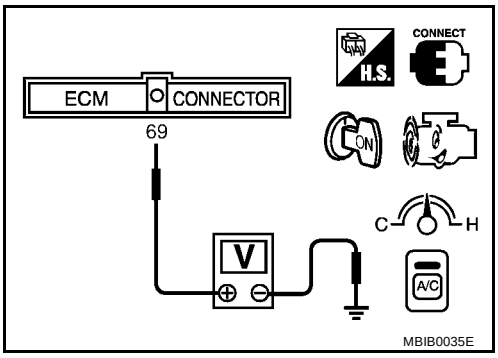
Diagnostic Procedure

EBS00KDB

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 69 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

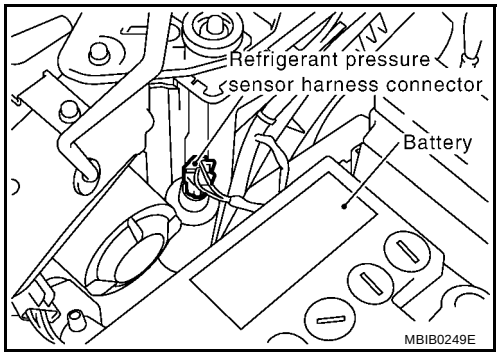


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

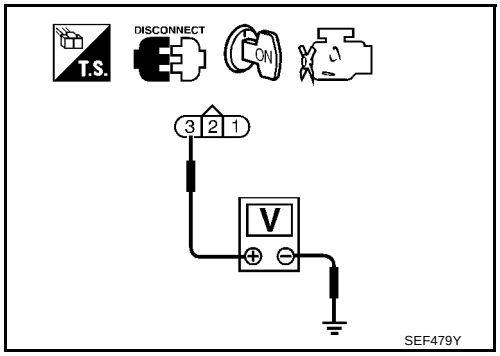
2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and refrigerant pressure sensor

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

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and refrigerant pressure sensor terminal 1. 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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and refrigerant pressure sensor

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

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and refrigerant pressure sensor

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

8. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace.

Removal and Installation

EBS00KDC

REFRIGERANT PRESSURE SENSOR

Refer to ATC-132, "REFRIGERANT LINES" .

ELECTRICAL LOAD SIGNAL

PFP:25350

Description

EBS00KDD

The electrical load signals except headlamp switch signal are transferred through the CAN communication line.

CONSULT-II Reference Value in Data Monitor Mode

EBS00KDE

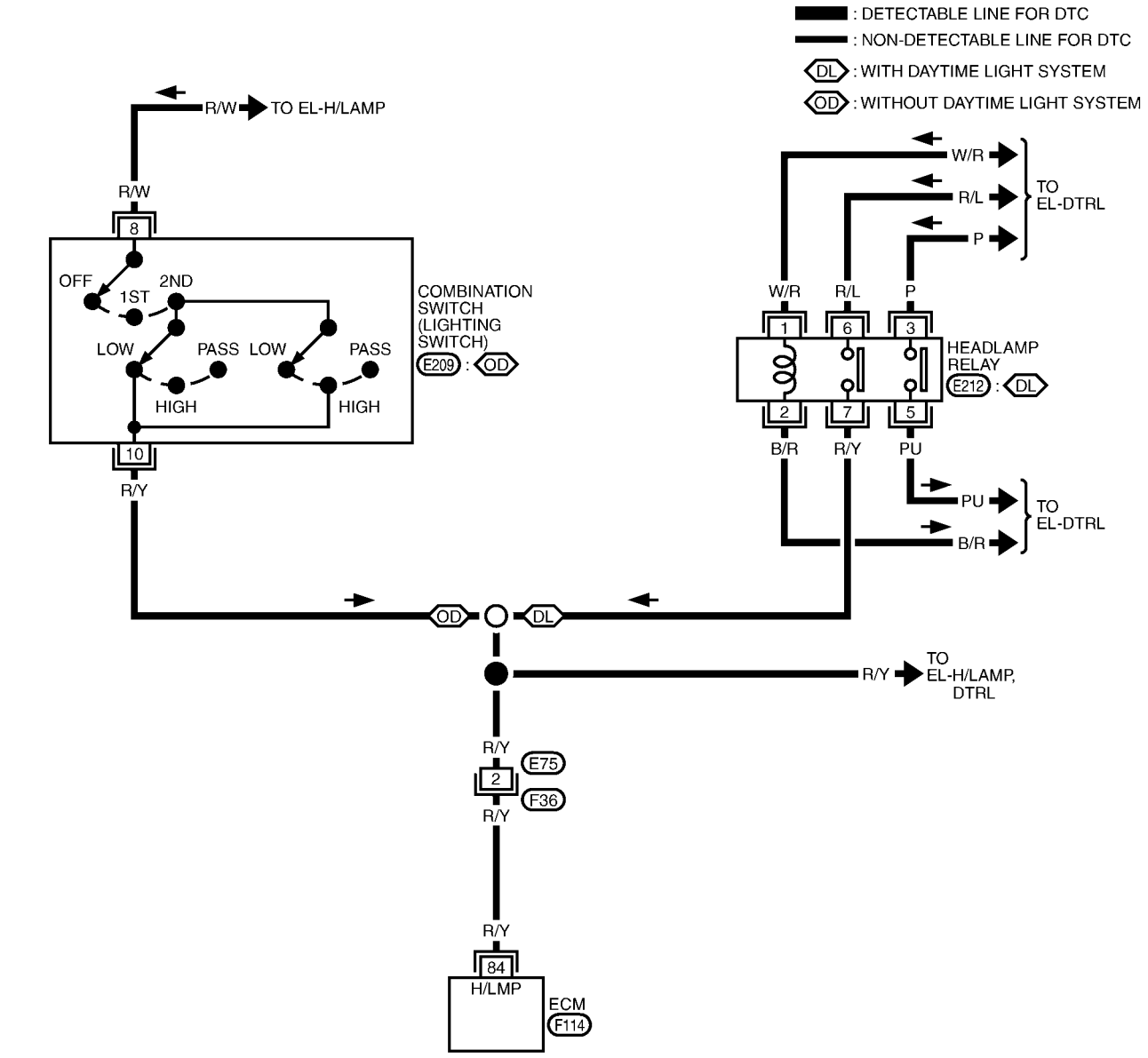
Specification data are reference values.

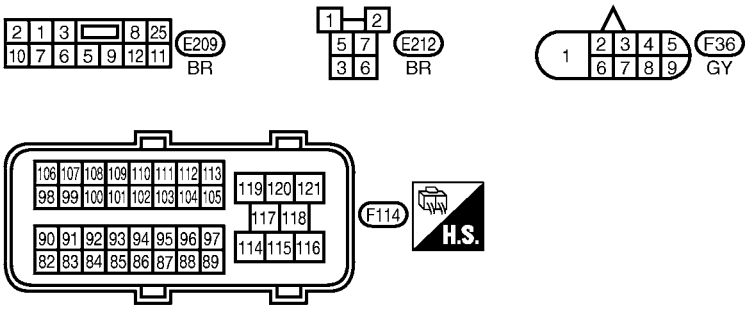
MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF

Wiring Diagram

EBS00KDF

EC-LOAD-01





YEC311A

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)
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position.	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF".	Approximately 0V

Diagnostic Procedure

EBS00KDG

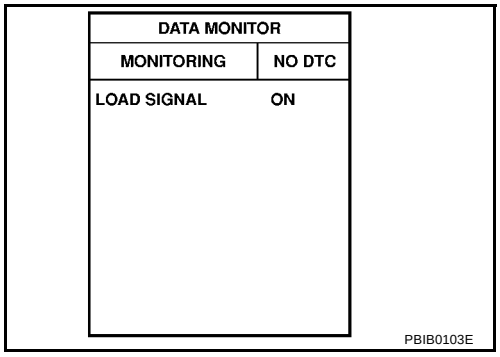
1. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

With GST

1. Turn ignition switch "ON".
2. Connect CONSULT-II or GST and select "DATA MONITOR" mode.
3. Select "LOAD SIGNAL" and check indication under the following conditions.

Condition	Indication
Rear window defogger switch "ON"	ON
Rear window defogger switch "OFF"	OFF



OK or NG

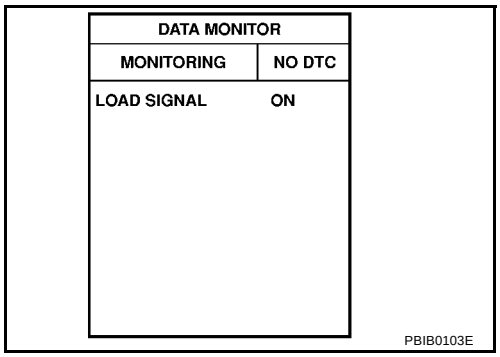
OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> GO TO 4.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

Check "LOAD SIGNAL" indication under the following conditions.

Condition	Indication
Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

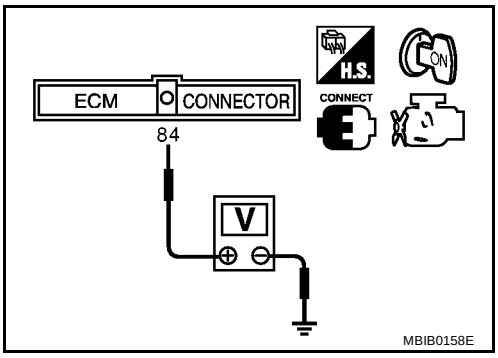
OK >> **INSPECTION END**
NG >> GO TO 5.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch “ON” at 2nd position	Battery voltage
Lighting switch “OFF”	Approximately 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

4. CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to EL-173.

>> **INSPECTION END**

5. CHECK HEADLAMP FUNCTION

1. Turn lighting switch “ON” at 2nd position.
2. Check that headlamps are illuminated.

OK or NG

OK >> GO TO 6.
NG >> Refer to EL-42 or EL-46 .

6. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

WITHOUT DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connector.
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 10. Refer to Wiring Diagram.

Continuity should exist.

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

WITH DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect daytime light relay.
4. Check harness continuity between ECM terminal 84 and daytime light relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- harness for open and short between ECM and lighting switch
- harness for open and short between ECM and daytime light relay

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

8. CHECK INTERMITTENT INCIDENT

Refer to EC-109, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

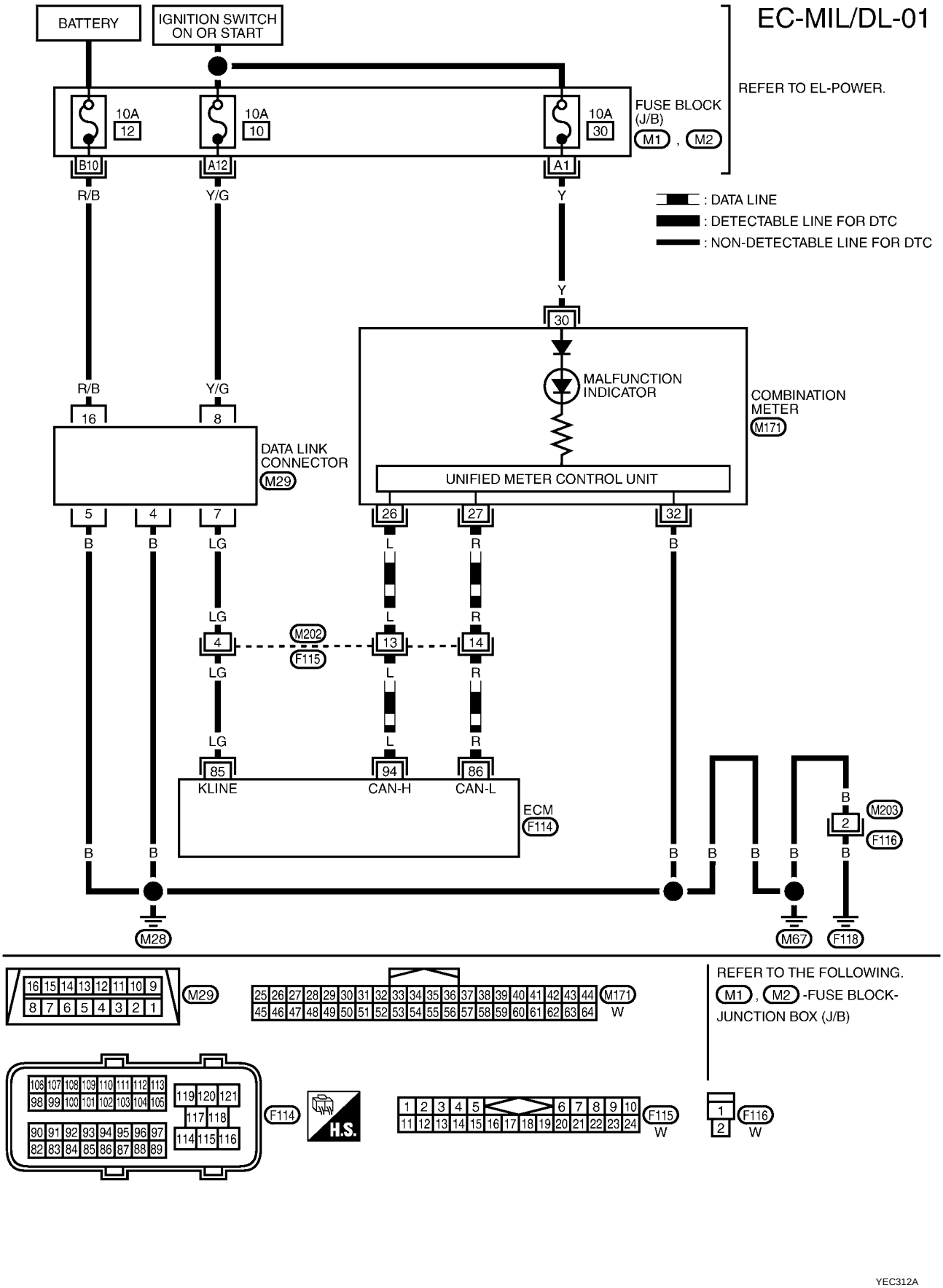
>> **INSPECTION END**

MI & DATA LINK CONNECTORS

PFP:24814

Wiring Diagram—LHD Models

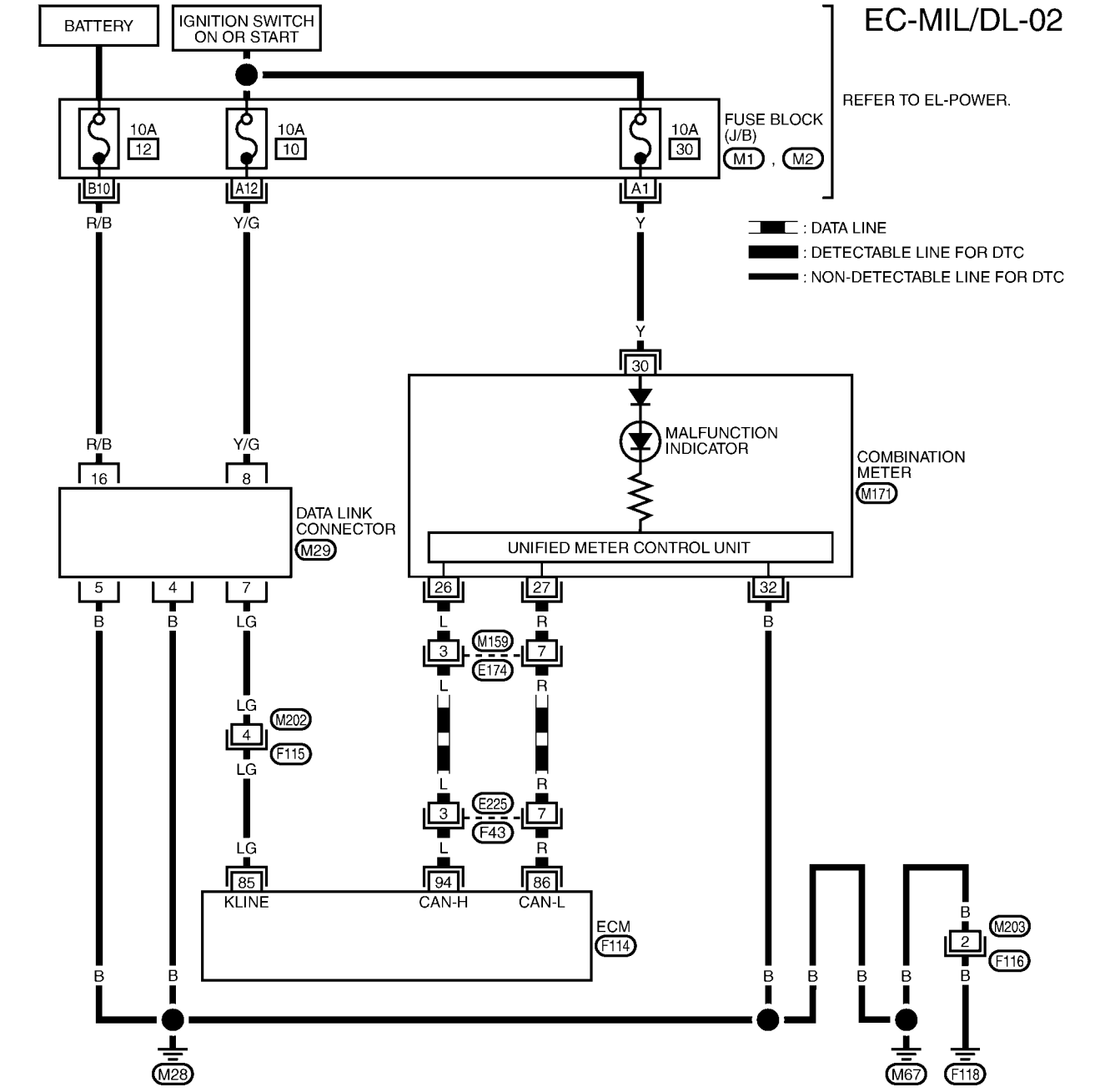
EBS00KDH

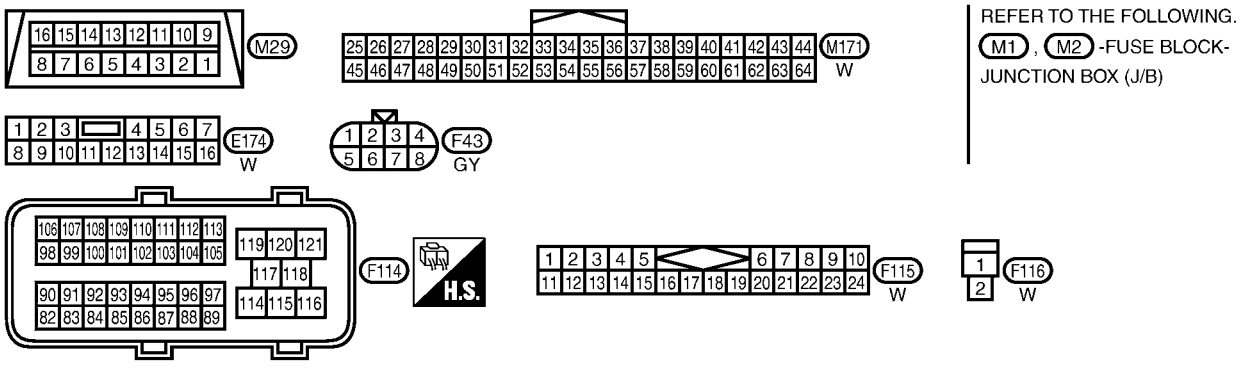


YEC312A

Wiring Diagram—RHD Models

EBS00KDI





YEC313A

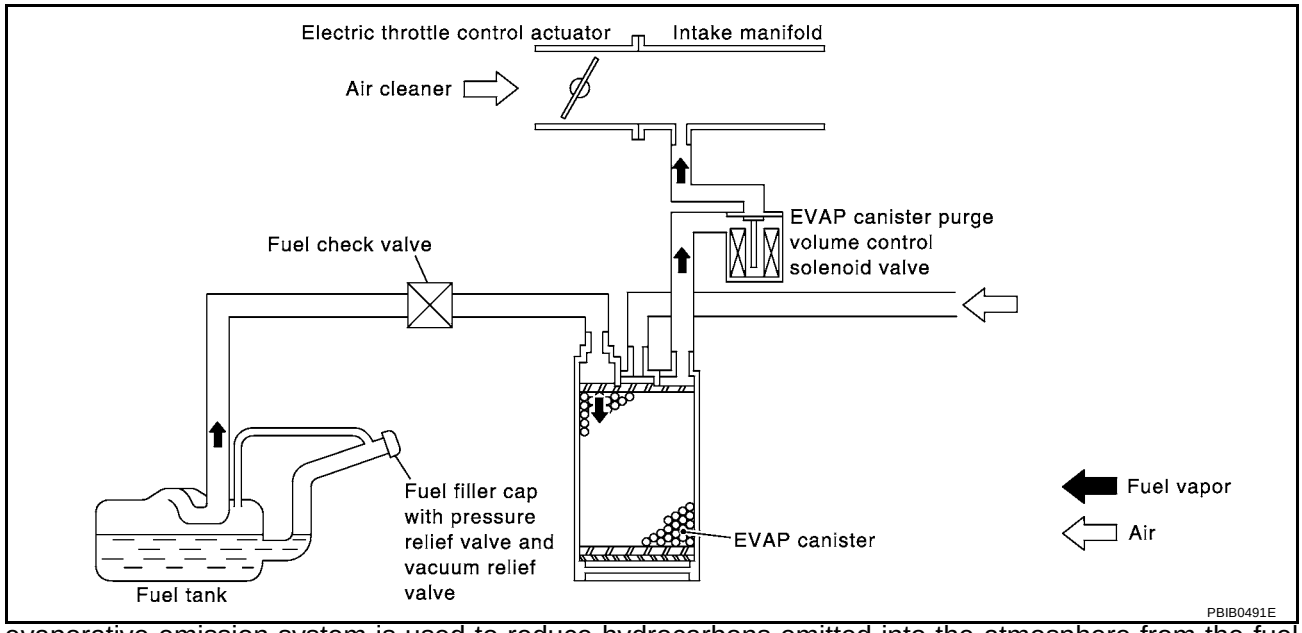
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

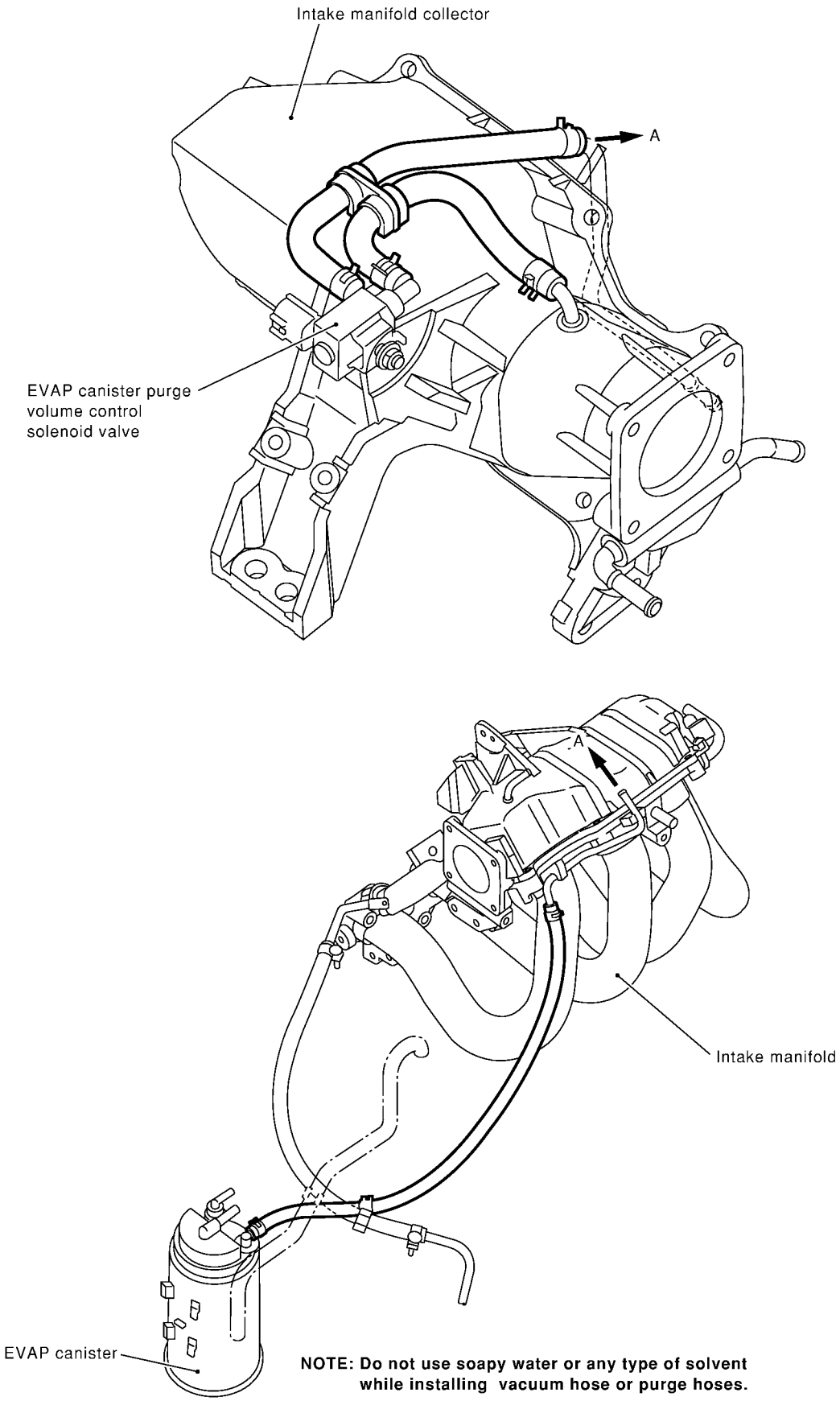
EBS00KDJ

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING



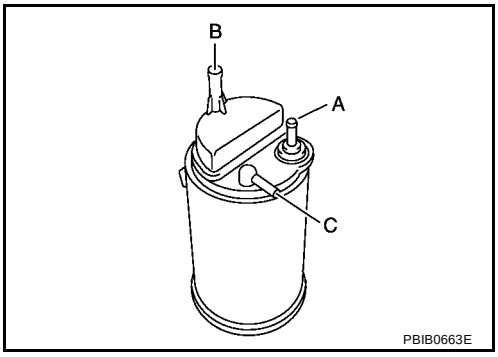
Component Inspection

EBS00KDK

EVAP CANISTER

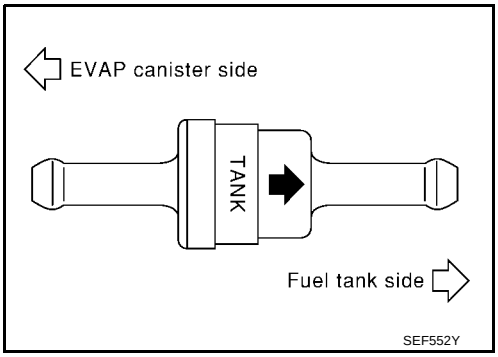
Check EVAP canister as follows:

1. Block port **B** . Orally blow air through port **A** . Check that air flows freely through port **C** .
2. Block port **A** . Orally blow air through port **B** . Check that air flows freely through port **C** .



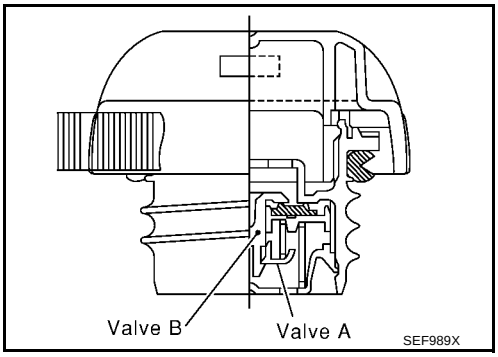
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side.
   Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

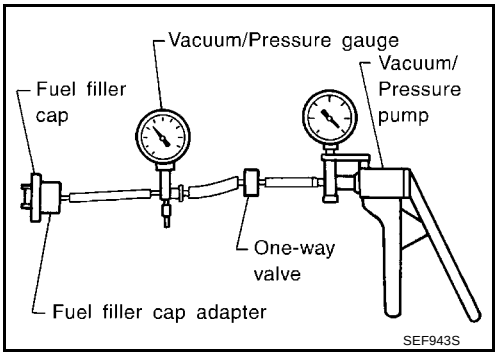
1. Wipe clean valve housing.



2. Check valve opening pressure and vacuum.

Pressure:	**15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)**
Vacuum:	**–6.0 to –3.3 kPa (–0.060 to –0.033 bar, –0.061 to –0.034 kg/cm^2 , –0.87 to –0.48 psi)**

3. If out of specification, replace fuel filler cap as an assembly.



EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-256, "Component Inspection" .

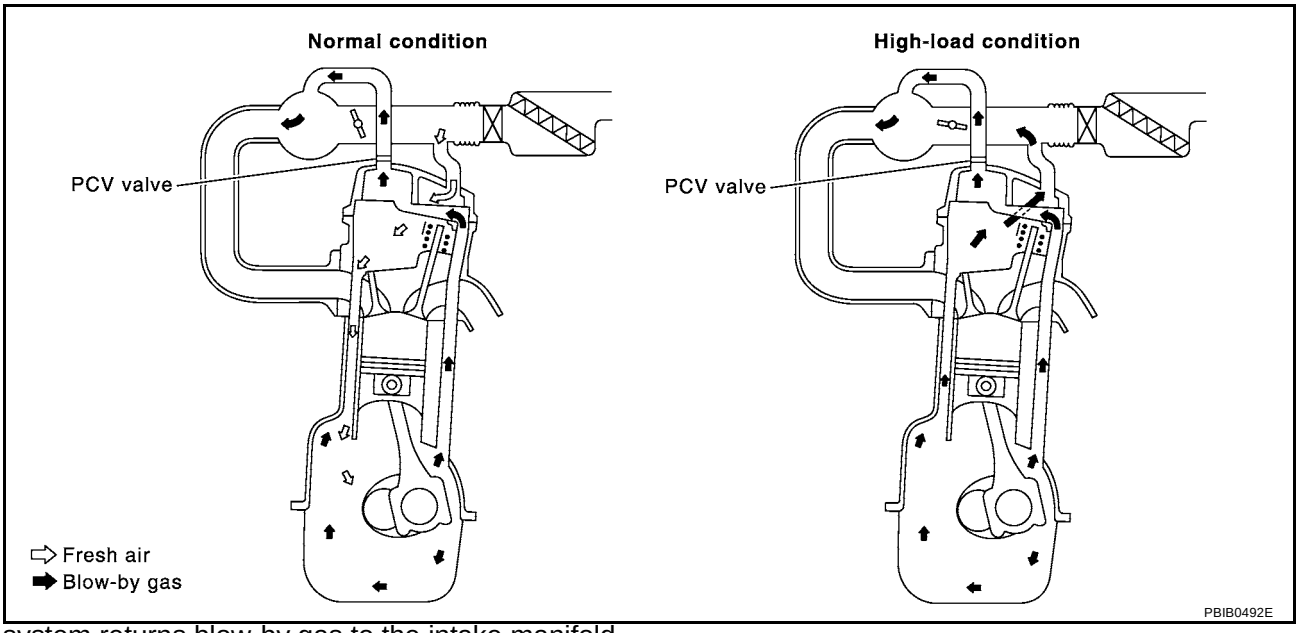
POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

EBS00KDL

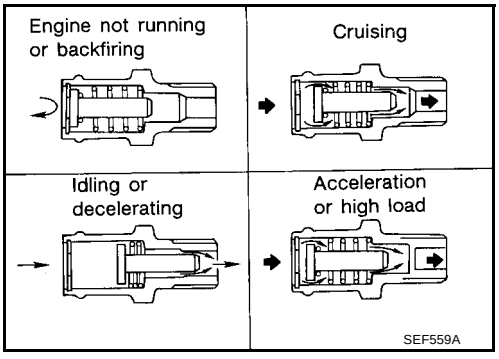
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

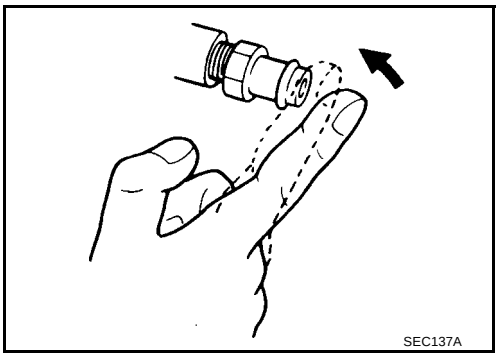


Component Inspection

EBS00KDM

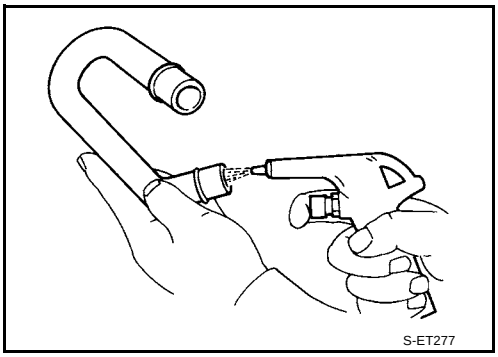
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

EBS00KDN

Fuel pressure at idle	Approximately 350 kPa (3.5bar, 3.57kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

EBS00KDO

Target idle speed	No-load*1 (in “P” or N” position)	A/T: 800±50 rpm M/T: 700±50 rpm
Air conditioner: ON	In “P” or N” position	900 rpm or more
Ignition timing	In “P” or N” position	A/T: 10°±5° BTDC M/T: 8°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

EBS00KDP

	Calculated load value % (Using CONSULT-II or GST)
At idle	10 - 35
At 2,500 rpm	10 - 35

Mass Air Flow Sensor

EBS00KDQ

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	1.0 - 1.7*V
Mass air flow (Using CONSULT-II or GST)	1.0 - 4.0 g·m/sec at idle* 5.0 - 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

EBS00KDR

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1
80 (176)	0.31 - 0.37

Engine Coolant Temperature Sensor

EBS00KDS

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Heated Oxygen Sensor 1 Heater

EBS00KDT

Resistance [at 20°C (68°F)]	8 - 10Ω

Heated Oxygen sensor 2 Heater

EBS00KDU

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (POS)

EBS00KDV

Refer to EC-238, "Component Inspection" .

Camshaft Position Sensor (PHASE)

EBS00KDW

Refer to EC-244, "Component Inspection" .

Throttle Control Motor

EBS00KDX

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Injector

EBS00KDY

Resistance [at 20°C (68°F)]	13.5 - 17.5Ω

Fuel Pump

EBS00KDZ

Resistance [at 25°C (77°F)]	Approximately 1.0Ω

INDEX FOR DTC

PFP:00024

Alphabetical Index

EBS00KE0

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-39.

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-492, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

×: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1		Trip	MI lighting up	Reference page
	CONSULT-II*2	ECM*3			
APP SEN 1/CIRC	P0227	0227	1	×	EC-543
APP SEN 1/CIRC	P0228	0228	1	×	EC-543
APP SEN 2/CIRC	P1227	1227	1	×	EC-617
APP SEN 2/CIRC	P1228	1228	1	×	EC-617
APP SENSOR	P0226	0226	1	×	EC-536
BRAKE SW/CIRCUIT	P1805	1805	1	×	EC-628
CAN COMM CIRCUIT*5	U1000	1000	1	×	EC-492
CAN COMM CIRCUIT*5	U1001	1001	2	—	EC-492
CKP SEN/CIRCUIT	P0335	0335	2	×	EC-554
CMP SEN/CIRC-B1	P0340	0340	2	×	EC-561
CTP LEARNING	P1225	1225	2	—	EC-613
CTP LEARNING	P1226	1226	2	—	EC-615
ECM	P0605	0605	1 or 2	× or —	EC-568
ECM BACK UP/CIRC	P1065	1065	2	×	EC-571
ECT SEN/CIRCUIT	P0117	0117	2	×	EC-501
ECT SEN/CIRCUIT	P0118	0118	2	×	EC-501
ENG OVER TEMP	P1217	1217	1	×	EC-596
ETC ACTR	P1121	1121	1 or 2	×	EC-575
ETC FUNCTION/CIRC	P1122	1122	1	×	EC-578
ETC MOT	P1128	1128	1	×	EC-591
ETC MOT PWR	P1124	1124	1	×	EC-585
ETC MOT PWR	P1126	1126	1	×	EC-585
HO2S1 (B1)	P0132	0132	2	×	EC-506
HO2S1 (B1)	P0134	0134	2	×	EC-512
HO2S2 (B1)	P0138	0138	2	×	EC-518
KNOCK SEN/CIRC-B1	P0327	0327	2	—	EC-550
KNOCK SEN/CIRC-B1	P0328	0328	2	—	EC-550
MAF SEN/CIRCUIT	P0102	0102	1	×	EC-495
MAF SEN/CIRCUIT	P0103	0103	1	×	EC-495
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	2	—	EC-431
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	—	Flashing*4	EC-433

Items (CONSULT-II screen terms)	DTC*1		Trip	MI lighting up	Reference page
	CONSULT-II*2	ECM*3			
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	—
SENSOR POWER/CIRC	P1229	1229	1	×	EC-624
TP SEN 1/CIRC	P0222	0222	1	×	EC-530
TP SEN 1/CIRC	P0223	0223	1	×	EC-530
TP SEN 2/CIRC	P1223	1223	1	×	EC-607
TP SEN 2/CIRC	P1224	1224	1	×	EC-607
TP SENSOR	P0221	0221	1	×	EC-524

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The trouble shooting for this DTC needs CONSULT-II.

DTC No. Index

EBS00KE1

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-39.

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-492, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

×: Applicable —: Not applicable

DTC*1		Items (CONSULT-II screen terms)	Trip	MI lighting up	Reference page
CONSULT-II*2	ECM*3				
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	—	Flashing*4	**EC-433**
U1000	1000*5	CAN COMM CIRCUIT	1	×	EC-492
U1001	1001*5	CAN COMM CIRCUIT	2	—	EC-492
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	—
P0102	0102	MAF SEN/CIRCUIT	1	×	EC-495
P0103	0103	MAF SEN/CIRCUIT	1	×	EC-495
P0117	0117	ECT SEN/CIRCUIT	2	×	EC-501
P0118	0118	ECT SEN/CIRCUIT	2	×	EC-501
P0132	0132	HO2S1 (B1)	2	×	EC-506
P0134	0134	HO2S1 (B1)	2	×	EC-512
P0138	0138	HO2S2 (B1)	2	×	EC-518
P0221	0221	TP SENSOR	1	×	EC-524
P0222	0222	TP SEN 1/CIRC	1	×	EC-530
P0223	0223	TP SEN 1/CIRC	1	×	EC-530
P0226	0226	APP SENSOR	1	×	EC-536
P0227	0227	APP SEN 1/CIRC	1	×	EC-543
P0228	0228	APP SEN 1/CIRC	1	×	EC-543
P0327	0327	KNOCK SEN/CIRC-B1	2	—	EC-550
P0328	0328	KNOCK SEN/CIRC-B1	2	—	EC-550

DTC*1		Items (CONSULT-II screen terms)	Trip	MI lighting up	Reference page
CONSULT-II*2	ECM*3				
P0335	0335	CKP SEN/CIRCUIT	2	×	EC-554
P0340	0340	CMP SEN/CIRC-B1	2	×	EC-561
P0605	0605	ECM	1 or 2	× or —	EC-568
P1065	1065	ECM BACK UP/CIRC	2	×	EC-571
P1121	1121	ETC ACTR	1 or 2	×	EC-575
P1122	1122	ETC FUNCTION/CIRC	1	×	EC-578
P1124	1124	ETC MOT PWR	1	×	EC-585
P1126	1126	ETC MOT PWR	1	×	EC-585
P1128	1128	ETC MOT	1	×	EC-591
P1217	1217	ENG OVER TEMP	1	×	EC-596
P1223	1223	TP SEN 2/CIRC	1	×	EC-607
P1224	1224	TP SEN 2/CIRC	1	×	EC-607
P1225	1225	CTP LEARNING	2	—	EC-613
P1226	1226	CTP LEARNING	2	—	EC-615
P1227	1227	APP SEN 2/CIRC	1	×	EC-617
P1228	1228	APP SEN 2/CIRC	1	×	EC-617
P1229	1229	SENSOR POWER/CIRC	1	×	EC-624
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	2	—	EC-431
P1805	1805	BRAKE SW/CIRCUIT	1	×	EC-628

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The troubleshooting for this DTC needs CONSULT-II.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EBS00KE2

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harness connectors.**

On Board Diagnostic (OBD) System of Engine

EBS00KE3

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

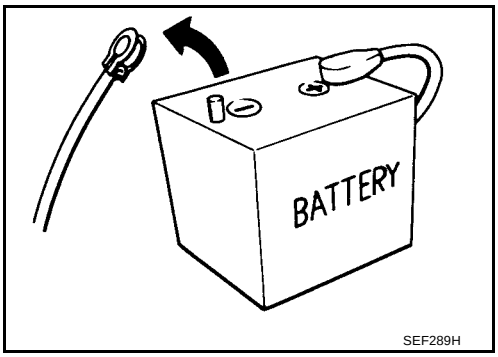
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to EL-7.**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.**

Precaution

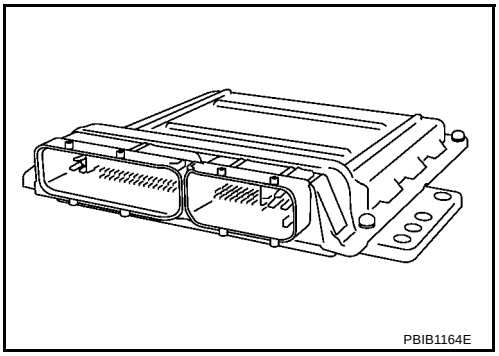
EBS00KE4

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**

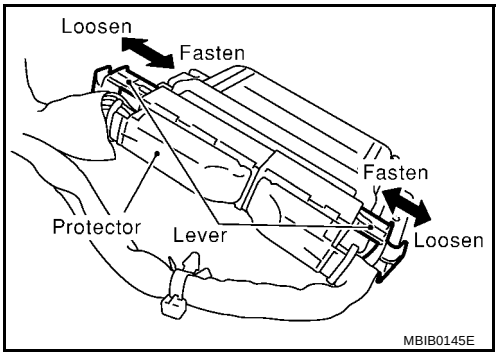


SEF289H

- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

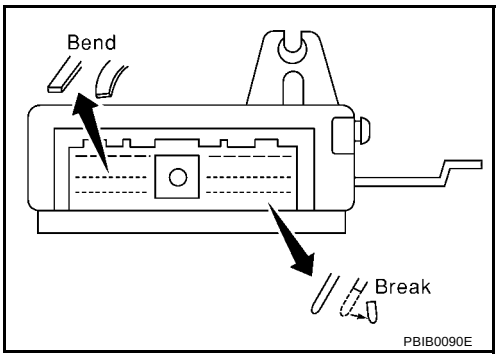

PBIB1164E

- **When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown at right.**



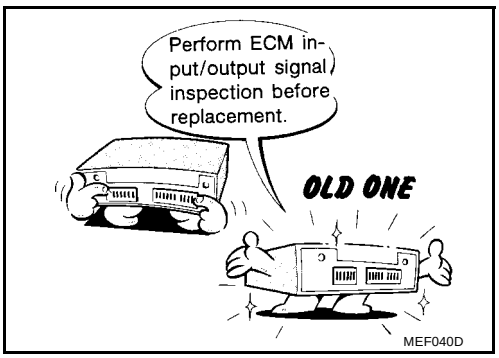
MBIB0145E

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



PBIB0090E

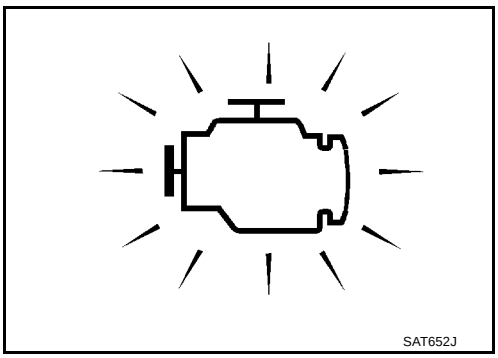
- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-458, "ECM Terminals and Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**



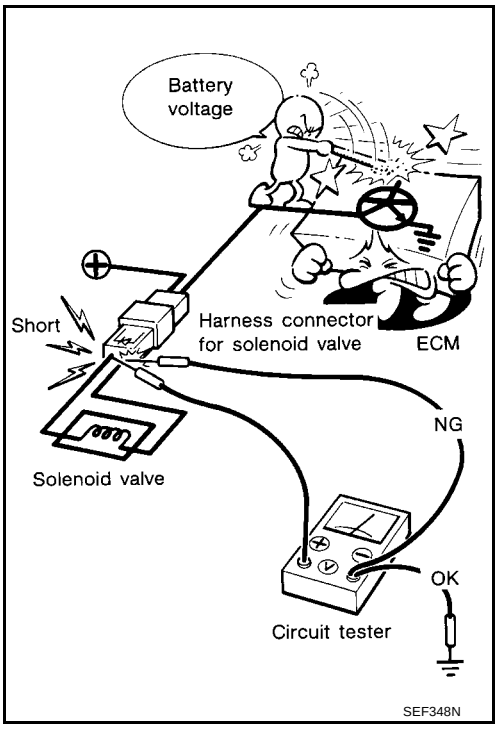
MEF040D

- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.

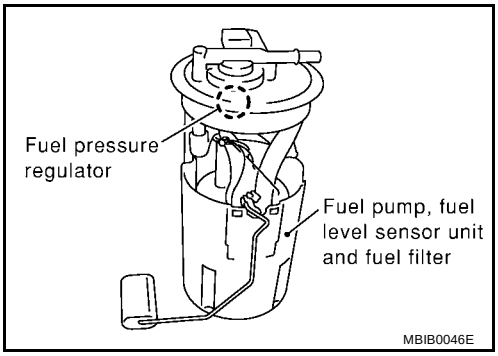

SAT652J

- **When measuring ECM signals with a circuit tester, connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.**
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **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.**



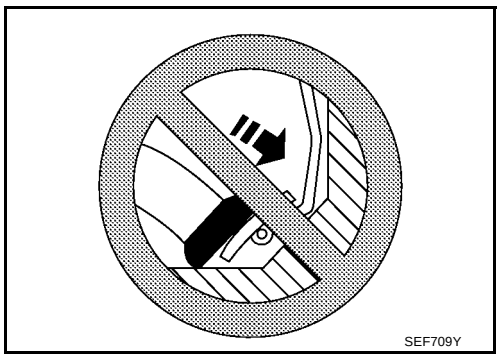
SEF348N

- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

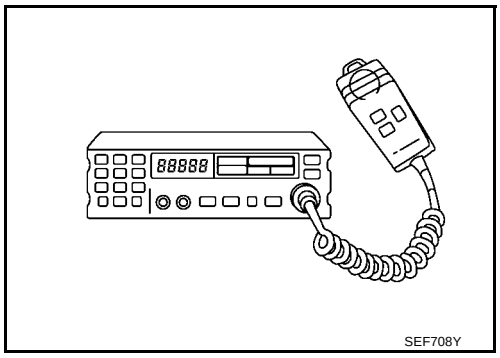


MBIB0046E

- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**



SEF708Y

Wiring Diagrams and Trouble Diagnosis

EBS00KE5

When you read wiring diagrams, refer to the following:

- GI-12
- EL-11 for power distribution circuit

When you perform trouble diagnosis, refer to the following:

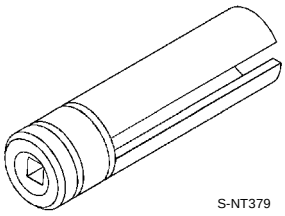
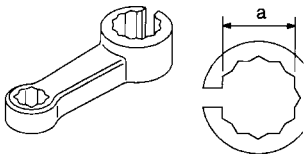
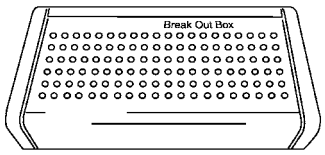
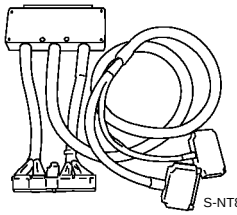
- GI-32
- GI-22

PREPARATION

PFP:00002

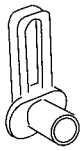
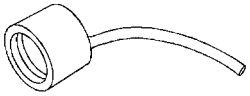
Special Service Tools

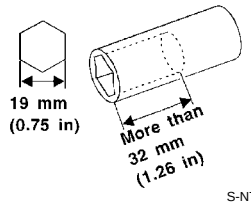
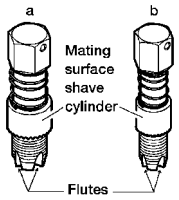
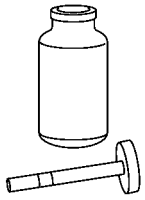
EBS00KE6

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensors **a: 22 mm (0.87 in)**
KV109E0010 Break-out box	 S-NT825	Measuring ECM signals with a circuit tester
KV109E0080 Y-cable adapter	 S-NT826	Measuring ECM signals with a circuit tester

Commercial Service Tools

EBS00KE7

Tool name	Description	
Quick connector release	 PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
Fuel filler cap adapter	 S-NT653	Checking fuel tank vacuum relief valve opening pressure

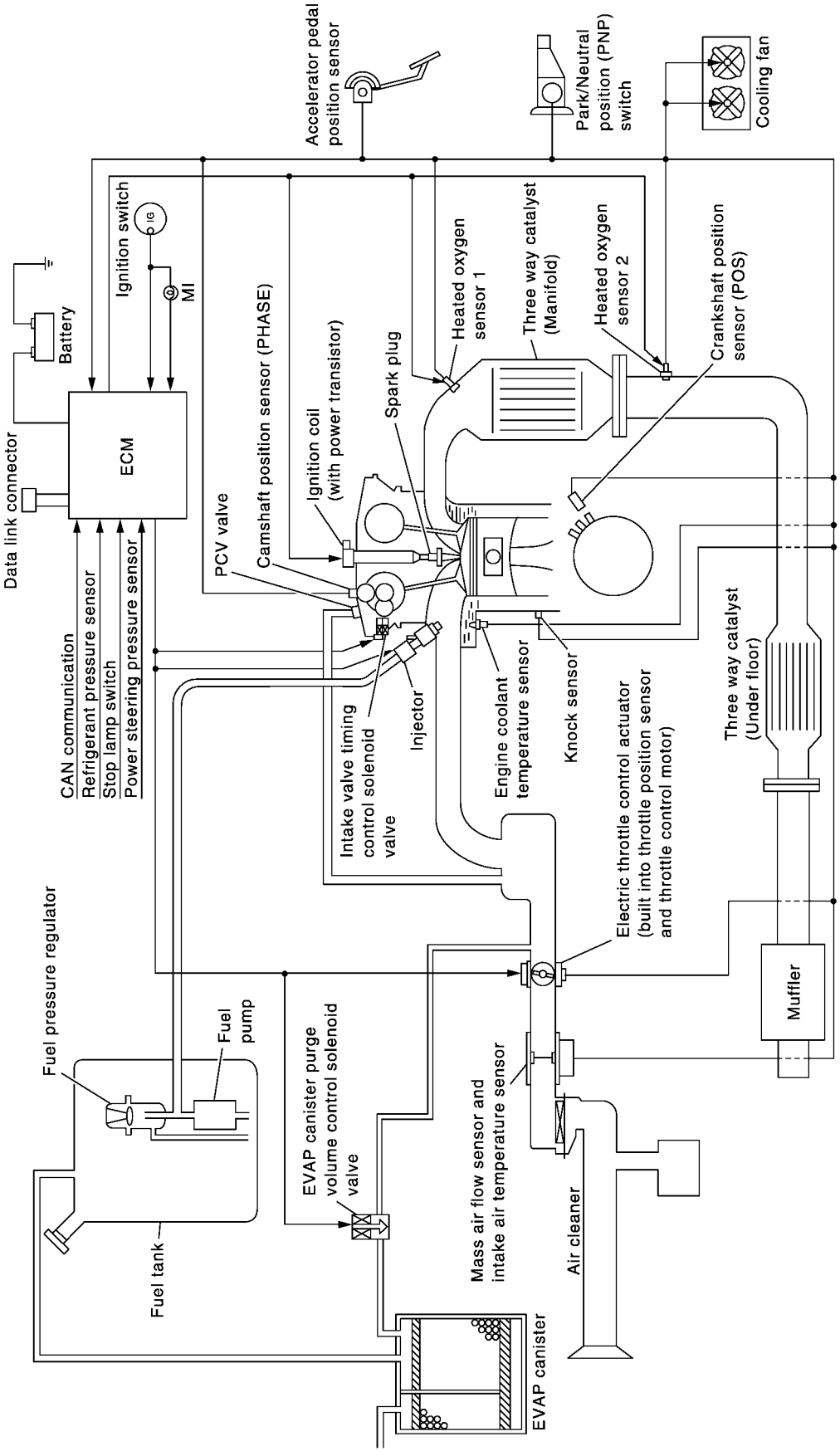
Tool name	Description	
Socket wrench	 S-NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner ie: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant ie: (Permatex^{TM} 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

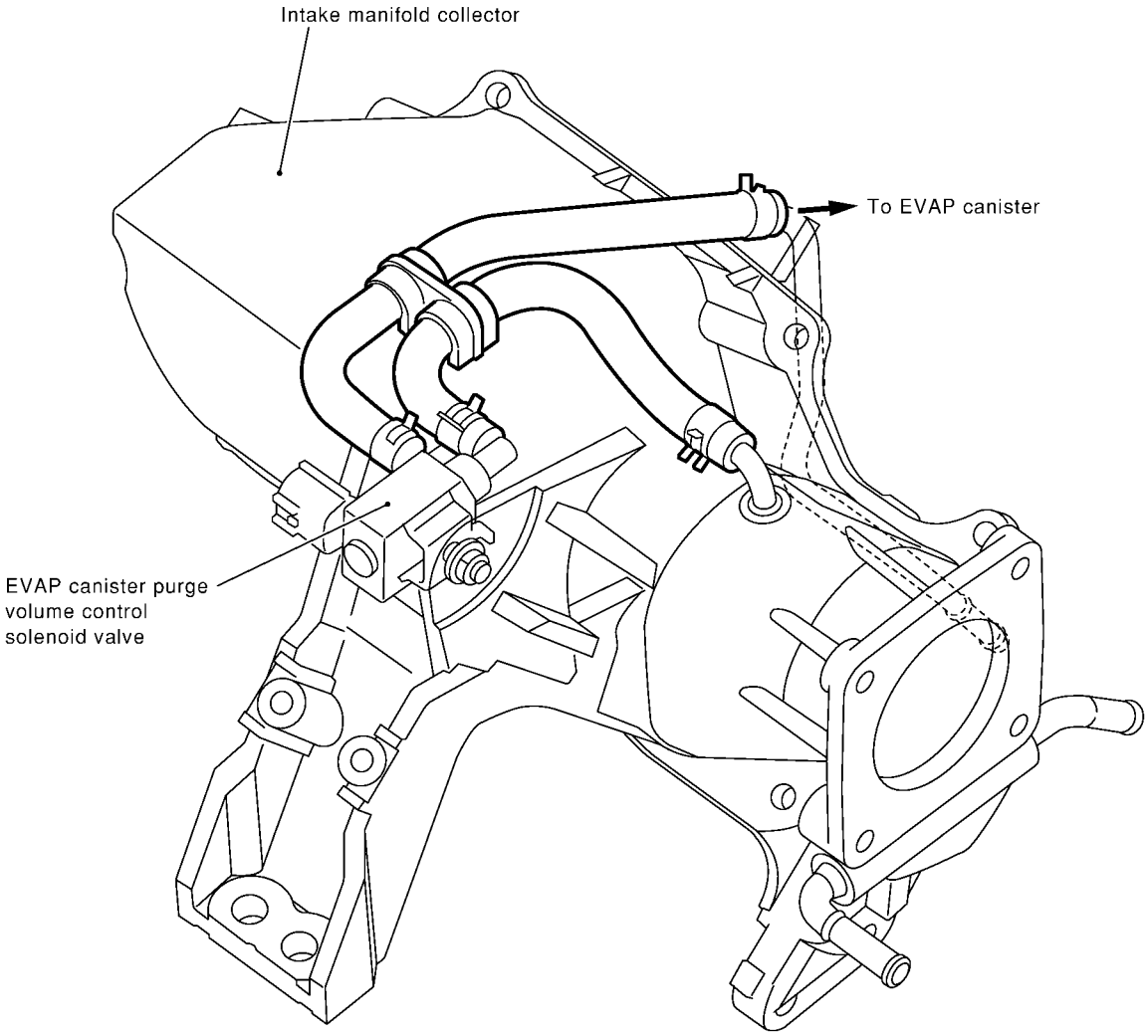
EBS00KE8



MBIB0239E

Vacuum Hose Drawing

EBS00KEA



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

MBIB0013E

Refer to EC-415, "System Diagram" for Vacuum Control System.

System Chart

EBS00KEB

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering pressure sensor ● Ignition switch ● Stop lamp switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● Heated oxygen sensor 2*1 ● TCM (Transmission control module)*2 ● Air conditioner switch*2 ● Vehicle speed signal*2 ● Electrical load signal*2	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	On board diagnostic system	MI (On the instrument panel)*3
	Intake valve timing control	Intake valve timing control solenoid valve
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay*3
	Cooling fan control	Cooling fan relays*3

*1: This sensor is not used to control the engine system under normal conditions.
*2: The signals are sent to the ECM through CAN communication line.
*3: The output signals are sent from the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

EBS00KEC

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*3 and piston position	Fuel injection & mixture ratio control	Fuel injectors
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage*3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
Vehicle speed signal*2	Vehicle speed		
Air conditioner switch*2	Air conditioner operation		

*1: Under normal conditions, this sensor is not for engine control operation.
*2: This signal is sent to the ECM through CAN communication line.
*3: The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the

ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), camshaft position sensor (PHASE) and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

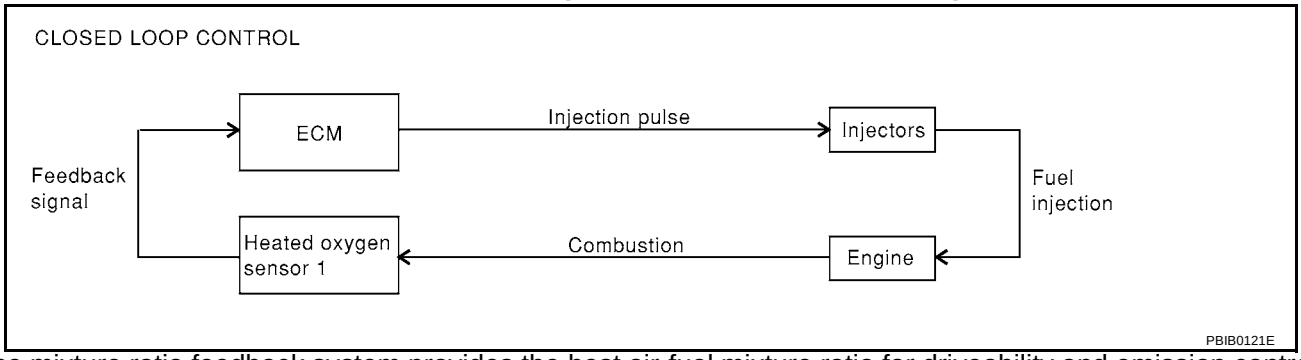
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (A/T models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-506 . This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

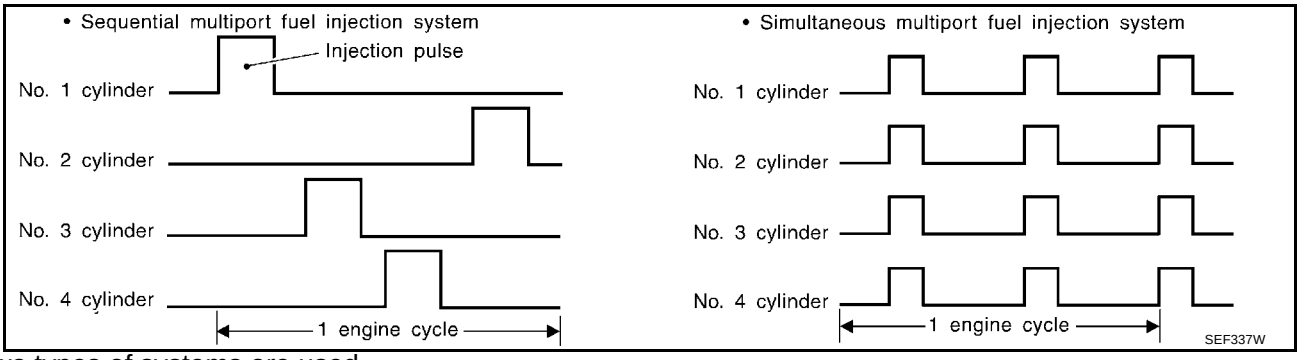
- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (A/T models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as orig-

inally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

EBS00KED

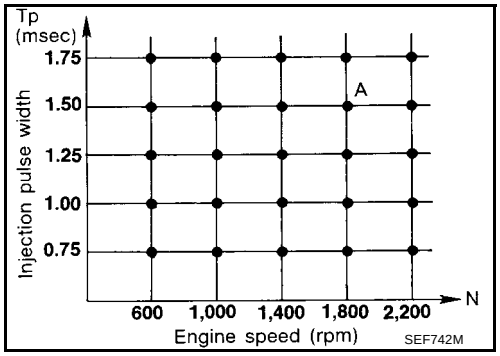
INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2 and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage*2		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.
*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.



- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

EBS00KEE

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch*1	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Vehicle speed signal*1	Vehicle speed		

*1: These signals are sent to the ECM through CAN communication line.
*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Fuel Cut Control (at No Load and High Engine Speed)

EBS00KEF

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:

This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-417
.

CAN Communication

EBS00KEG

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

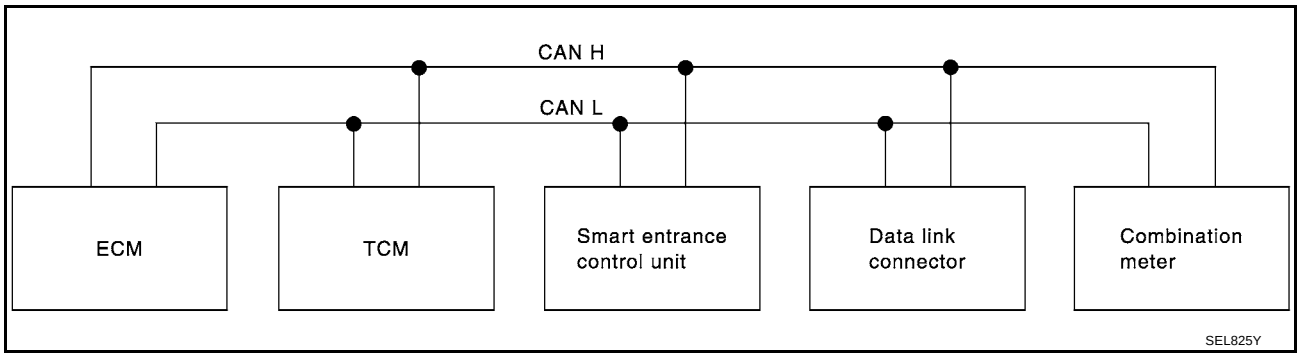
CAN COMMUNICATION UNIT

Body type	Sedan/ 5DH/B/ 3DH/B	
Axle	2WD	
Engine	QG18DE	QG15DE/QG18DE
Transmission	A/T	M/T
Brake control	ABS	
CAN communication unit		
ECM	×	×
TCM	×	
Data link connector	×	×
Smart entrance control unit	×	×
Combination meter	×	×
CAN communication type	EC-422, "Type 1"	EC-423, "Type 2"

×:Applicable

Type 1

SYSTEM DIAGRAM



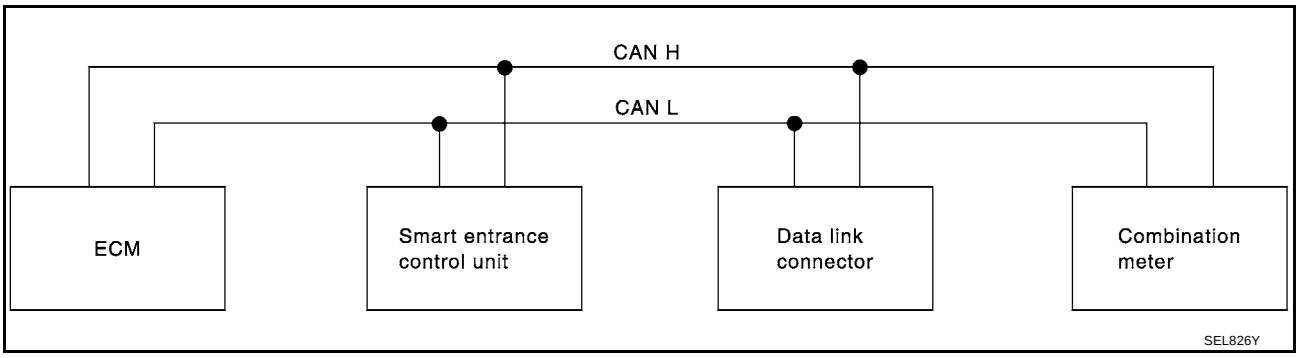
INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	TCM	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Brake switch signal		R		T
Rear window defogger signal	R		T	
Heater fan switch signal	R			T
Air conditioner switch signal	R			T
MI signal	T			R
Current gear position signal		T		R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
A/C compressor signal	T		R	
Accelerator pedal position signal	T	R		
Output shaft revolution signal	R	T		
OD OFF switch signal		R		T
OD OFF indicator signal		T		R
A/T self-diagnosis signal	R	T		

Type 2

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	Smart entrance control unit	Combination meter
Engine speed signal	T		R
Rear window defogger signal	R	T	
Heater fan switch signal	R		T
Air conditioner switch signal	R		T
MI signal	T		R
Engine coolant temperature signal	T		R
Fuel consumption signal	T		R
Vehicle speed signal	R		T
Seat belt reminder signal		R	T
Headlamp switch signal		T	R
Flashing indicator signal		T	R
Engine cooling fan speed signal	T	R	
Child lock indicator signal		T	R
Door switches state signal		T	R
A/C compressor signal	T	R	

BASIC SERVICE PROCEDURE

PFP:00018

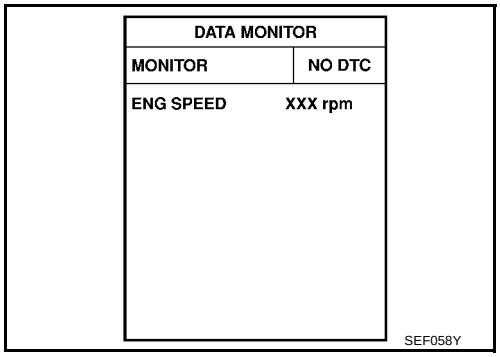
Idle Speed and Ignition Timing Check

EBS00KEH

IDLE SPEED

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.

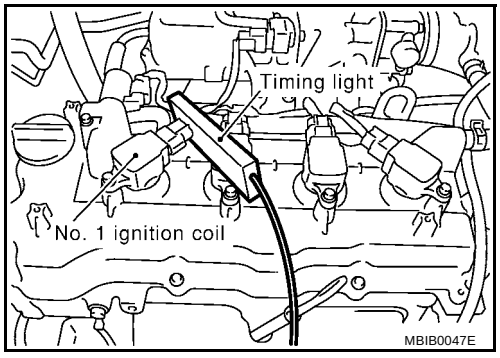


IGNITION TIMING

Any of following two methods may be used.

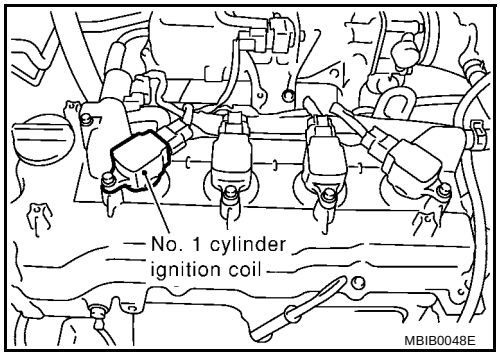
Method A

1. Slide the harness protector of ignition coil No. to clear the wires.
2. Attach timing light to the wires as shown.
3. Check ignition timing.

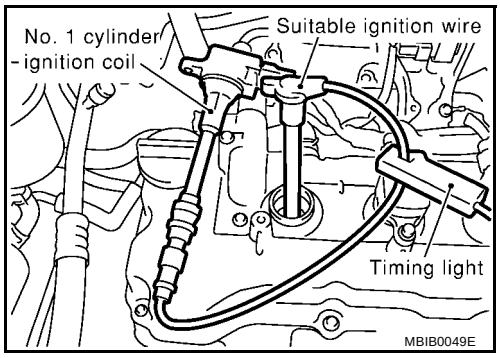


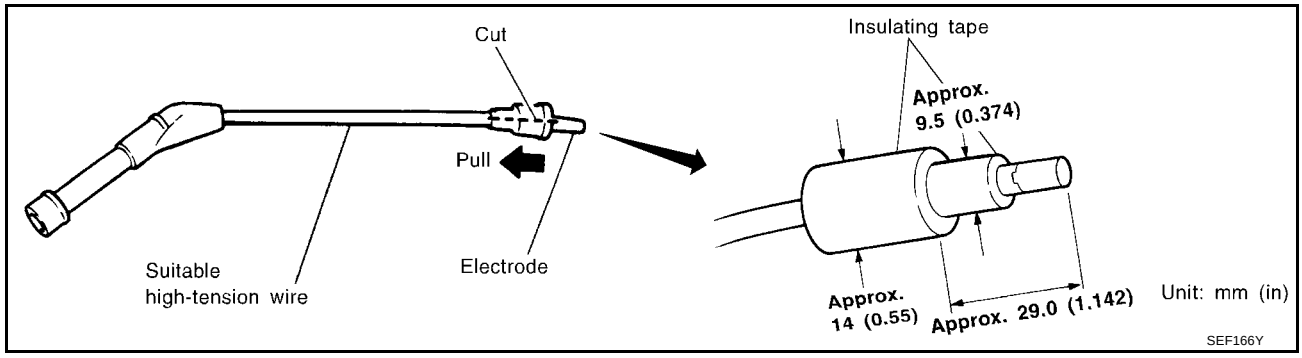
Method B

1. Remove No. 1 ignition coil.



2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.

Accelerator Pedal Released Position Learning

EBS00KEI

DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

Throttle Valve Closed Position Learning

EBS00KEJ

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

EBS00KEK

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.

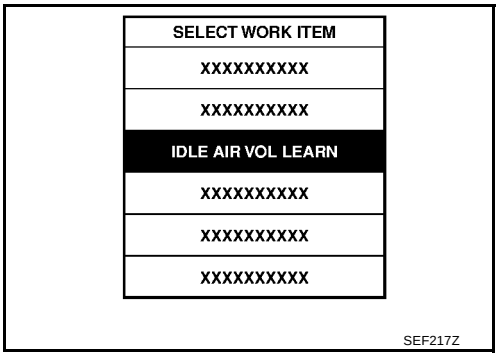
- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped

- Transmission: Warmed-up
  For A/T models with CONSULT-II, drive vehicle until “FLUID TEMP SE” in “DATA MONITOR” mode of “A/T” system indicates less than 0.9V.
  For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

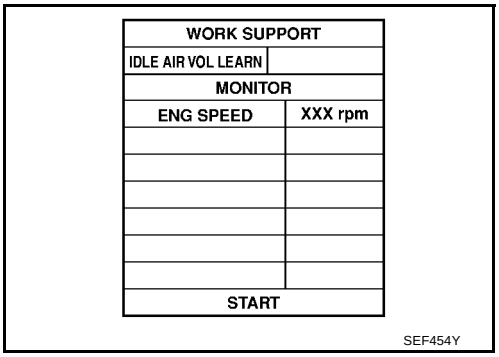
OPERATION PROCEDURE

With CONSULT-II

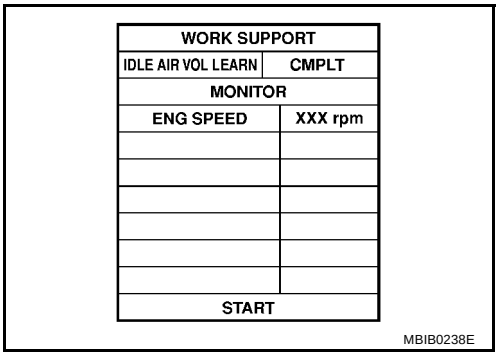
1. Perform EC-425, "Accelerator Pedal Released Position Learning" .
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.



6. Touch “START” and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “CMPLT” is not displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 8±5° BTDC A/T: 10±5° BTDC (in “P” or “N” position)

Without CONSULT-II

NOTE:

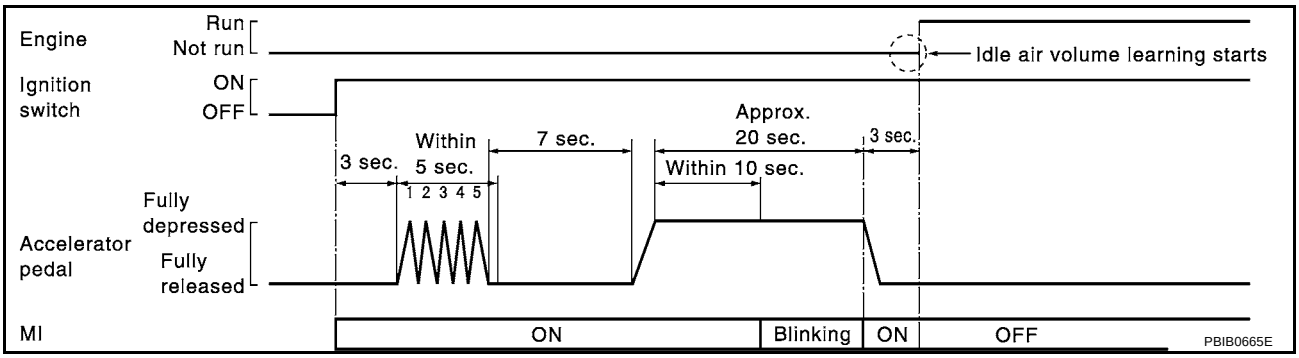
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-425, "Accelerator Pedal Released Position Learning" .
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.

4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MI turned ON.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 8±5° BTDC A/T: 10±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.**
   It is useful to perform EC-481, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform “Idle air volume learning” all over again:**

- **Engine stalls.**
- **Erroneous idle.**

Fuel Pressure Check

EBS00KEL

FUEL PRESSURE RELEASE

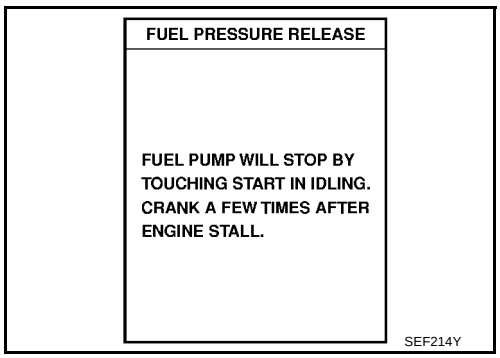
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because N16 models do not have fuel return system.

With CONSULT-II

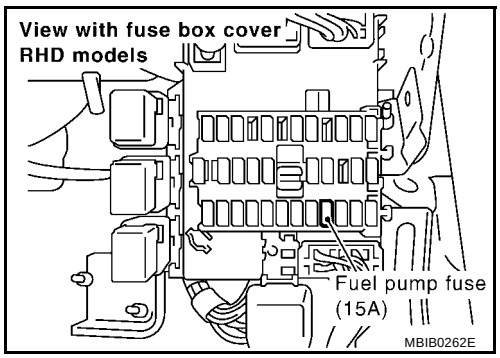
1. Turn ignition switch “ON”.

2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch “OFF”.



Without CONSULT-II

1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch “OFF”.
5. Reinstall fuel pump fuse after servicing fuel system.



FUEL PRESSURE CHECK

NOTE:

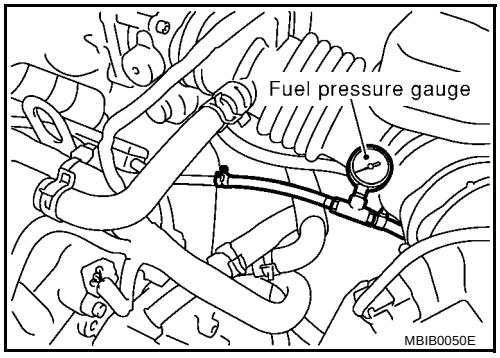
- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**

1. Release fuel pressure to zero. Refer to EC-427, "FUEL PRESSURE RELEASE" .
2. Install the fuel pressure gauge with the fuel pressure check adapter as shown in the figure.
3. Turn ignition switch “ON”, and check for fuel leakage.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

   At idling: Approximately 350 kPa
   (3.5 bar, 3.57 kg/cm^2 , 51 psi)

6. If result is unsatisfactory, go to next step.
7. Check the following.
   - Fuel hoses and fuel tubes for clogging
   - Fuel filter for clogging
   - Fuel pump
   - Fuel pressure regulator for clogging

   If OK, replace fuel pressure regulator.
   If NG, repair or replace.



ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

EBS00KEM

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information
Diagnostic Trouble Code (DTC)
Freeze Frame data
1st Trip Diagnostic Trouble Code (1st Trip DTC)
1st Trip Freeze Frame data

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data
CONSULT-II	×	×	×	×
ECM	×	×*1	—	—

*1: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-441 .)

Two Trip Detection Logic

EBS00KEN

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MI will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MI lights up. The MI lights up at the same time when the DTC is stored. <2nd trip>
The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. When the ECM enters fail-safe mode (Refer to EC-441 .), the DTC is stored in the ECM memory even in the 1st trip.
When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting MI up when there is malfunction on engine control system.
Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function.
The fail-safe function also operates when above diagnoses except MI circuit and demands the driver to repair the malfunction.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

Emission-related Diagnostic Information

EBS00KEO

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For fail-safe items, the DTC is stored in the ECM memory even in the 1st trip.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-430, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-437 . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II

CONSULT-II displays the DTC in “SELF-DIAG RESULTS” mode. Examples: P0117, P0340, P1065, etc. (CONSULT-II also displays the malfunctioning component or system.)

Without CONSULT-II

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0117, 0340 1065 etc.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, the Diagnostic Test Mode II does not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

PBIB0911E

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II. For details, see EC-468 .
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-430, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC (With CONSULT-II)

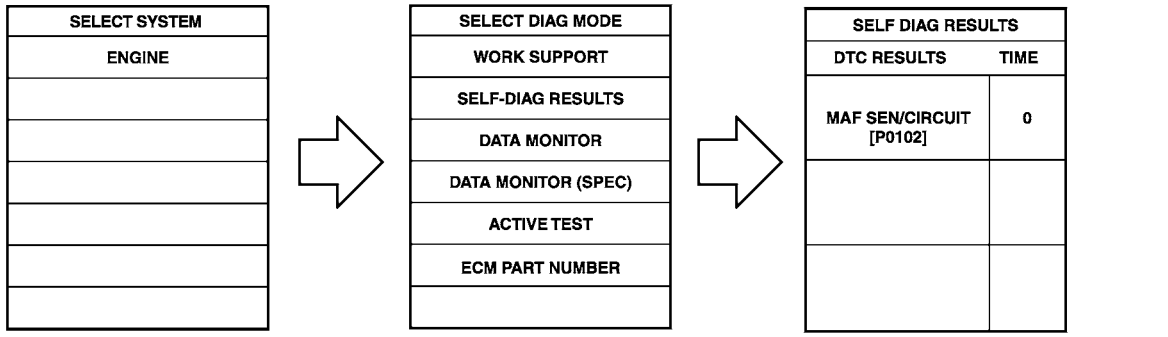
The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.

4. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” again.



2. Turn **CONSULT-II** “ON” and touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the ECM will be erased.)

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How to Erase DTC (Without CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once.
2. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-433, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

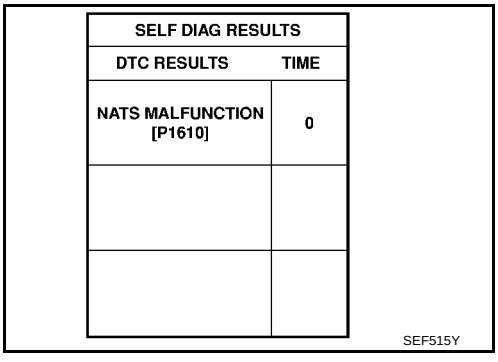
- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**
  - Diagnostic trouble codes
  - 1st trip diagnostic trouble codes
  - Freeze frame data
  - 1st trip freeze frame data
  - Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

NATS (Nissan Anti-theft System)

EBS00KEP

- **If the security indicator lights up with the ignition switch in the “ON” position or “NATS MALFUNCTION” is displayed on “SELF-DIAG RESULTS” screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to EL-386.**
- **Confirm no self-diagnostic results of NATS is displayed before touching “ERASE” in “SELF-DIAG RESULTS” mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  Therefore, be sure to receive all keys from vehicle owner.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.



SEF515Y

Malfunction Indicator (MI)

EBS00KEQ

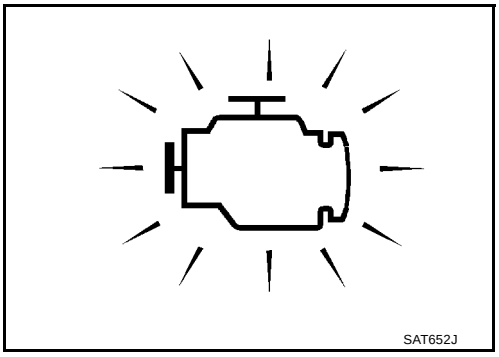
DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.

- If the MI does not light up, refer to EL-129, or see EC-715, "MI & DATA LINK CONNECTORS" .

2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.



ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in "ON" position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up the MI in the 1st trip. ● "One trip detection diagnoses"
Mode II	Ignition switch in "ON" position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running 	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting MI up when there is malfunction on engine control system.
Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function.
The fail-safe function also operates when above diagnoses except MI circuit and demands the driver to repair the malfunction.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

MI Flashing without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode. Refer to EC-433, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later EC-433, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

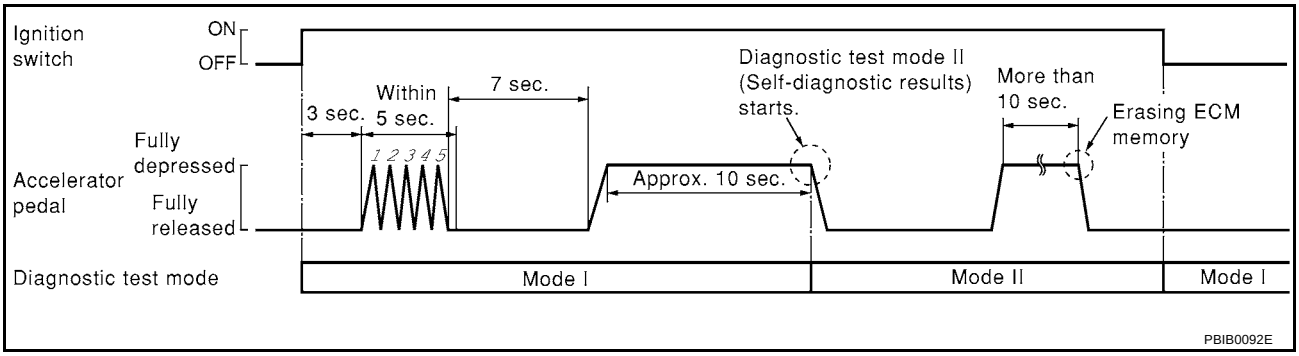
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned “OFF”.**

How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-433, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-433, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL-129 or see EC-715, "MI & DATA LINK CONNECTORS" .

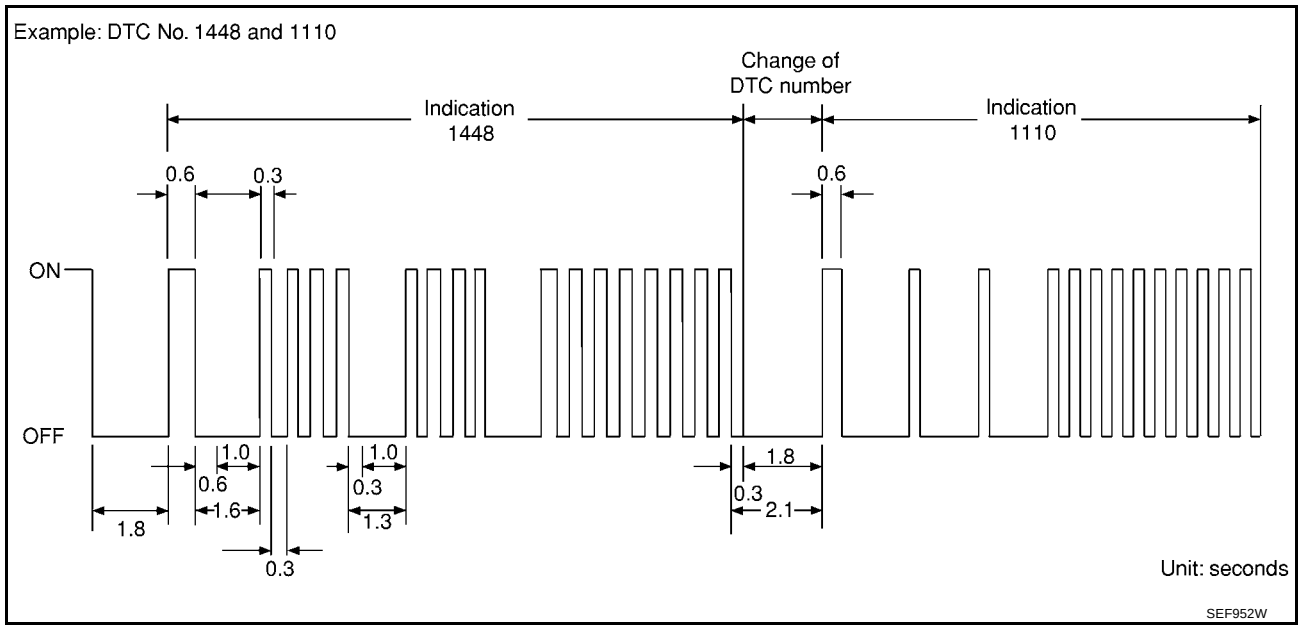
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

- These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI as shown below.
The DTC and 1st trip DTC are displayed at the same time. If the MI does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MI illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-II. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-406, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-433, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

TROUBLE DIAGNOSIS

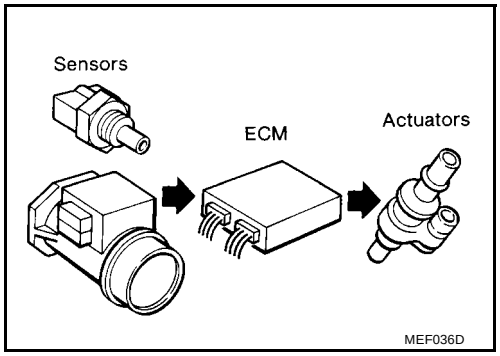
PFP:00004

Trouble Diagnosis Introduction

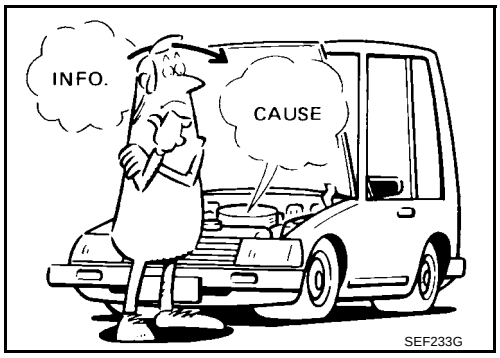
EBS00KER

INTRODUCTION

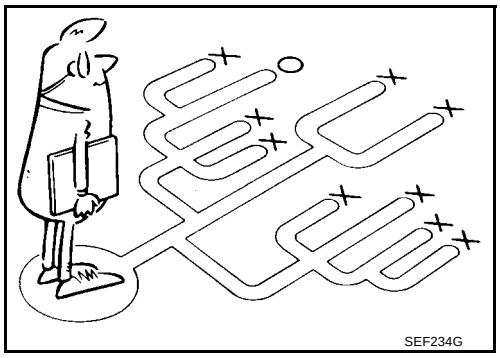
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.



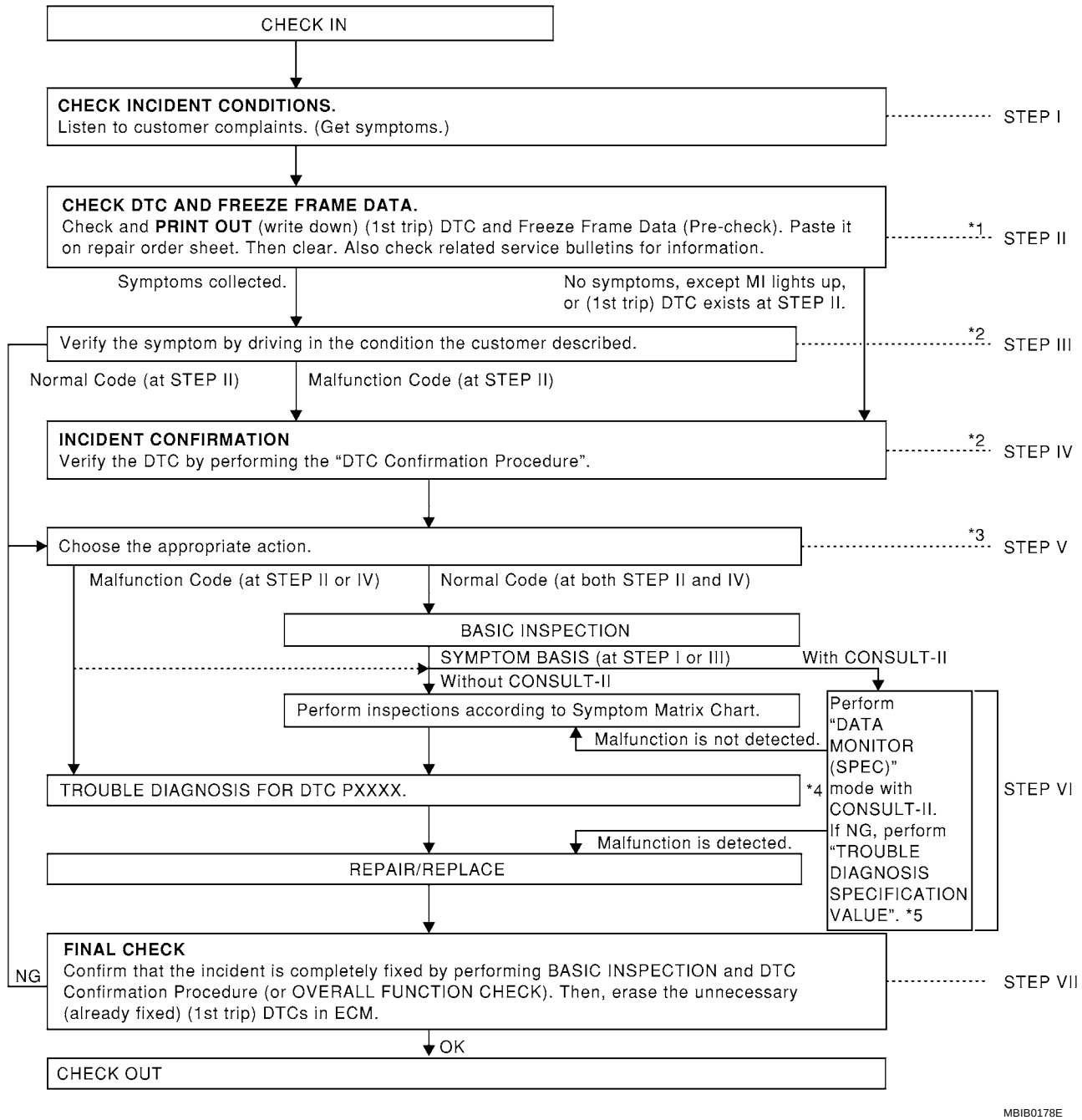
It is much more difficult to diagnose a incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



A visual check only may not find the cause of the incidents. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the “Work Flow” on EC-437 .
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-440 should be used.
Start your diagnosis by looking for “conventional” malfunctions first. This will help troubleshoot driveability malfunctions on an electronically controlled engine vehicle.



WORK FLOW
Flow Chart



MBIB0178E

*1 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-486, "POWER SUPPLY CIRCUIT FOR ECM" .

*4 If the incident cannot be verified, perform EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5 EC-481, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE"

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-440 .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-430 .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-448 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-443 .) If COSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TOROUBLE DIAGNOSIS – SPECIFICATION VALUE”. (Refer to EC-481 .) (If malfunction is detected, proceed to “PERAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-448 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-458 , EC-475 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to “Circuit Inspection” in GI-22. Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-430, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

Some conditions may cause the MI to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

EBS00KES

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-492, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

Priority	Detected items (DTC)
1	● U1000 U1001 CAN communication line ● P0102 P0103 Mass air flow sensor ● P0117 P0118 Engine coolant temperature sensor ● P0221 P0222 P0223 P1223 P1224 P1225 P1226 P1229 Throttle position sensor ● P0226 P0227 P0228 P1227 P1228 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0605 ECM ● P1610-P1615 NATS
2	● P0132 P0134 Heated oxygen sensor 1 ● P0138 Heated oxygen sensor 2 ● P1065 ECM power supply ● P1122 Electric throttle control function ● P1124 P1126 P1128 Electric throttle control actuator ● P1805 Brake switch
3	● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT)

Fail-safe Chart

EBS00KET

- When the DTC listed below is detected, the ECM enters the fail-safe mode and the MI lights up.

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0102
P0103</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0221
P0222
P0223
P1223
P1224</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P0226
P0227
P0228
P1227
P1228</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P1121</td><td>Electric throttle control actuator
(ECM detect the throttle valve is stuck open.)</td><td colspan="2">While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
</table>

DTC No.	Detected items	Engine operating condition in fail-safe mode
P1122	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1124 P1126	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1128	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1229	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

- When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting MI up when there is malfunction on engine control system.
  Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function.
  The fail-safe function also operates when above diagnoses except MI circuit and demands the driver to repair the malfunction.

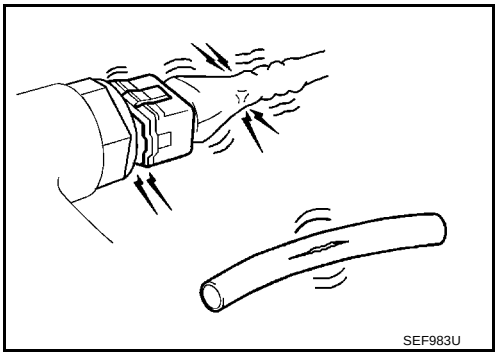
Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

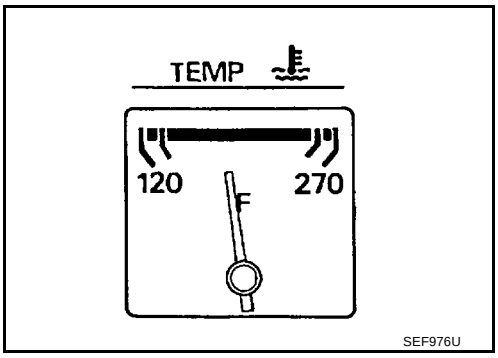
Basic Inspection

EBS00KEU

1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
   - Harness connectors for improper connections
   - Wiring harness for improper connections, pinches and cut
   - Vacuum hoses for splits, kinks and improper connections
   - Hoses and ducts for leaks
   - Air cleaner clogging
   - Gasket
3. Confirm that electrical or mechanical loads are not applied.
   - Headlamp switch is OFF.
   - Air conditioner switch is OFF.
   - Rear window defogger switch is OFF.
   - Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
   Ensure engine stays below 1,000 rpm.


SEF983U

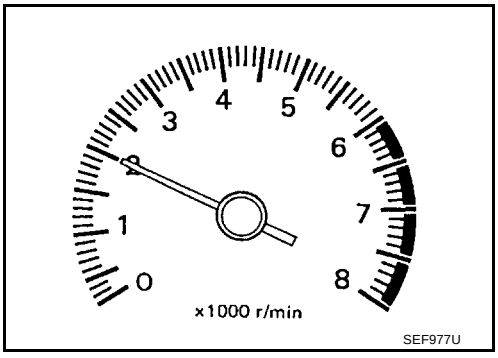


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or ECM.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

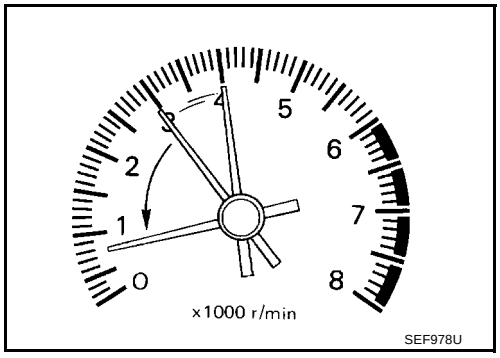
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

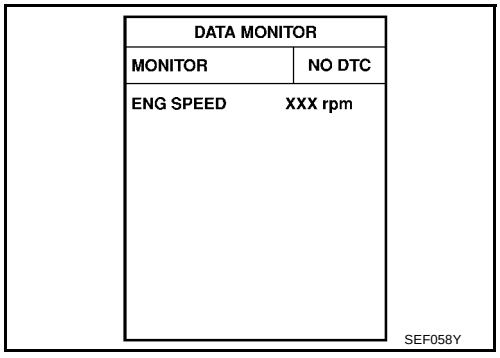
With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-425, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-425, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-425, "Idle Air Volume Learning" .

Is “Idle Air Volume Learning” carried out successfully?

Yes or No

Yes >> GO TO 7.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-561 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-554 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-431, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 8 ± 5° BTDC
A/T: 10 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-425, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-425, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-425, "Idle Air Volume Learning" .

Is “Idle Air Volume Learning” carried out successfully?

Yes or No

Yes >> GO TO 14.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 8 ± 5° BTDC
A/T: 10 ± 5° BTDC (in "P" or "N" position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-47, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-561 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-554 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-431, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

Symptom Matrix Chart
SYSTEM — BASIC ENGINE CONTROL SYSTEM

EBS00KEV

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-699
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-427
	Injector circuit	1	1	2	3	2		2	2			2			EC-693
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-717
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-720
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-443
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-575, EC-578 , EC-585 , EC-591
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-443
	Ignition circuit	1	1	2	2	2		2	2			2			EC-660
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-486
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-495
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-501
Throttle position sensor circuit			1	2		2	2	2	2	2		2			EC-524, EC-530 , EC-607 , EC-613 , EC-615 , EC-624
Accelerator pedal position sensor circuit				3	2	1	2			2					EC-536, EC-543 , EC-617
Heated oxygen sensor 1 circuit			1	2	3	2		2	2			2			EC-506, EC-512 , EC-647
Knock sensor circuit				2	2							3			EC-550
Crankshaft position sensor (POS) circuit		2	2												EC-554
Camshaft position sensor (PHASE) circuit		2	2												EC-561
Vehicle speed signal circuit			2	3		3						3			EC-677
Power steering pressure sensor circuit			2				3	3	3	3					EC-678

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-568, EC-571
Intake valve timing control solenoid valve circuit	3	3	2		1	3	2	2	3		3			EC-683
PNP switch circuit			3		3	3	3	3	3		3			EC-689
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-705
Electrical load signal circuit						3	3	3	3					EC-710
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	ATC-29

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FE-4
	Fuel piping			5	5	5		5	5			5			FE-4
	Vapor lock		5												—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—

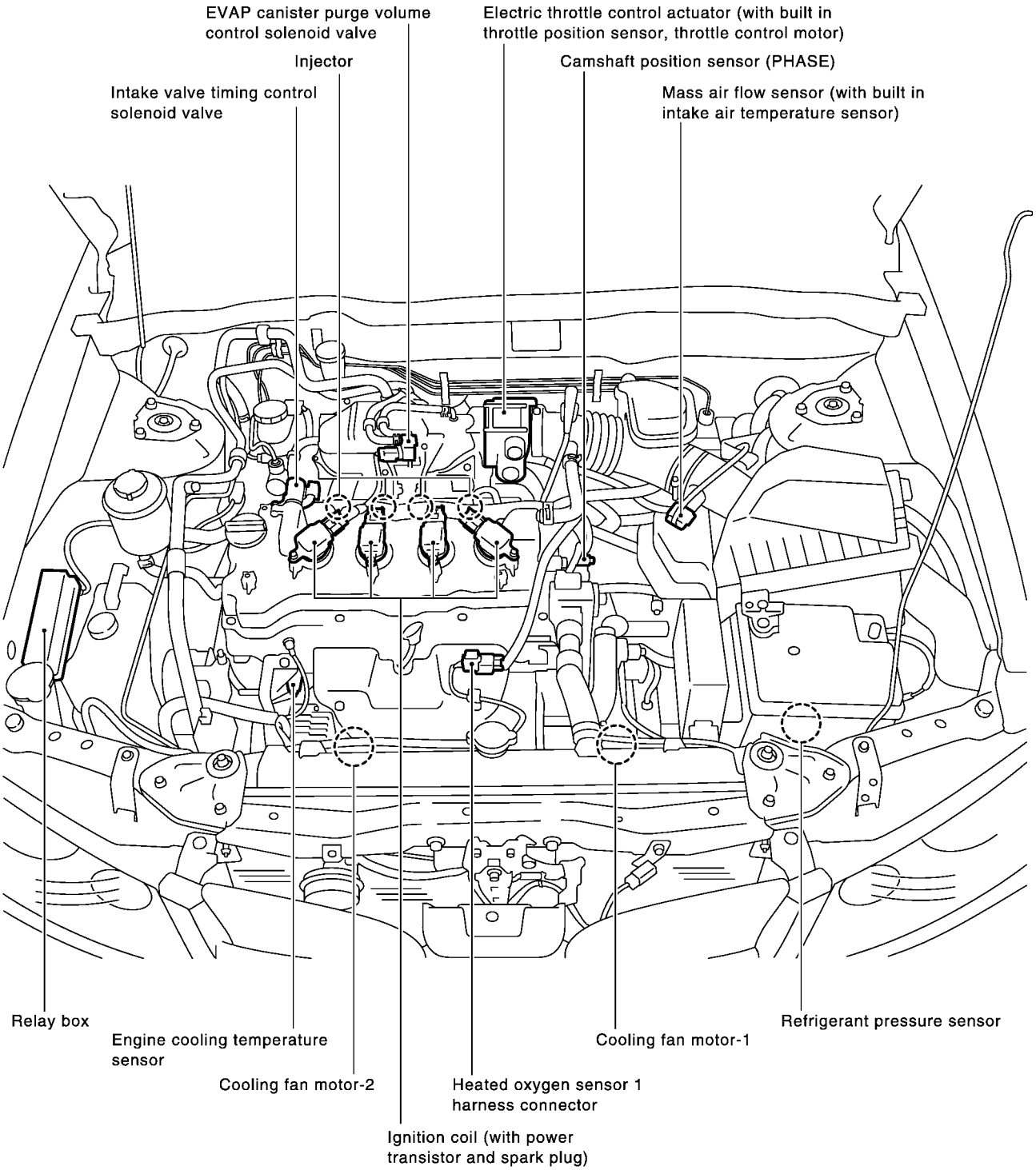
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Air duct		5	5		5		5	5			5			EM-14
	Air cleaner														EM-14
	Air leakage from air duct (Mass air flow sensor —electric throttle control actuator)	5			5		5			5					EM-14
	Electric throttle control actuator														EM-16
	Air leakage from intake manifold/ Collector/Gasket														EM-16
Cranking	Battery	1	1	1		1		1	1			1		1	SC-3
	Alternator circuit														SC-27
	Starter circuit	3													SC-13
	Signal plate/Flywheel/Drive plate	6													EM-70
	PNP switch	4													AT-116, MT-21
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-57
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-70
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-47
	Camshaft														EM-32
	Intake valve timing control														EM-47
	Intake valve												3		EM-57
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-19, FE-26
	Three way catalyst														
Lubrica-tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5	2		EM-22, LC-5, LC-9, LC-4
	Oil level (Low)/Filthy oil														LC-8

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		2	5			LC-12
	Thermostat									5					LC-15
	Water pump														LC-14
	Water gallery														LC-12
	Cooling fan									5					LC-17
	Coolant level (low)/Contaminated coolant														LC-17
NATS (Nissan Anti-Theft System)		1	1												EC-431 or EL-386

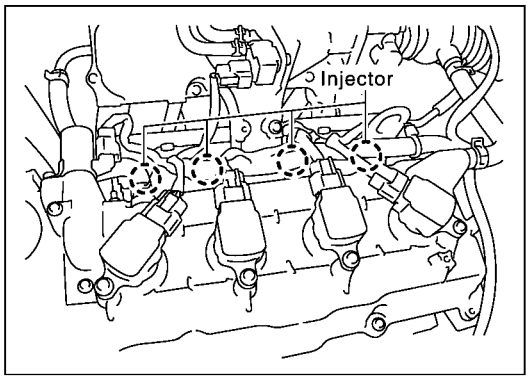
1 - 6: The numbers refer to the order of inspection.

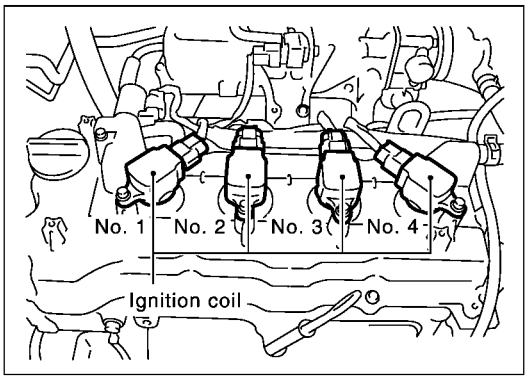
Engine Control Component Parts Location

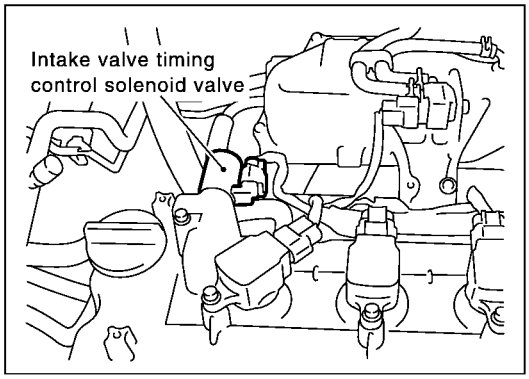
EBS00KEW

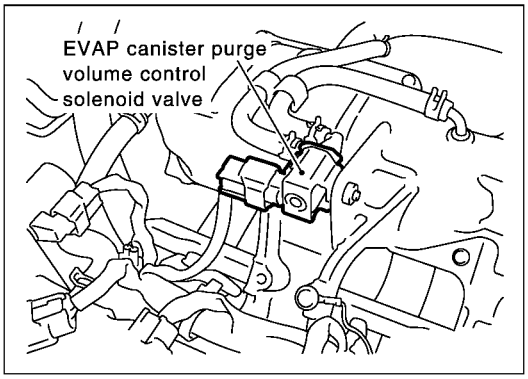


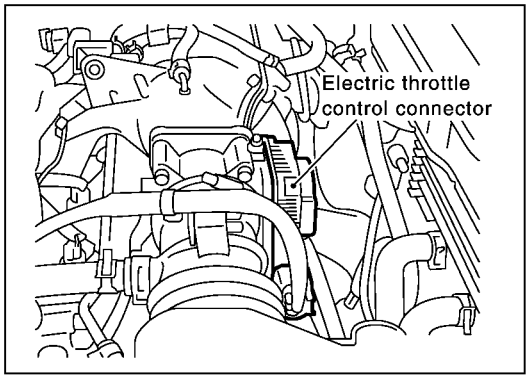
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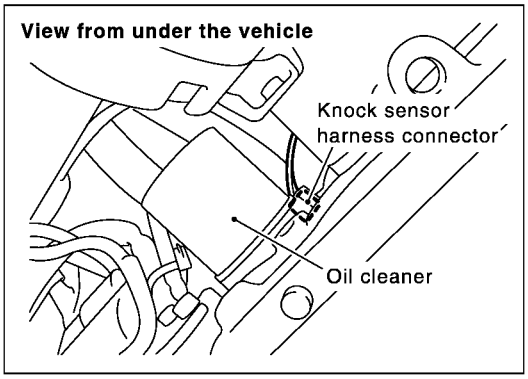

Injector

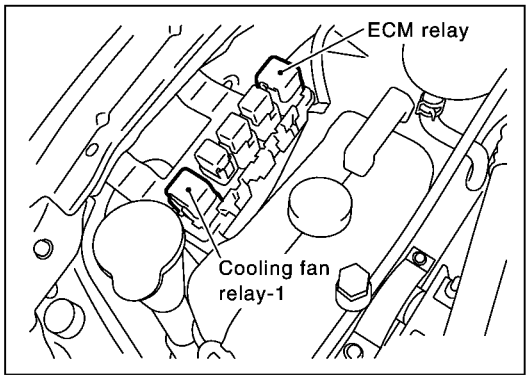

No. 1
No. 2
No. 3
No. 4
Ignition coil

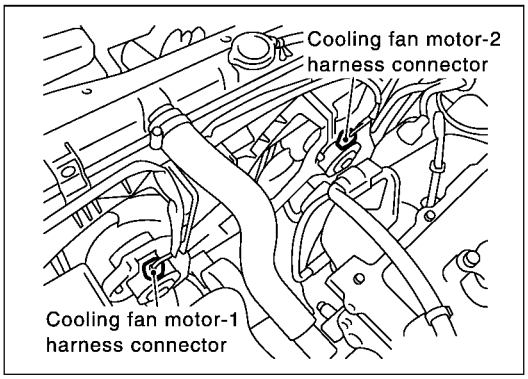

Intake valve timing
control solenoid valve


EVAP canister purge
volume control
solenoid valve

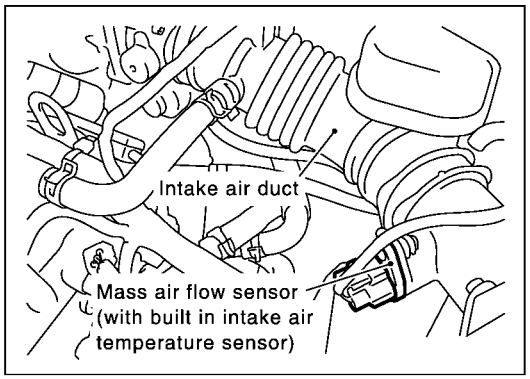

Electric throttle
control connector

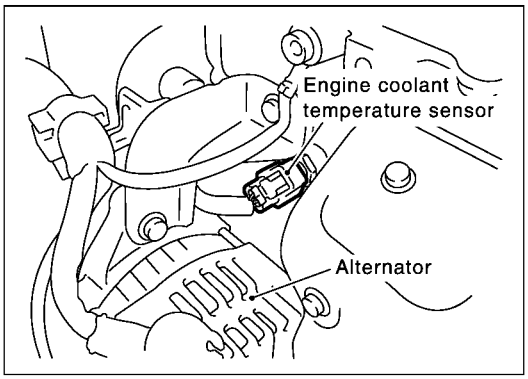

View from under the vehicle
Knock sensor
harness connector
Oil cleaner

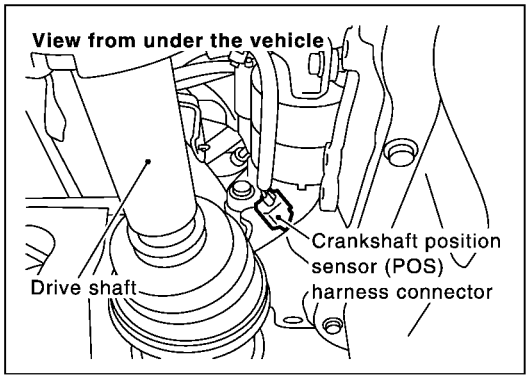

ECM relay
Cooling fan
relay-1

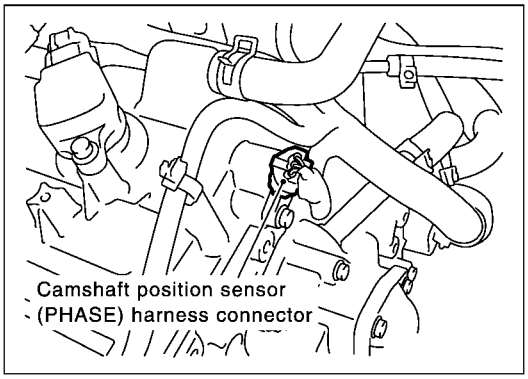

Cooling fan motor-2
harness connector
Cooling fan motor-1
harness connector

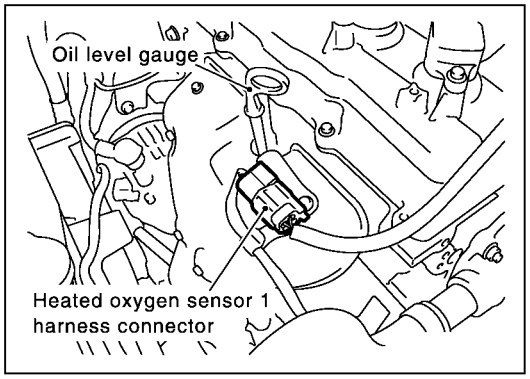
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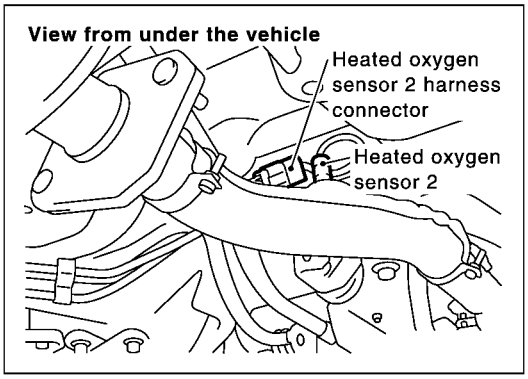

Intake air duct
Mass air flow sensor
(with built in intake air
temperature sensor)

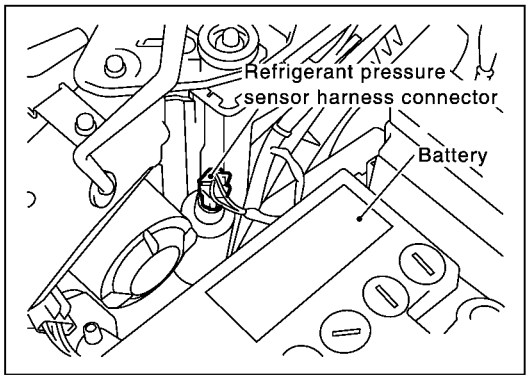

Engine coolant
temperature sensor
Alternator

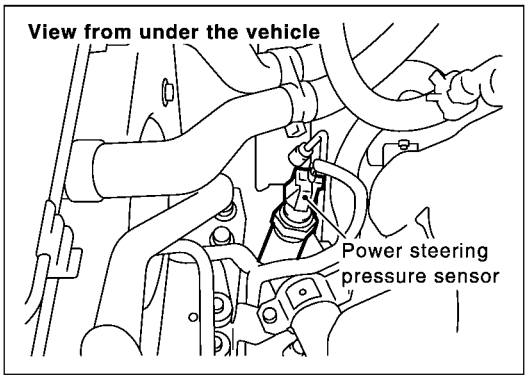

View from under the vehicle
Crankshaft position
sensor (POS)
harness connector
Drive shaft


Camshaft position sensor
(PHASE) harness connector

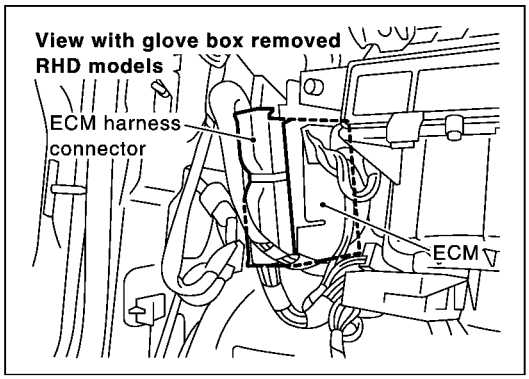

Oil level gauge
Heated oxygen sensor 1
harness connector

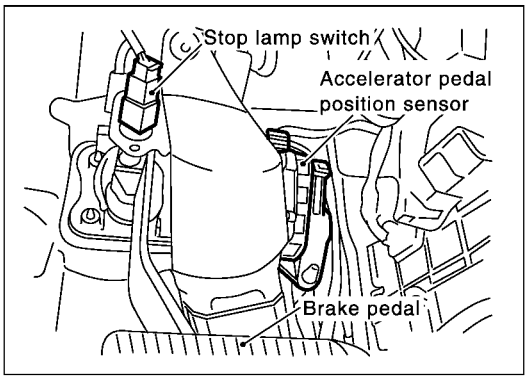

View from under the vehicle
Heated oxygen
sensor 2 harness
connector
Heated oxygen
sensor 2

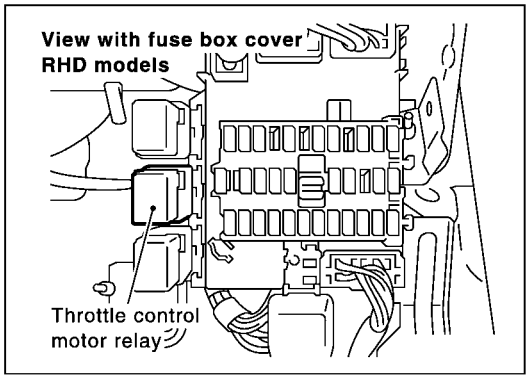

Refrigerant pressure
sensor harness connector
Battery

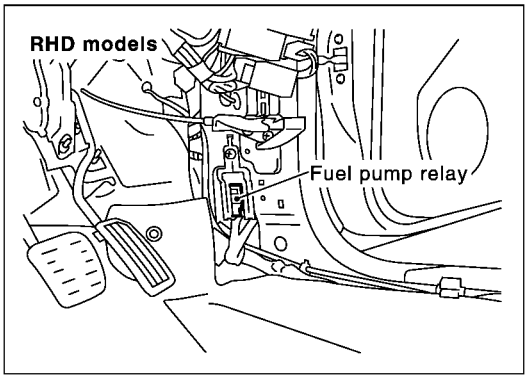

View from under the vehicle
Power steering
pressure sensor

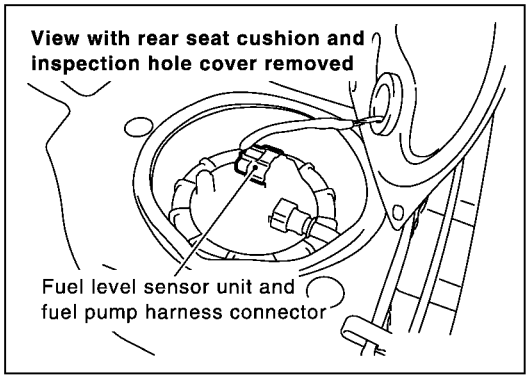
MBIB0260E

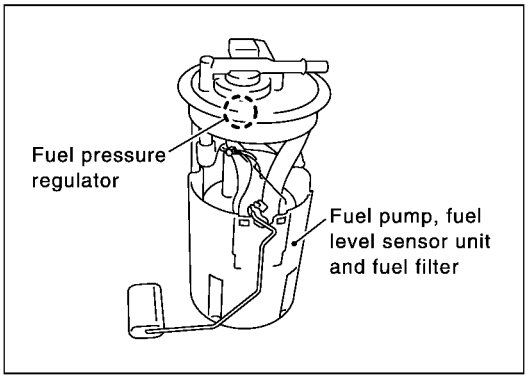

View with glove box removed
RHD models
ECM harness connector
ECM


Stop lamp switch
Accelerator pedal position sensor
Brake pedal


View with fuse box cover
RHD models
Throttle control motor relay


RHD models
Fuel pump relay

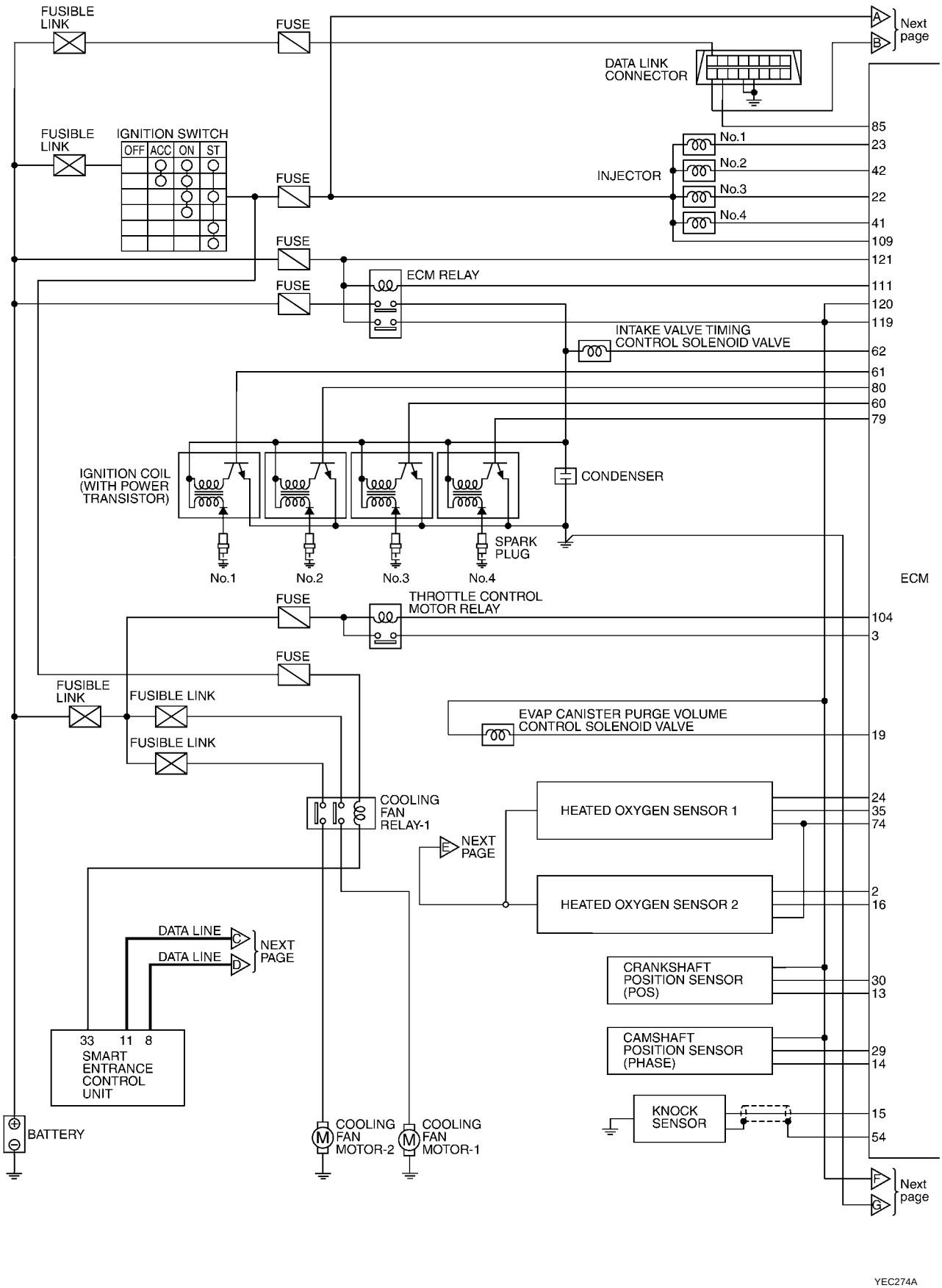

View with rear seat cushion and inspection hole cover removed
Fuel level sensor unit and fuel pump harness connector


Fuel pressure regulator
Fuel pump, fuel level sensor unit and fuel filter

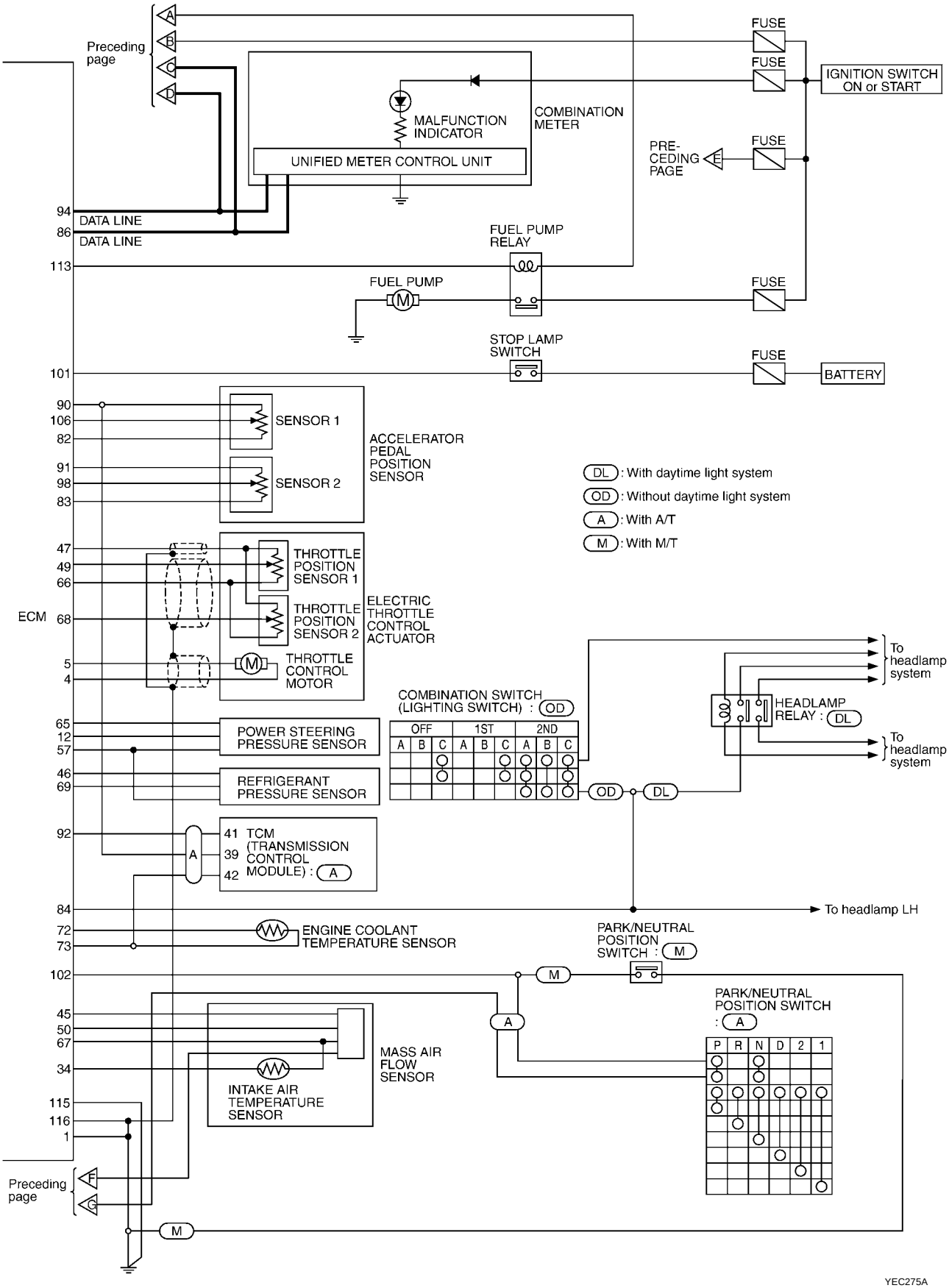
MBIB0261E

Circuit Diagram

EBS00KEX

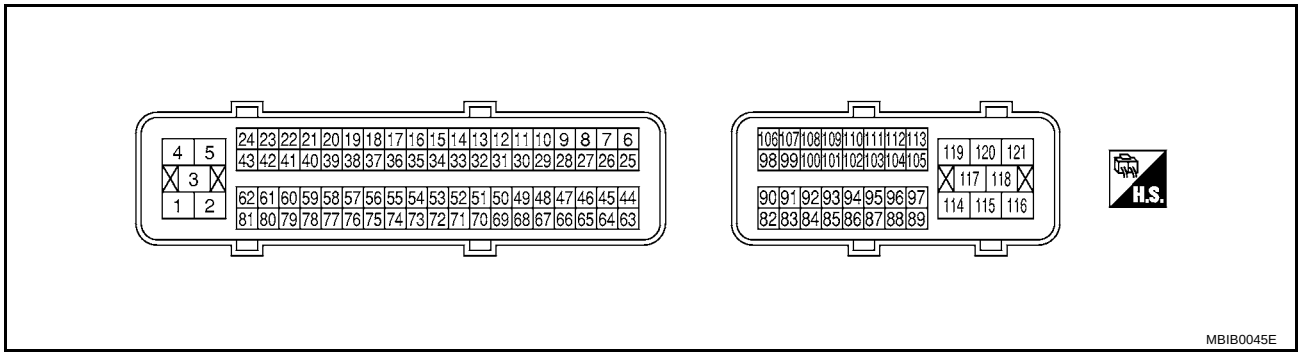


YEC274A


Preceding page
A
B
C
D
FUSE
FUSE
IGNITION SWITCH ON or START
MALFUNCTION INDICATOR
COMBINATION METER
UNIFIED METER CONTROL UNIT
PRE-CEDING PAGE
E
FUSE
94 DATA LINE
86 DATA LINE
FUEL PUMP RELAY
113
FUEL PUMP
M
FUSE
STOP LAMP SWITCH
FUSE
101
BATTERY
90
106
82
SENSOR 1
ACCELERATOR PEDAL POSITION SENSOR
91
98
83
SENSOR 2
DL : With daytime light system
OD : Without daytime light system
A : With A/T
M : With M/T
47
49
66
THROTTLE POSITION SENSOR 1
ECM
68
THROTTLE POSITION SENSOR 2
ELECTRIC THROTTLE CONTROL ACTUATOR
5
4
M
THROTTLE CONTROL MOTOR
COMBINATION SWITCH (LIGHTING SWITCH) : OD
To headlamp system
HEADLAMP RELAY : DL
To headlamp system
OFF
1ST
2ND
A B C A B C A B C
65
12
57
POWER STEERING PRESSURE SENSOR
46
69
REFRIGERANT PRESSURE SENSOR
OD
DL
92
A
41 TCM (TRANSMISSION CONTROL MODULE) : A
39
42
84
To headlamp LH
72
73
ENGINE COOLANT TEMPERATURE SENSOR
PARK/NEUTRAL POSITION SWITCH : M
102
M
PARK/NEUTRAL POSITION SWITCH : A
A
P R N D 2 1
45
50
67
34
MASS AIR FLOW SENSOR
INTAKE AIR TEMPERATURE SENSOR
115
116
1
Preceding page
F
G
M
YEC275A

ECM Harness Connector Terminal Layout

EBS00KEY

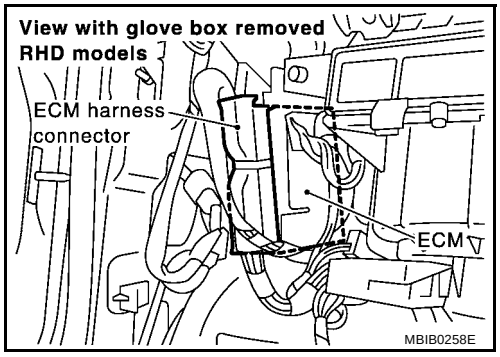


ECM Terminals and Reference Value

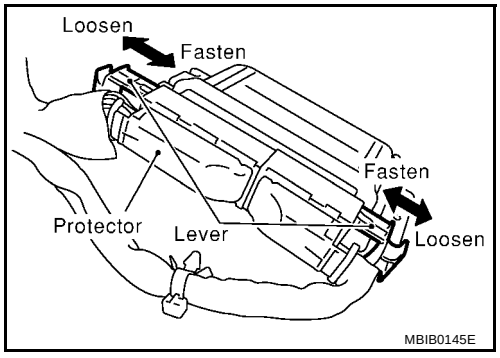
EBS00KEZ

PREPARATION

1. ECM is located behind the glove box. For this inspection, remove glove box.
2. Remove ECM harness protector.



3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as shown at right.
4. Connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



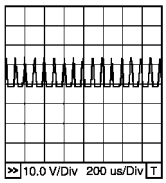
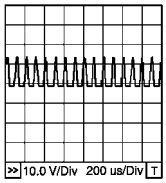
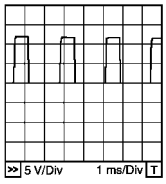
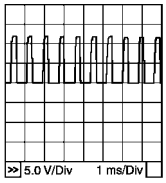
ECM INSPECTION TABLE

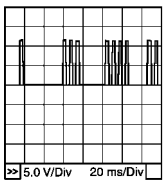
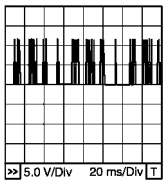
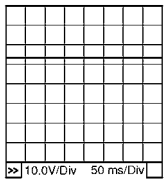
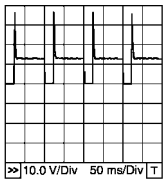
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II

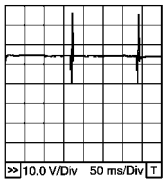
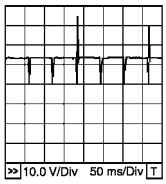
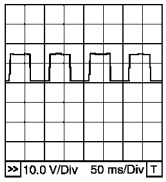
CAUTION:

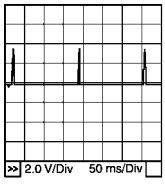
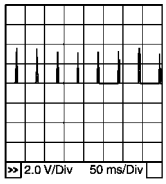
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

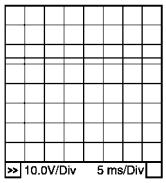
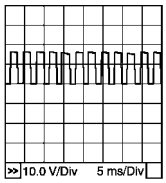
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed: Below 3,800 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,800 rpm.	BATTERY VOLTAGE (11 - 14V)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	W (LHD) BR (RHD)	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is releasing.	0 - 14V★  PBIB0534E
5	B (LHD) Y (RHD)	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is depressing.	0 - 14V★  PBIB0533E
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8V
13	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 3.0V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 3,000 rpm quickly after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	Approximately 10V★  PBIB0520E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,200 rpm (A/T models). ● Engine speed is below 3,600 rpm (M/T models).	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,200 rpm (A/T models). ● Engine speed is above 3,600 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V
30	B	Crankshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V
34	BR	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is ″D″ (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is ″D″ (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	Less than 4.75V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
54	-	Sensor ground (Knock sensor shield circuit)	**[Engine is running]** ● Idle speed	Approximately 0V
57	B	Sensor ground (Power steering pressure sensor/Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly.	7 - 10V★  PBIB0532E
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is ″D″ (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is ″D″ (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	More than 0.36V
69	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V
72	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
73	B	Sensor ground (Engine coolant temperature sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2nd" position.	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF".	Approximately 0V
85	LG	DATA link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	R	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.3V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
94	L	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.8V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.175 - 0.335V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 1.95V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released.	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed.	BATTERY VOLTAGE (11 - 14V)
102	P (A/T) G/OR (M/T)	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models). ● Shift lever position is "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position.	Approximately 5V
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.35 - 0.67V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 3.9V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
109	B/R	Ignition switch	**[Ignition switch “OFF”]**	0V
			[Ignition switch “ON”]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch “OFF”]** ● For 5 seconds after turning ignition switch “OFF”.	0 - 1.0V
			[Ignition switch “OFF”] ● 5 seconds passed after turning ignition switch “OFF”.	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch “ON”]** ● For 1 second after turning ignition switch “ON”. **[Engine is running]**	0 - 1.0V
			[Ignition switch “ON”] ● More than 1 second after turning ignition switch “ON”.	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch “OFF”]**	BATTERY VOLTAGE (11 - 14V)

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

CONSULT-II Function

EBS00KF0

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
ECM part number	ECM part number can be read.

*1: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

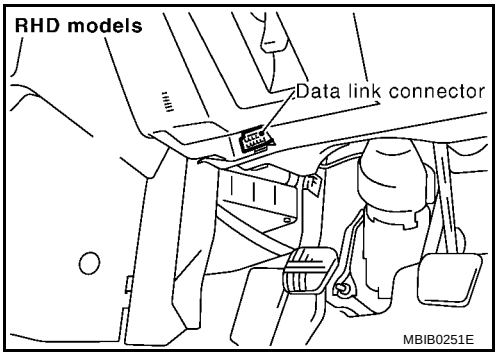
		Item	DIAGNOSTIC TEST MODE					
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST
				DTC*1	FREEZE FRAME DATA*2			
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	×	
		Camshaft position sensor (PHASE)		×		×	×	
		Mass air flow sensor		×		×	×	
		Engine coolant temperature sensor		×	×	×	×	×
		Heated oxygen sensor 1		×		×	×	
		Heated oxygen sensor 2		×		×	×	
		Vehicle speed signal			×	×	×	
		Accelerator pedal position sensor		×		×	×	
		Throttle position sensor		×		×	×	
		Intake air temperature sensor				×	×	
		Knock sensor		×				
		Refrigerant pressure sensor				×	×	
		Closed throttle position switch (accelerator pedal position sensor signal)				×	×	
		Air conditioner switch				×	×	
		Park/neutral position (PNP) switch				×	×	
		Stop lamp switch		×		×	×	
		Power steering pressure sensor				×	×	
		Battery voltage				×	×	
		Electrical load signal				×	×	
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				×	×	×
		Power transistor (Ignition timing)				×	×	×
		Throttle control motor relay		×		×	×	
		Throttle control motor		×				
		EVAP canister purge volume control solenoid valve				×	×	×
		Air conditioner relay				×	×	
		Fuel pump relay	×			×	×	×
		Cooling fan relay		×		×	×	×
		Heated oxygen sensor 1 heater				×	×	
		Heated oxygen sensor 2 heater				×	×	
		Intake valve timing control solenoid valve				×	×	×
		Calculated load value			×	×	×	

X: Applicable
*1: This item includes 1st trip DTCs.
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-468 .

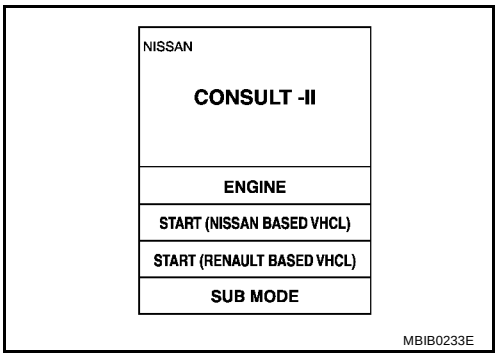
CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.

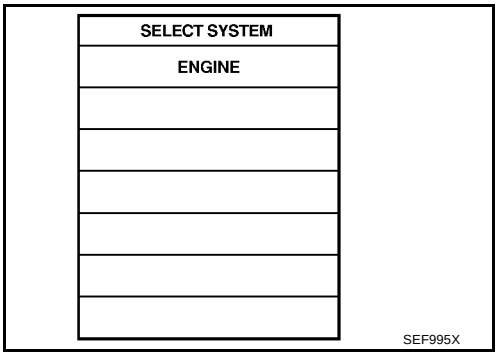
2. Connect “CONSULT-II” and ″CONSULT-II CONVERTER″ to data link connector, which is located under the driver’s side dash panel.
3. Turn ignition switch ON.



4. Touch “START (NISSAN BASED VHCL)”.

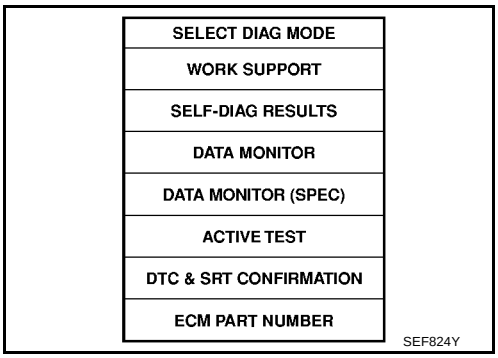


5. Touch “ENGINE”.
If ″ENGINE″ is not indicated, go to GI-38.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume

WORK ITEM	CONDITION	USAGE
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to EC-406, "INDEX FOR DTC" .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to EC-406, "INDEX FOR DTC" .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*1: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE
Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	CAN DIAG SUPPORT MNTR	Description	Remarks
ENG SPEED [rpm]	×	×		● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×		● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×		● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×		● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	×	×		● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuit, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×		● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1) [V]	×			● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	×	×		● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	×			● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	×	×		● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×		● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	×	×		● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×				

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
THRTL SEN 1 [V]	×	×		● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×				
INT/A TEMP SE [°C] or [°F]	×	×		● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the starter signal computed from the signals of the crankshaft position sensor (POS), camshaft position sensor (PHASE) and battery voltage.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×		● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×		● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×			● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×		● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		×		● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]				● “Calculated load value” indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]				● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
PURG VOL C/V [%]				● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]				● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]				● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
AIR COND RLY [ON/OFF]		×		● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×		● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
THRTL RELAY [ON/OFF]		×		● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [ON/OFF]				● Indicates the condition of the cooling fan (determined by ECM according to the input signals). ON ... Operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
VEHICLE SPEED [km/h] or [mph]	×			● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
IDL A/V LEARN [YET/CMPLT]				● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully.	
TRVL AFTER MIL [km] or [mile]				● Distance traveled while MI is activated.	
O2SEN HTR DTY [%]				● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals.	
AC PRESS SEN [V]	×			● The signal voltage from the refrigerant pressure sensor is displayed.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
Voltage [V]				● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]					
DUTY-HI					
DUTY-LOW					
PLS WIDTH-HI					
PLS WIDTH-LOW					
CAN COMM [OK/NG]			×	● Indicates the communication condition of CAN communication line.	● These items are not displayed in "SELECTION FROM MENU" mode.
CAN CIRC 1 [OK/UNKWN]			×		
CAN CIRC 2 [OK/UNKWN]			×		
CAN CIRC 3 [OK/UNKWN]			×		
CAN CIRC 4 [OK/UNKWN]			×		
CAN CIRC 5 [OK/UNKWN]			×		
CAN CIRC 6 [OK/UNKWN]			×		
CAN CIRC 7 [OK/UNKWN]			×		

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE
Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signal of the crankshaft position sensor (POS).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]		×	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform “Idle Air Volume Learning”.
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever: N (A/T models) Neutral (M/T models) ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN*	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

*: Leaving cooling fan ″OFF″ with CONSULT-II while engine is running may cause the engine to overheat.

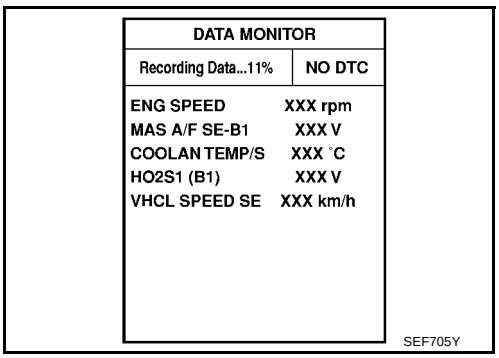
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

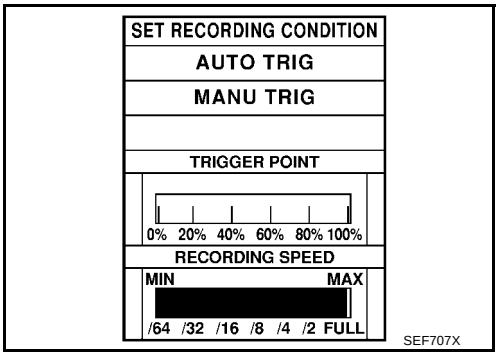
CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

1. “AUTO TRIG” (Automatic trigger):

- The malfunction will be identified on the CONSULT-II screen in real time.
  In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.

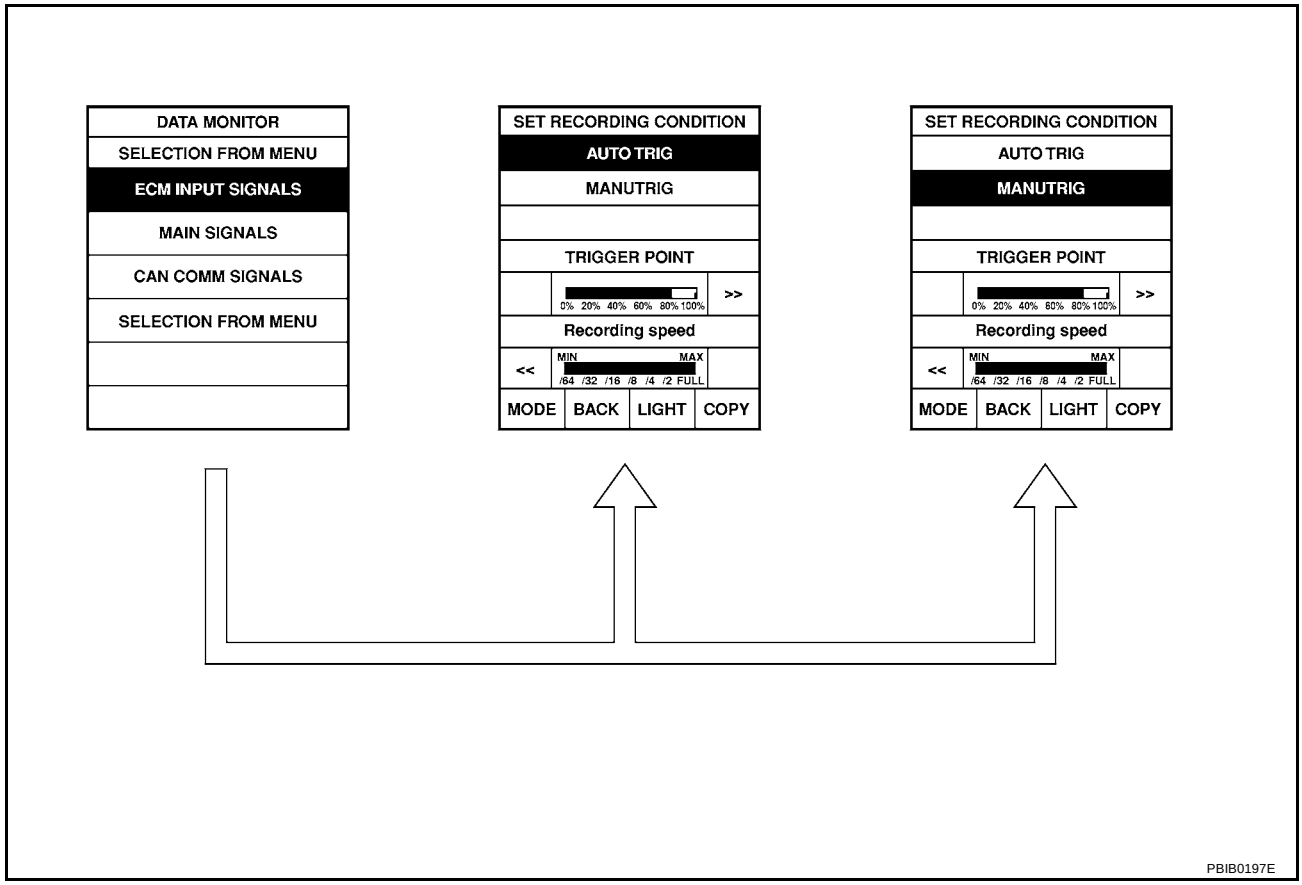


2. “MANU TRIG” (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.



Operation

1. “AUTO TRIG”
   - While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in GI-23.)
2. “MANU TRIG”
   - If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



PBIB0197E

CONSULT-II Reference Value in Data Monitor Mode

EBS00KF1

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	75% - 125%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1 ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T models) Neutral (M/T models)	ON
		Shift lever: Except above	OFF

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	M/T: 8°±5° BTDC A/T: 10°±5° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s
PURG VOL C/V	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
THRTL RELAY	● Ignition switch: ON		ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm (M/T models) Below 3,200 rpm (A/T models)		ON
	● Engine speed: Above 3,600 rpm (M/T models) Above 3,200 rpm (A/T models)		OFF
HO2S2 HTR (B1)	● Engine speed: Below 3,800 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load		ON
	● Engine speed: Above 3,800 rpm		OFF
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,280 km (0 - 40,565 mile)
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80° (176°F) ● Engine speed: Below 3,600 rpm (M/T models) Below 3,200 rpm (A/T models)		Approx. 50%
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
CAN COMM	● Ignition switch: ON		OK
CAN CIRC 1			OK
CAN CIRC 2			OK or UNKWN
CAN CIRC 3			UNKWN
CAN CIRC 4			OK
CAN CIRC 5			UNKWN
CAN CIRC 6			OK
CAN CIRC 7			UNKWN

*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

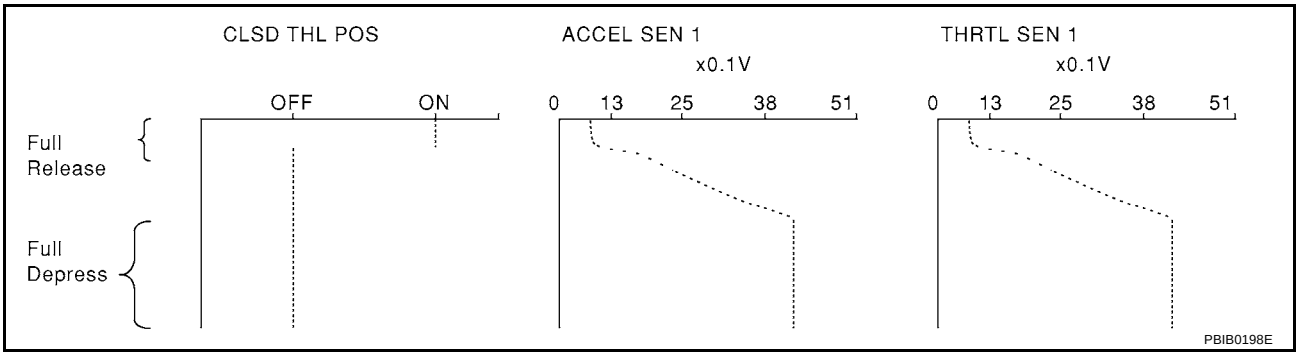
Major Sensor Reference Graph in Data Monitor Mode

EBS00KF2

The following are the major sensor reference graphs in “DATA MONITOR” mode.

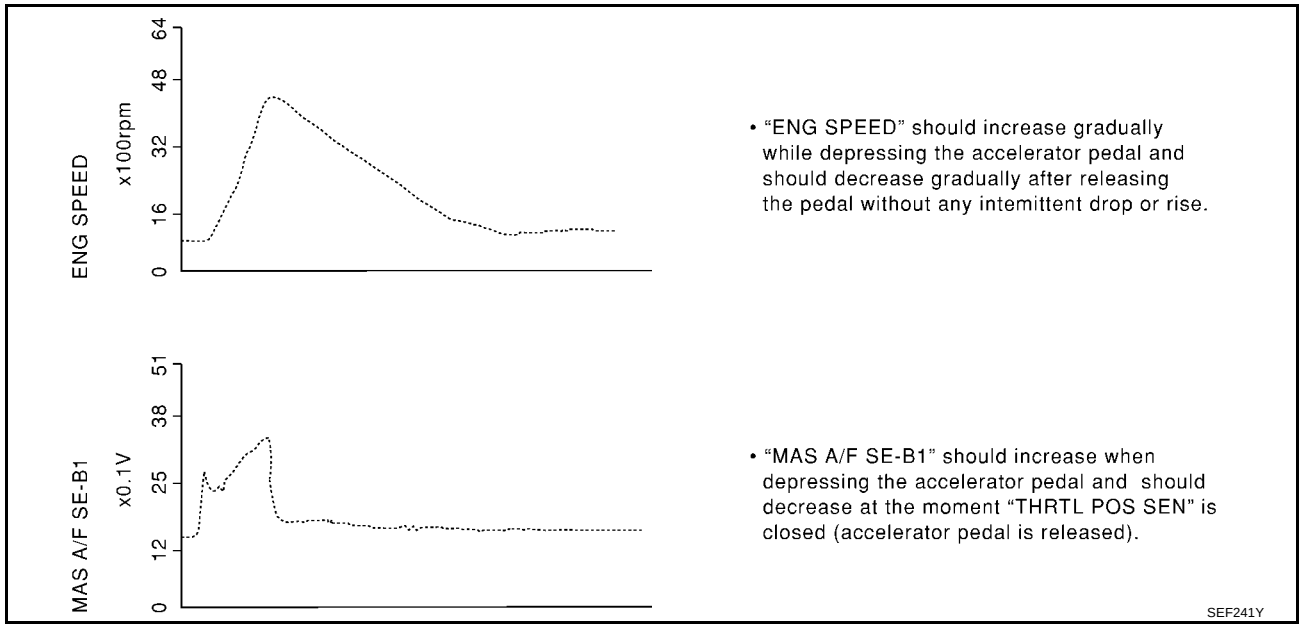
CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

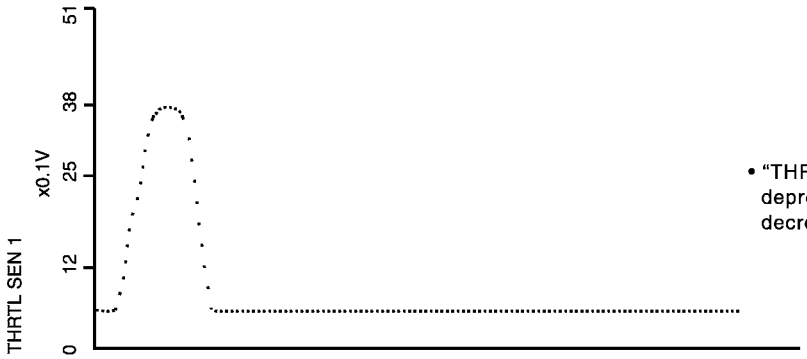
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position (A/T models) or with shift lever in “1st” position (M/T models).
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.



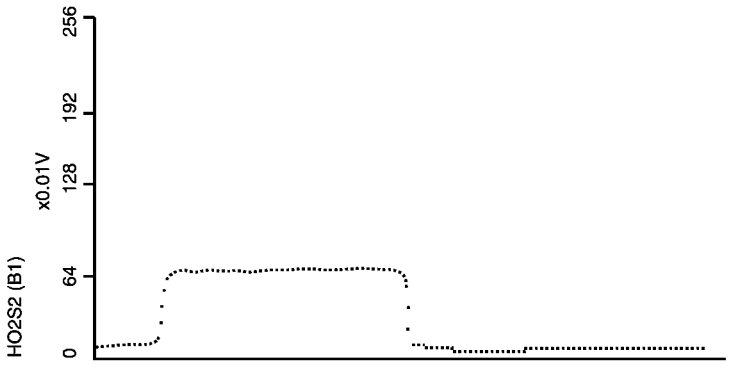
ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.

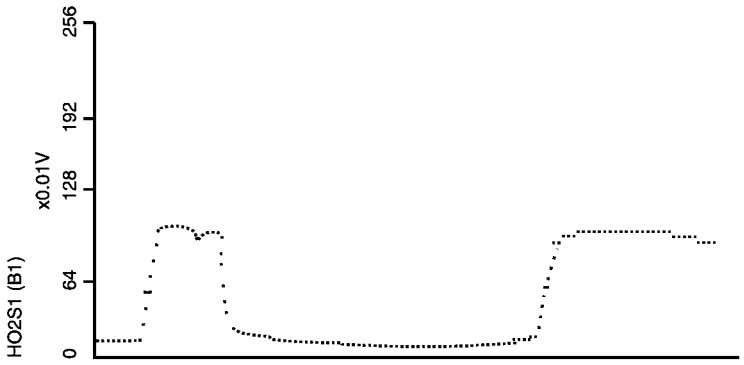




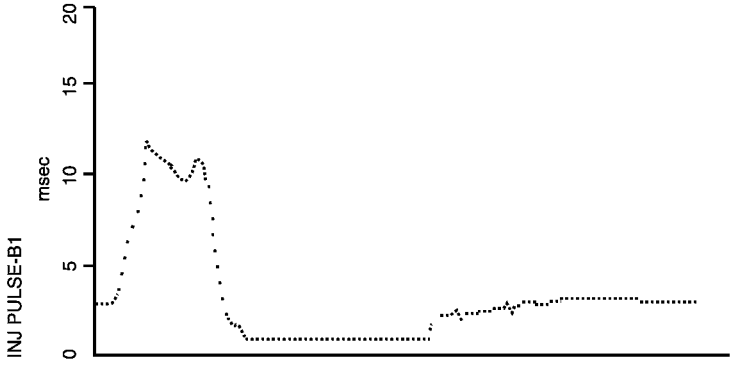
• "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

EBS00KF3

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MI.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

EBS00KF4

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.983 - 1.043 bar, 1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

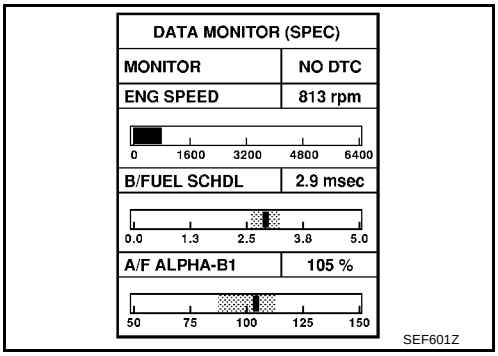
*1: For A/T models, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
For M/T models, after the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

Inspection Procedure

EBS00KF5

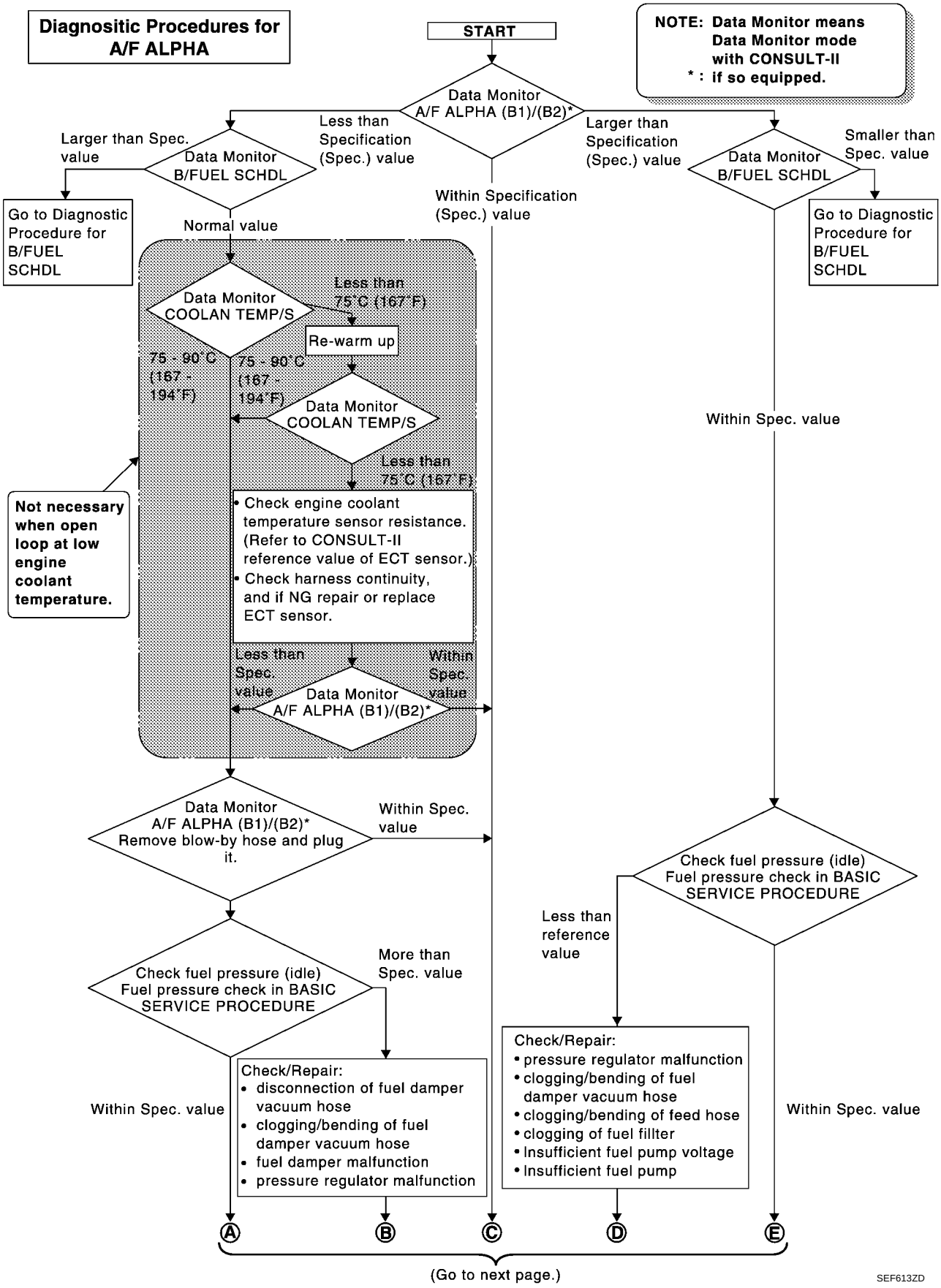
NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

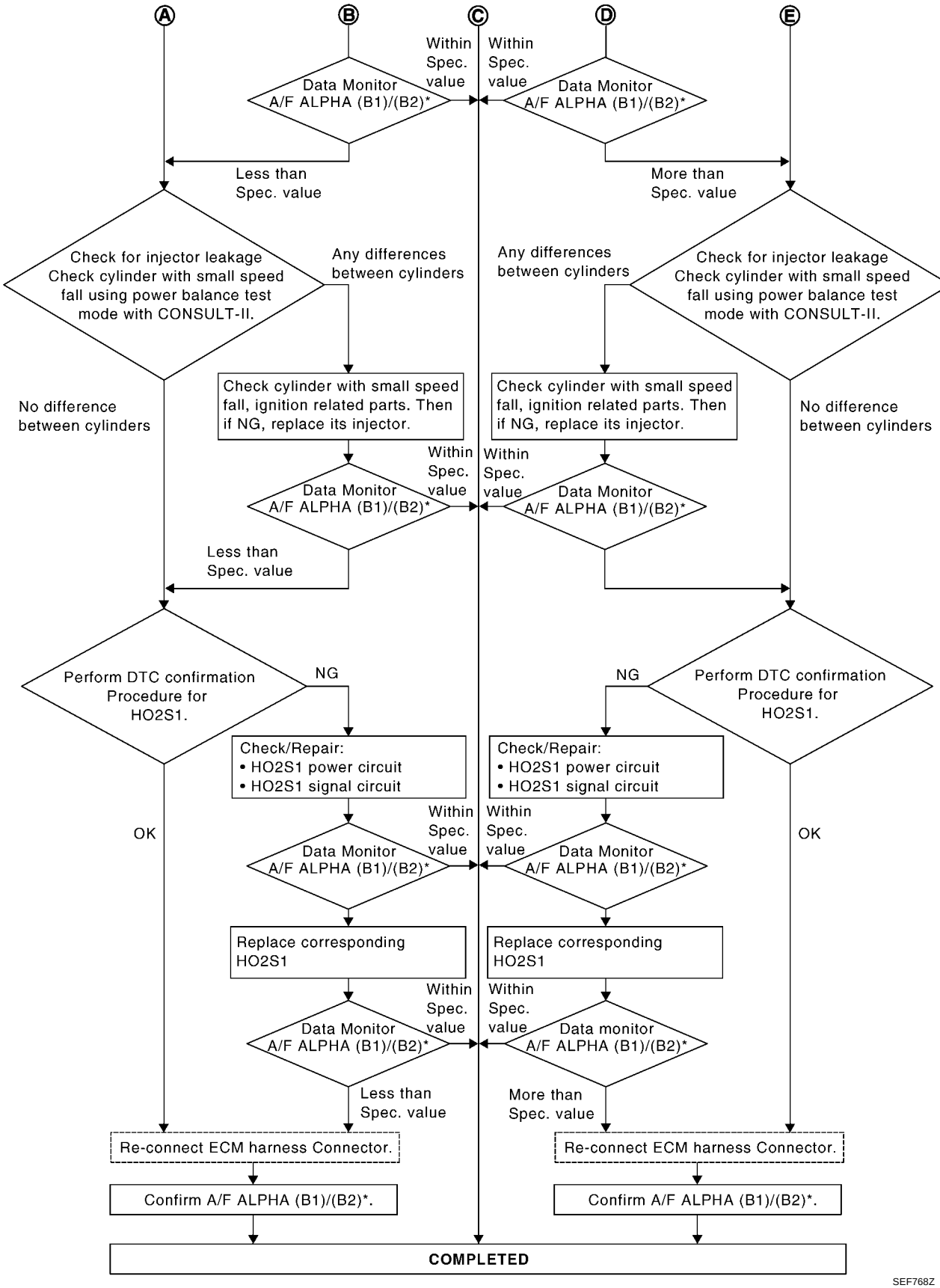
1. Perform EC-443, "Basic Inspection" .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-482, "Diagnostic Procedure" .

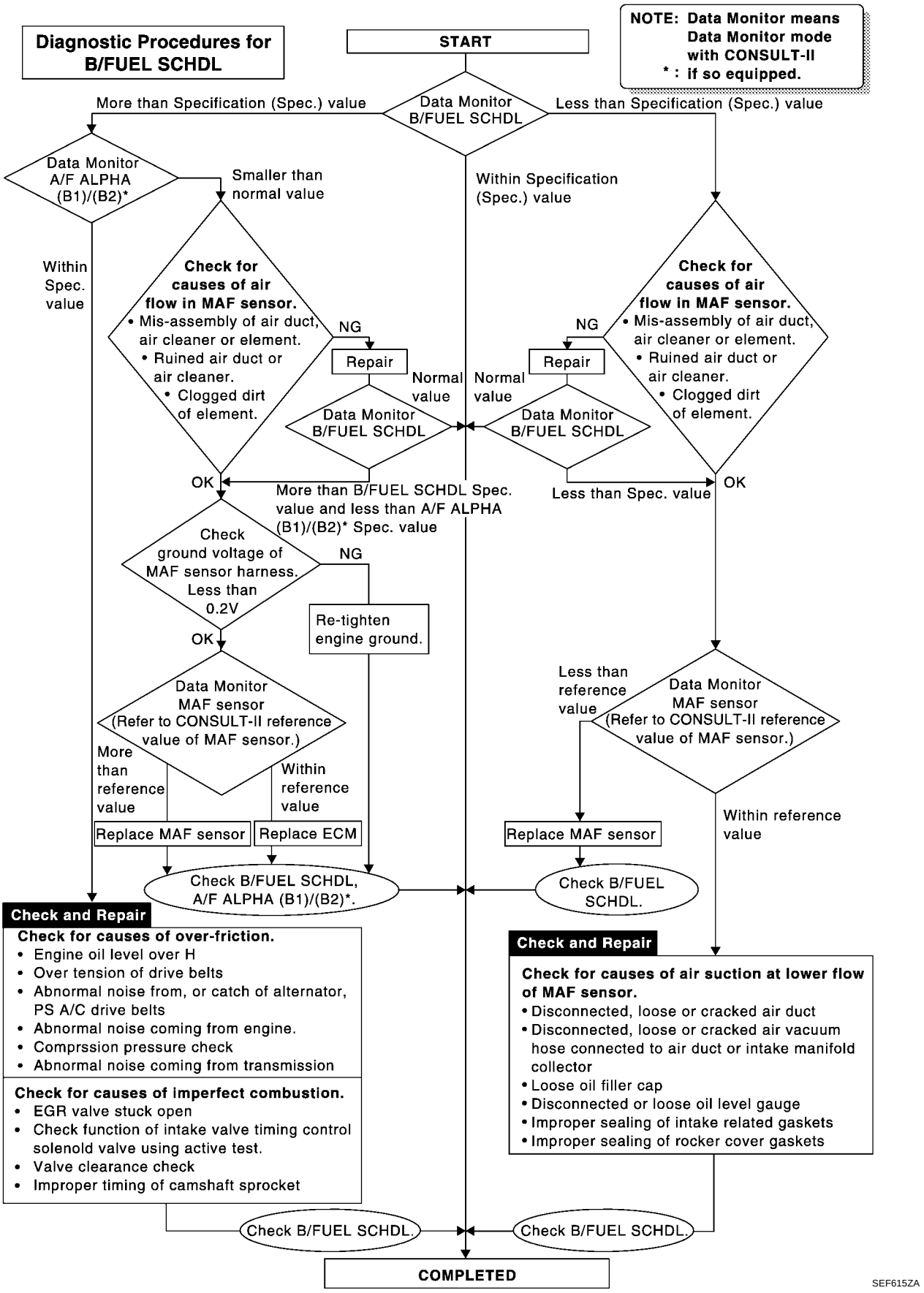


Diagnostic Procedure

EBS00KF6




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Perform DTC confirmation Procedure for HO2S1.
NG
OK
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
Replace corresponding HO2S1
Data monitor A/F ALPHA (B1)/(B2)*
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED
SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
Re-tighten engine ground.
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Less than reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check B/FUEL SCHDL.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check and Repair
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

EBS00KF7

Intermittent incidents (I/I) may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “[1t]”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the malfunctioning area.

Diagnostic Procedure

EBS00KF8

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-430, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-23, “Incident Simulation Tests”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-23, “Incident Simulation Tests”.

OK or NG

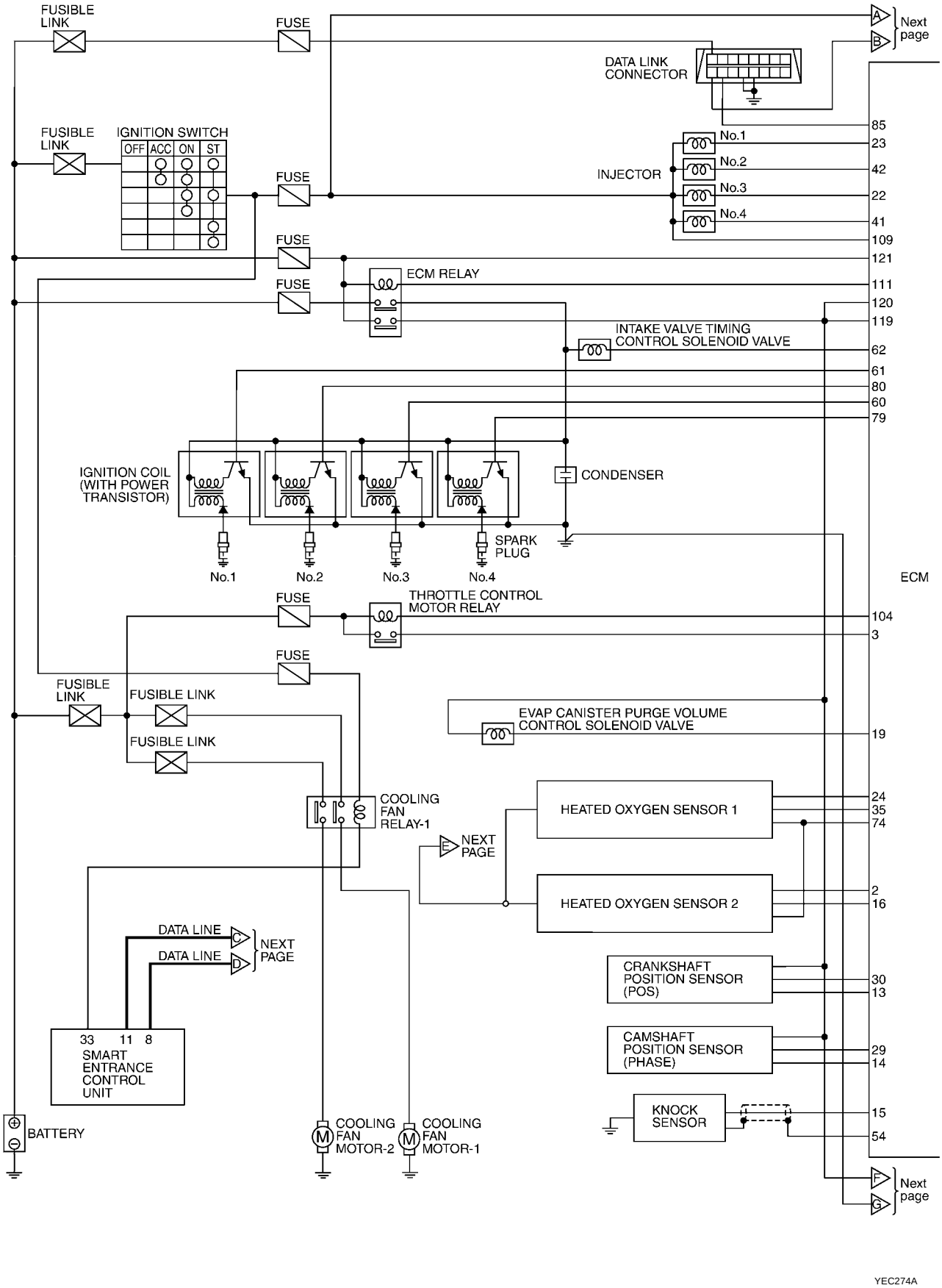
OK >> **INSPECTION END**
NG >> Repair or replace.

POWER SUPPLY CIRCUIT FOR ECM

PFP:24110

Wiring Diagram

EBS00KF9



YEC274A

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)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● More than a few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00KFA

1. INSPECTION START

Start engine.

Is engine running?

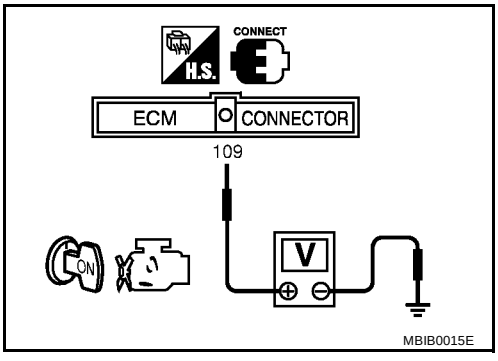
Yes or No

Yes >> GO TO 10.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and fuse

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

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

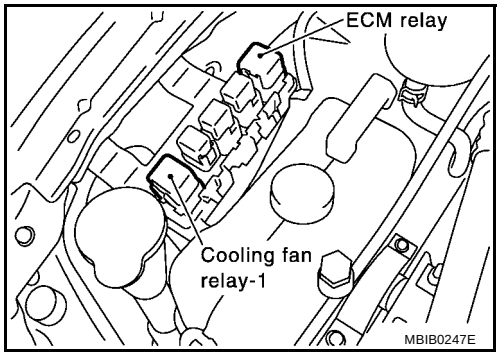
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

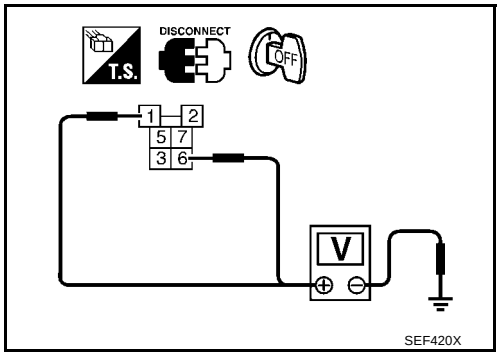
5. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminals 1 and 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- 15A fuse
- Harness for open or short between ECM relay and battery

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

7. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between ECM and ECM relay

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

9. CHECK ECM RELAY

Refer to EC-491, "Component Inspection" .

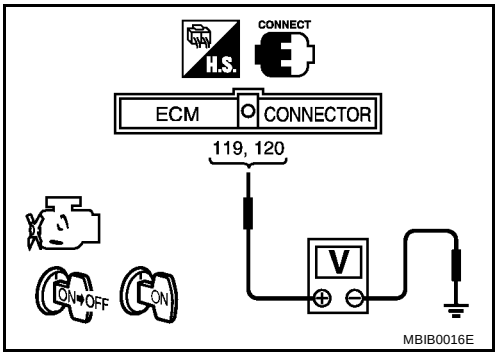
OK or NG

OK >> GO TO EC-660, "IGNITION SIGNAL" .
NG >> Replace ECM relay.

10. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Stop engine and wait at least 10 seconds.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

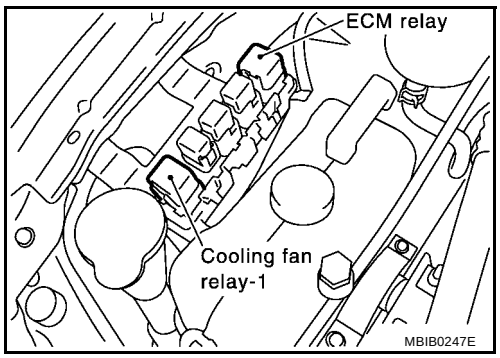


OK or NG

OK >> GO TO 14.
NG (Battery voltage does not exist.)>>GO TO 11.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 12.

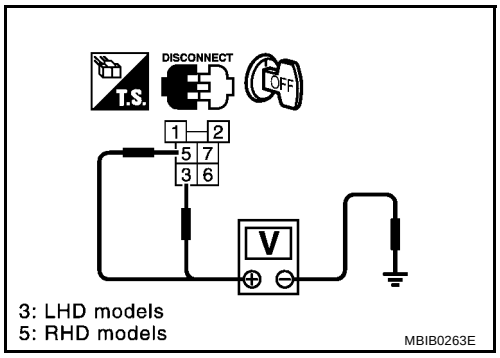
11. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 (LHD models) or 5 (RHD models) and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 119, 120 and ECM relay terminal 5 (LHD models) or 3 (RHD models).
   Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between ECM and ECM relay

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

14. CHECK ECM RELAY

Refer to EC-491, "Component Inspection" .

OK or NG

OK >> GO TO 15.
NG >> Replace ECM relay.

15. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to power in harness or connectors.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

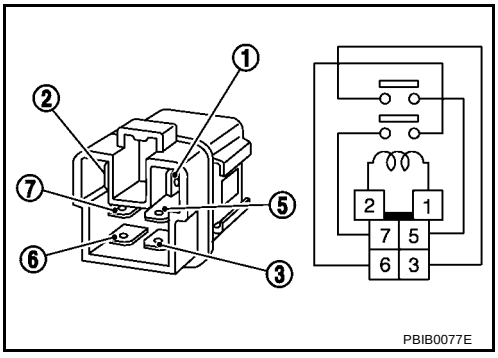
EBS00KFB

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

EBS00KFC

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

EBS00KFD

The MI will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000*1 1000*1	CAN communication line	● ECM cannot communicate to other control units. ● ECM cannot communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted.)
U1001*2 1001 *2			

***1: This self-diagnosis has the one trip detection logic.**
***2: The MI will not light up for this diagnosis.**

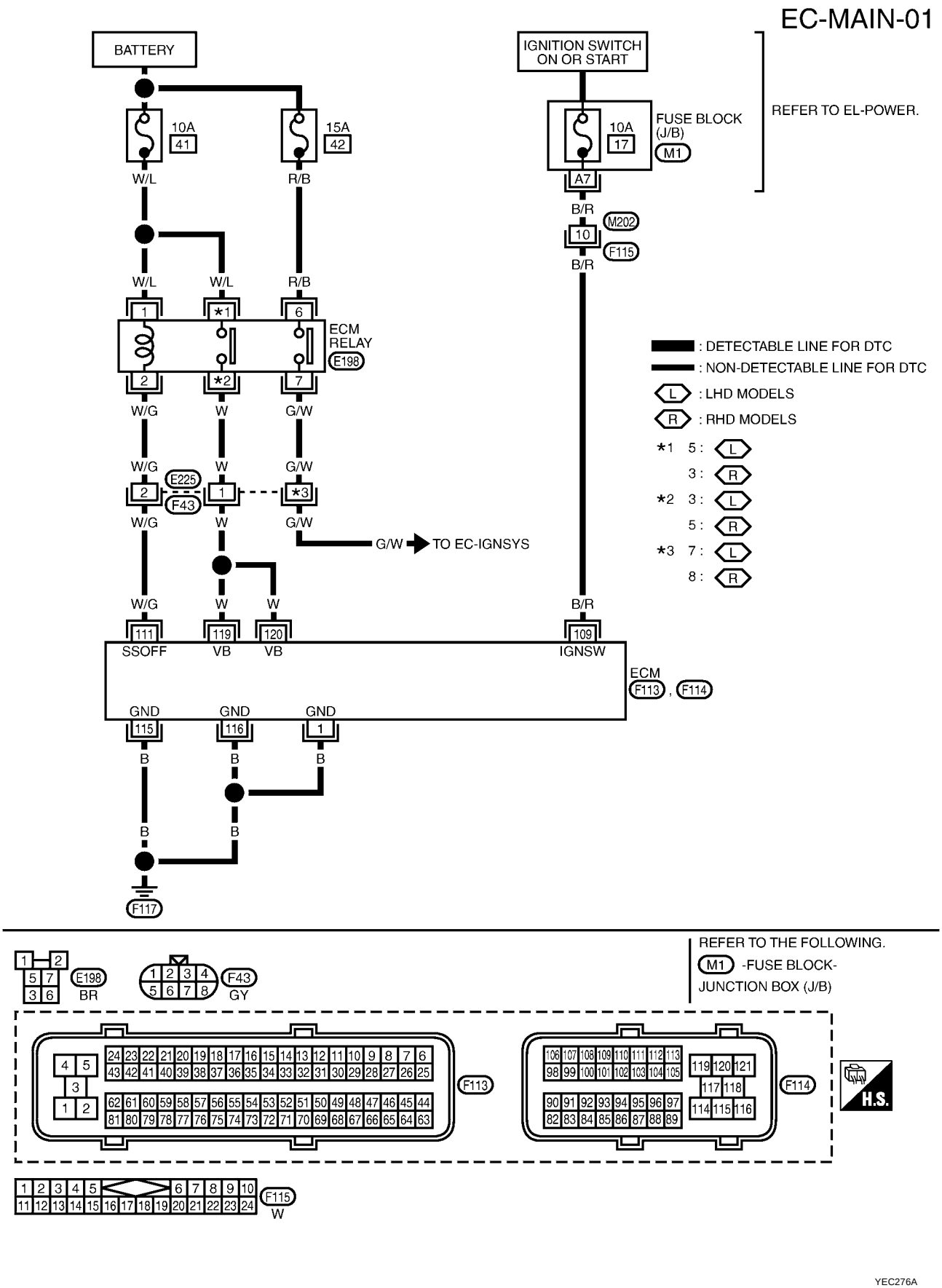
DTC Confirmation Procedure

EBS00KFE

1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-494, "Diagnostic Procedure" .

Wiring Diagram

EBS00KFF



YEC276A

Diagnostic Procedure

EBS00KFG

1. INSPECTION START

1. Turn ignition switch “ON”.
2. Select “CAN DIAG SUPPORT MNTR” in “DATA MONITOR” mode with CONSULT-II.
3. Print out the CONSULT-II screen.

A/T models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	OK
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0180E

M/T models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0179E

>> Go to EL-509.

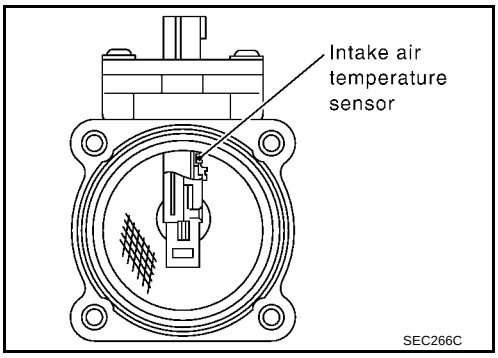
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

EBS00KFH

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KFI

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

EBS00KFJ

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

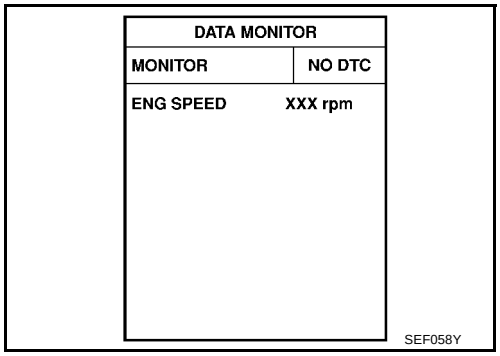
EBS00KFK

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.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-498, "Diagnostic Procedure" .



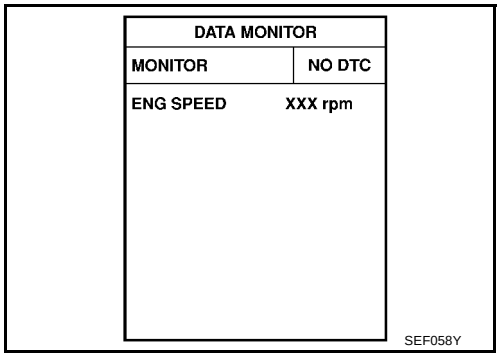
Without CONSULT-II

1. Start engine and wait 5 seconds at most.
2. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-498, "Diagnostic Procedure" .

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-498, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-498, "Diagnostic Procedure" .



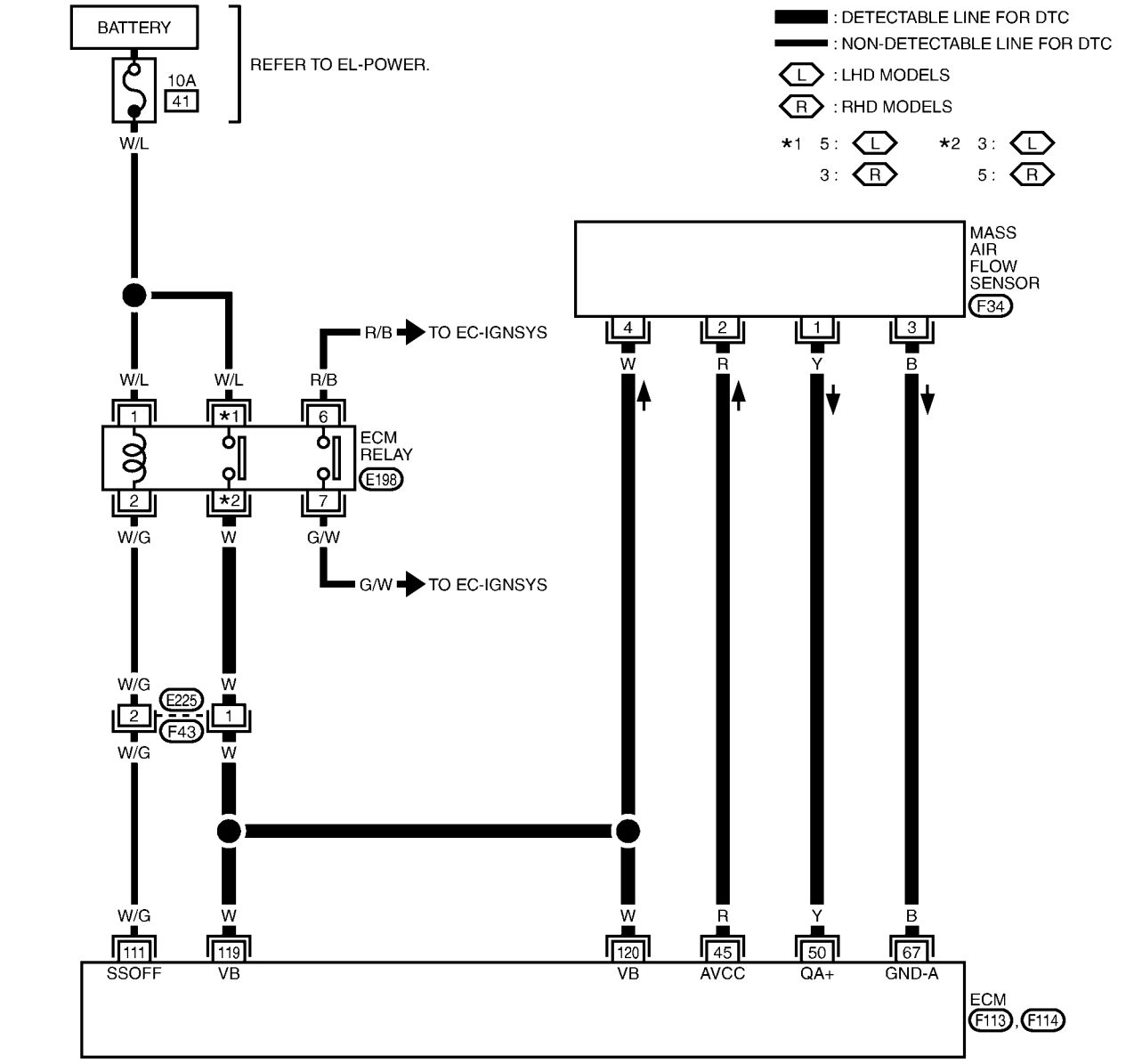
Without CONSULT-II

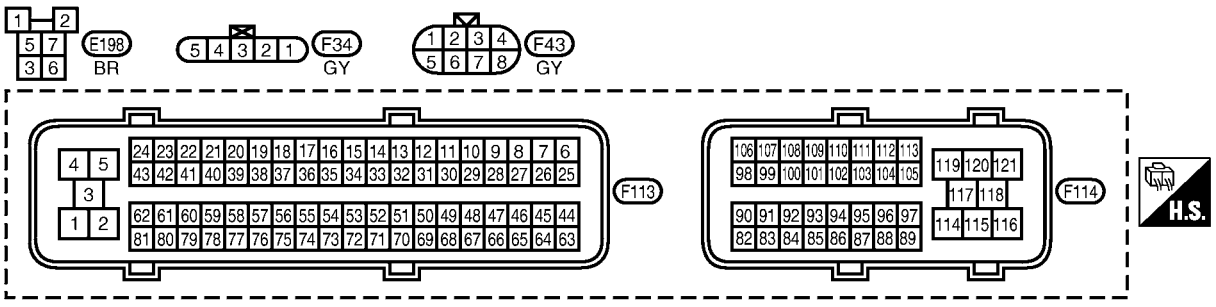
1. Turn ignition switch “ON” and wait at least 5 seconds.
2. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-498, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and wait at least 5 seconds.
7. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
8. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
9. If DTC is detected, go to EC-498, "Diagnostic Procedure" .

Wiring Diagram

EBS00KFL

EC-MAFS-01





YEC278A

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)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00KFM

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

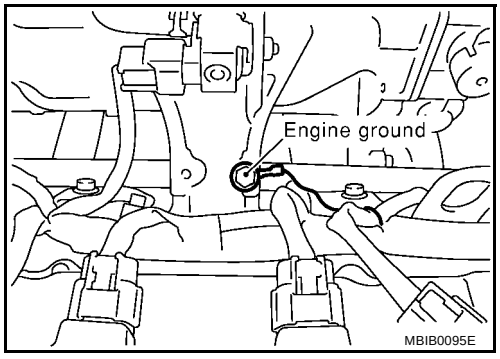
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

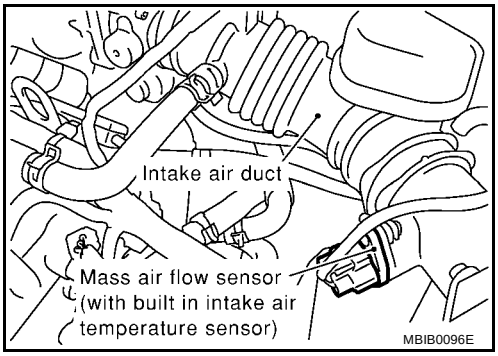
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



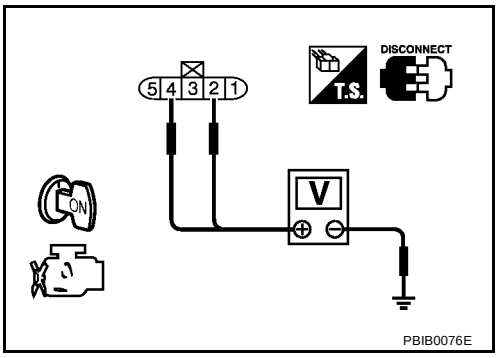
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

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

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67.
   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 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 50. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-500, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

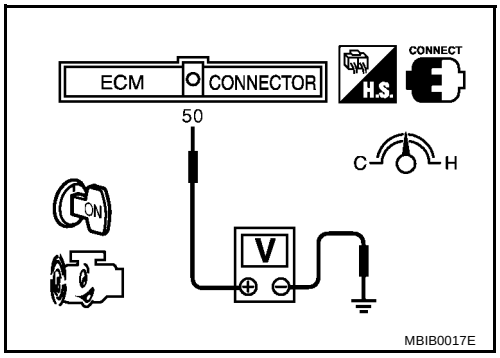
EBS00KFN

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

EBS00KFO

MASS AIR FLOW SENSOR

Refer to EM-14, "AIR CLEANER AND AIR DUCT" .

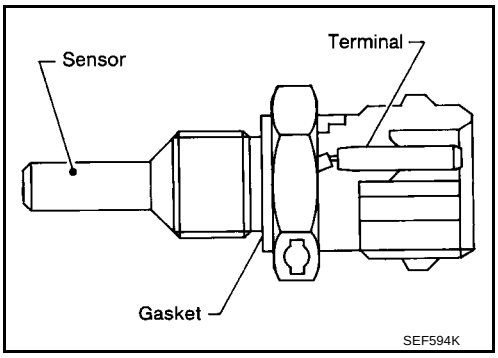
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

EBS00KFP

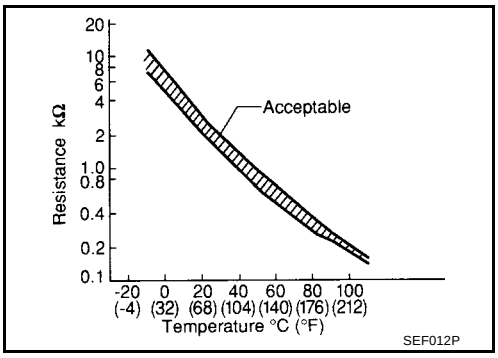
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) 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.

On Board Diagnosis Logic

EBS00KFQ

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

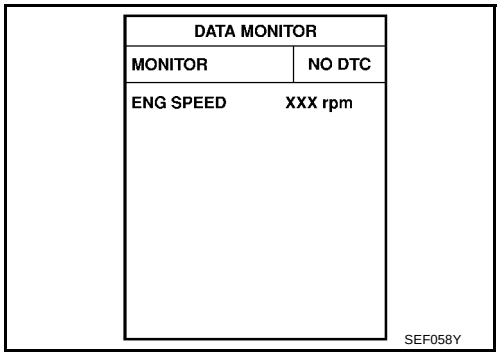
DTC Confirmation Procedure

EBS00KFR

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”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-504, "Diagnostic Procedure" .



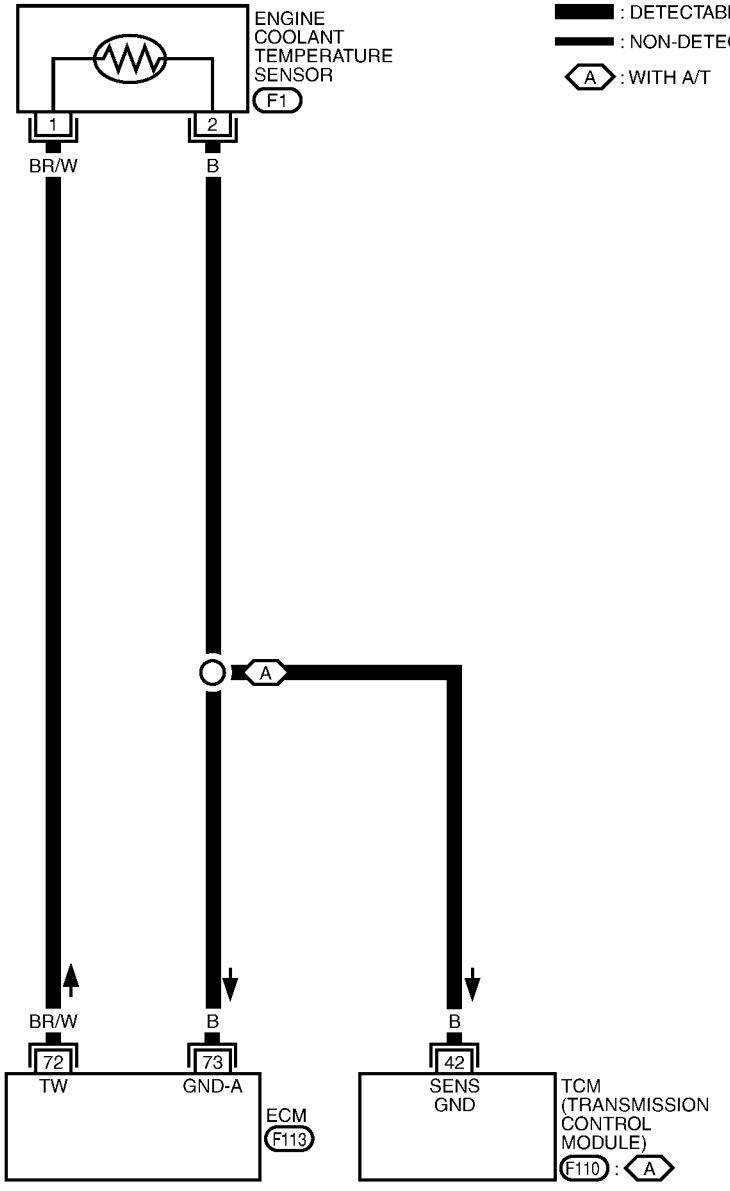
WITHOUT CONSULT-II

1. Turn ignition switch “ON” and wait at least 5 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-504, "Diagnostic Procedure" .

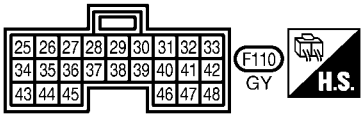
Wiring Diagram

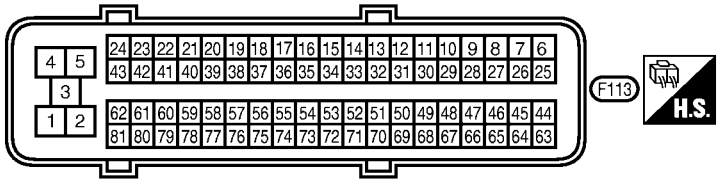
EBS00KFS

EC-ECTS-01









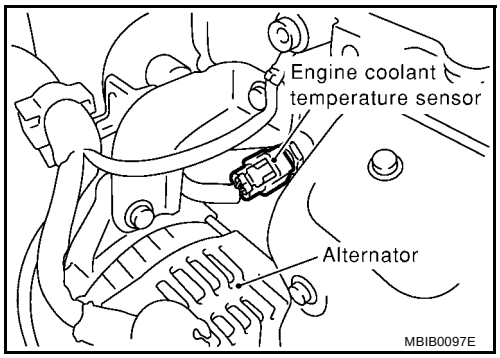
YEC280A

Diagnostic Procedure

EBS00KFT

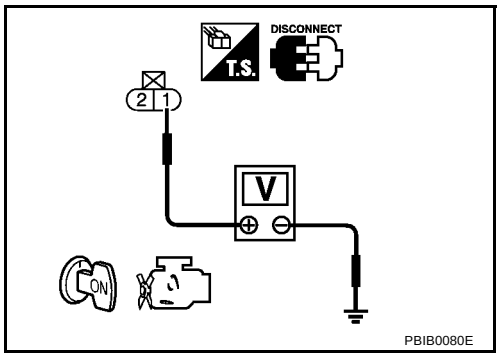
1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between engine coolant temperature sensor and ECM
- Harness for open or short between engine coolant temperature sensor and TCM (A/T models only)

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

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-505, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

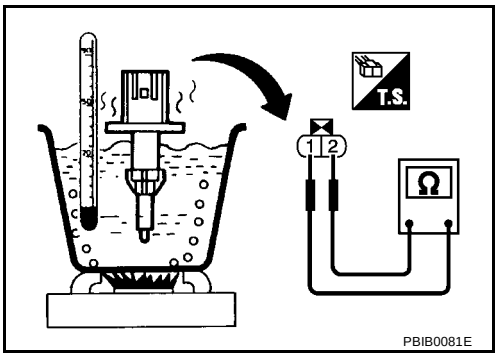
>> **INSPECTION END**

Component Inspection

EBS00KFU

ENGINE COOLANT TEMPERATURE SENSOR

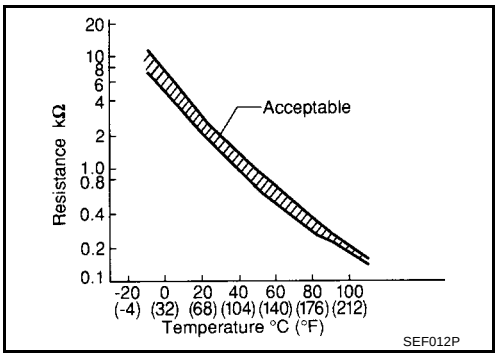
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

EBS00KFV

ENGINE COOLANT TEMPERATURE SENSOR

Refer to LC-15.

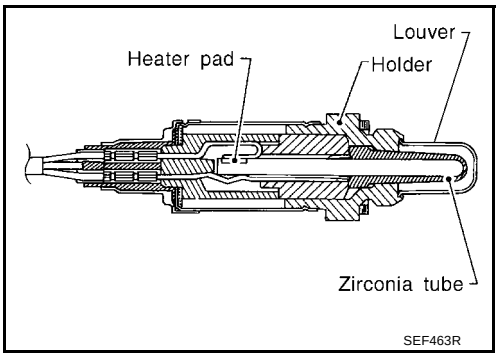
DTC P0132 HO2S1

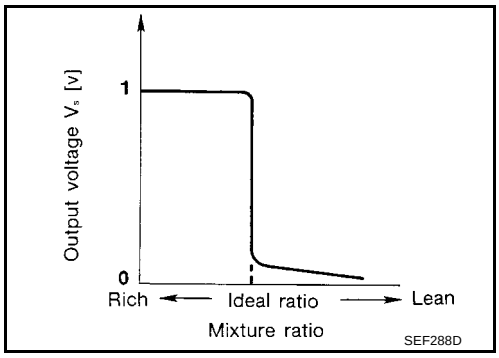
PFP:22690

Component Description

EBS00KFW

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00KFX

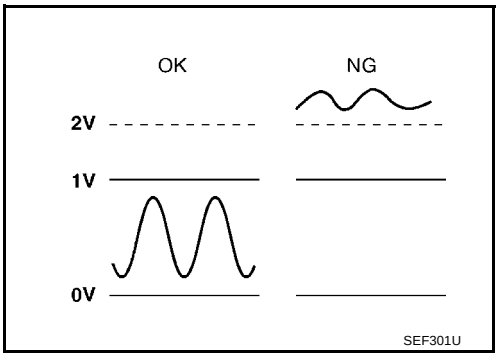
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00KFY

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132	Heated oxygen sensor 1 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 1

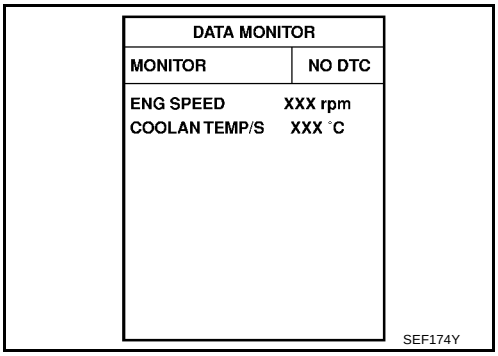
DTC Confirmation Procedure

EBS00KFZ

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. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-509, "Diagnostic Procedure" .



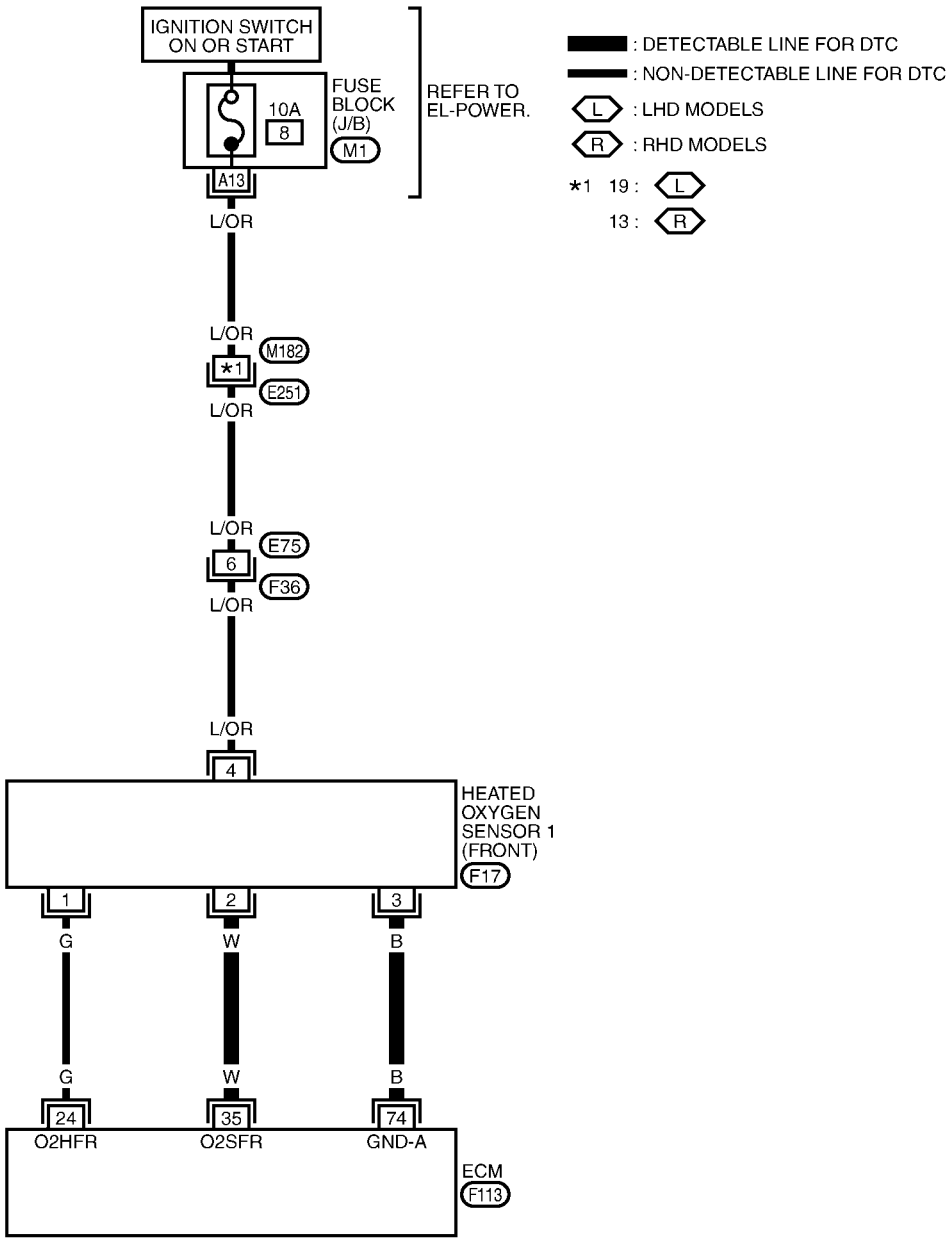
WITHOUT CONSULT-II

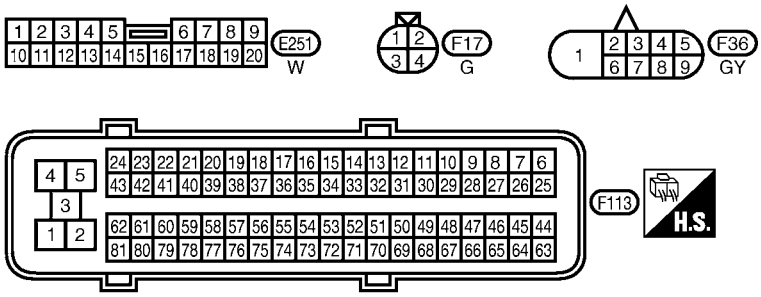
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6. If DTC is detected, go to EC-509, "Diagnostic Procedure" .

Wiring Diagram

EBS00KG0

EC-O2S1B1-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC281A

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)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

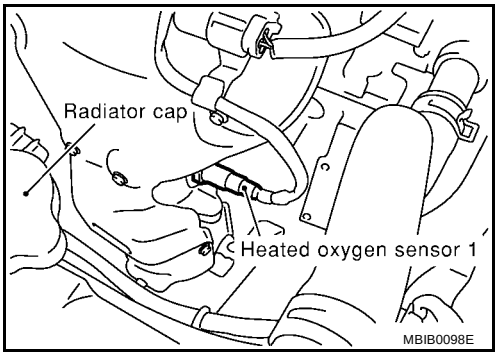
EBS00KG1

1. RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

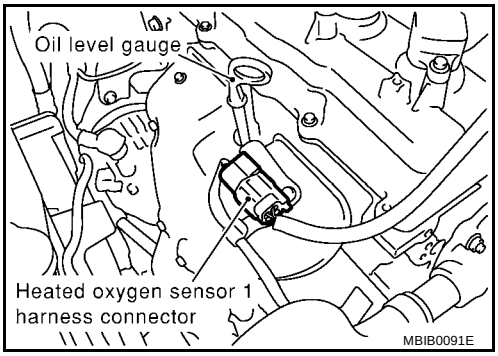
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

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 HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground.
   Refer to Wiring Diagram.

   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 HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 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 1

Refer to EC-510, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

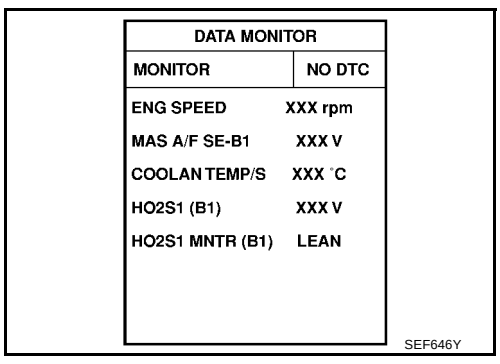
Component Inspection

EBS00KG2

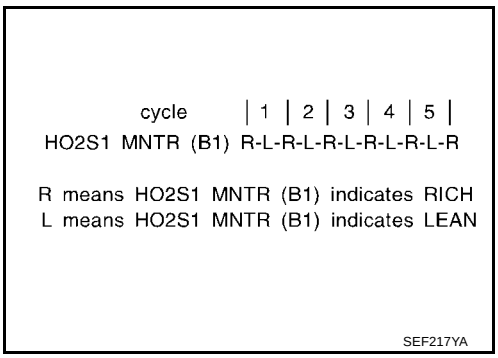
HEATED OXYGEN SENSOR 1

With CONSULT-II

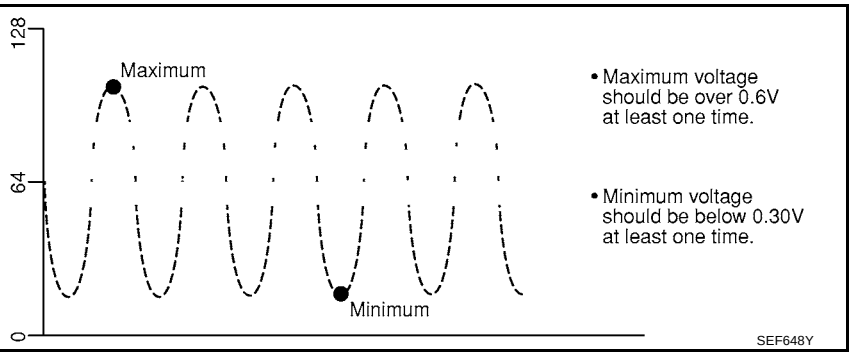
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - "HO2S1 (B1)" voltage goes above 0.6V at least once.
   - "HO2S1 (B1)" voltage goes below 0.3V at least once.
   - "HO2S1 (B1)" voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

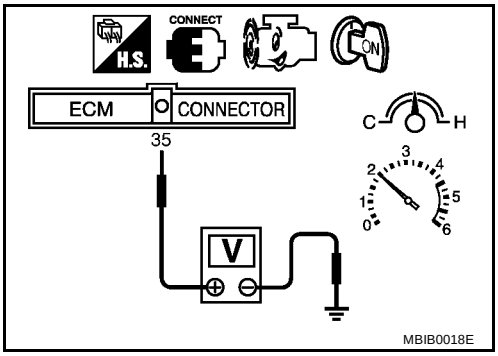


CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



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

EBS00KG3

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

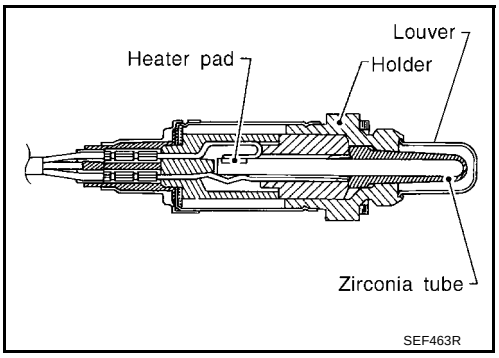
DTC P0134 HO2S1

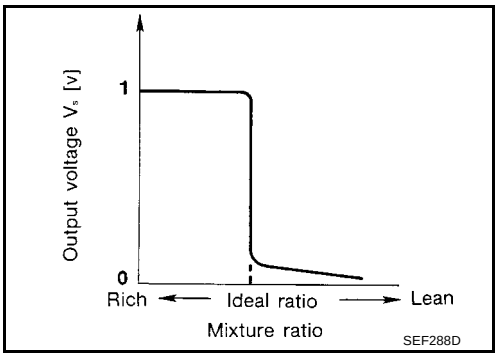
PFP:22690

Component Description

EBS00KG4

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00KG5

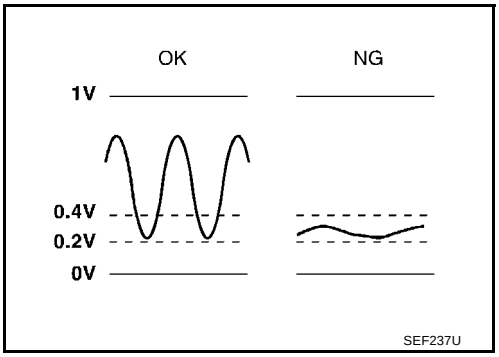
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00KG6

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

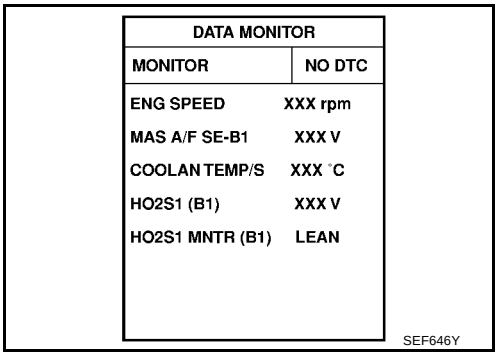
Overall Function Check

EBS00KG7

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” in “DATA MONITOR” mode with CONSULT-II, and select “HO2S1 (B1)”.
3. Hold engine speed at 2,000 rpm under no load.
4. Make sure that the indications do not remain in the range between 0.2 to 0.4V.
5. If NG, go to EC-515, "Diagnostic Procedure" .

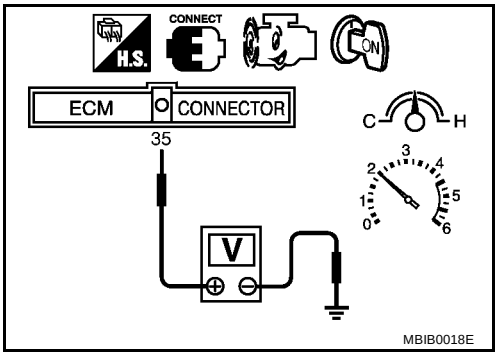


WITHOUT CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

– The voltage does not remain in the range of 0.2 - 0.4V.

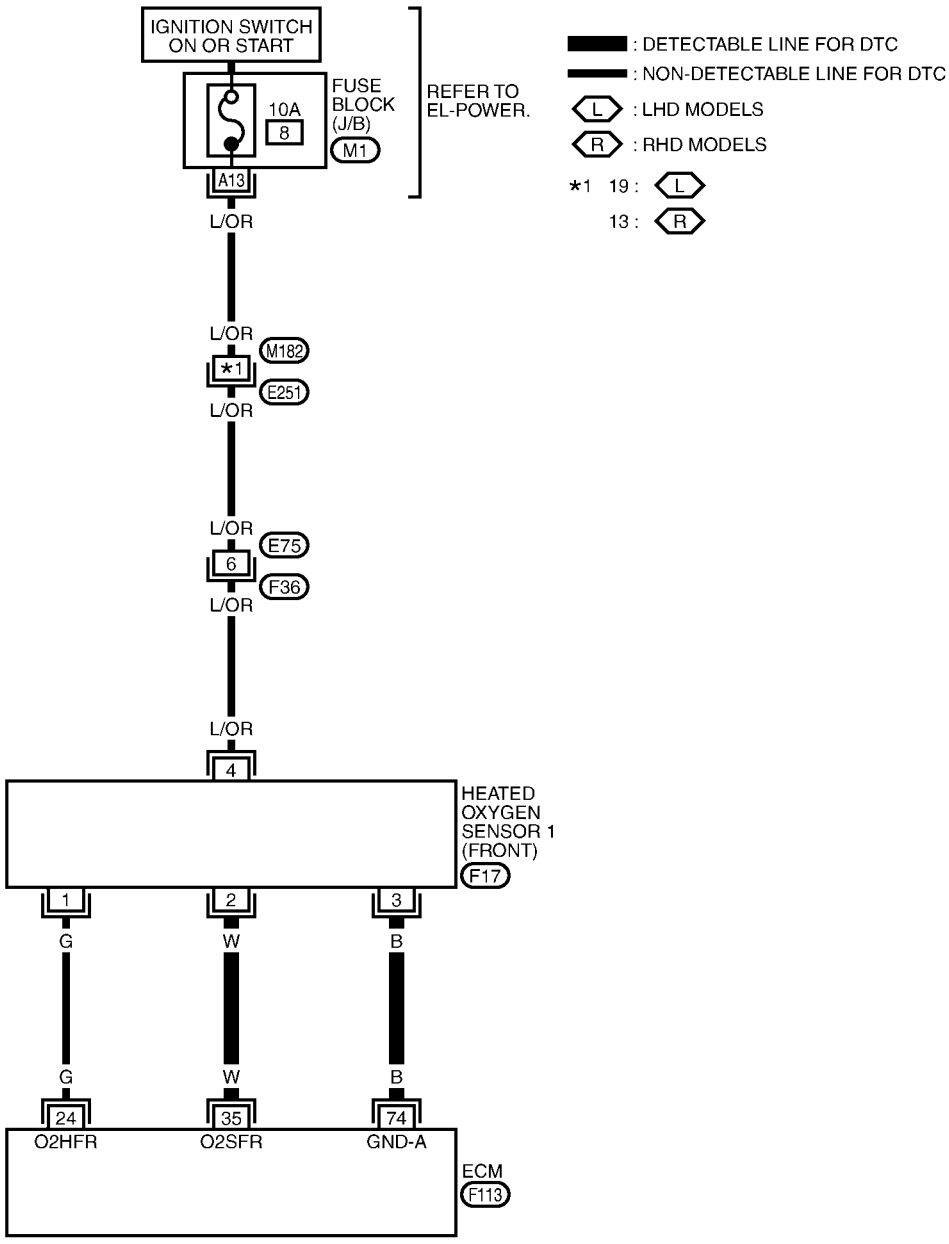
4. If NG, go to EC-515, "Diagnostic Procedure" .

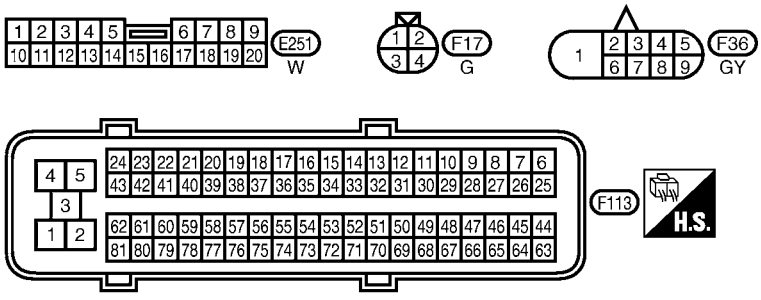


Wiring Diagram

EBS00KG8

EC-O2S1B1-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC281A

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)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

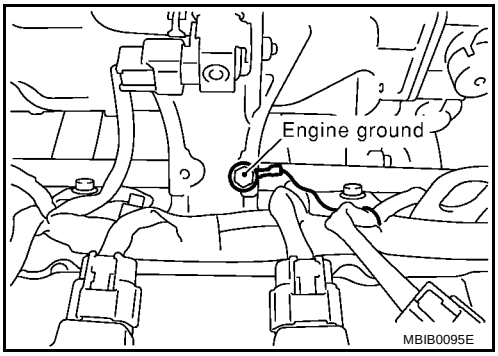
Diagnostic Procedure

EBS00KG9

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

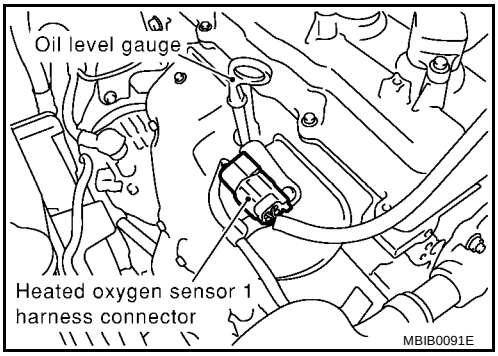
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

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 HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

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 HEATED OXYGEN SENSOR 1

Refer to EC-515, "Diagnostic Procedure" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KGA

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

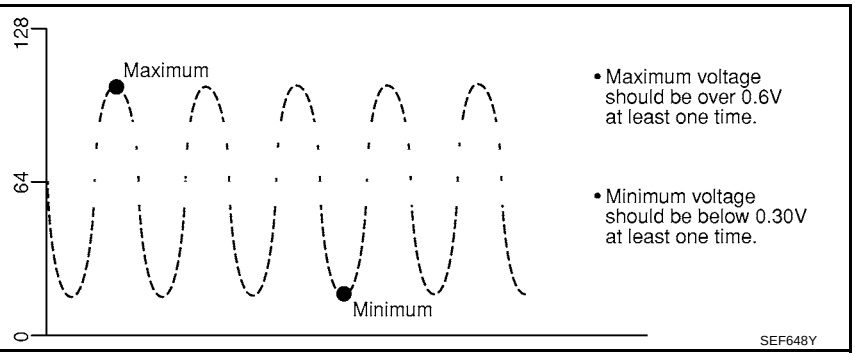
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



CAUTION:

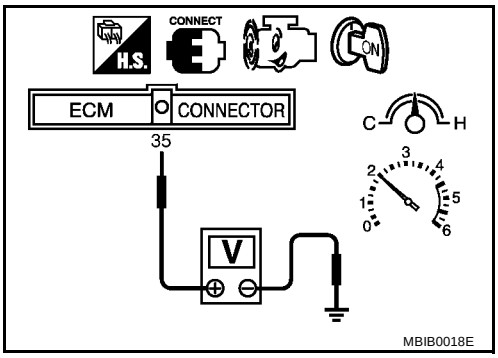
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **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 normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



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

EBS00KGB

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

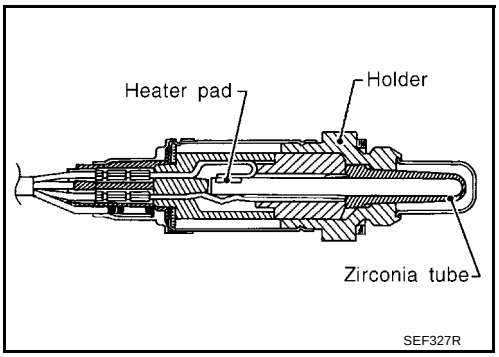
DTC P0138 HO2S2

PFP:226A0

Component Description

EBS00KGC

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen 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

EBS00KGD

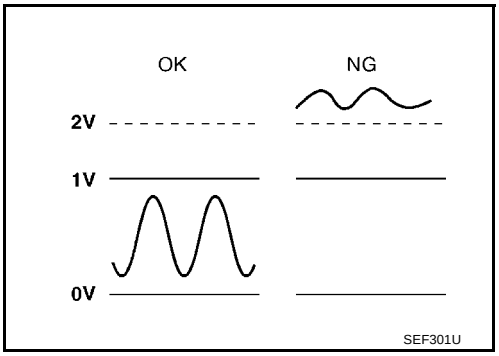
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	LEAN ⟷ RICH

On Board Diagnosis Logic

EBS00KGE

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) 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	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

DTC Confirmation Procedure

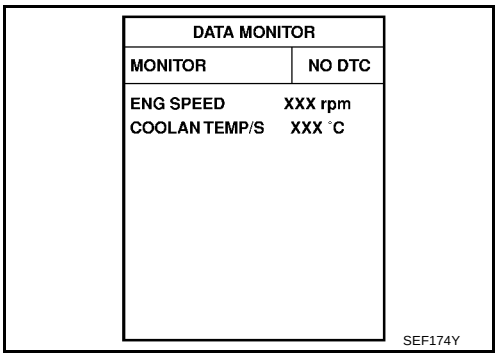
EBS00KGF

CAUTION:
Always drive vehicle at a safe speed.

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 one minute under no load.
5. Let engine idle for two minutes.
6. If 1st trip DTC is detected, go to EC-521, "Diagnostic Procedure" .



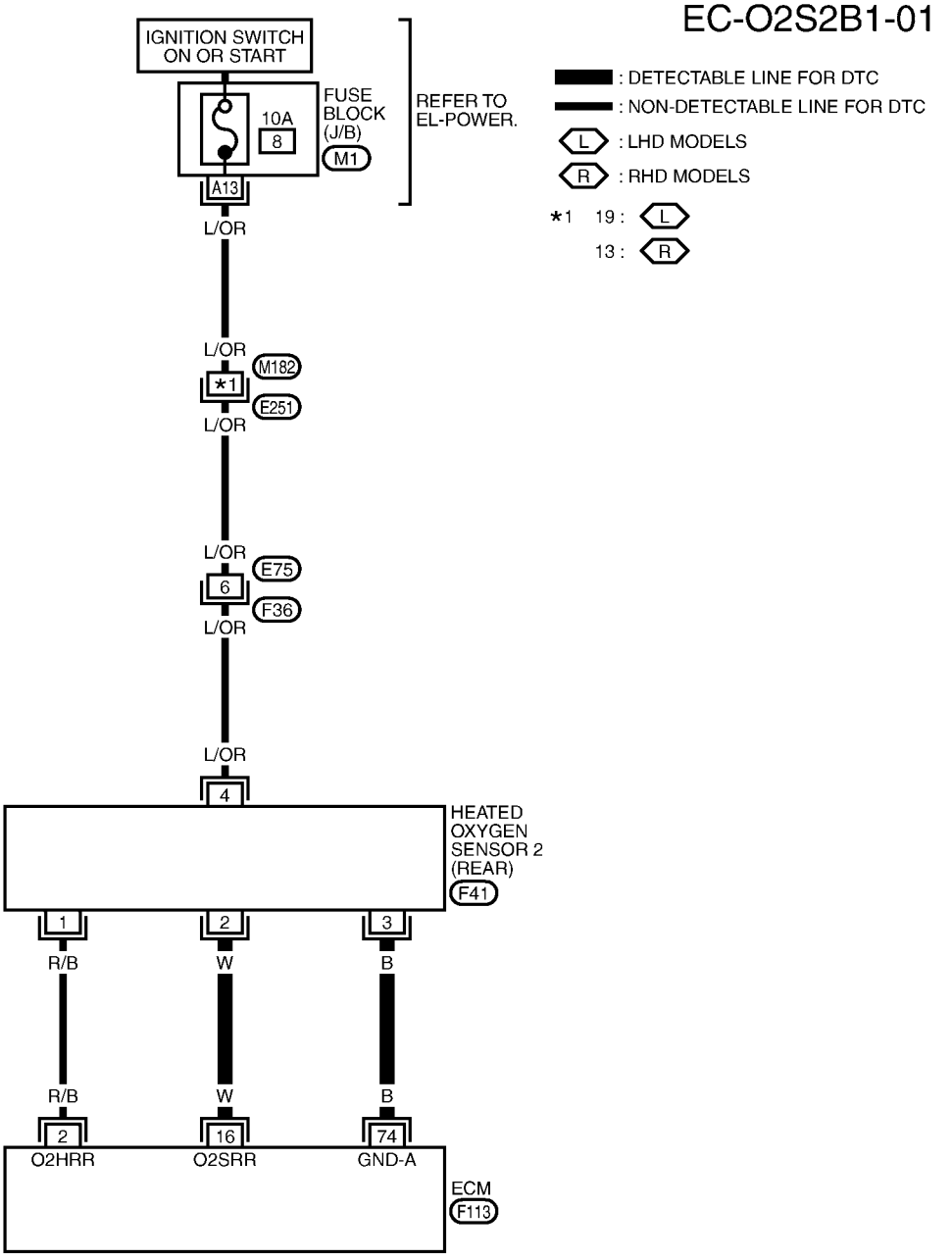
WITHOUT CONSULT-II

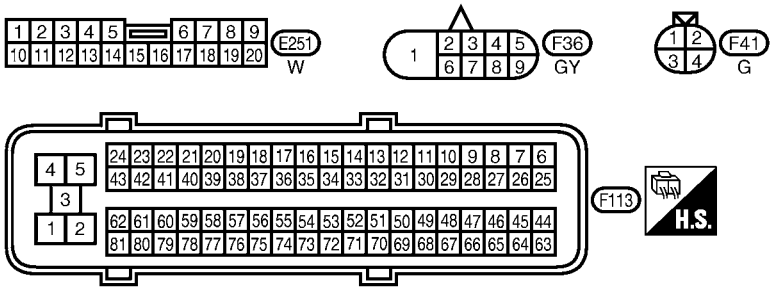
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under on load.
4. Let engine idle for two minutes.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under on load.
7. Let engine idle for two minutes.
8. Select “Mode 3” with GST.
9. If NG, go to EC-521, "Diagnostic Procedure" .

- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

EBS00KGG





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC283A

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)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 3,000 rpm quickly after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

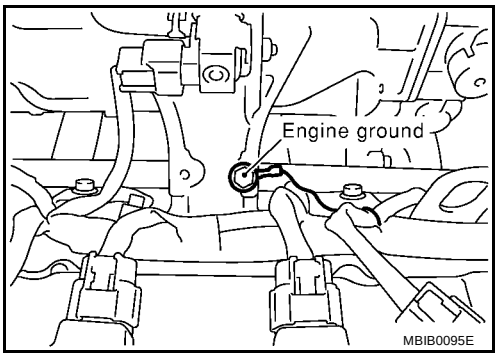
Diagnostic Procedure

EBS00KGH

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



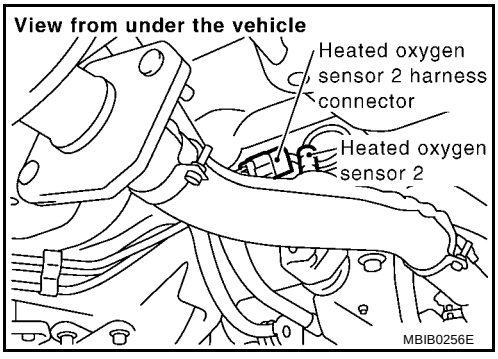
2. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 2 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   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 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   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.

OK or NG

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

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-522, "Component Inspection" .

OK or NG

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

6. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KGI

HEATED OXYGEN SENSOR 2

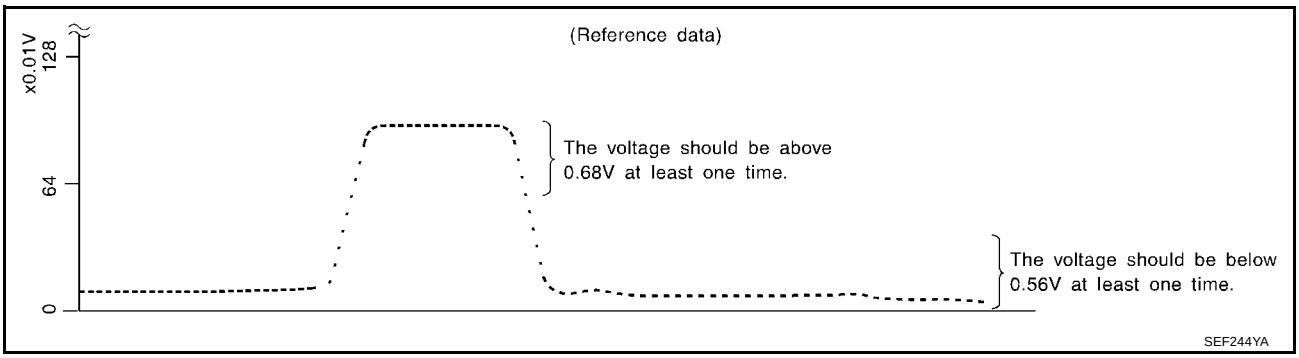
With CONSULT-II

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 one minute under no load.
4. Let engine idle for one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

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



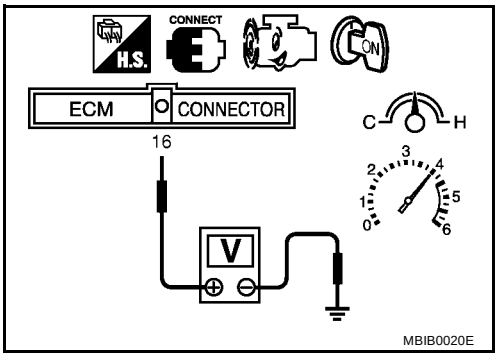
“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

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 one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.56V 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

EBS00KGJ

HEATED OXYGEN SENSOR 2

Refer to FE-10.

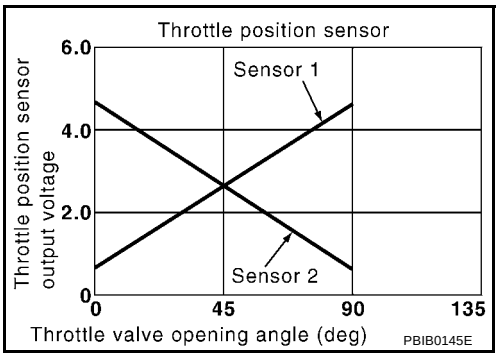
DTC P0221 TP SENSOR

PFP:16119

Component Description

EBS00KGK

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KGL

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T models) 1st (M/T models)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00KGM

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0221 0221	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

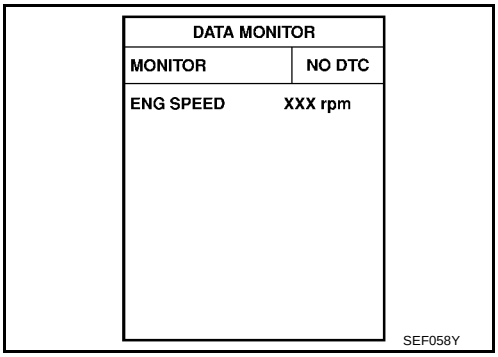
DTC Confirmation Procedure

EBS00KGN

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-527, "Diagnostic Procedure" .



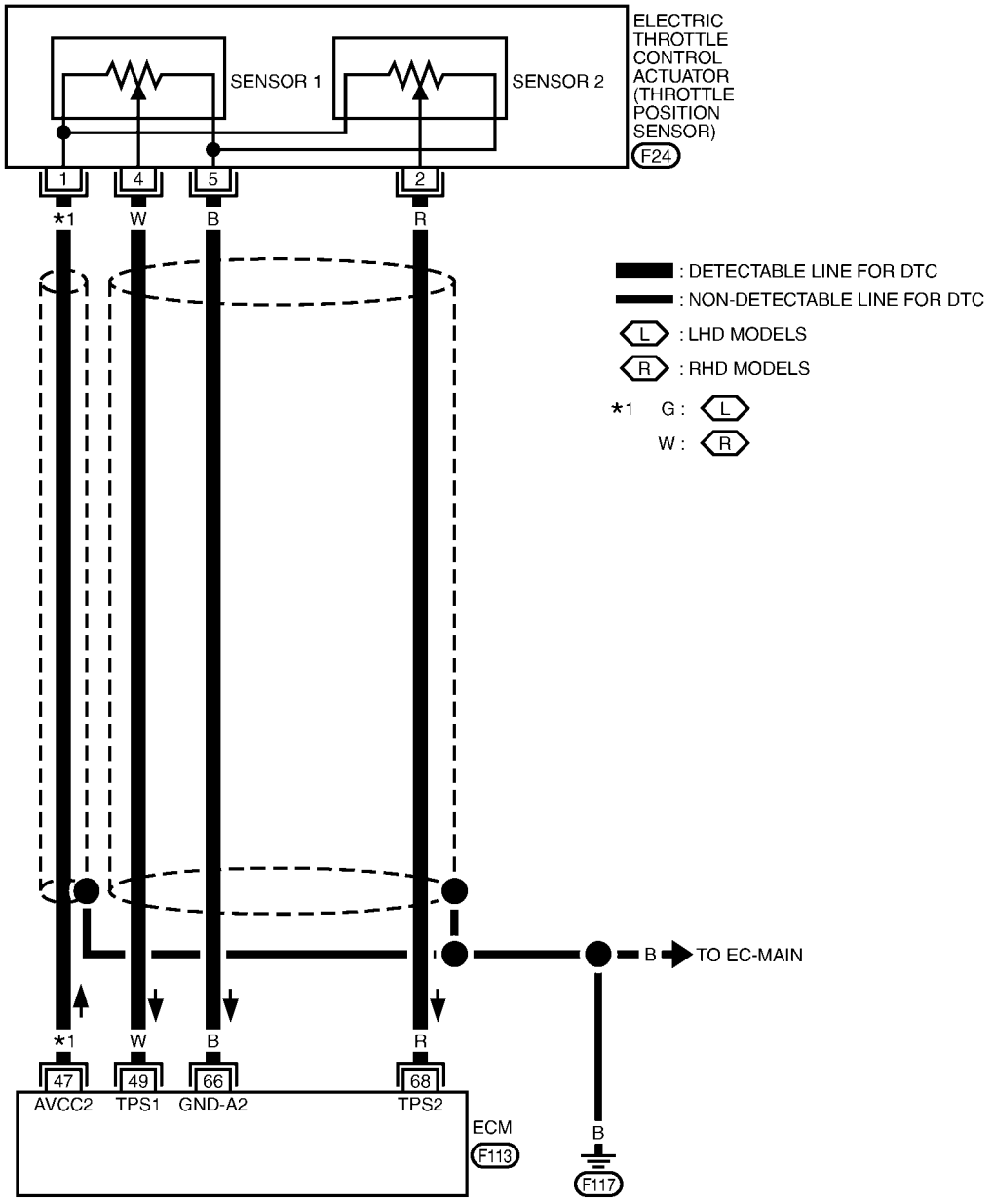
WITHOUT CONSULT-II

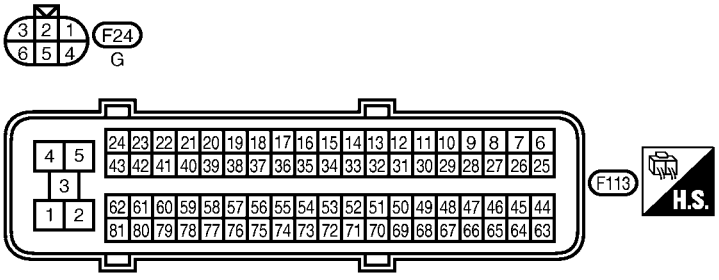
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-527, "Diagnostic Procedure" .

Wiring Diagram

EBS00KGO

EC-TPS3-01





YEC286A

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)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	More than 0.36V

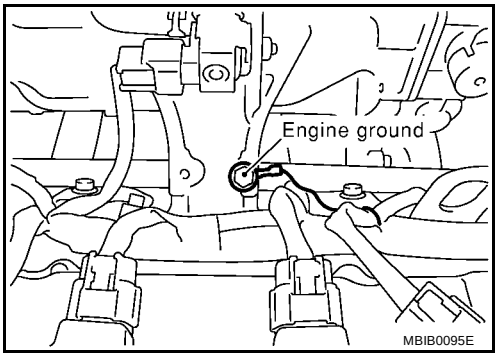
Diagnostic Procedure

EBS00KGP

1. RETIGHTEN GROUND SCREWS

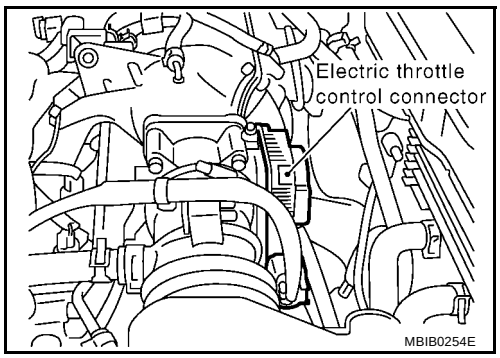
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

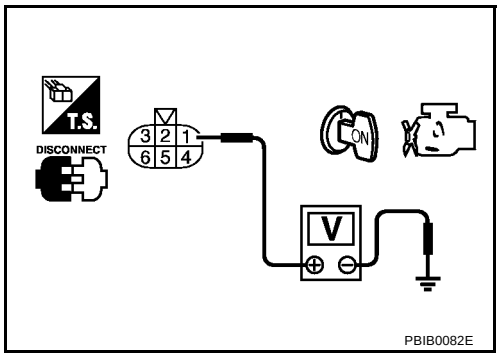


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

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 THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4, ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-529, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

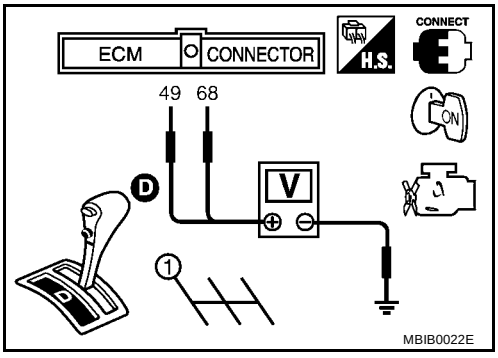
Component Inspection

EBS00KGQ

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-425, "Throttle Valve Closed Position Learning" .
8. Perform EC-425, "Idle Air Volume Learning" .

Removal and Installation

EBS00KGR

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

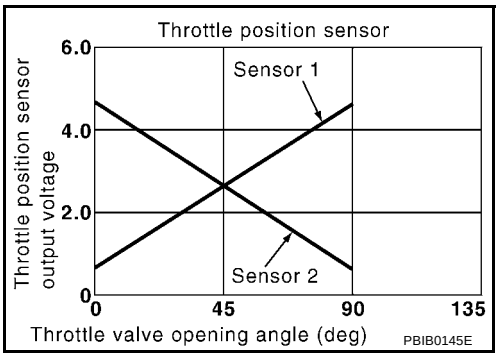
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

EBS00KGS

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KGT

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T models) 1st (M/T models)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00KGU

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

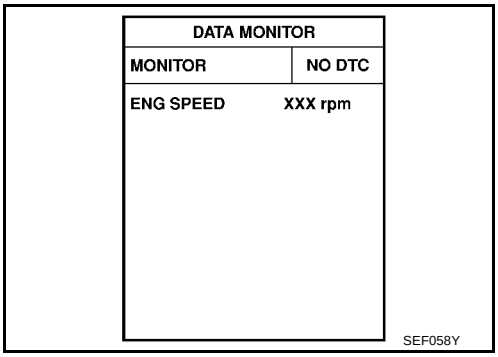
DTC Confirmation Procedure

EBS00KGV

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-533, "Diagnostic Procedure" .



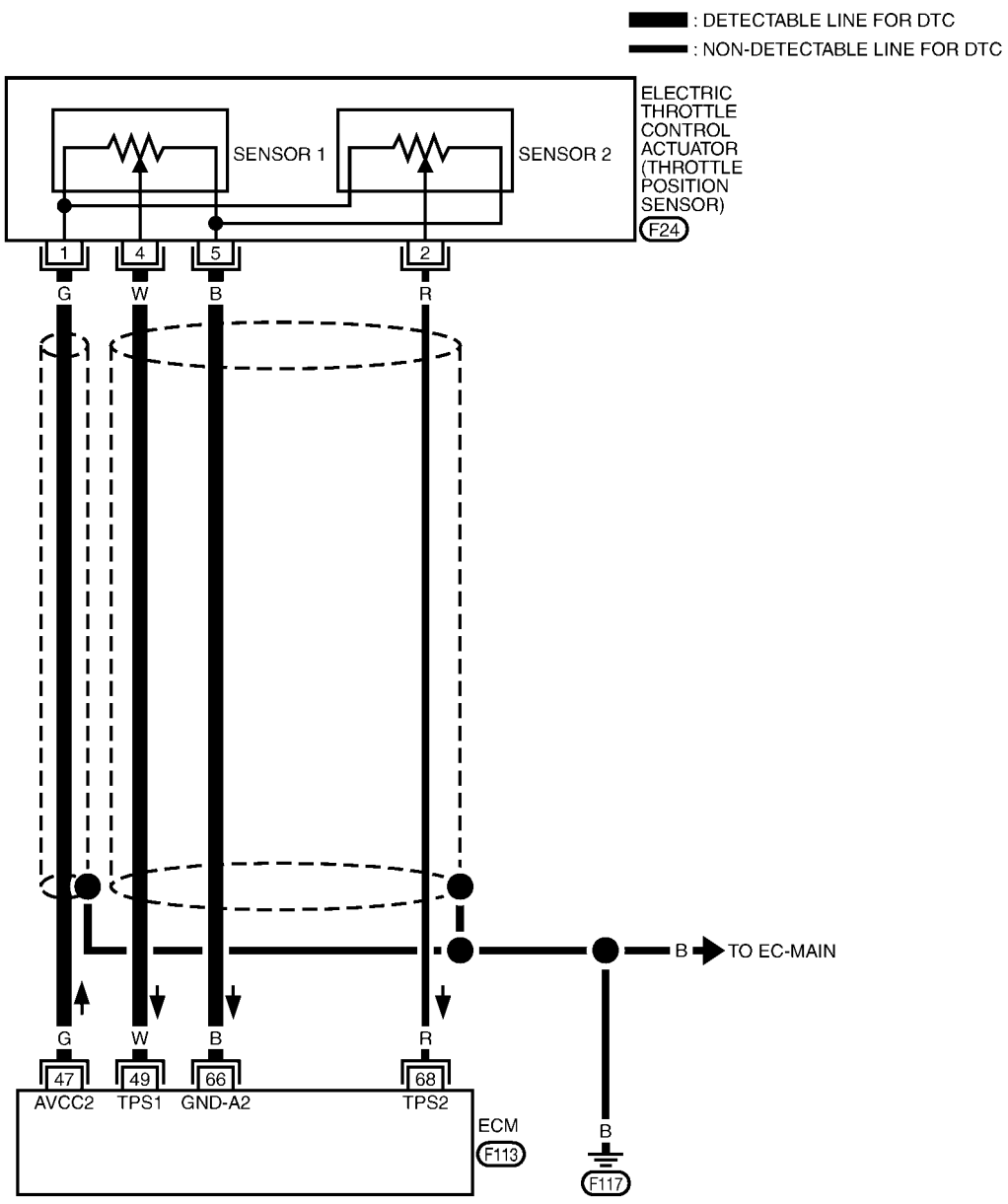
WITHOUT CONSULT-II

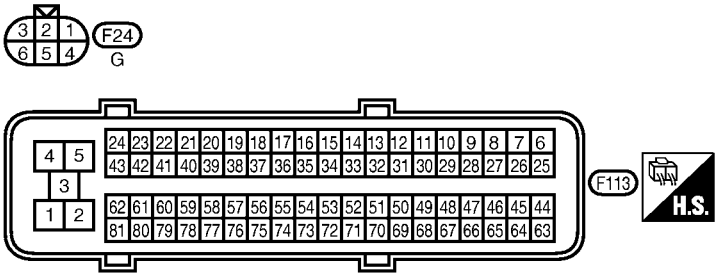
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-533, "Diagnostic Procedure" .

Wiring Diagram

EBS00KGW

EC-TPS1-01





YEC287A

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)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	Less than 4.75V
66	B	Throttle position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully released.	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	More than 0.36V

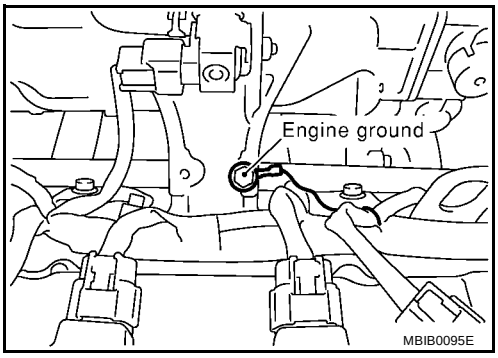
Diagnostic Procedure

EBS00KGX

1. RETIGHTEN GROUND SCREWS

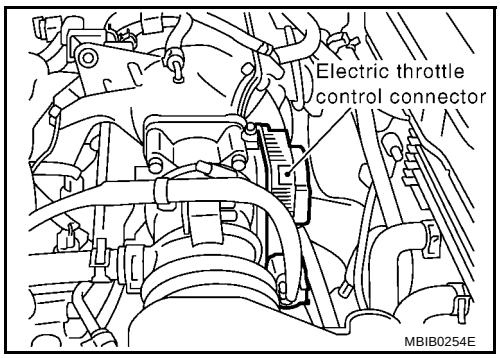
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

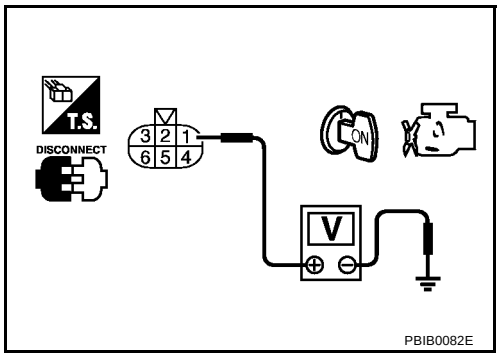


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

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 THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-535, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

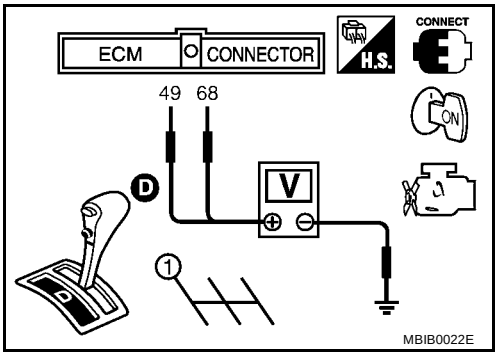
Component Inspection

EBS00KGY

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-425, "Throttle Valve Closed Position Learning" .
8. Perform EC-425, "Idle Air Volume Learning" .

Removal and Installation

EBS00KGZ

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

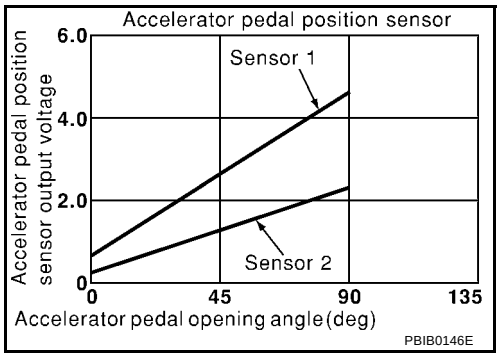
DTC P0226 APP SENSOR

PFP:18002

Component Description

EBS00KH0

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KH1

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00KH2

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0226 0226	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

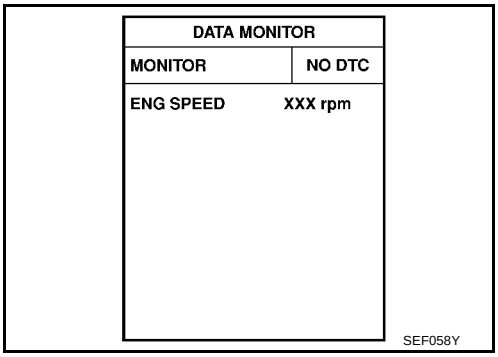
DTC Confirmation Procedure

EBS00KH3

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-539, "Diagnostic Procedure" .



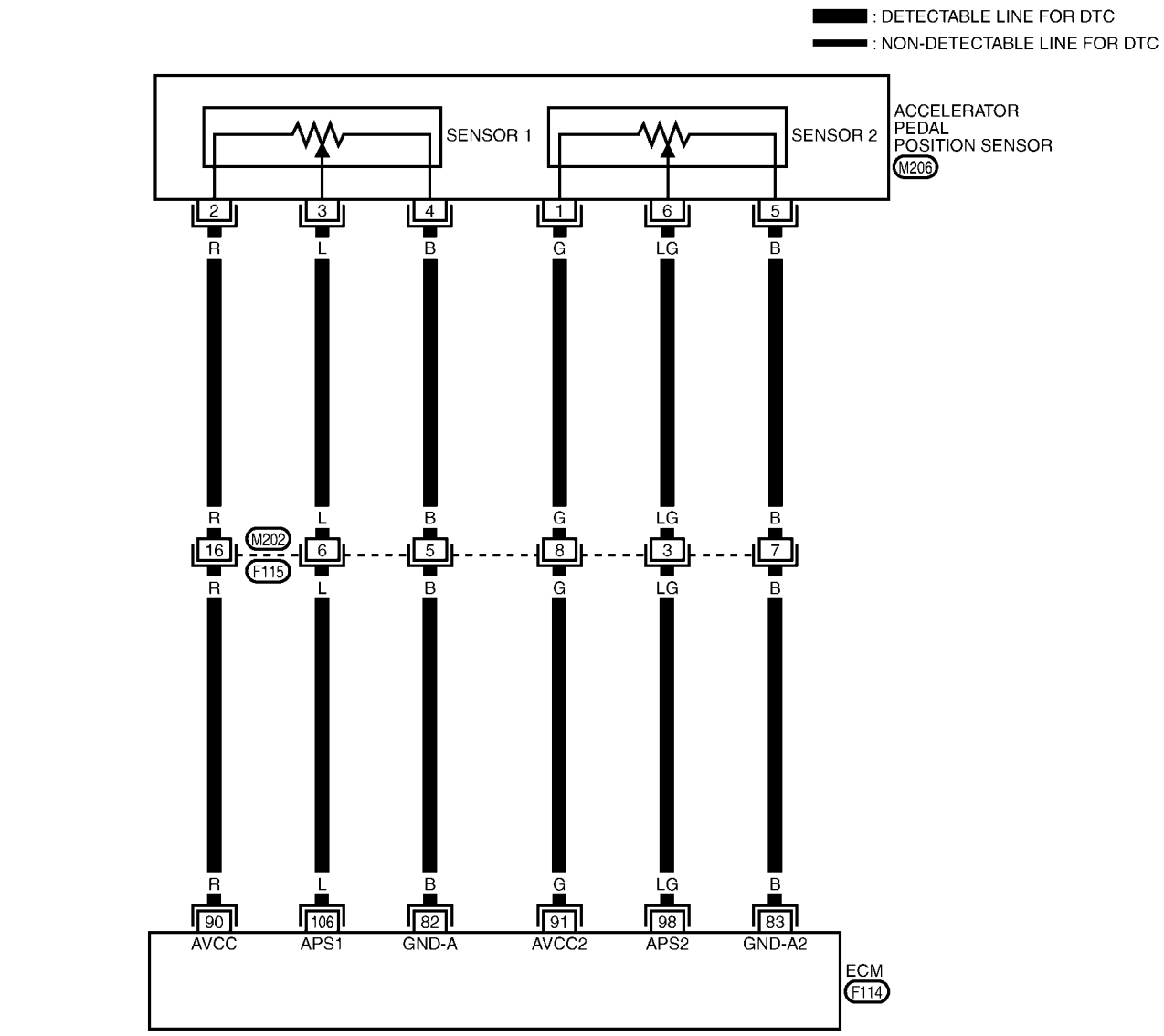
WITHOUT CONSULT-II

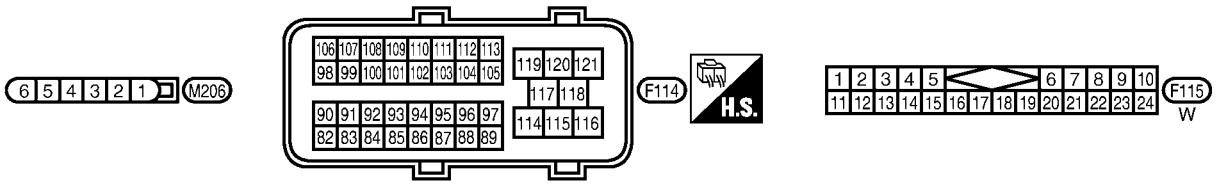
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-539, "Diagnostic Procedure" .

Wiring Diagram

EBS00KH4

EC-APPS3-01





YEC288A

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)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.175 - 0.335V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.35 - 0.67V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 3.9V

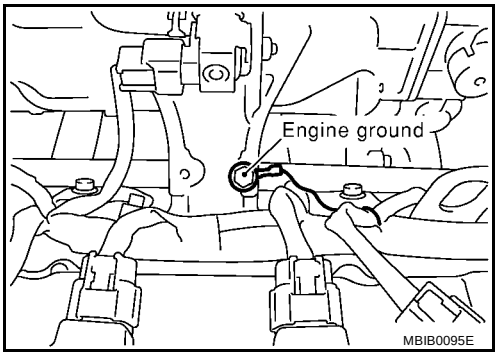
Diagnostic Procedure

EBS00KH5

1. RETIGHTEN GROUND SCREWS

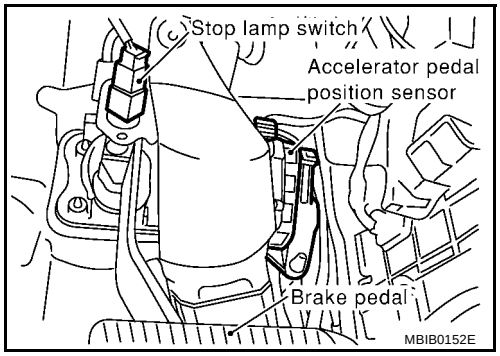
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



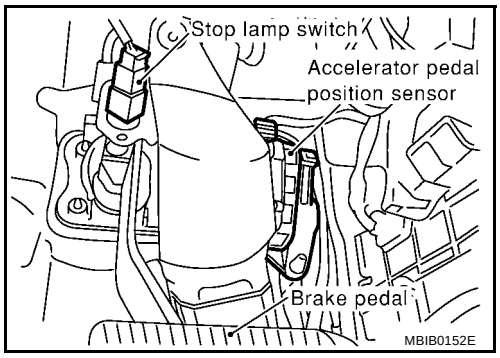
2. CHECK APP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminals 1, 2 and ground with CONSULT-II or tester.

Voltage: Approximatelly 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F1115
- Harness for open or short between ECM and accelerator pedal position sensor

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

4. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4, ECM terminal 83 and APP sensor terminal 5.
   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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

   Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

8. CHECK APP SENSOR

Refer to EC-541, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-425, "Accelerator Pedal Released Position Learning" .
3. Perform EC-425, "Throttle Valve Closed Position Learning" .
4. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

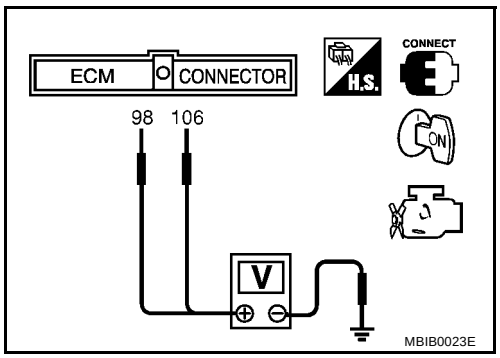
Component Inspection

EBS00KH6

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.

3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.195V

4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-425, "Accelerator Pedal Released Position Learning" .
6. Perform EC-425, "Throttle Valve Closed Position Learning" .
7. Perform EC-425, "Idle Air Volume Learning" .

Removal and Installation

EBS00KH7

ACCELERATOR PEDAL

Refer to FE-3.

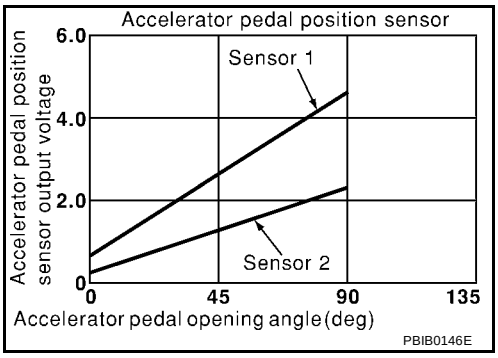
DTC P0227, P0228 APP SENSOR

PFP:18002

Component Description

EBS00KH8

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KH9

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00KHA

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0227 0227	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P0228 0228	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

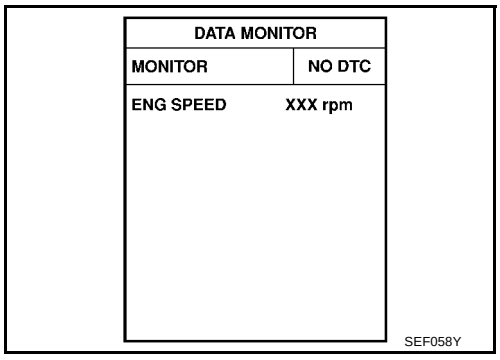
DTC Confirmation Procedure

EBS00KHB

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-546, "Diagnostic Procedure" .



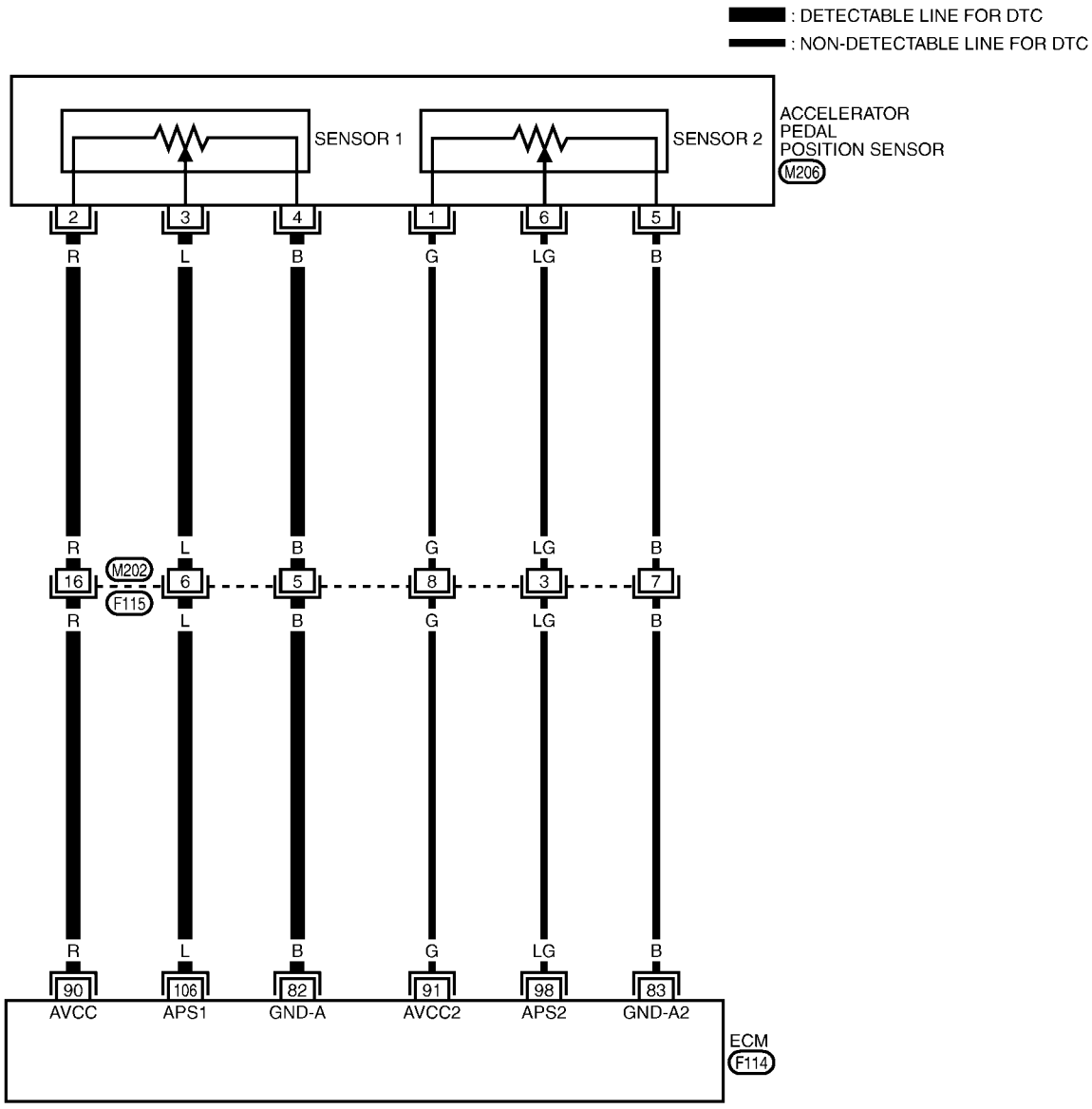
WITHOUT CONSULT-II

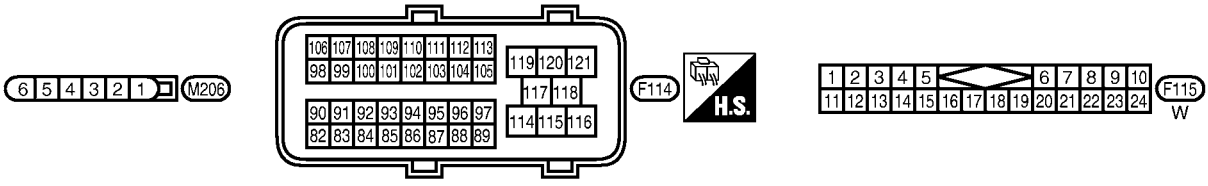
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-546, "Diagnostic Procedure" .

Wiring Diagram

EBS00KHC

EC-APPS1-01





YEC289A

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)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.175 - 0.335V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.35 - 0.67V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 3.9V

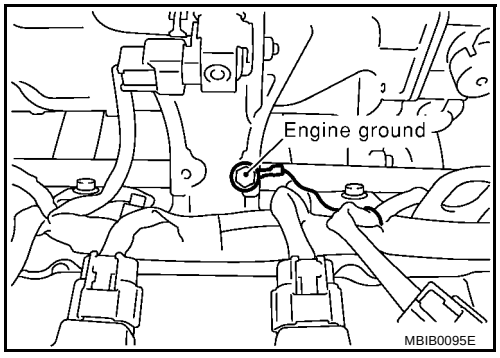
Diagnostic Procedure

EBS00KHD

1. RETIGHTEN GROUND SCREWS

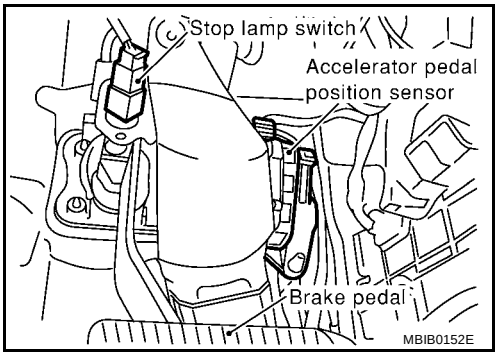
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



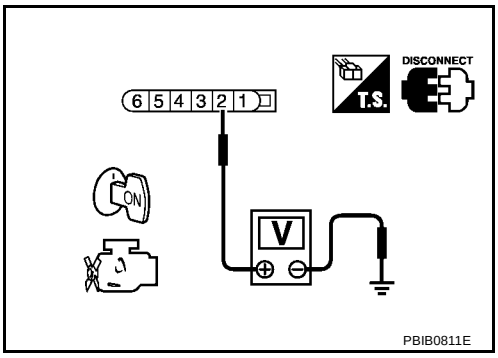
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4. 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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

8. CHECK APP SENSOR

Refer to EC-548, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-425, "Accelerator Pedal Released Position Learning" .
3. Perform EC-425, "Throttle Valve Closed Position Learning" .
4. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

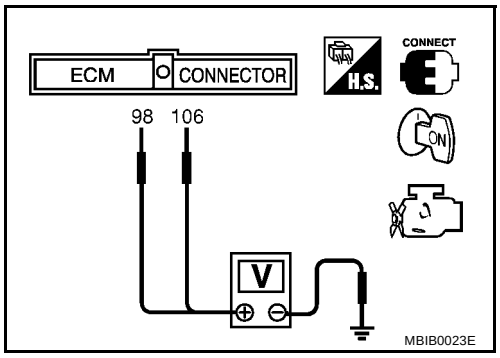
Component Inspection

EBS00KHE

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.195V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-425, "Accelerator Pedal Released Position Learning" .
6. Perform EC-425, "Throttle Valve Closed Position Learning" .
7. Perform EC-425, "Idle Air Volume Learning" .

Removal and Installation

EBS00KHF

ACCELERATOR PEDAL

Refer to FE-3.

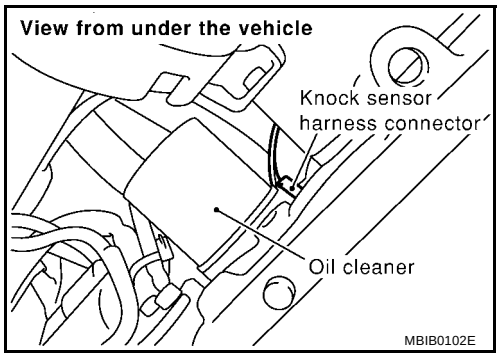
DTC P0327, P0328 KS

PFP:22060

Component Description

EBS00KHG

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

EBS00KHH

The MI will not light up for this diagnosis.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

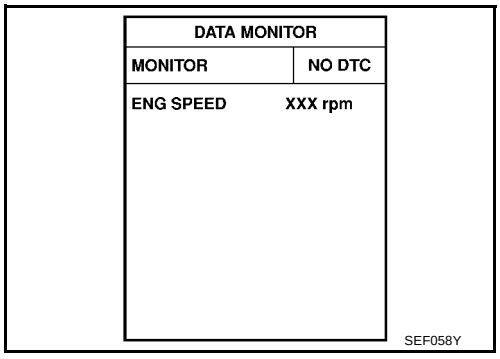
DTC Confirmation Procedure

EBS00KHI

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-552, "Diagnostic Procedure" .



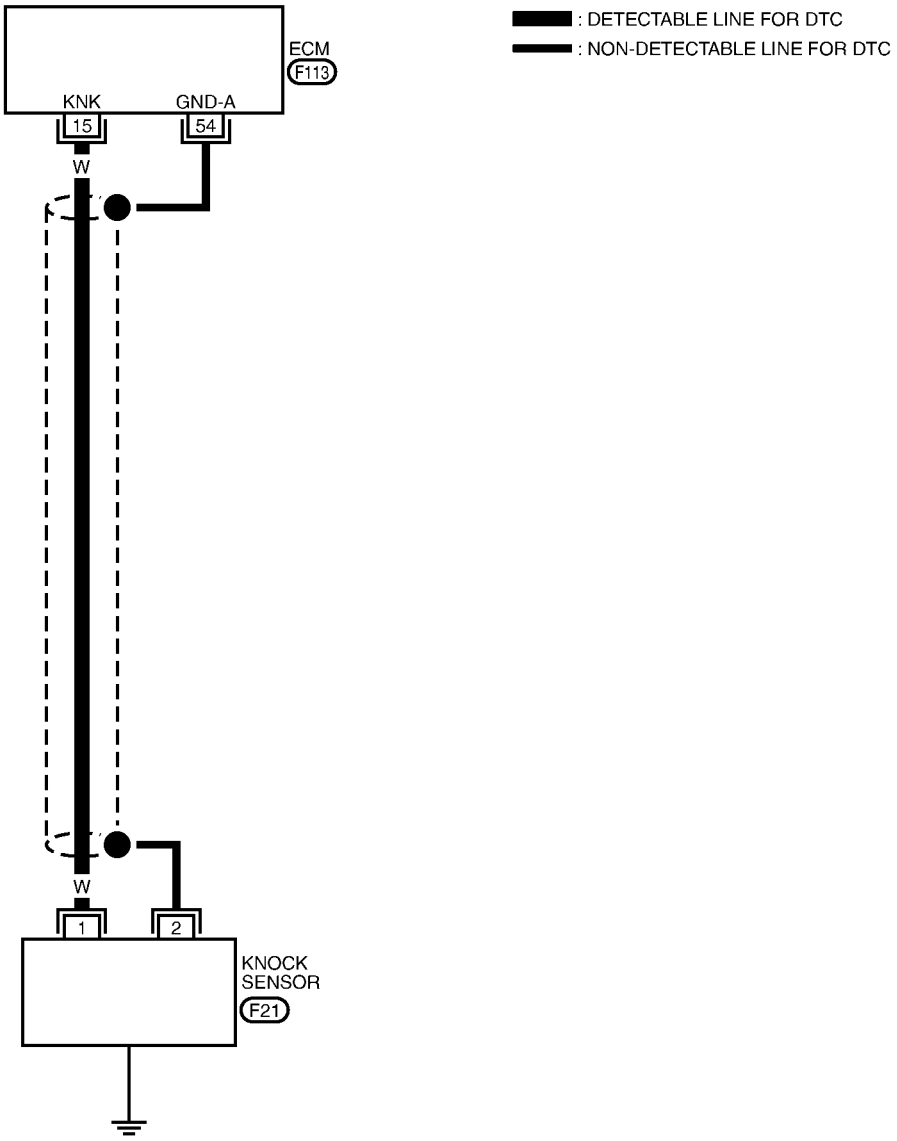
WITHOUT CONSULT-II

1. Start engine and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-552, "Diagnostic Procedure" .

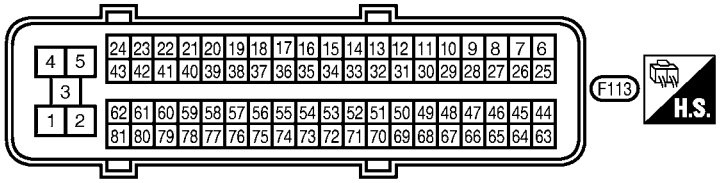
Wiring Diagram

EBS00KHJ

EC-KS-01







YEC290A

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)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
54	—	Knock sensor shield circuit ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00KHK

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.

   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

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

OK or NG

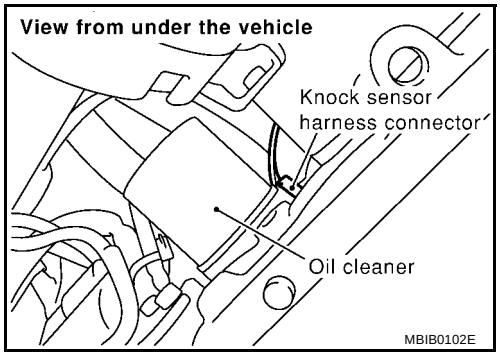
OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. 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 KNOCK SENSOR

Refer to EC-553, "Component Inspection" .

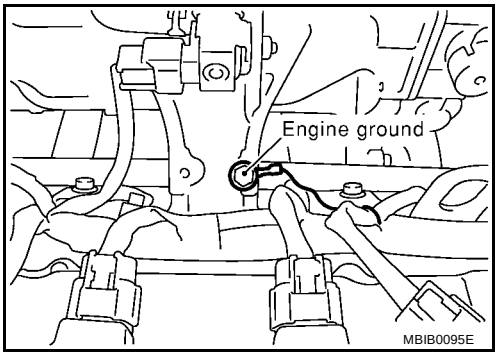
OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 5.



5. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KHL

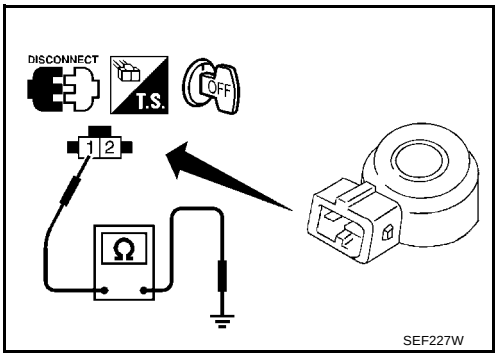
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



Removal and Installation

EBS00KHM

KNOCK SENSOR

Refer to EM-70, "CYLINDER BLOCK" .

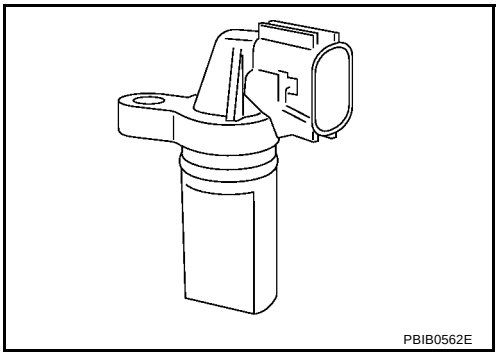
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

EBS00KHN

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

EBS00KHO

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

EBS00KHP

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Signal plate

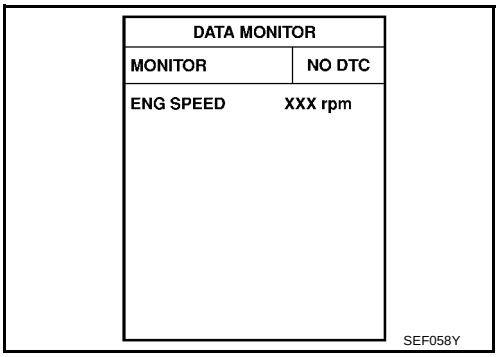
DTC Confirmation Procedure

EBS00KHQ

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 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-557, "Diagnostic Procedure" .



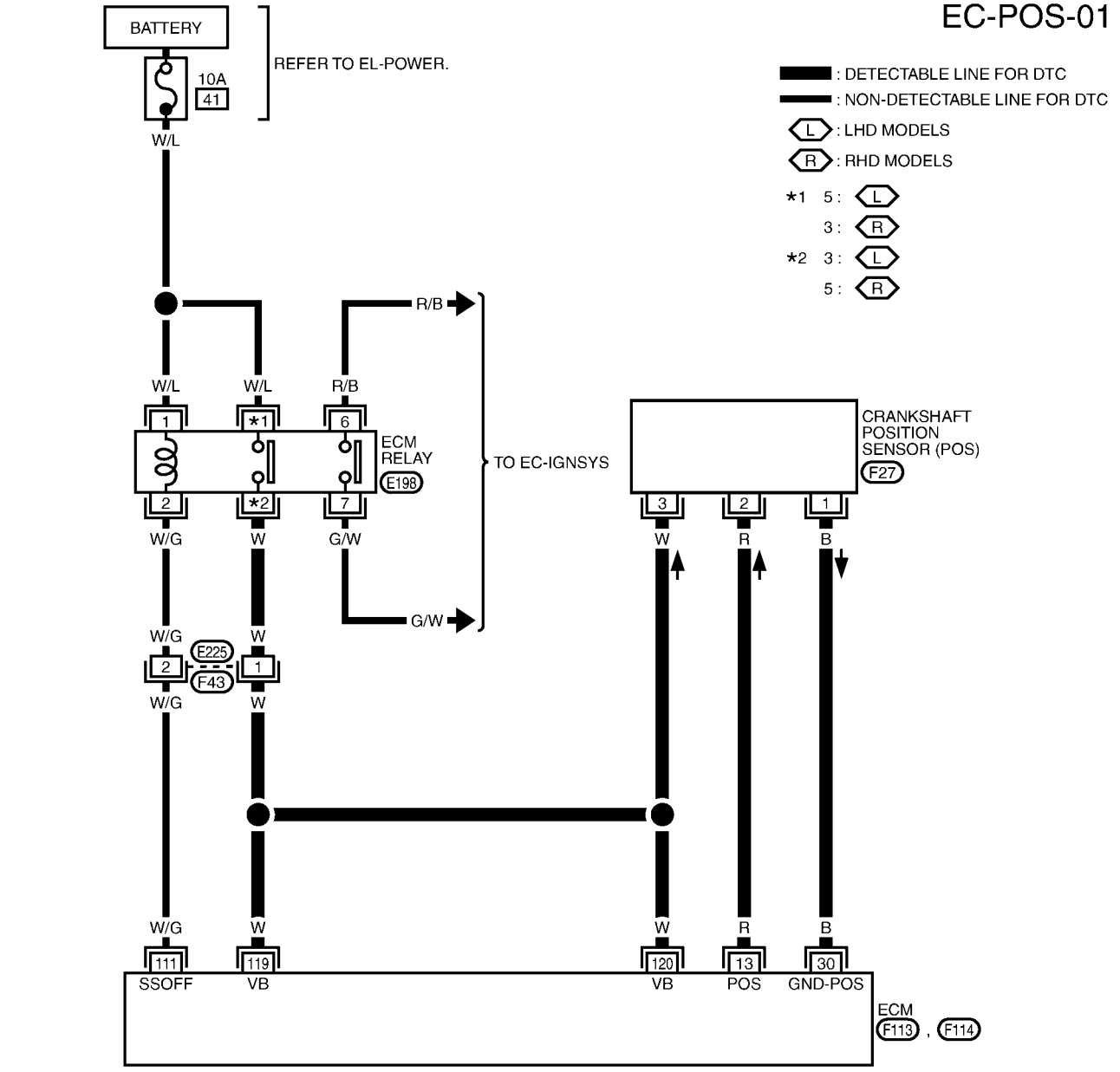
SEF058Y

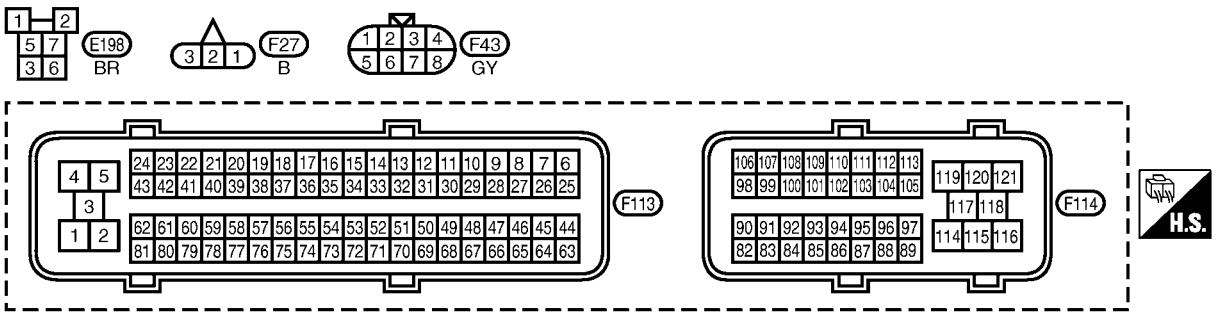
WITHOUT CONSULT-II

1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-557, "Diagnostic Procedure" .

Wiring Diagram

EBS00KHR



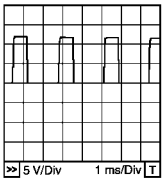
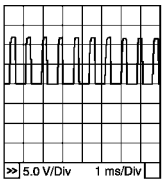


YEC291A

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)
13	W	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 3V★  PBIB0528E
30	B	Crankshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V

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

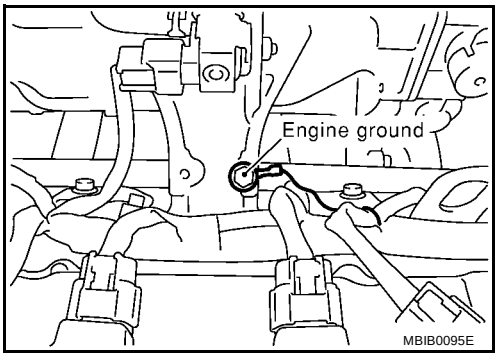
Diagnostic Procedure

EBS00KHS

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

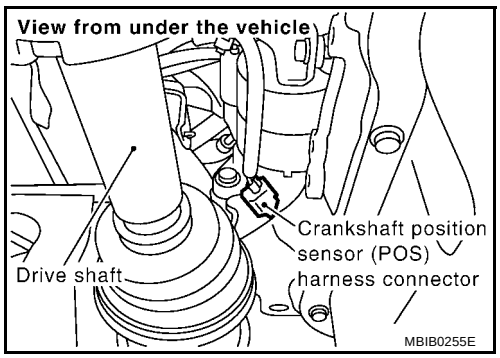
>> GO TO 2.



MBIB0095E

2. CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT

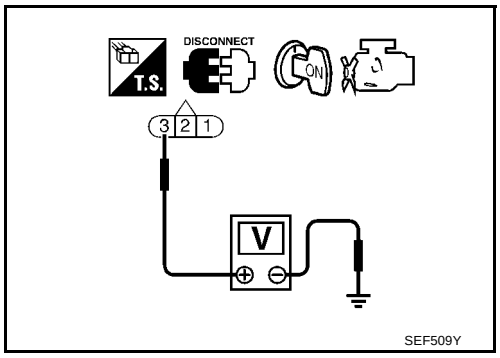
1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between CKP sensor (POS) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

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



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

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

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 30 and CKP sensor (POS) terminal 1
   Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-559, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 8.
NG >> Replace the signal plate.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

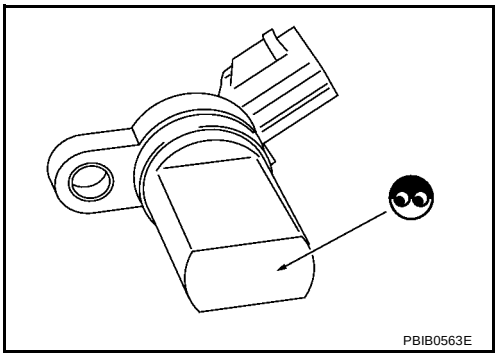
>> **INSPECTION END**

Component Inspection

EBS00KHT

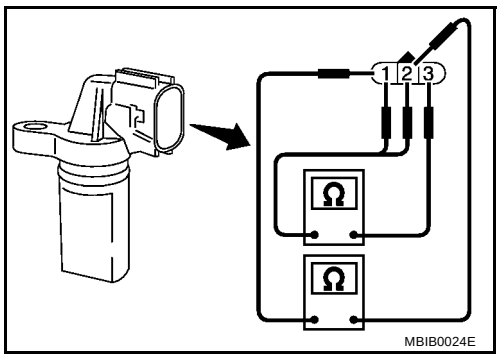
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

EBS00KHU

CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-70, "CYLINDER BLOCK" .

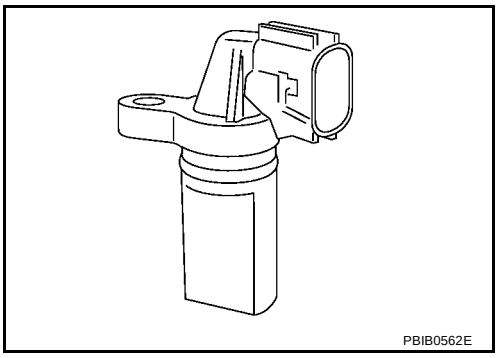
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

EBS00KHV

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

EBS00KHW

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-13.) ● Starting system circuit (Refer to SC-13.) ● Dead (Weak) battery

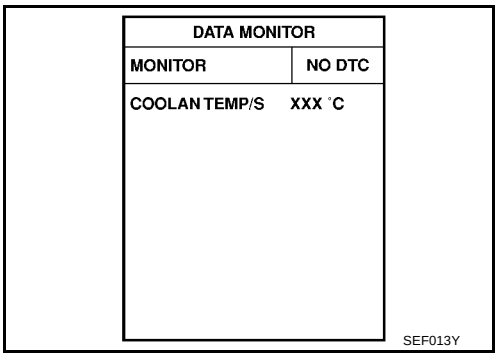
DTC Confirmation Procedure

EBS00KHX

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 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-564, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintain engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-564, "Diagnostic Procedure" .



SEF013Y

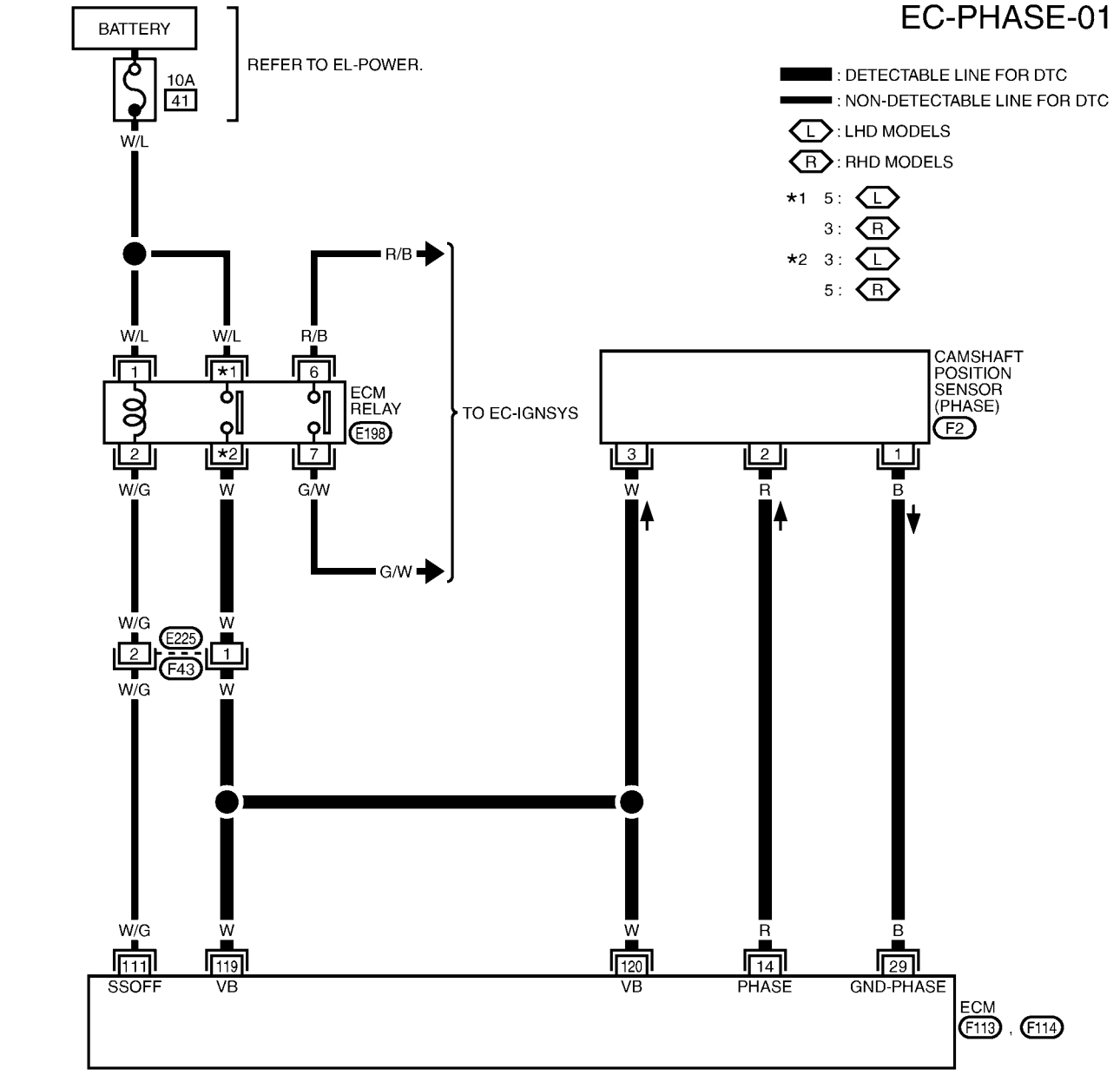
WITHOUT CONSULT-II

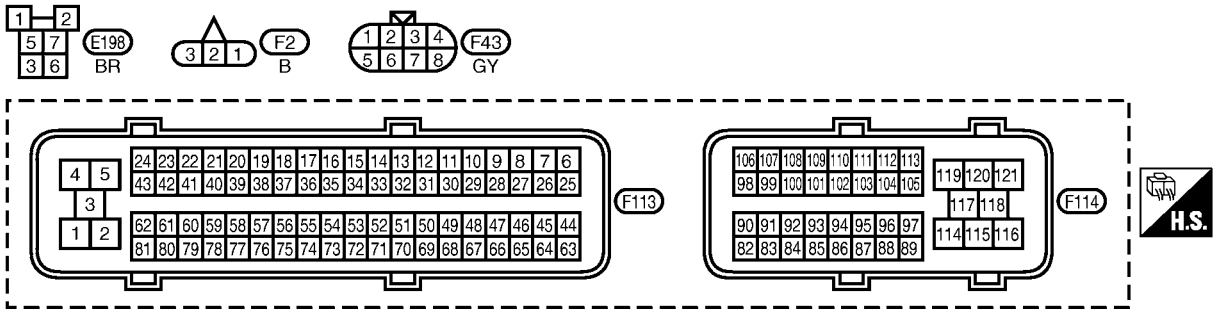
1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-564, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and maintain engine speed at more than 800 rpm for at least 5 seconds.

7. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
8. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
9. If 1st trip DTC is detected, go to EC-564, "Diagnostic Procedure" .

Wiring Diagram

EBS00KHY



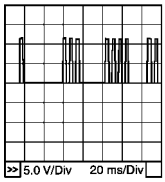
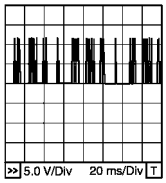


YEC292A

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)
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V

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

Diagnostic Procedure

EBS00KHZ

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

Yes or No

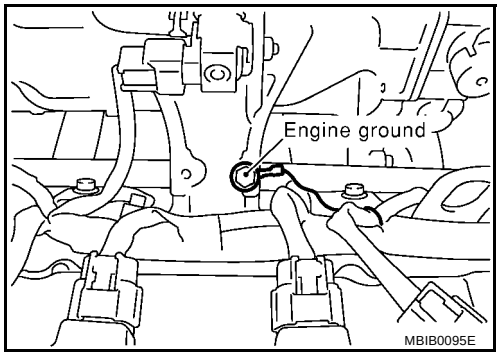
Yes >> GO TO 2.

No >> Check starting system. (Refer to SC-13.)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

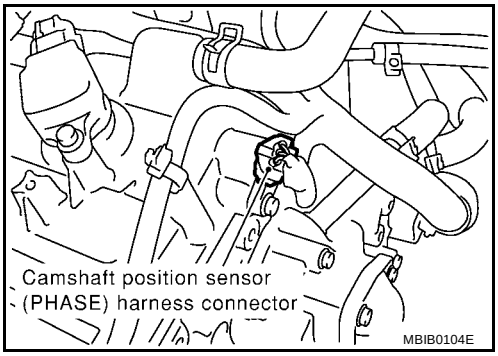
>> GO TO 3.



MBIB0095E

3. CHECK CMP SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



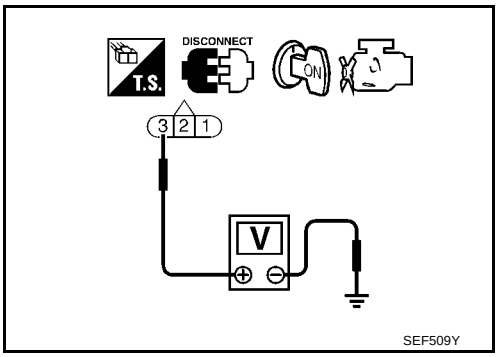
3. Check voltage between CMP sensor (PHASE) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

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

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

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

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and CMP sensor (PHASE) terminal 1.

Continuity should exist.

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

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 14 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-566, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

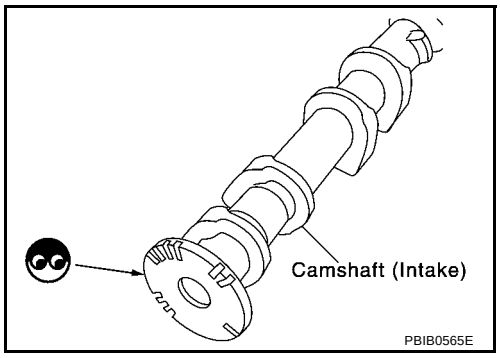
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

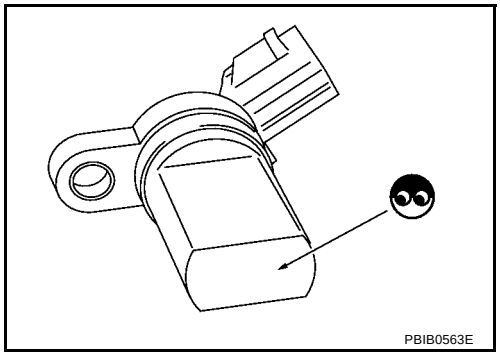
>> **INSPECTION END**

Component Inspection

EBS00KI0

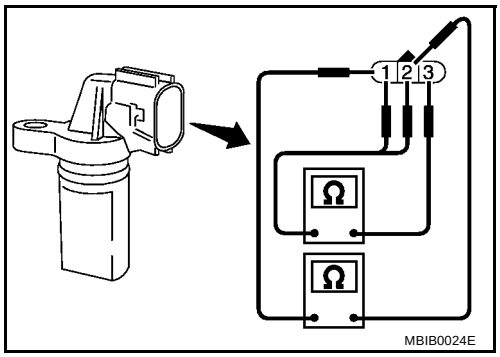
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



Removal and Installation

EBS00KI1

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-29, "ROCKER COVER" .

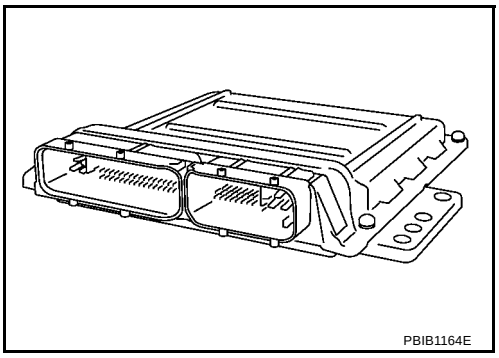
DTC P0605 ECM

PFP:23710

Component Description

EBS00KI2

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


PBIB1164E

On Board Diagnosis Logic

EBS00KI3

This self-diagnosis has one or tow trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00KI4

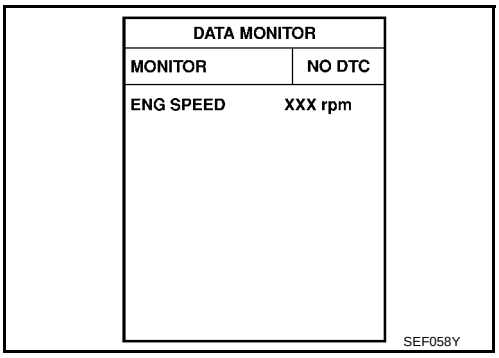
Perform “PROCEDURE FOR MALFUNCTION A” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no malfunction on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

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.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-570, "Diagnostic Procedure" .



SEF058Y

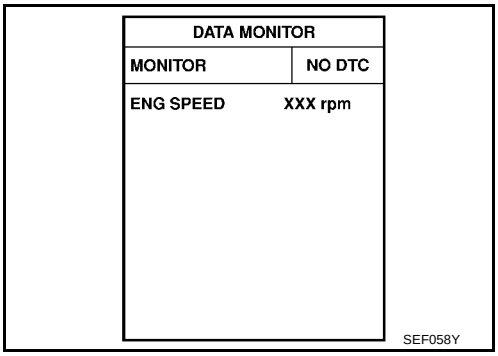
Without CONSULT-II

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-570, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-570, "Diagnostic Procedure" .



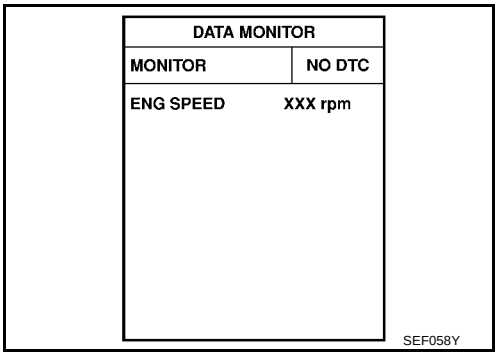
Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-570, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 for, 32 times.
5. If 1st trip DTC is detected, go to EC-570, "Diagnostic Procedure" .



Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Repeat step 2 procedure, 32 times.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-570, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00KI5

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-568 .
5. Is the 1st trip DTC P0605 displayed again?

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-430, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
3. **Perform “DTC Confirmation Procedure”.**
   See EC-568 .
4. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-431, "NATS (Nissan Anti-theft System)" .
3. Perform EC-425, "Accelerator Pedal Released Position Learning" .
4. Perform EC-425, "Throttle Valve Closed Position Learning" .
5. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

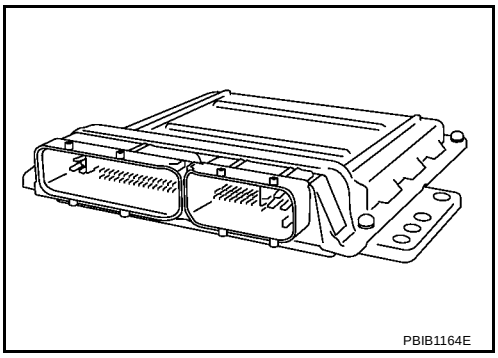
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

EBS00KI6

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.


PBIB1164E

On Board Diagnosis Logic

EBS00KI7

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

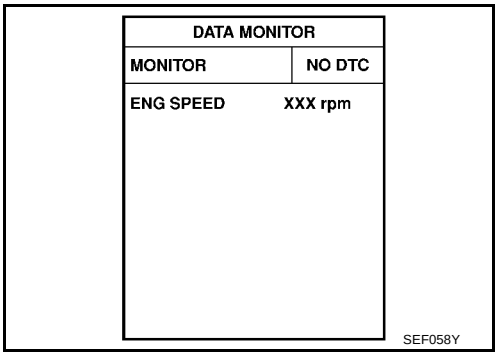
DTC Confirmation Procedure

EBS00KI8

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 wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-573, "Diagnostic Procedure" .



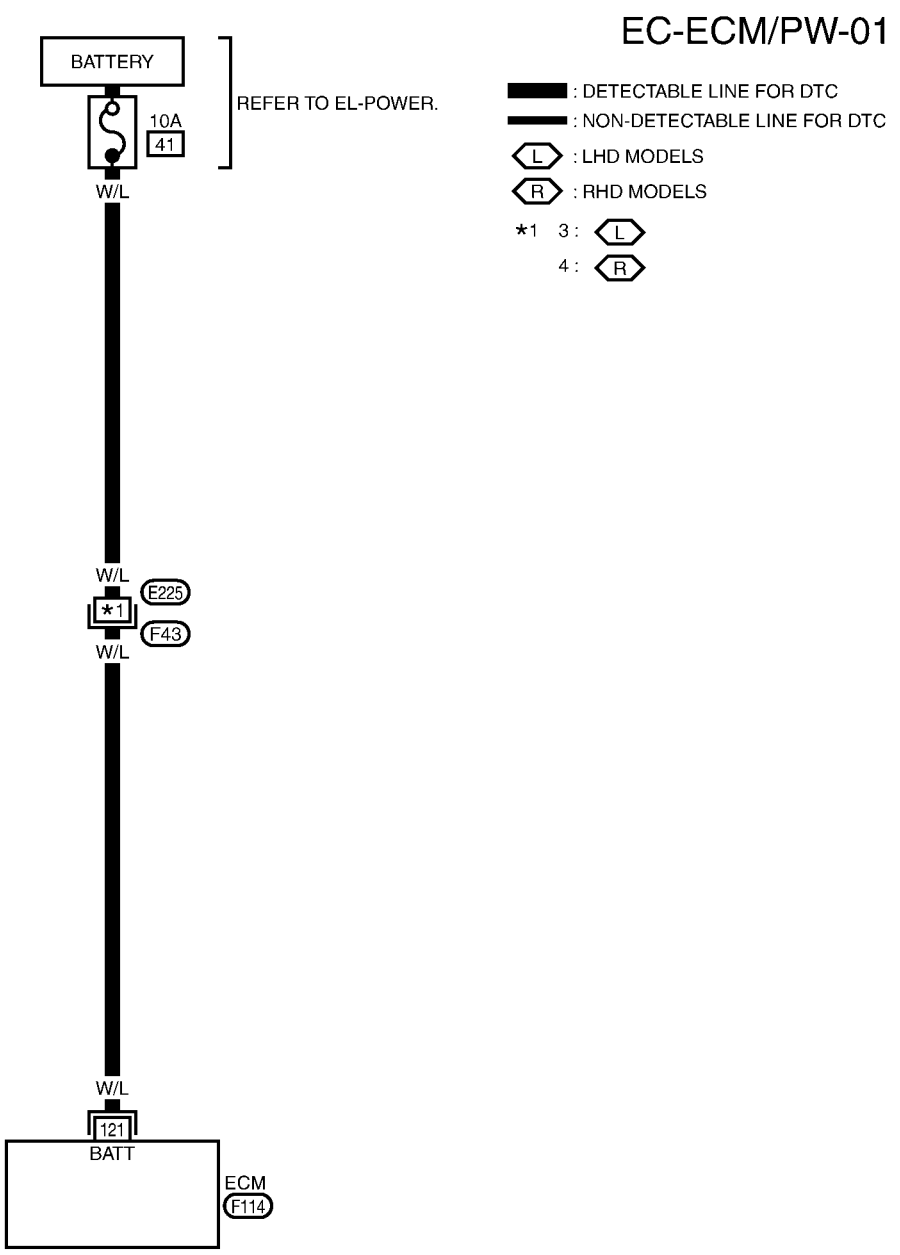
SEF058Y

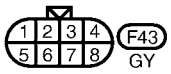
WITHOUT CONSULT-II

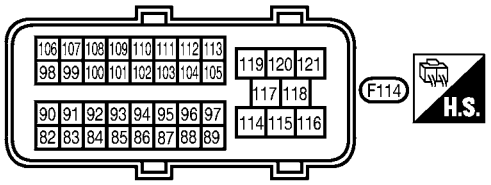
1. Turn ignition switch “ON” and wait at least 1 second.
2. Start engine and let it idle for 1 second.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Repeat steps 2 and 3 four times.
5. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
6. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
7. If 1st trip DTC is detected, go to EC-573, "Diagnostic Procedure" .

Wiring Diagram

EBS00KI9







YEC295A

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)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

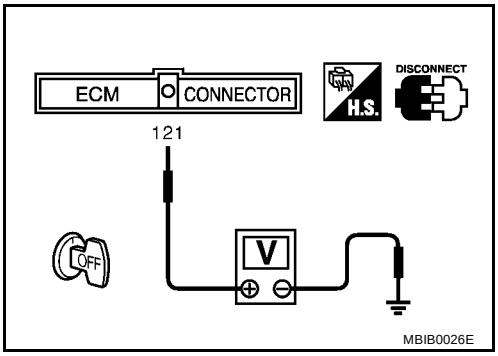
Diagnostic Procedure

EBS00KIA

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- 10A fuse
- Harness for open or short between ECM and battery

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

3. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

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

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-571 .
5. Is the 1st trip DTC P1065 displayed again?

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-430, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
3. **Perform “DTC Confirmation Procedure”.**
   See EC-571 .
4. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-431, "NATS (Nissan Anti-theft System)" .
3. Perform EC-425, "Accelerator Pedal Released Position Learning" .
4. Perform EC-425, "Throttle Valve Closed Position Learning" .
5. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

EBS00KIB

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00KIC

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters fail-safe mode and MI lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

EBS00KID

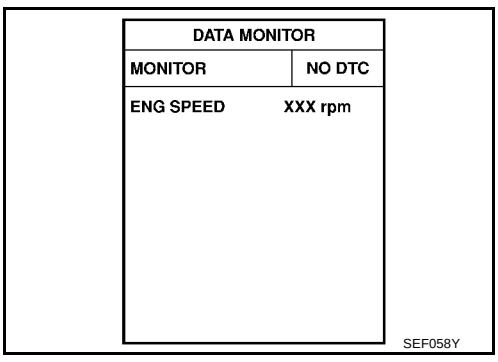
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
  If there is no malfunction on “PROCEDURE FOR MALFUNCTION A AND B”, perform “PROCEDURE FOR MALFUNCTION C”.
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-576, "Diagnostic Procedure"
   .



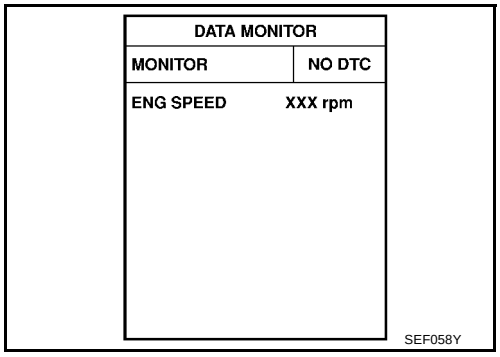
Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-576, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-576, "Diagnostic Procedure" .



Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
3. Shift selector lever to “N” or “P” position.
4. Start engine and let it idle for the 3 seconds.
5. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
6. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
7. If DTC is detected, go to EC-576, "Diagnostic Procedure" .

Diagnostic Procedure

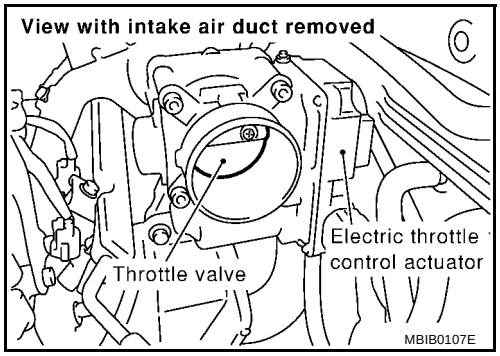
EBS00KIE

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

EBS00KIF

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

EBS00KIG

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-575 or EC-585 .

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00KIH

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted.) ● Harness or connectors (Throttle control motor relay circuit is open or shorted.) ● Electric throttle control actuator ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

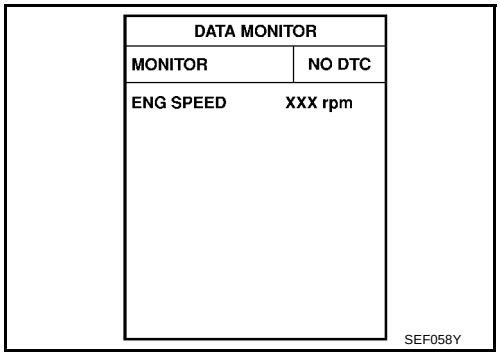
DTC Confirmation Procedure

EBS00KII

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 wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-580, "Diagnostic Procedure" .



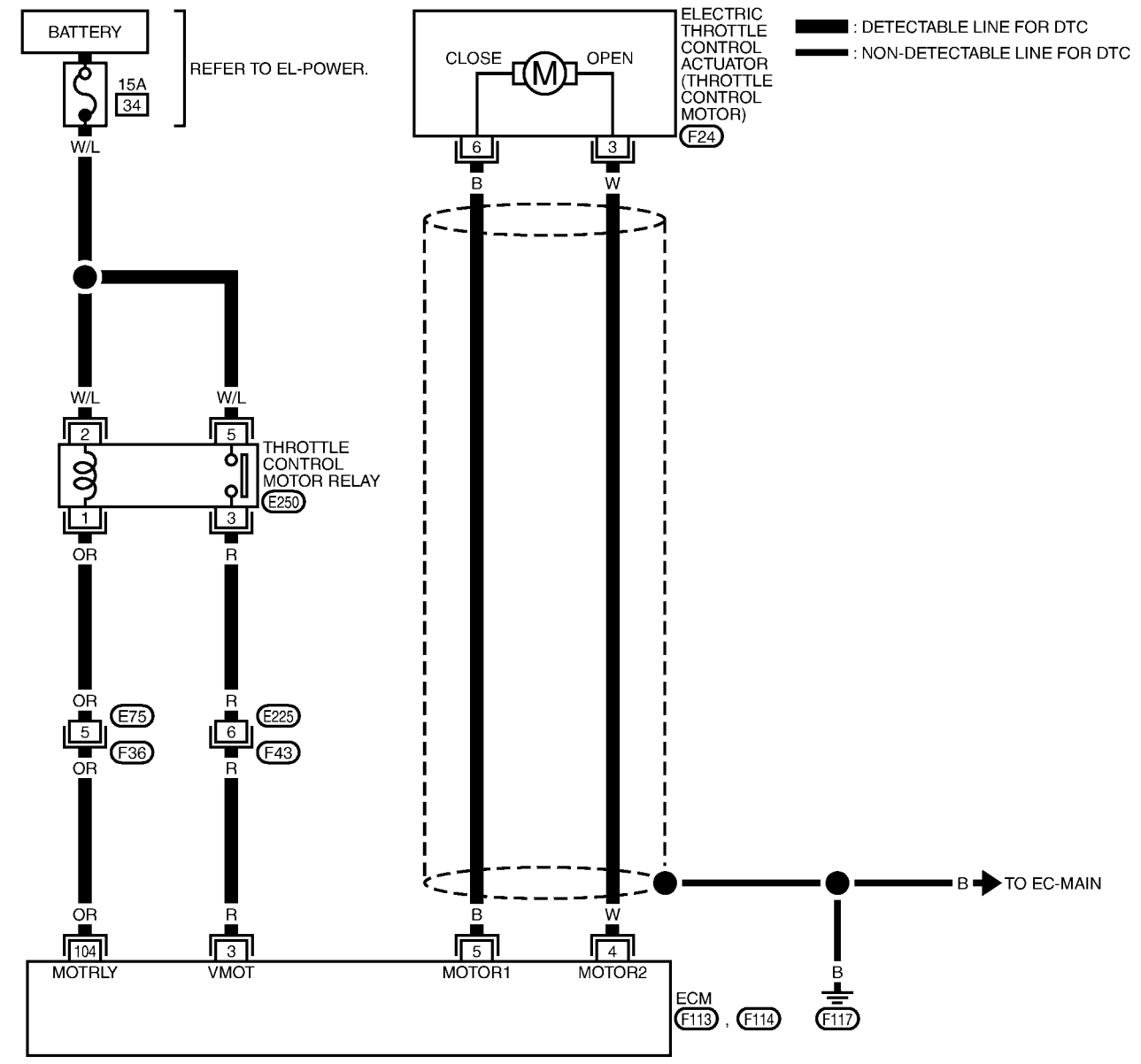
WITHOUT CONSULT-II

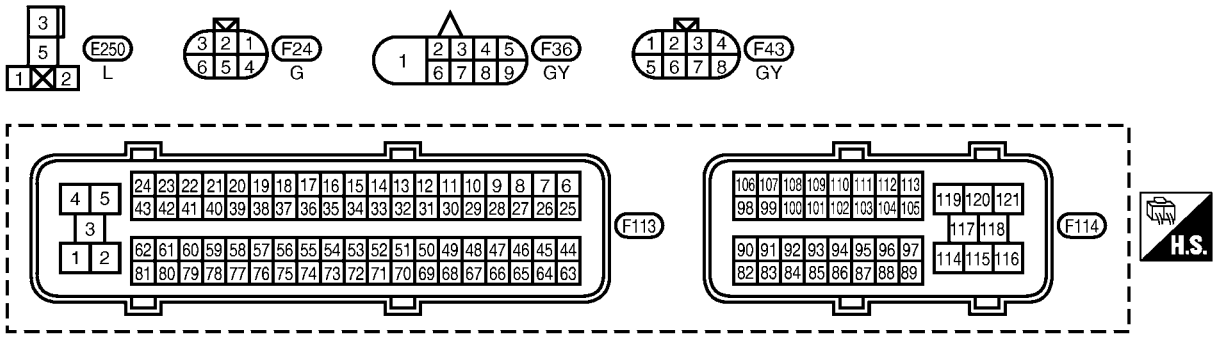
1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-580, "Diagnostic Procedure" .

Wiring Diagram

EBS00KIJ

EC-ETC1-01



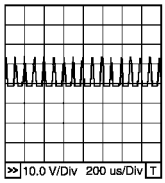
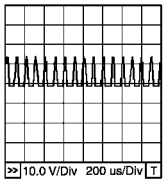


YEC297A

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)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

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

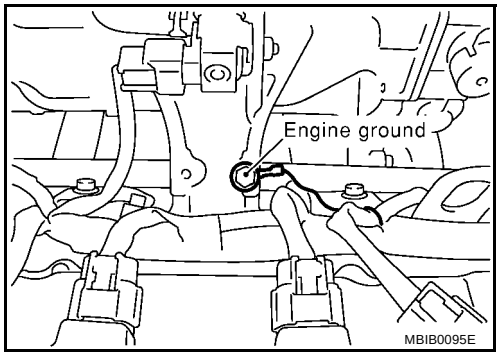
Diagnostic Procedure

EBS00KIK

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.

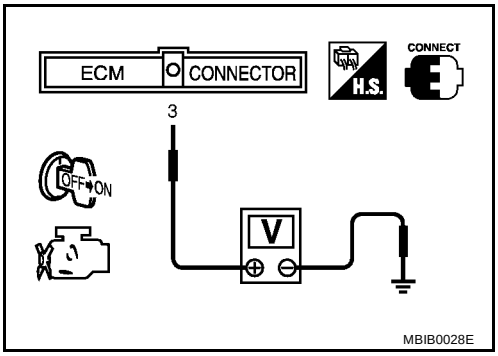


MBIB0095E

2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

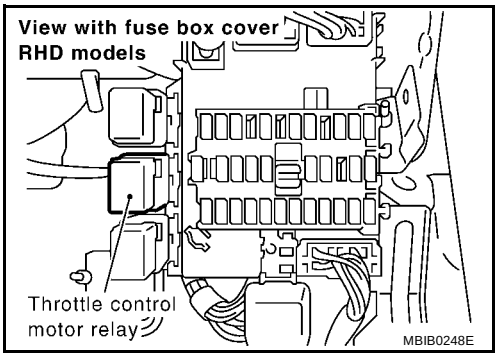


OK or NG

OK >> GO TO 10.
NG >> GO TO 3.

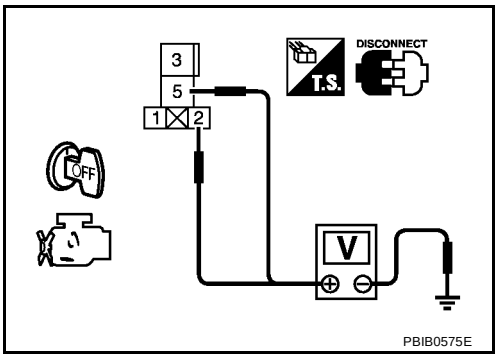
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

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

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between ECM and throttle control motor relay

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

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and throttle control motor relay

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

9. CHECK THROTTLE CONTROL MOTOR RELAY

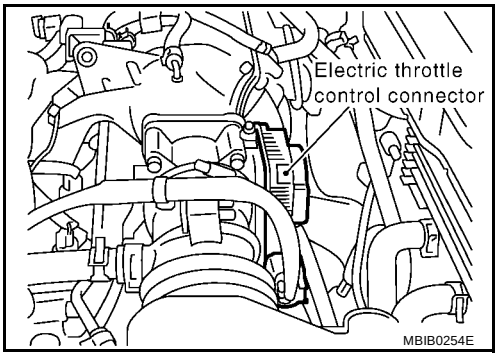
Refer to EC-584, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace throttle control motor relay.

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

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

OK or NG

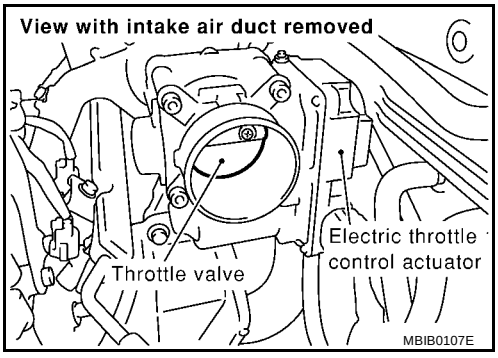
OK >> GO TO 11.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-584, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

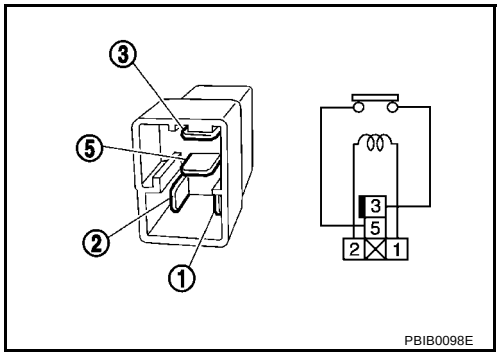
EBS00KIL

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



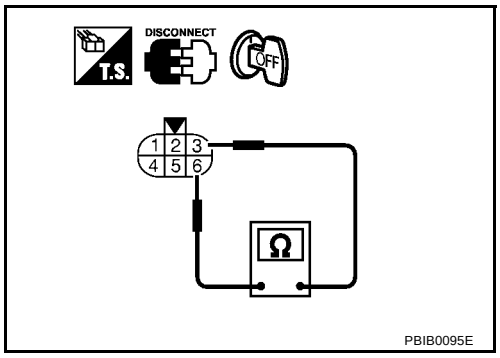
PBIB0098E

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-425, "Throttle Valve Closed Position Learning" .
5. Perform EC-425, "Idle Air Volume Learning" .



PBIB0095E

Removal and Installation

EBS00KIM

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

EBS00KIN

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

EBS00KIO

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

EBS00KIP

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted.) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	● Harness or connectors (Throttle control motor relay circuit is open.) ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00KIQ

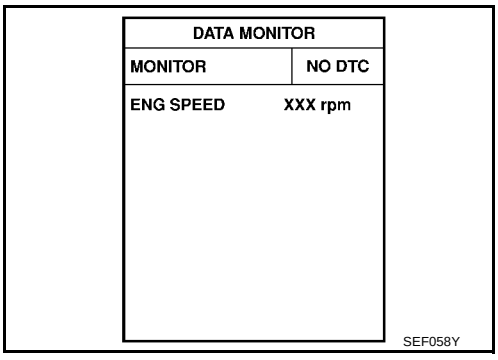
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-588, "Diagnostic Procedure"
.



Without CONSULT-II

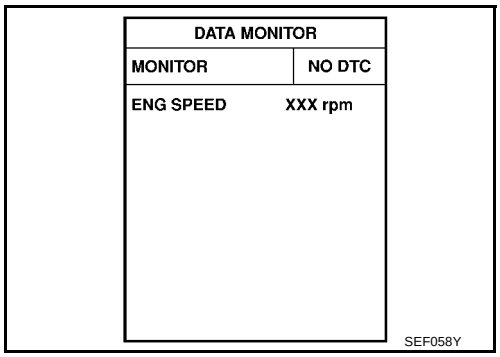
1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.

3. If 1st trip DTC is detected, go to EC-588, "Diagnostic Procedure" .

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-588, "Diagnostic Procedure" .



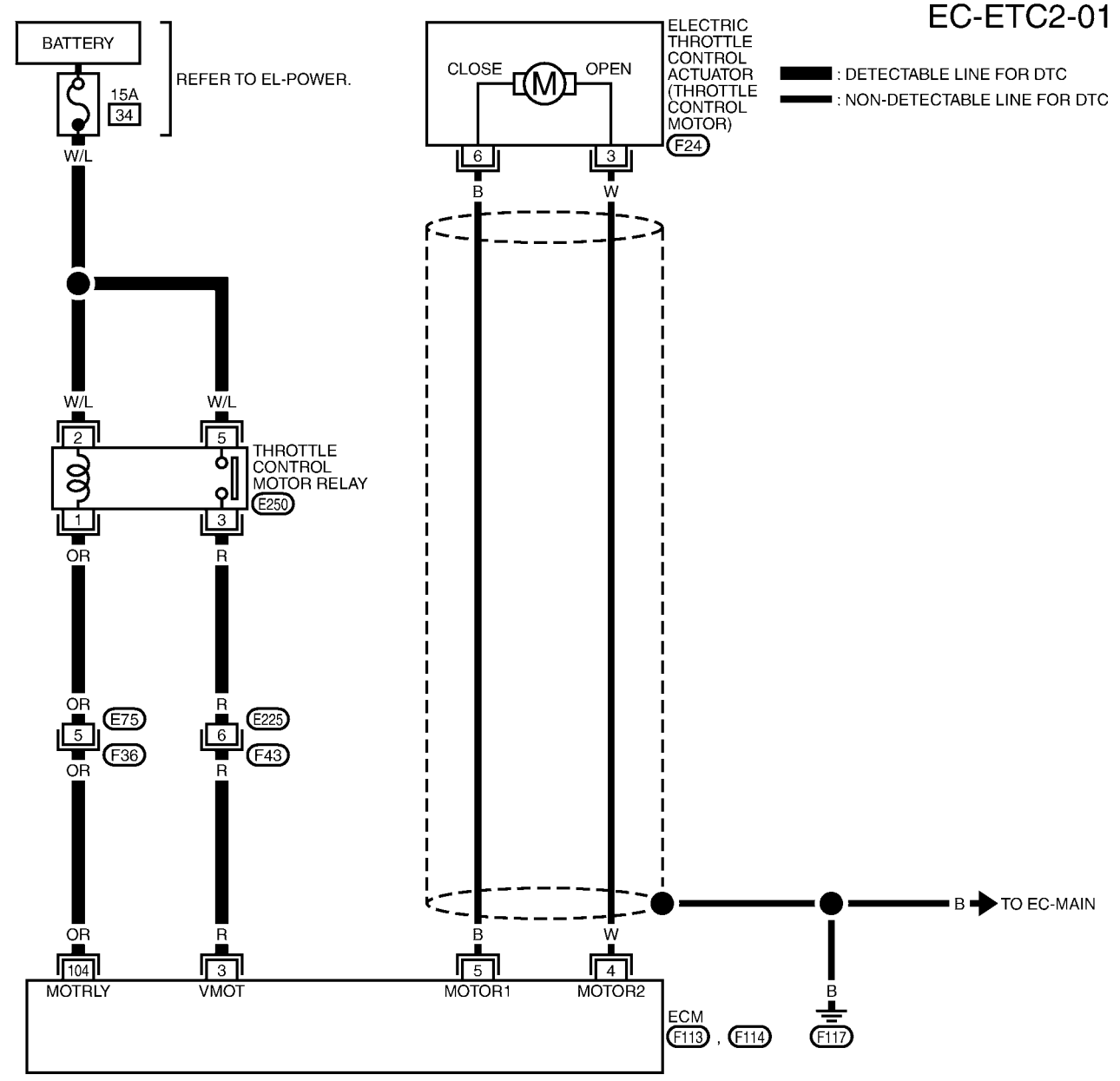
Without CONSULT-II

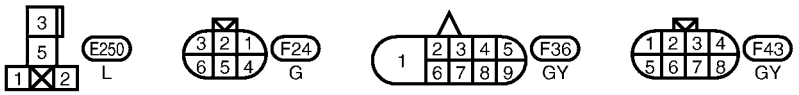
1. Turn ignition switch “ON” and wait at least 2 second.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-588, "Diagnostic Procedure" .

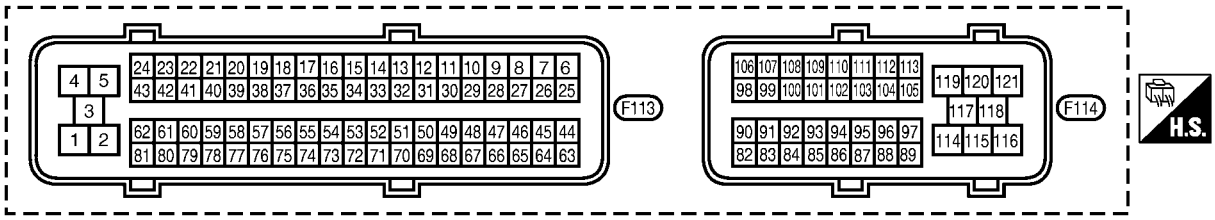
Wiring Diagram

EBS00KIR

EC-ETC2-01







YEC298A

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.

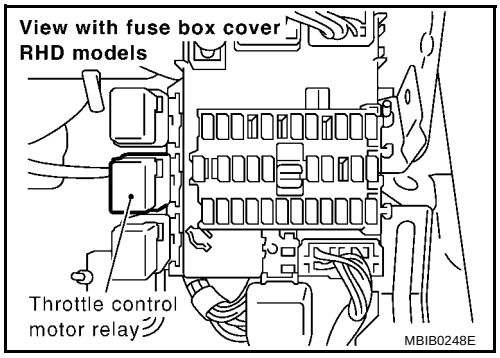
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

Diagnostic Procedure

EBS00KIS

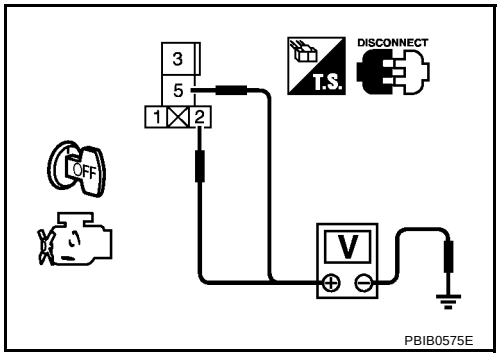
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

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

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between ECM and throttle control motor relay

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

5. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and throttle control motor relay

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

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-590, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace throttle control motor relay.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

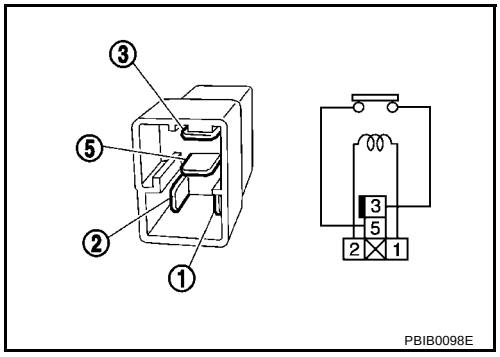
EBS00KIT

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

EBS00KIU

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00KIV

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

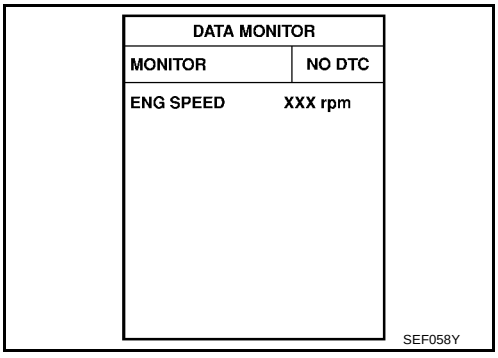
DTC Confirmation Procedure

EBS00KIW

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 wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-593, "Diagnostic Procedure" .



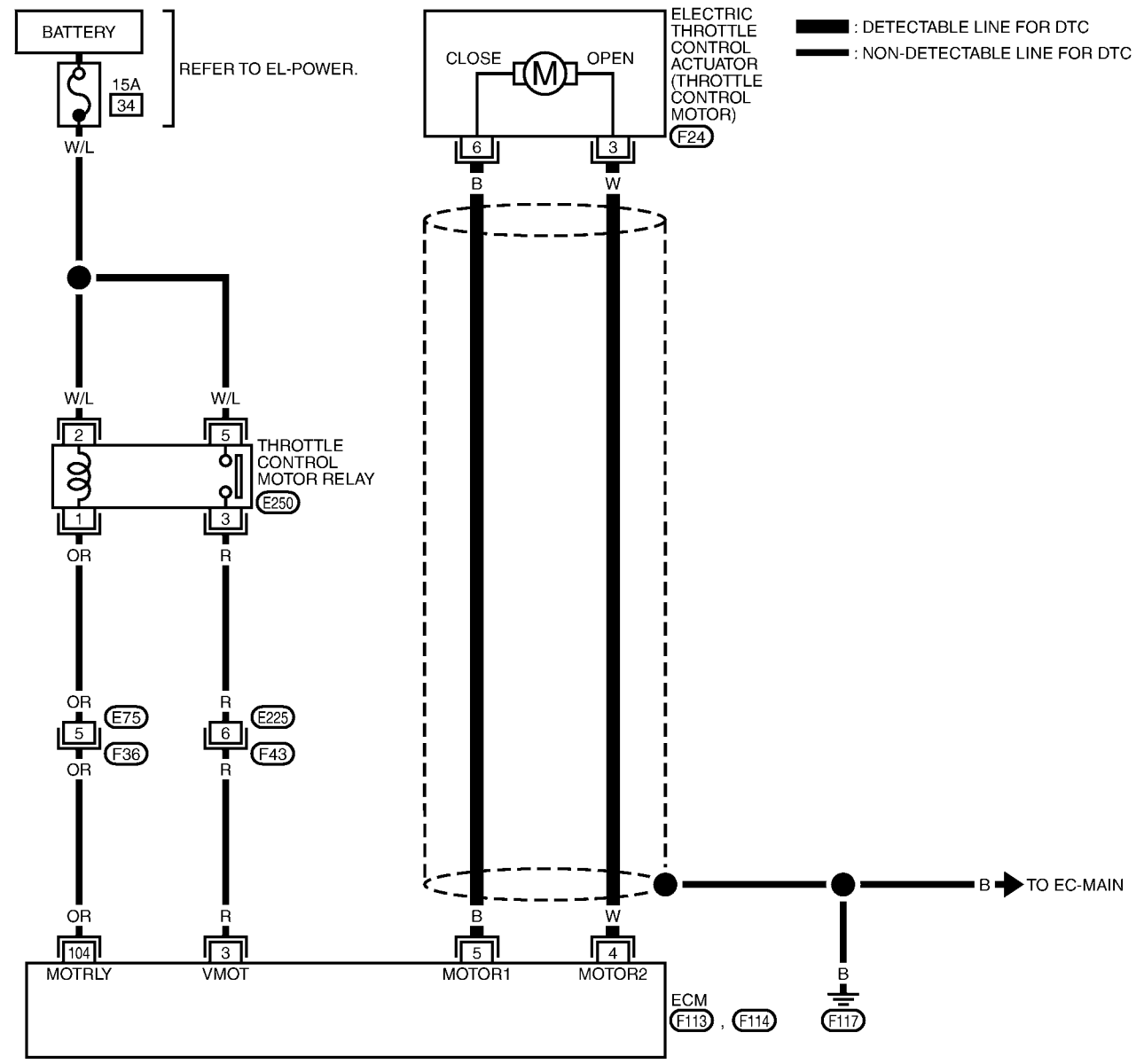
WITHOUT CONSULT-II

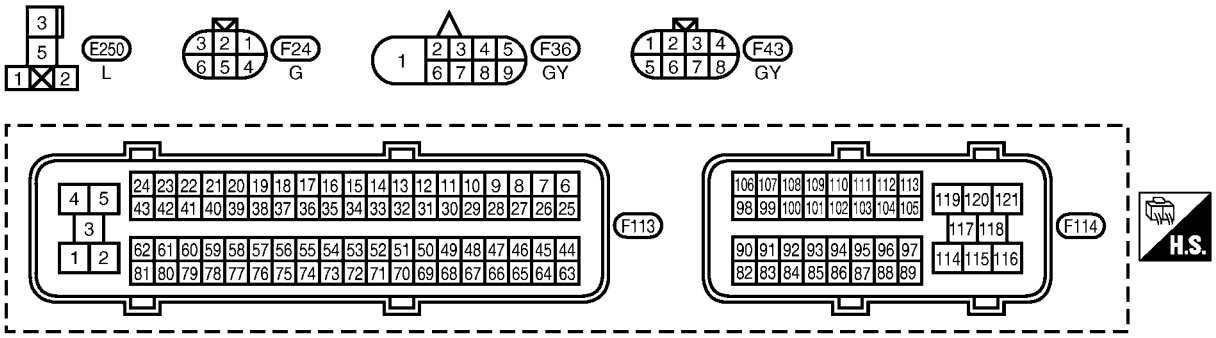
1. Turn ignition switch “ON” and wait at least 2 second.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-593, "Diagnostic Procedure" .

Wiring Diagram

EBS00KIX

EC-ETC3-01



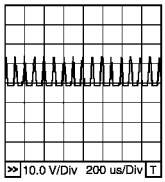
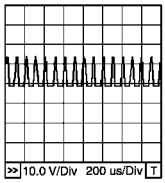


YEC299A

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)
4	W (LHD) BR (RHD)	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is releasing.	0 - 14V★  PBIB0534E
5	B (LHD) Y (RHD)	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal is depressing.	0 - 14V★  PBIB0533E

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

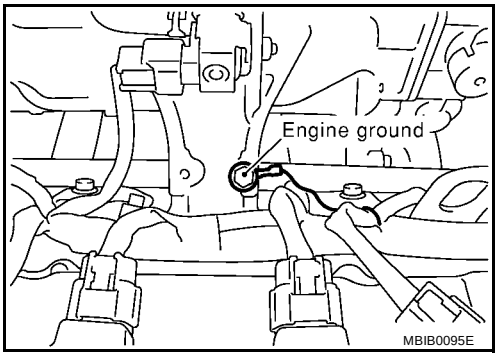
Diagnostic Procedure

EBS00KIY

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

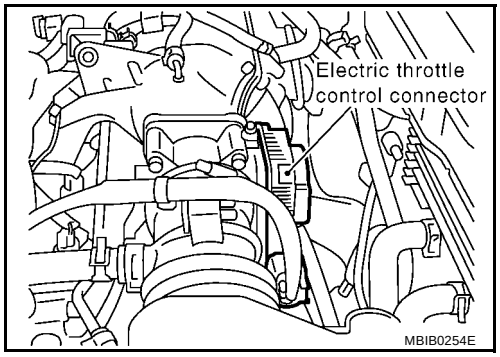
>> GO TO 2.



MBIB0095E

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. 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 connectors.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-594, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

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

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

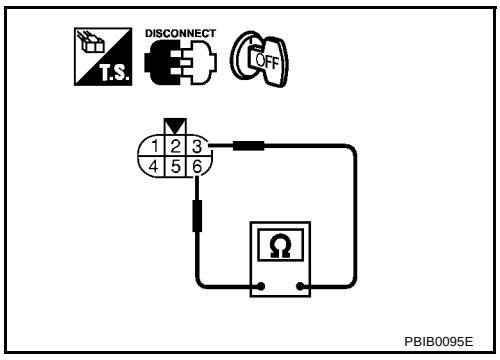
Component Inspection

EBS00KIZ

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-425, "Throttle Valve Closed Position Learning" .
5. Perform EC-425, "Idle Air Volume Learning" .

Removal and Installation

EBS00KJ0

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

EBS00KJ1

NOTE:
If DTC P1217 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-492, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

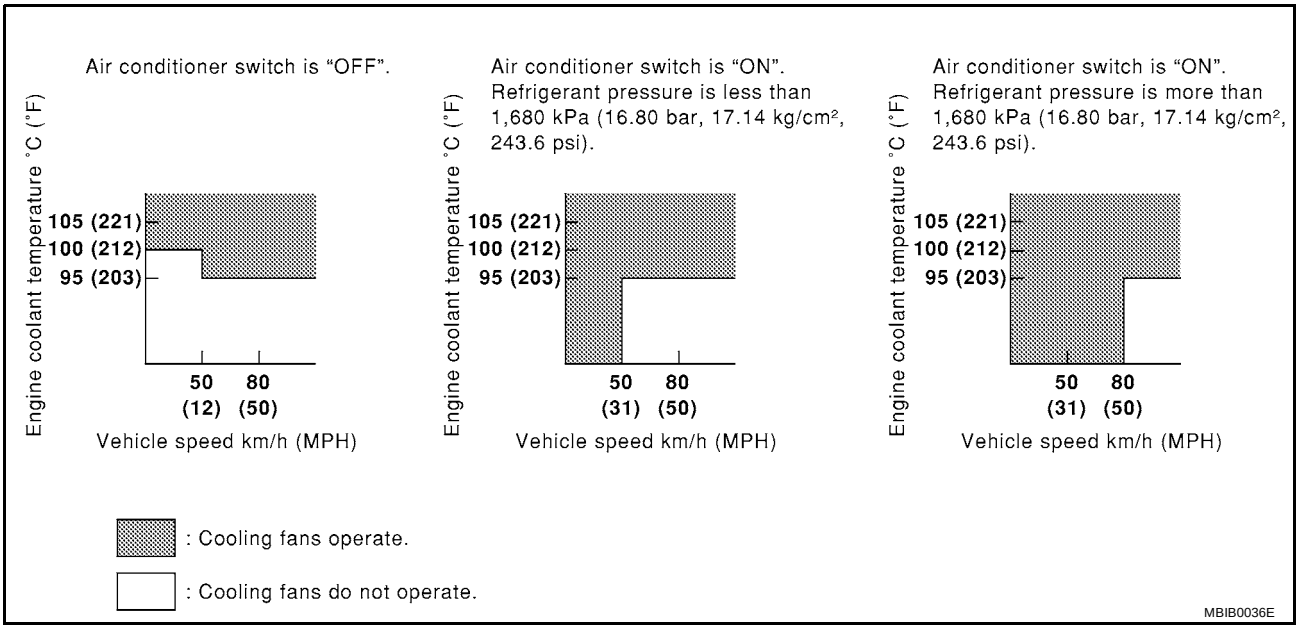
COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	Cooling fan control	Cooling fan relay
Battery	Battery voltage*1		
Vehicle speed signal	Vehicle speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal*2		
Refrigerant pressure sensor	Refrigerant pressure		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: These signals are sent to the ECM through CAN communication line.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 2-step control [ON/OFF].
The ECM sends a cooling fan control signal to the smart entrance control unit through CAN communication line, and the smart entrance control unit controls cooling fan relay.

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

EBS00KJ2

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

On Board Diagnosis Logic

EBS00KJ3

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Harness or connectors (The CAN communication line is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-605, "Main 12 Causes of Overheating" .

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to LC-11. Also, replace the engine oil. Refer to LC-8.

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-21.**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

EBS00KJ4

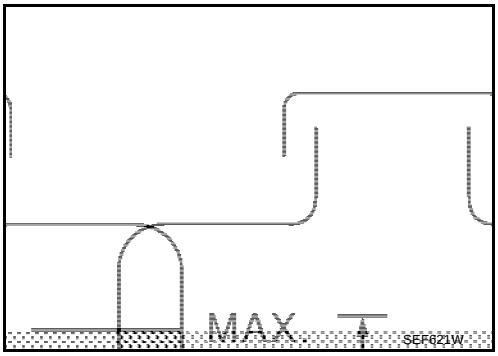
Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-600, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-600, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.



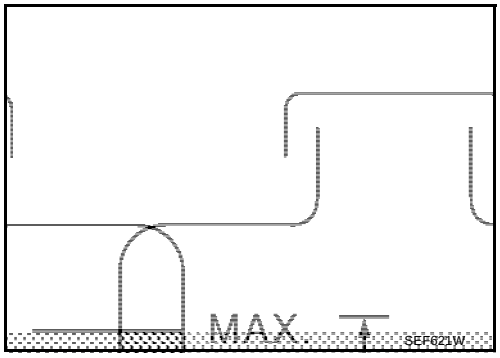
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-600, "Diagnostic Procedure" .

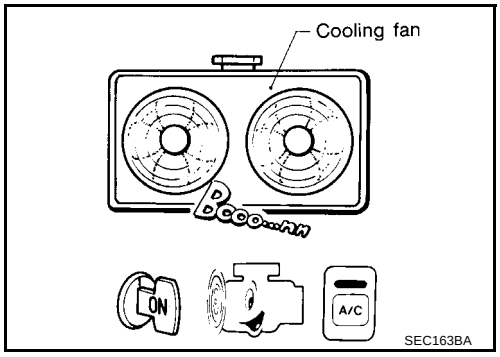
ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

MBIB0037E

WITHOUT CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-600, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-600, "Diagnostic Procedure" .
3. Start engine and let it idle.
   Be careful not to overheat engine.
4. Turn air conditioner switch “ON”.
5. Turn blower fan switch “ON”.
6. Make sure that cooling fans operate.
   If NG, go to EC-600, "Diagnostic Procedure" .





Diagnostic Procedure

EBS00KJ6

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK COOLING FAN OPERATION

With CONSULT-II

1. Start engine and let it idle.
2. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “ON” on the CONSULT-II screen.
3. Make sure that cooling fans-1 and -2 operate.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan control circuit. (Go to EC-603, "PROCEDURE A" .)

ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

MBIB0037E

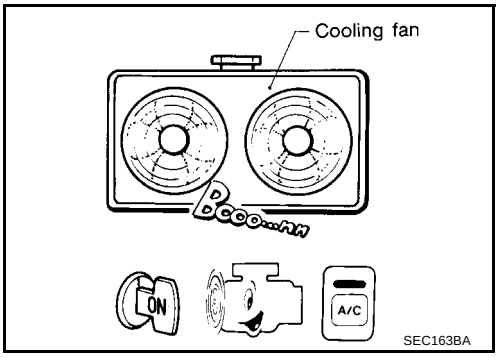
3. CHECK COOLING FAN OPERATION

Without CONSULT-II

1. Start engine and let it idle.
2. Turn air conditioner switch “ON”.
3. Turn blower fan switch “ON”.
4. Make sure that cooling fans-1 and -2 operate.

OK or NG

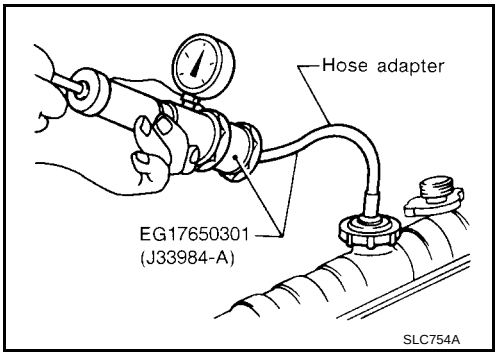
OK >> GO TO 4.
NG >> Check cooling fan control circuit. (Go to EC-603, "PROCEDURE A" .)



4. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.57 bar 1.6 kg/cm^2 , 23 psi)



CAUTION:
Higher than the specified pressure may cause radiator damage. Pressure should not drop.

OK or NG

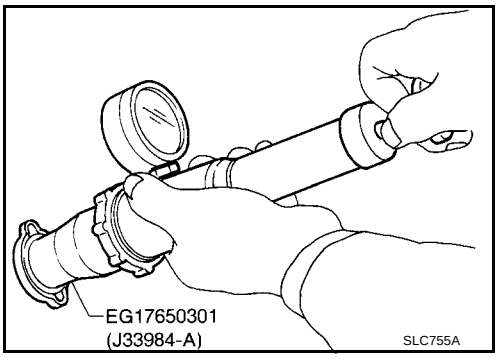
OK >> GO TO 5.
NG >> Check the following for leak

- Hose
- Radiator
- Water pump
  Refer to LC-14.

5. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure: 59 - 98 kPa (0.59 - 0.98 bar 0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



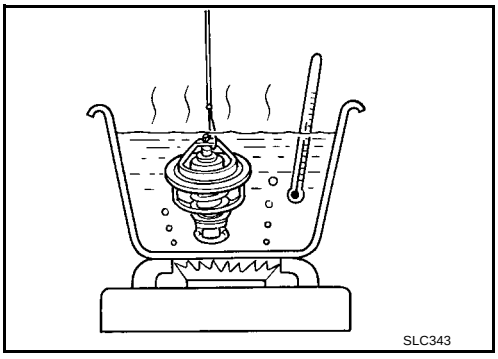
OK or NG

OK >> GO TO 6.
NG >> Replace radiator cap.

6. CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.

Valve opening temperature: 82°C (180°F) [standard]
Valve lift: More than 8 mm/95°C (0.31 in/203°F)



3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC-15.

OK or NG

OK >> GO TO 7.
NG >> Replace thermostat

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-505, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace engine coolant temperature sensor.

8. CHECK MAIN 12 CAUSES

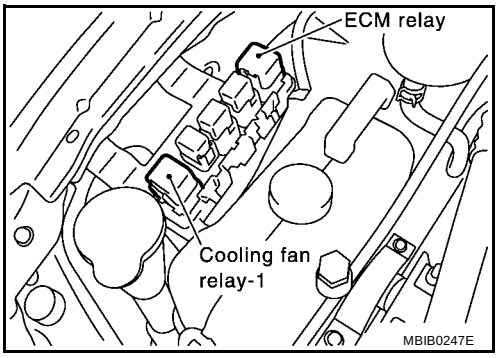
If the cause cannot be isolated, go to EC-605, "Main 12 Causes of Overheating" .

>> **INSPECTION END**

PROCEDURE A

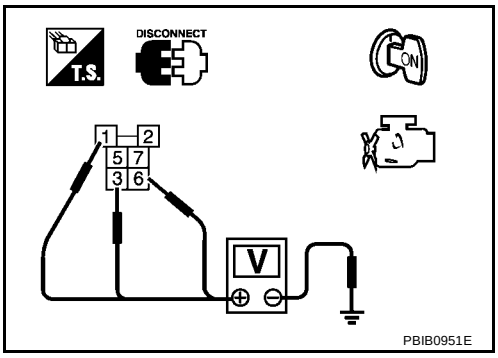
1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.



4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E104
- 10A fuse
- 30A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

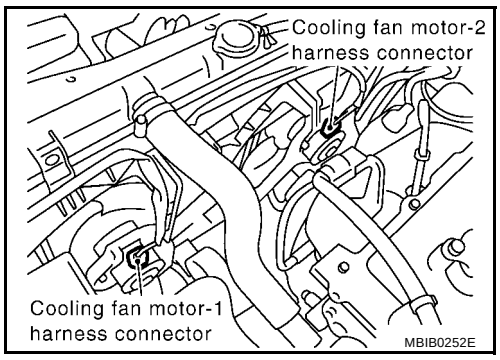
>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 2 and body ground.
   Refer to wiring diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 2 and body ground.
   Refer to wiring diagram.

   Continuity should exist.
6. Also check harness for short to ground and short to power.



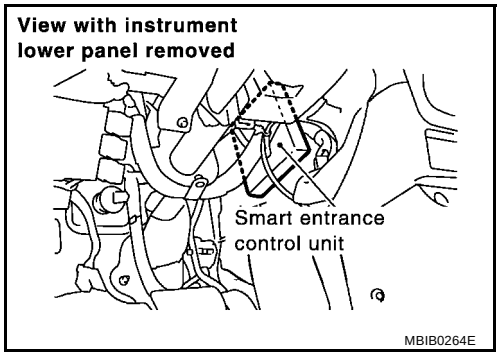
OK or NG

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

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect smart entrance control unit.
2. Check harness continuity between smart entrance control unit terminal 33 and cooling fan relay-1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E251, M182 (LHD models)
- Harness connectors E174, M159 (RHD models)
- Harness for open or short between smart entrance control unit and cooling fan relay-1

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

6. CHECK COOLING FAN RELAY-1

Refer to EC-606, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS

Refer to EC-606, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK SMART ENTRANCE CONTROL UNIT

Refer to EL-368.

OK or NG

OK >> GO TO 9.
NG >> Replace cooling fan motors.

9. CHECK INTERMITTENT INCIDENT

Perform EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

EBS00KJ7

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-19.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-7.
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See LC-12.
ON*2	5	● Coolant leaks	● Visual	No leaks	See LC-11.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-15, and LC-16.
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-596).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-7.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See MA-7.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-57, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-70, "CYLINDER BLOCK" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.
For more information, refer to LC-23.

Component Inspection

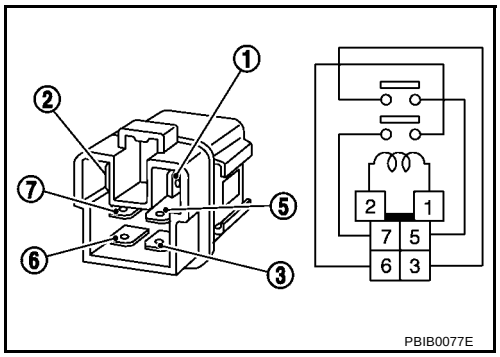
EBS00KJ8

COOLING FAN RELAY-1

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace cooling fan relay.

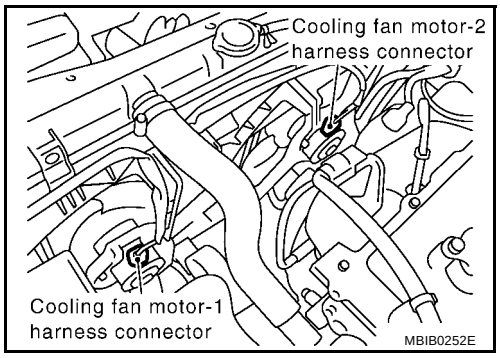


COOLING FAN MOTORS-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(–)
Cooling fan motor	1	2

Cooling fan motor should operate.
If NG, replace cooling fan motor.



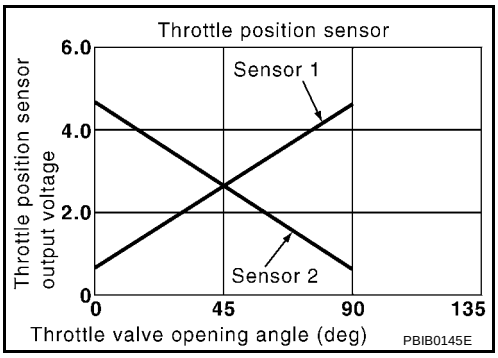
DTC P1223, P1224 TP SENSOR

PFP:16119

Component Description

EBS00KJ9

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KJA

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T models) 1st (M/T models)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00KJB

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1223 1223	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 2)
P1224 1224	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

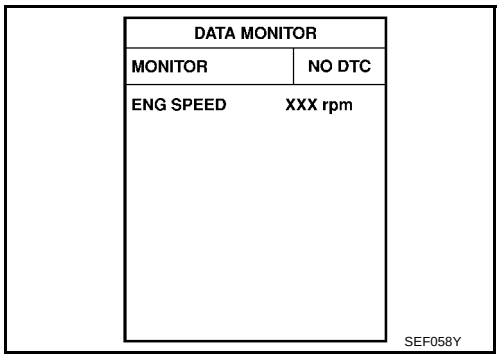
DTC Confirmation Procedure

EBS00KJC

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-610, "Diagnostic Procedure" .



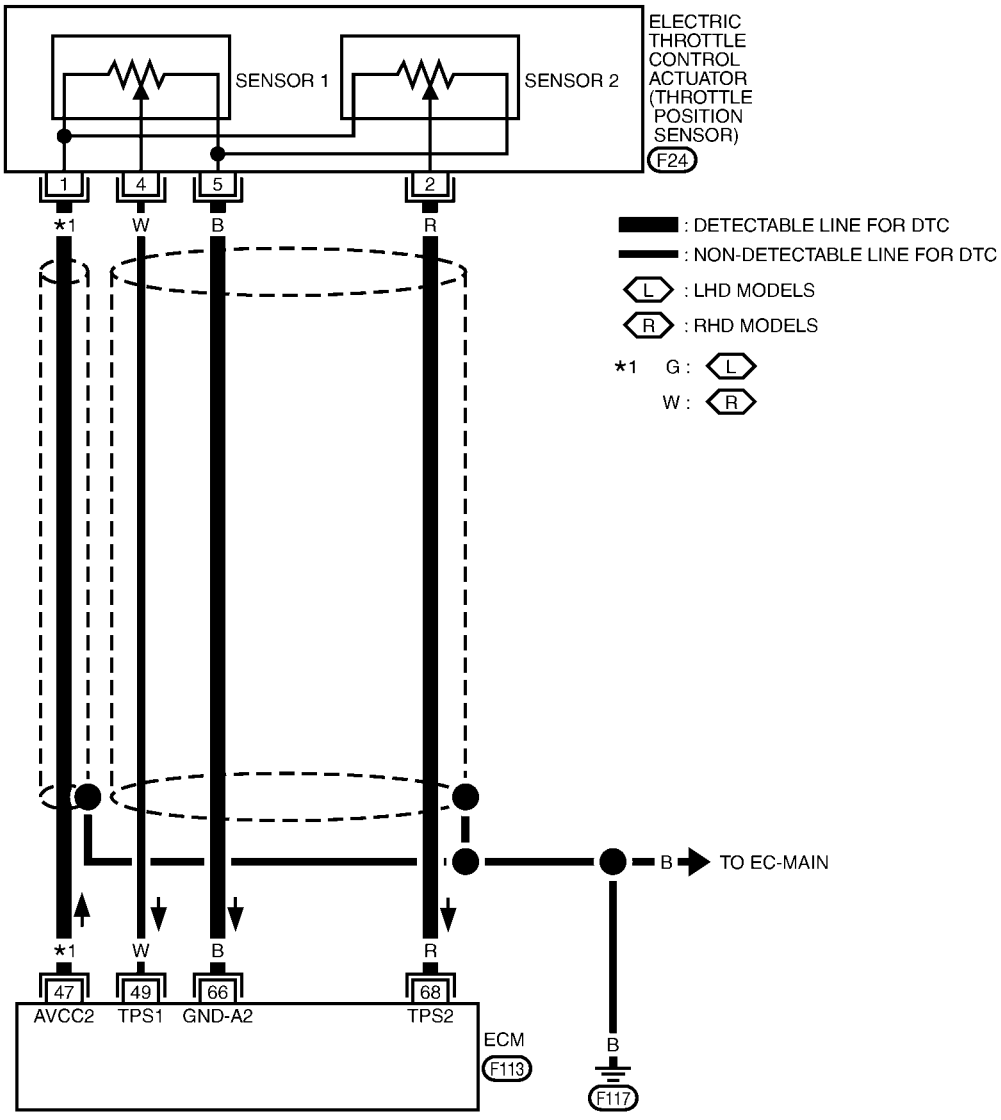
WITHOUT CONSULT-II

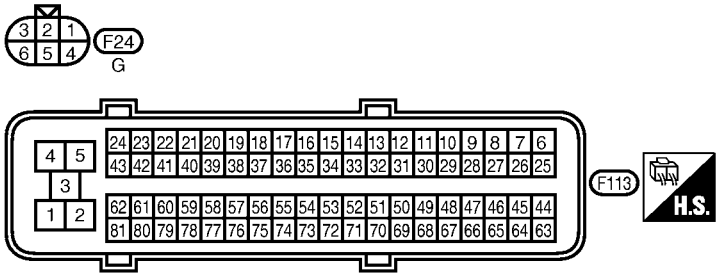
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-612, "Component Inspection" .

Wiring Diagram

EBS00KJD

EC-TPS2-01





YEC301A

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)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models.) ● Accelerator pedal fully released.	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models.) ● Accelerator pedal fully depressed.	Less than 4.75V
66	B	Throttle position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models.) ● Accelerator pedal fully released.	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped. ● Shift lever position is "D" (A/T models). ● Shift lever position is "1st" (M/T models). ● Accelerator pedal fully depressed.	More than 0.36V

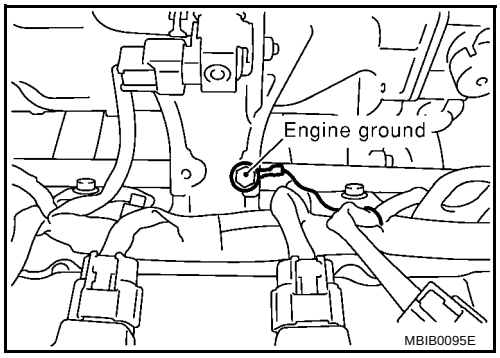
Diagnostic Procedure

EBS00KJE

1. RETIGHTEN GROUND SCREWS

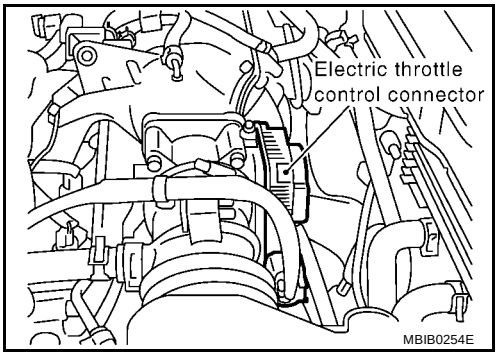
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



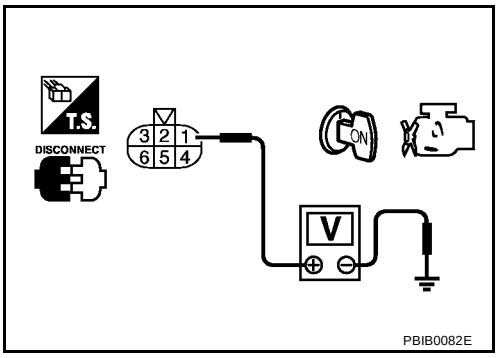
2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



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 THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-612, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

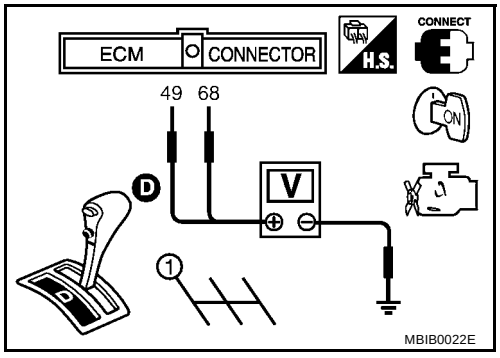
Component Inspection

EBS00KJF

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-425, "Throttle Valve Closed Position Learning" .
8. Perform EC-425, "Idle Air Volume Learning" .

Removal and Installation

EBS00KJG

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

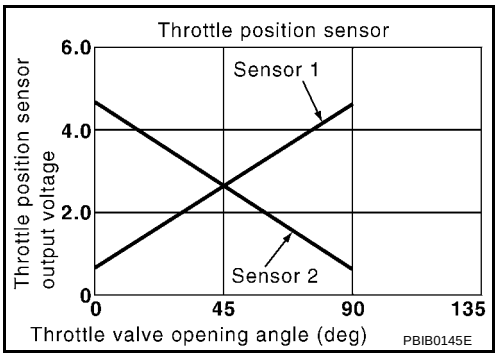
DTC P1225 TP SENSOR

PFP:16119

Component Description

EBS00KJH

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00KJI

The MI will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

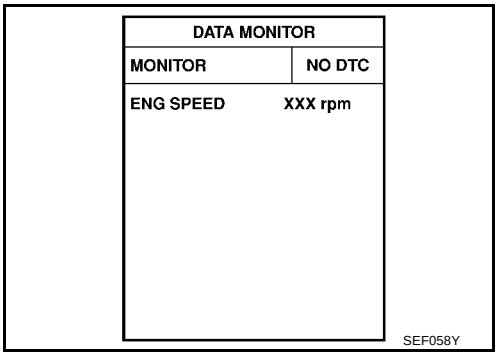
DTC Confirmation Procedure

EBS00KJJ

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-614, "Diagnostic Procedure" .



WITHOUT CONSULT-II

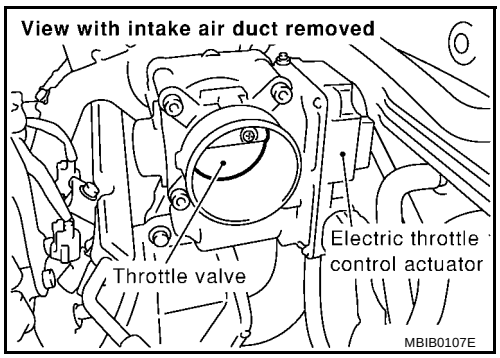
1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-614, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00KJK

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

EBS00KJL

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

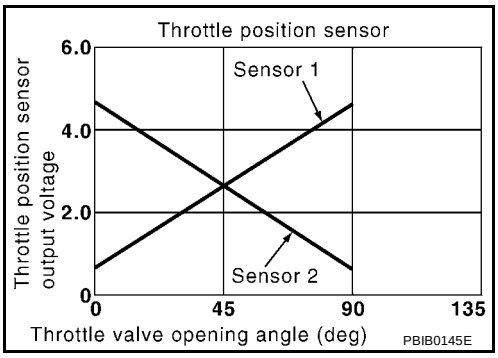
DTC P1226 TP SENSOR

PFP:16119

Component Description

EBS00KJM

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00KJN

The MI will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

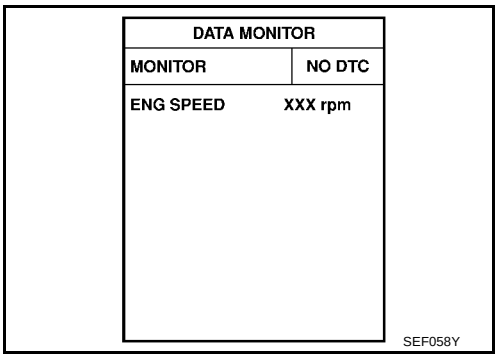
DTC Confirmation Procedure

EBS00KJO

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-616, "Diagnostic Procedure" .



WITHOUT CONSULT-II

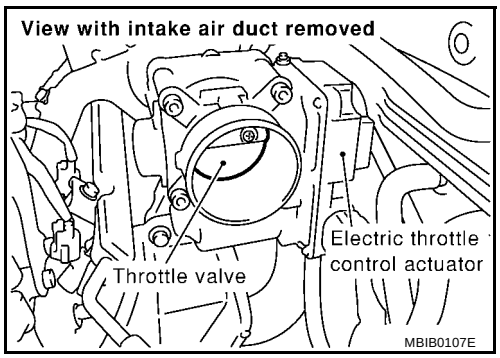
1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Repeat step 2, 32 times.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-616, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00KJP

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

EBS00KJQ

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-16, "INTAKE MANIFOLD" .

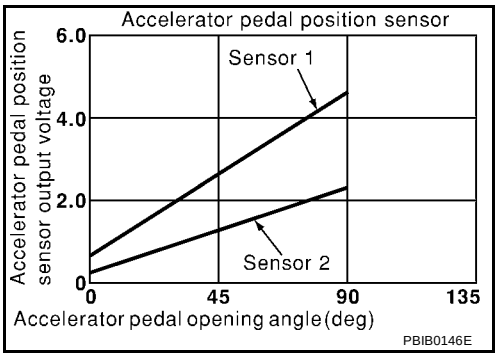
DTC P1227, P1228 APP SENSOR

PFP:18002

Component Description

EBS00KJR

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KJS

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internality. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

EBS00KJT

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1227 1227	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2)
P1228 1228	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

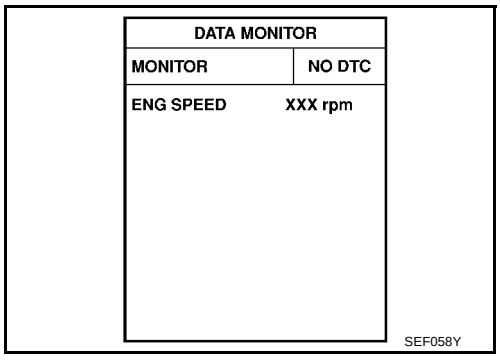
DTC Confirmation Procedure

EBS00KJU

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-620, "Diagnostic Procedure" .



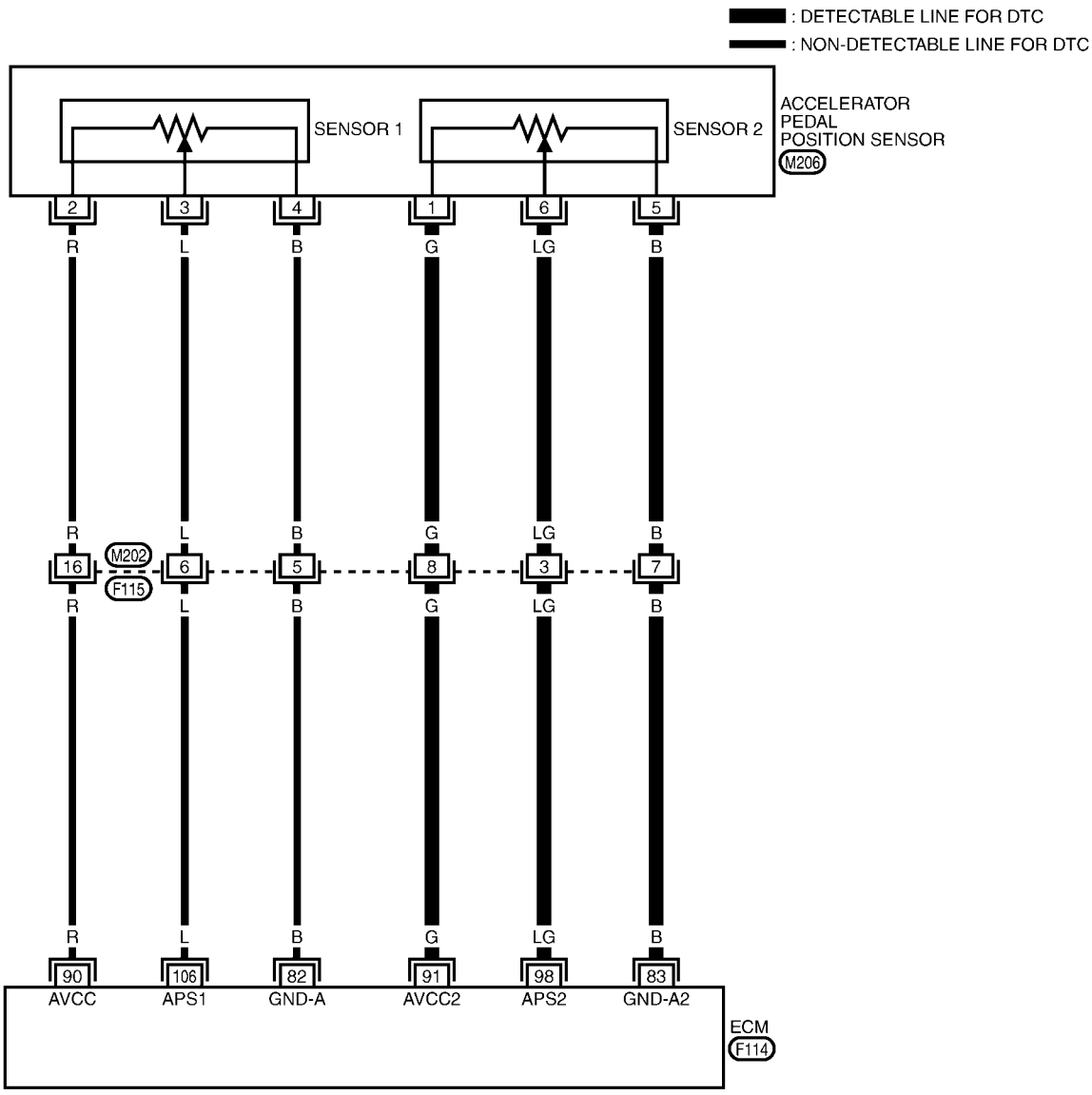
WITHOUT CONSULT-II

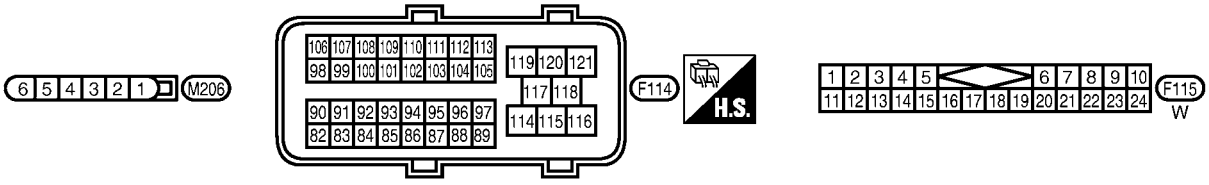
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-620, "Diagnostic Procedure" .

Wiring Diagram

EBS00KJV

EC-APPS2-01





YEC302A

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)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.175 - 0.335V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped. ● Accelerator pedal fully released.	0.35 - 0.67V
			[Ignition switch "ON"] ● Engine stopped. ● Accelerator pedal fully depressed.	More than 3.9V

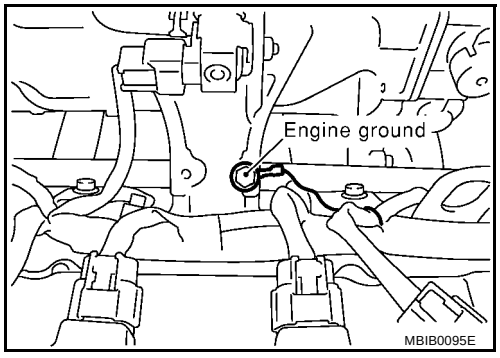
Diagnostic Procedure

EBS00KJW

1. RETIGHTEN GROUND SCREWS

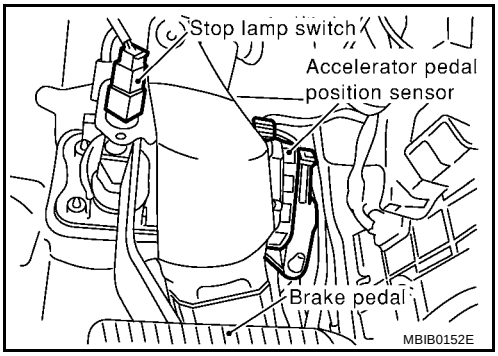
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



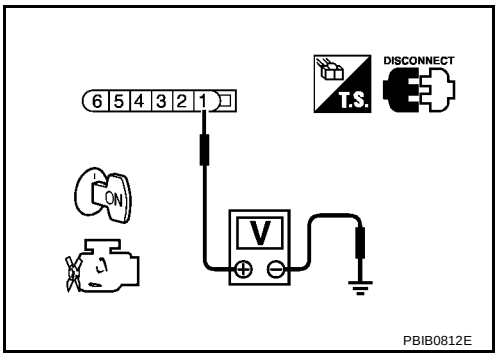
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

4. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 83 and APP sensor terminal 5. 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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

6. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and accelerator pedal position sensor

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

8. CHECK APP SENSOR

Refer to EC-622, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-425, "Accelerator Pedal Released Position Learning" .
3. Perform EC-425, "Throttle Valve Closed Position Learning" .
4. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

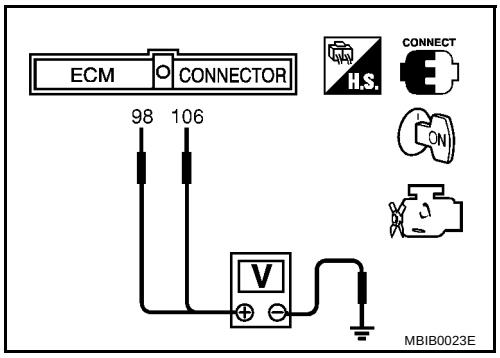
Component Inspection

EBS00KJX

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-425, "Accelerator Pedal Released Position Learning" .
6. Perform EC-425, "Throttle Valve Closed Position Learning" .
7. Perform EC-425, "Idle Air Volume Learning" .

Removal and Installation

EBS00KJY

ACCELERATOR PEDAL

Refer to FE-3.

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

EBS00KJZ

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

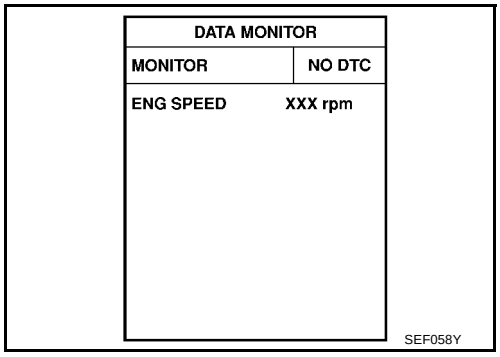
DTC Confirmation Procedure

EBS00KK0

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 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-626, "Diagnostic Procedure" .



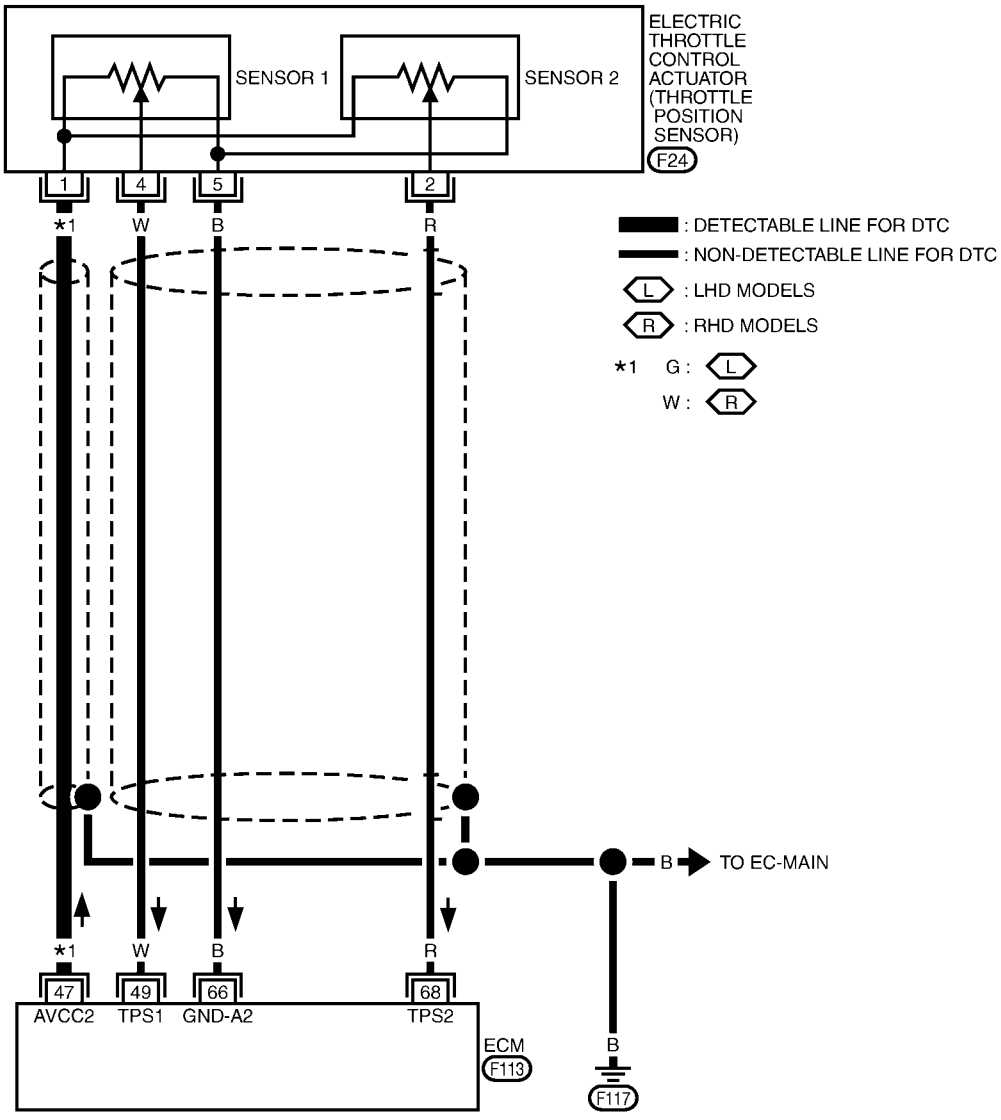
WITHOUT CONSULT-II

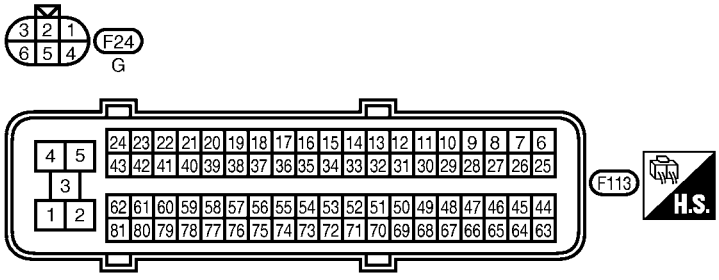
1. Start engine and let it idle for 1 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-626, "Diagnostic Procedure" .

Wiring Diagram

EBS00KK1

EC-SEN/PW-01





YEC303A

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)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V

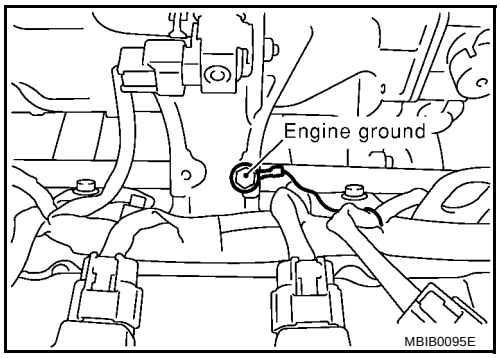
Diagnostic Procedure

EBS00KK2

1. RETIGHTEN GROUND SCREWS

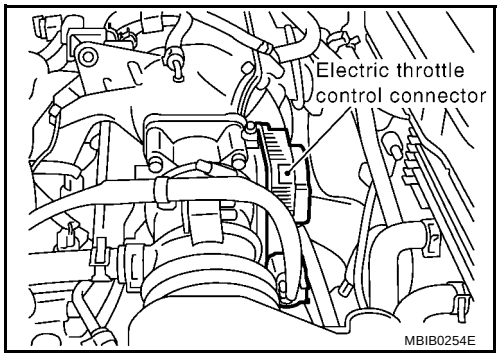
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch "ON".

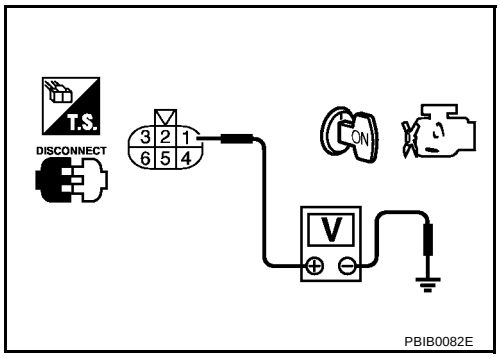


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground between ECM terminal 47 and electric throttle control actuator terminal 1.
- ECM pin terminal.

OK or NG

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

4. CHECK THROTTLE POSITION SENSOR

Refer to EC-529, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-425, "Throttle Valve Closed Position Learning" .
3. Perform EC-425, "Idle Air Volume Learning" .

>> **INSPECTION END**

6. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

EBS00KK3

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

EBS00KK4

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

EBS00KK5

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

FALI-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

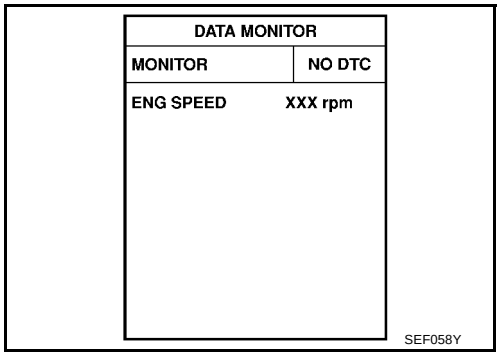
Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.	
	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

EBS00KK6

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-630, "Diagnostic Procedure" .



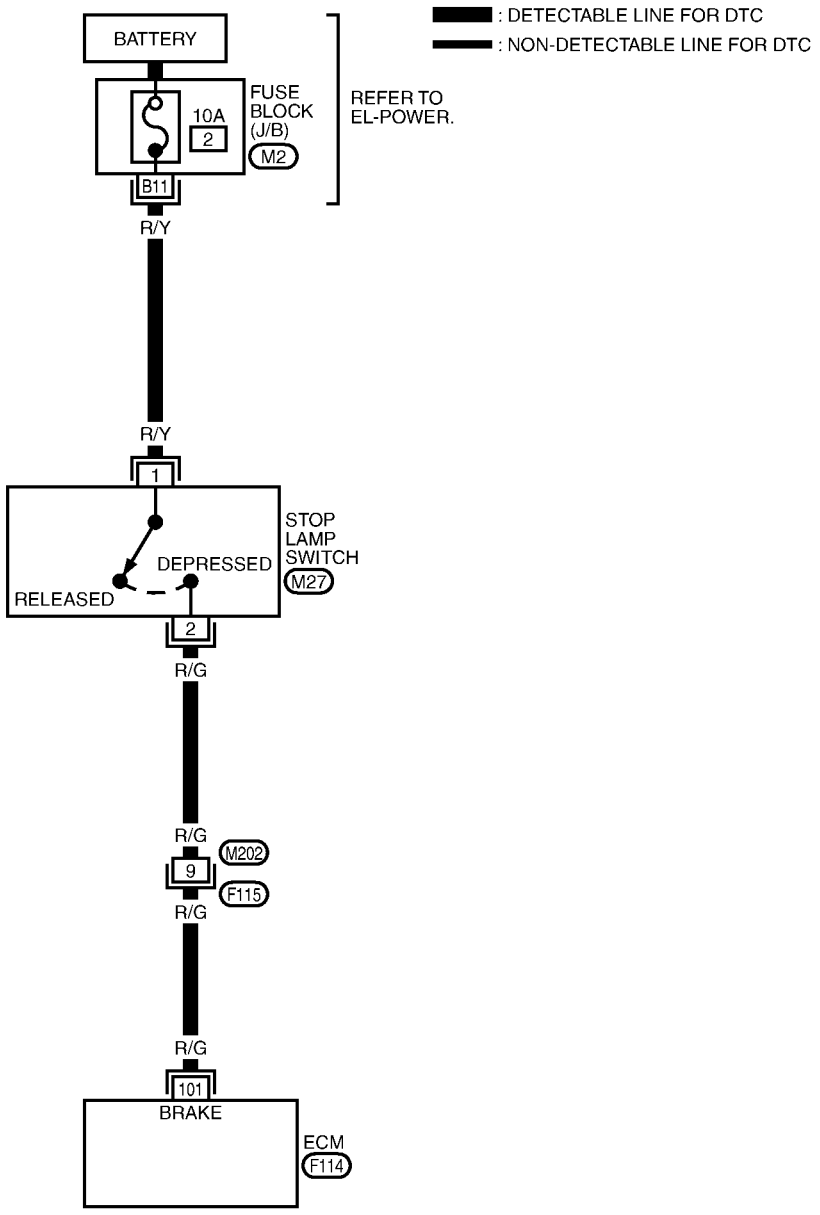
WITHOUT CONSULT-II

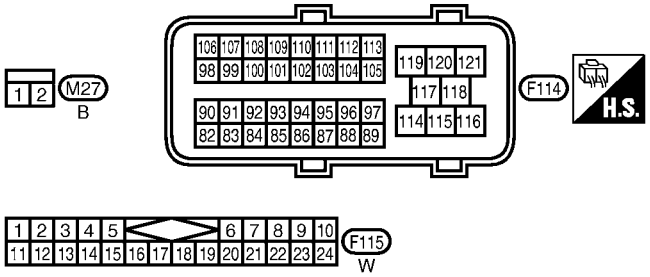
1. Turn ignition switch “ON”.
2. Fully depress the brake pedal at least 5 seconds.
3. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-430 .
4. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
5. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6. If 1st trip DTC is detected, go to EC-630, "Diagnostic Procedure" .

Wiring Diagram

EBS00KK7

EC-BRK/SW-01





REFER TO THE FOLLOWING.
M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC305A

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)
101	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released.	Approximately 0V
			[Engine is running] ● Brake pedal depressed.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00KK8

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the brake pedal.

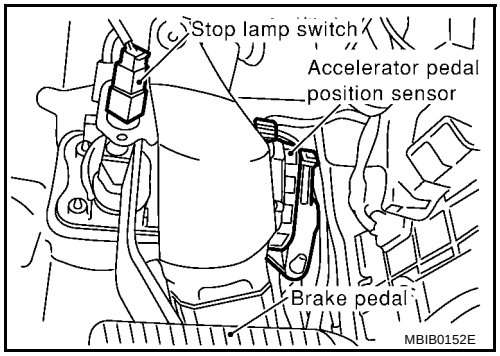
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

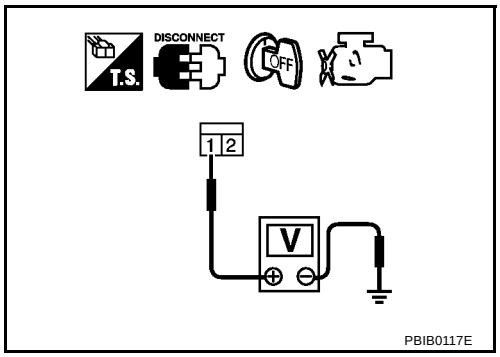
2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.



2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

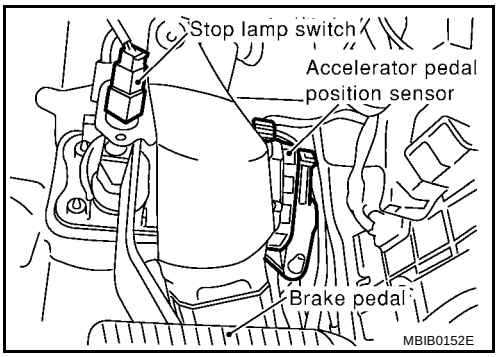
>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.
4. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

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



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness for open or short between ECM and stop lamp switch

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

6. CHECK STOP LAMP SWITCH

Refer to EC-632, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

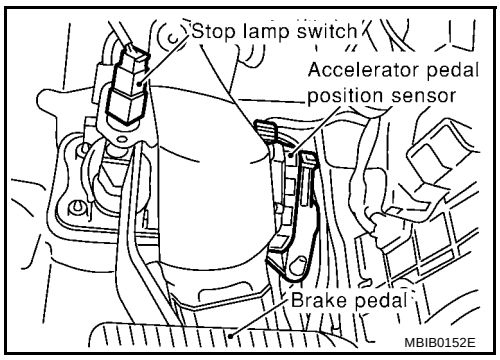
>> **INSPECTION END**

Component Inspection

EBS00KK9

STOP LAMP SWITCH

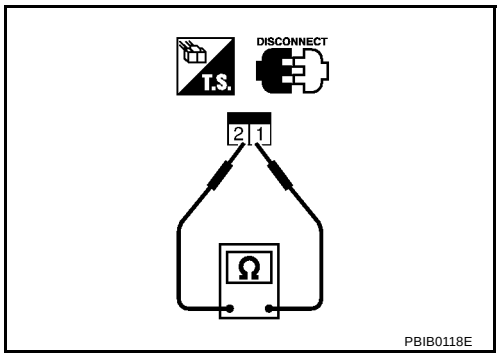
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

If NG, adjust brake pedal installation, refer to BR-12, and perform step 2 again.



HO2S1 HEATER

PFP:22690

Description

EBS00KKA

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,200 (A/T models) Above 3,600 (M/T models)	OFF
Below 3,200 (A/T models) Below 3,600 (M/T models)	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00KKB

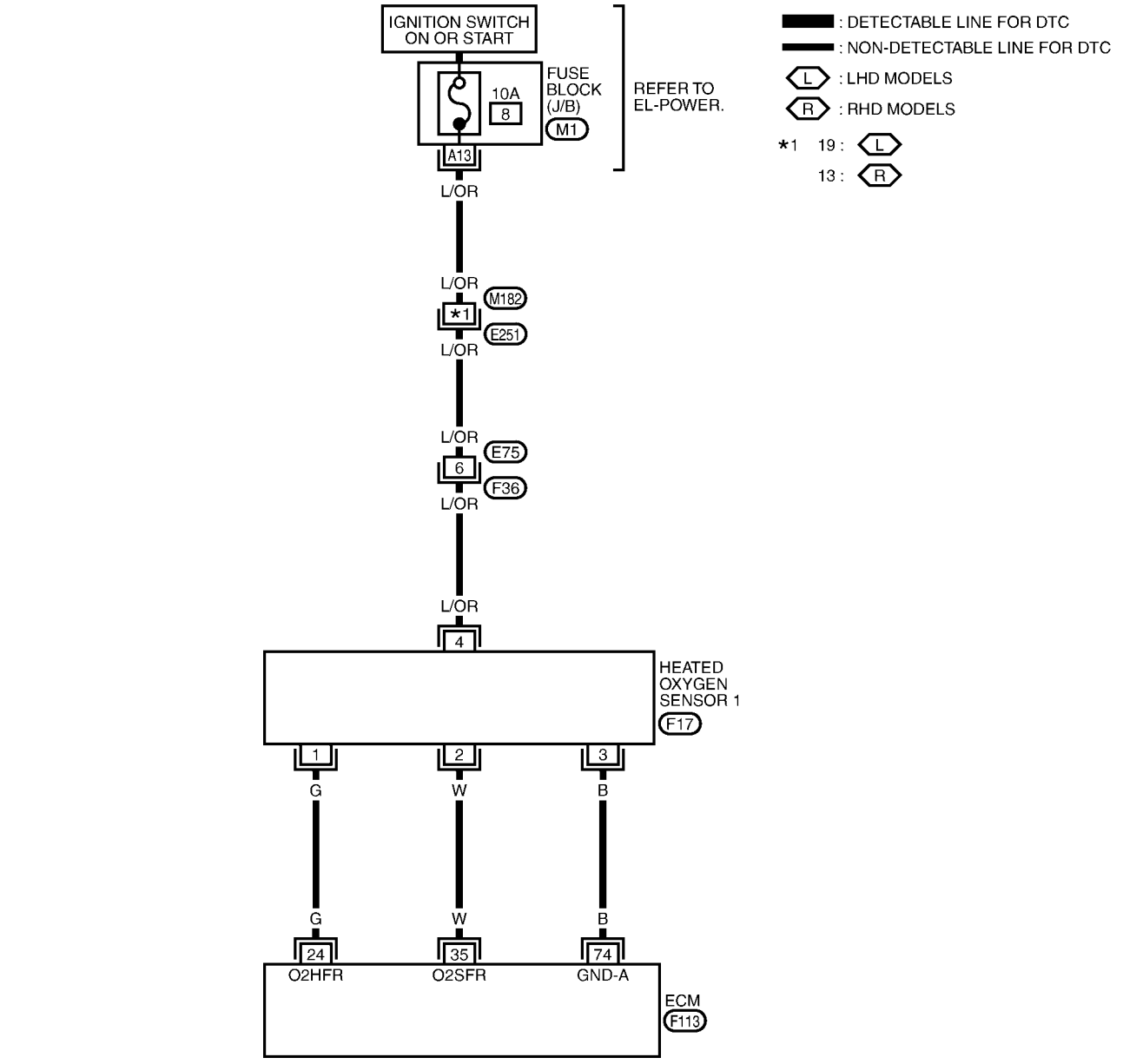
Specification data are reference values.

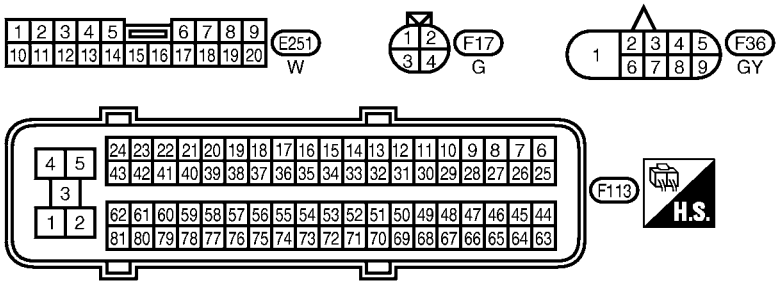
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,200 rpm (A/T models) Below 3,600 rpm (M/T models)	ON
	● Engine speed: Above 3,200 rpm (A/T models) Above 3,600 rpm (M/T models)	OFF

Wiring Diagram

EBS00KKC

EC-FRO2-01





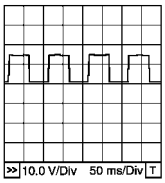
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC314A

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)
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,200 rpm (A/T models). ● Engine speed is below 3,600 rpm (M/T models).	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,200 rpm (A/T models). ● Engine speed is above 3,600 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)

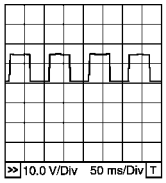
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

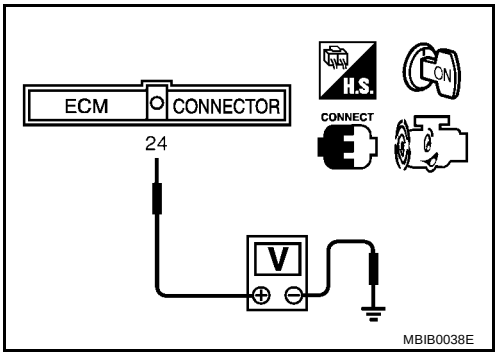
Diagnostic Procedure

EBS00KKD

1. CHECK OVERALL FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON".
4. Set the tester probe between ECM terminal 24 (HO2S1 heater signal) and ground.
5. Start engine and let it idle.
6. Check the voltage under the following conditions.
   Verify that the oscilloscope screen shows the signal wave as shown below.

Conditions	Voltage
At idle	Approximately 7.0V★  PBIB0519E
Engine speed is above 3,200 rpm (A/T models) Engine speed is above 3,600 rpm (M/T models)	BATTERY VOLTAGE (11 - 14V)



MBIB0038E

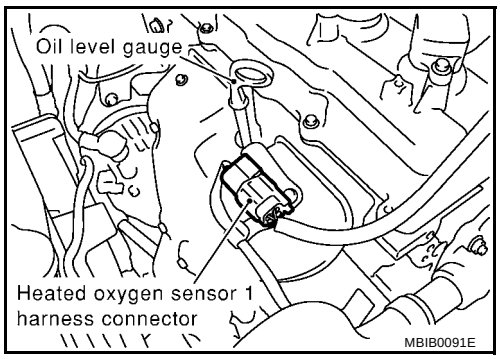
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 2.

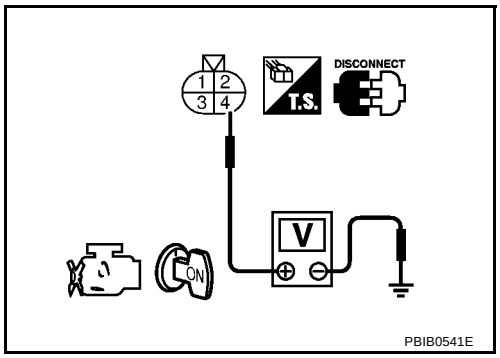
2. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between HO2S1 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M182, E251
- Harness connectors E75, F36
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

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

4. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 24 and HO2S1 terminal 1.
   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 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-637, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KKE

HEATED OXYGEN SENSOR 1 HEATER

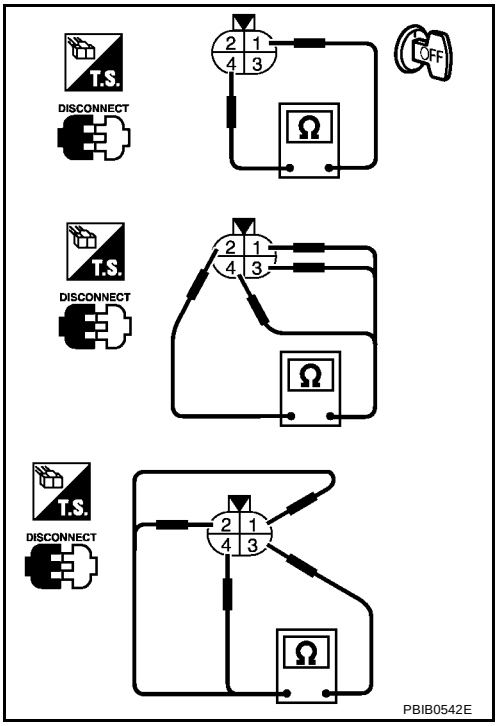
1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
1 and 4	8 - 10 Ω at 20°C (68°F)
2 and 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 1.

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

EBS00KKF

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

HO2S2 HEATER

PFP:226A0

Description

EBS00KKG

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,800	OFF
● Below 3,800 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00KKH

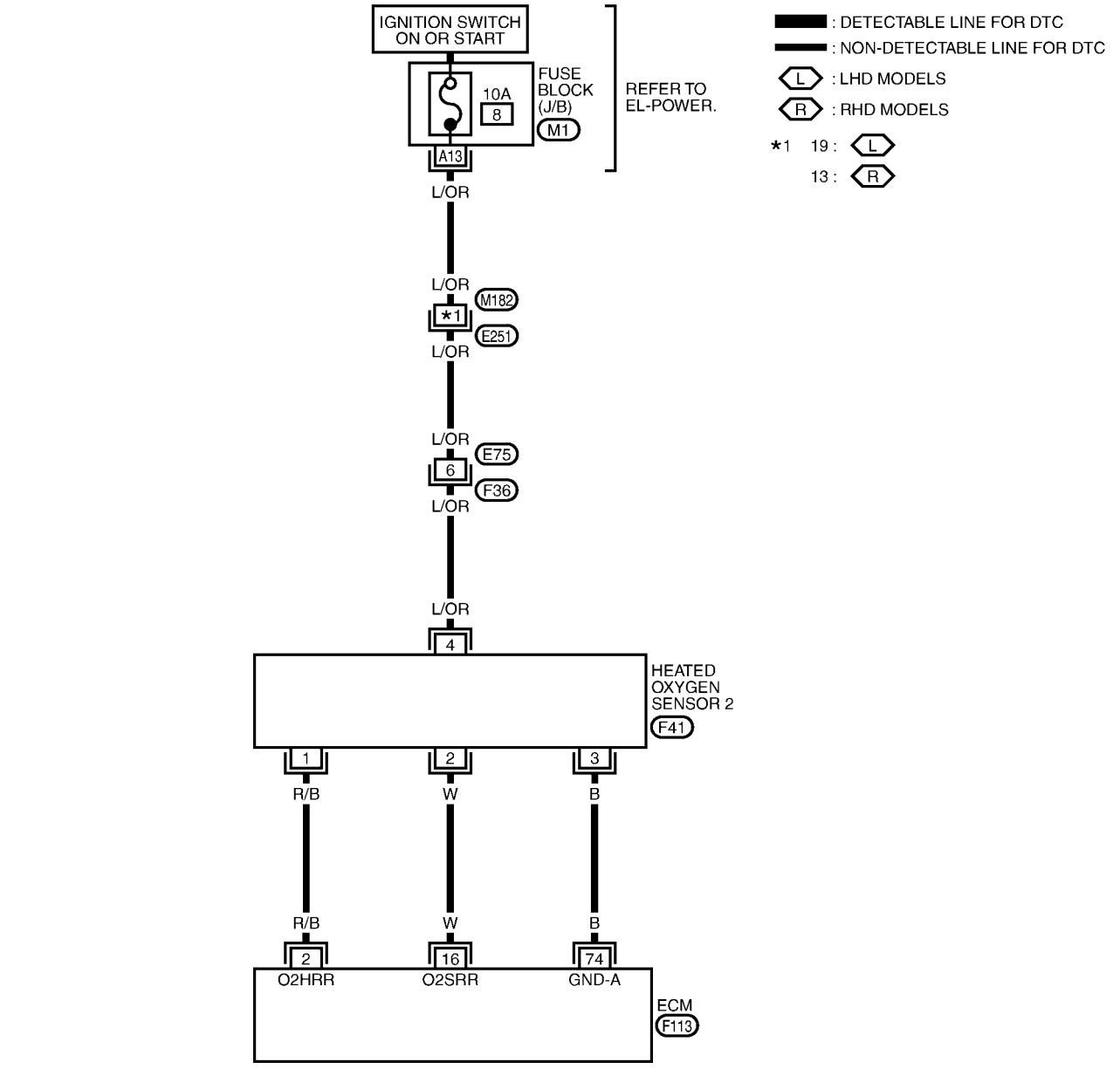
Specification data are reference values.

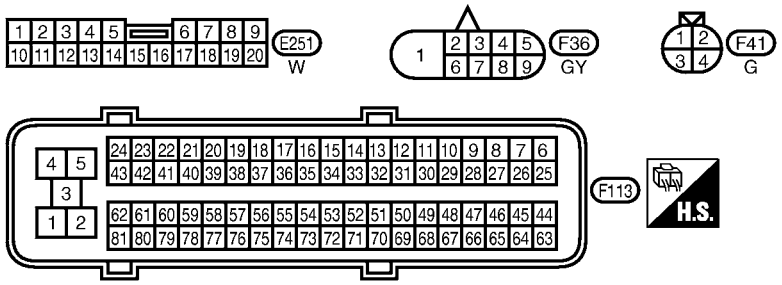
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,800 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	ON
	● Engine speed: Above 3,800 rpm	OFF

Wiring Diagram

EBS00KKI

EC-RRO2-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC315A

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)
2	R/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed: Below 3,800 rpm [after the following conditions are met.] ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,800 rpm.	BATTERY VOLTAGE (11 - 14V)

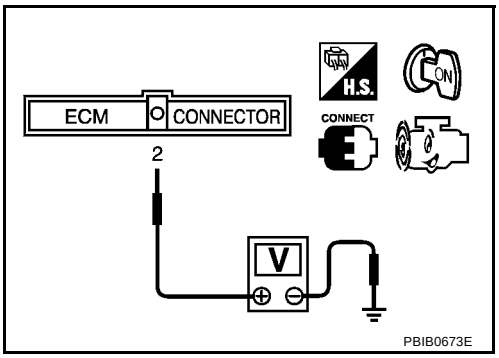
Diagnostic Procedure

EBS00KKJ

1. CHECK OVERALL FUNCTION CHECK

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 one minute under no load.
4. Let engine idle for one minute.
5. Set the voltmeter probe between ECM terminal 2 (HO2S2 heater signal) and ground.
6. Check the voltage under the following conditions.

Conditions	Voltage
At idle	0 - 1V
Engine speed is above 3,600 rpm	Battery voltage

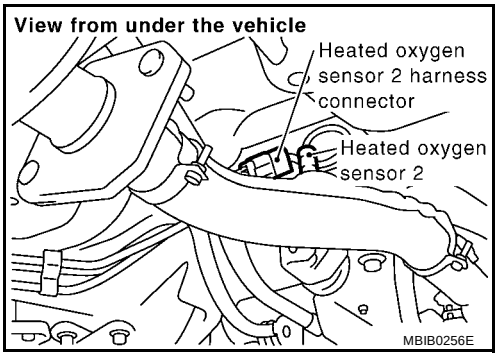


OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 2.

2. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch “ON”.

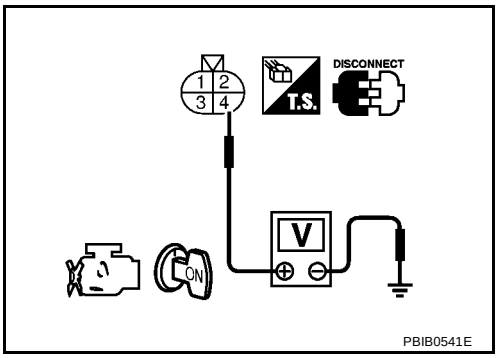


4. Check voltage between HO2S2 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M182, E251
- Harness connectors E75, F36
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

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

4. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S2 terminal 1. 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 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-642, "Component Inspection" .

OK or NG

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

6. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

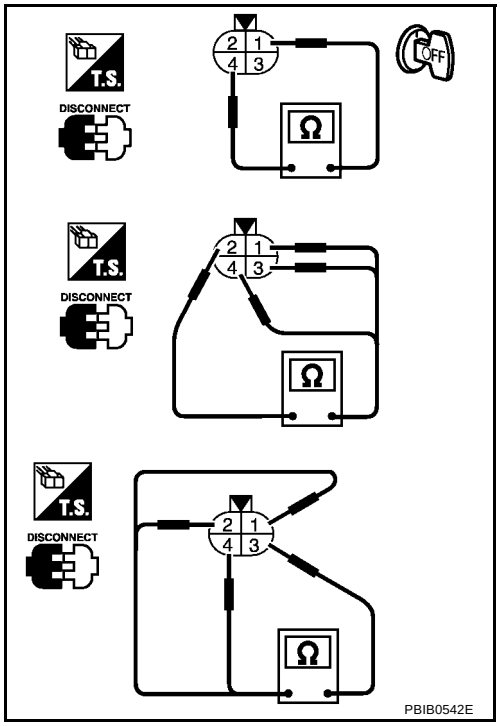
Component Inspection

EBS00KKK

HEATED OXYGEN SENSOR 2 HEATER

1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	



2. 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

EBS00KKL

HEATED OXYGEN SENSOR 2

Refer to FE-10.

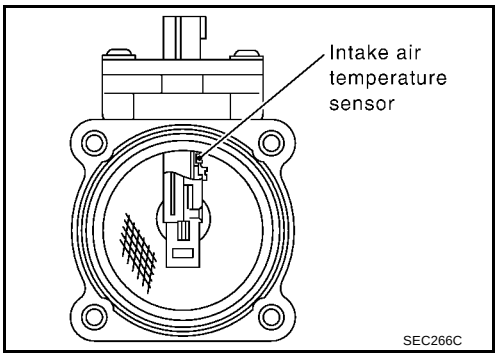
IAT SENSOR

PFP:22630

Component Description

EBS00KKM

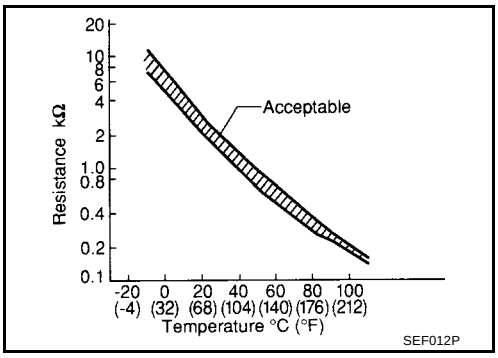
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and body ground.

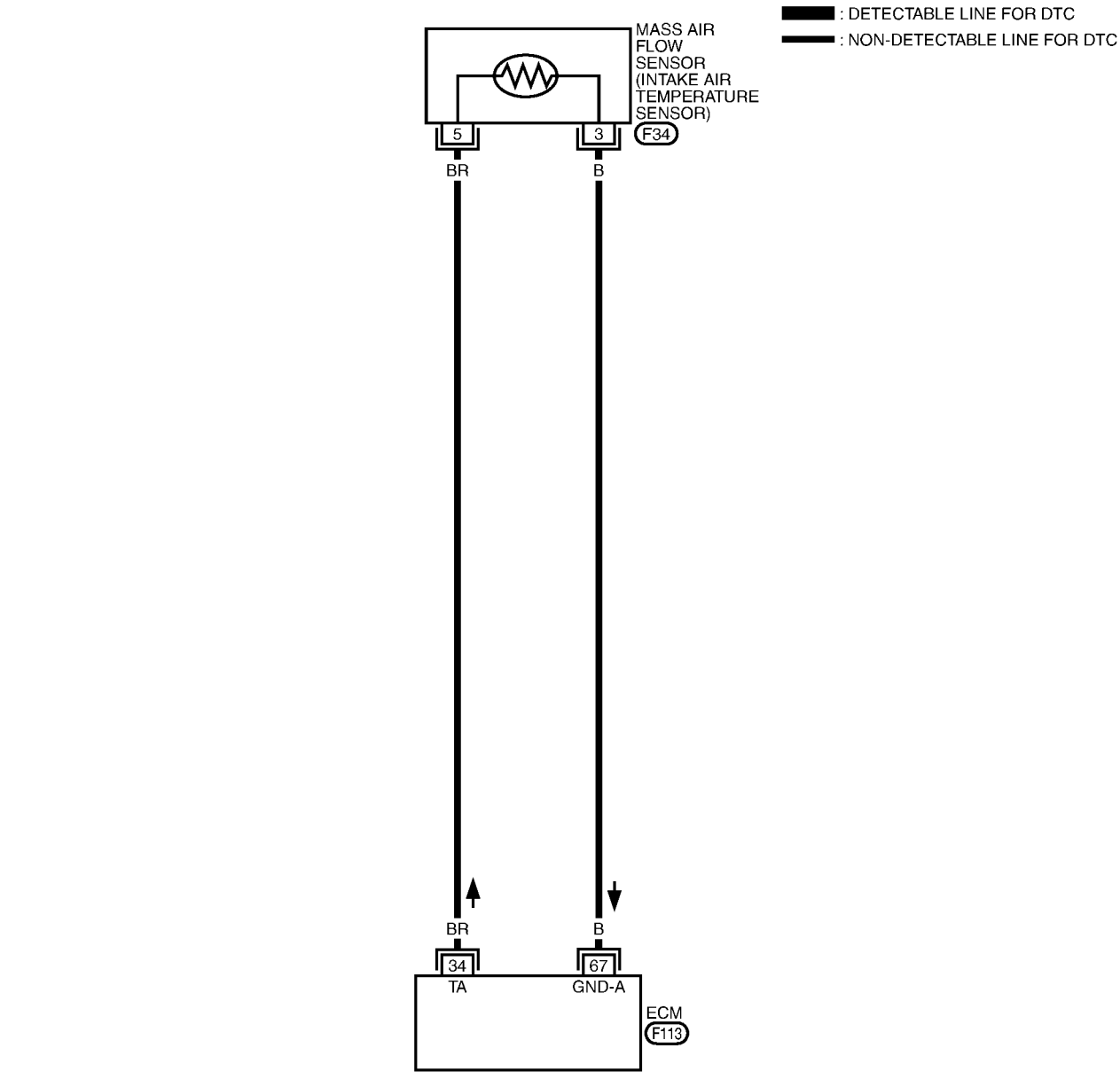


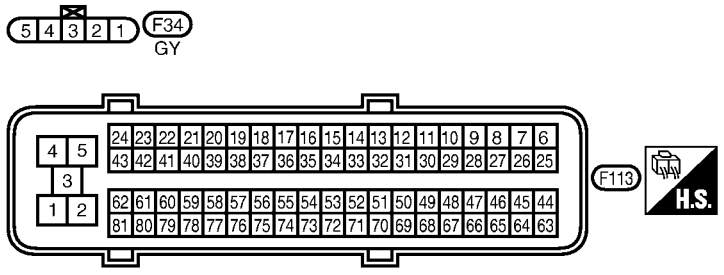
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

Wiring Diagram

EBS00KKN

EC-IATSEN-01





YEC317A

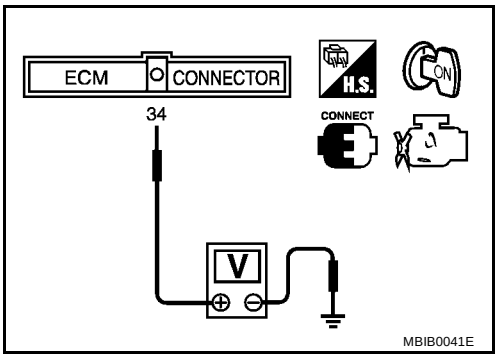
Diagnostic Procedure

EBS00KKO

1. CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 34 and ground with CONSULT-II or tester.

Voltage: Approximately 0 - 4.8V

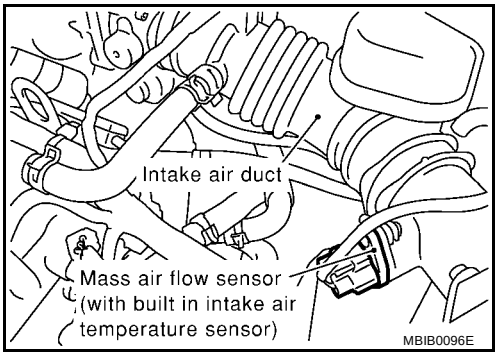


OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 2.

2. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.

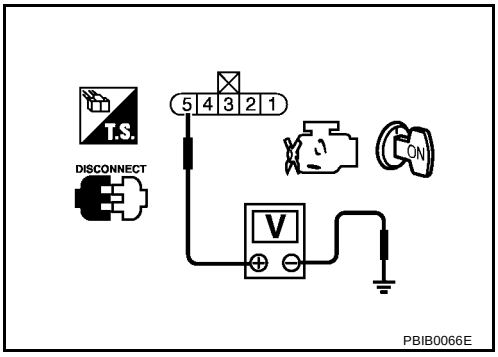


4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V

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 INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 67 and mass air flow sensor terminal 3. 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 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-646, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

5. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

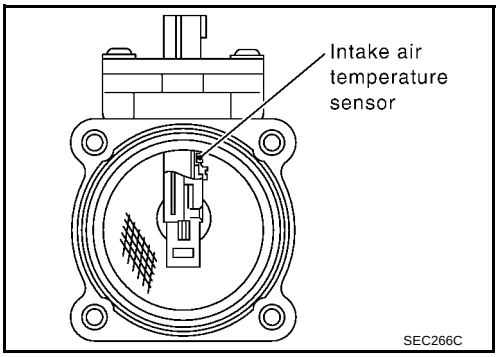
EBS00KKP

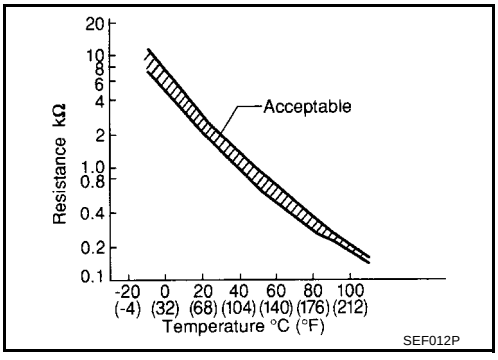
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

EBS00KKQ

MASS AIR FLOW SENSOR

Refer to EM-14, "AIR CLEANER AND AIR DUCT" .

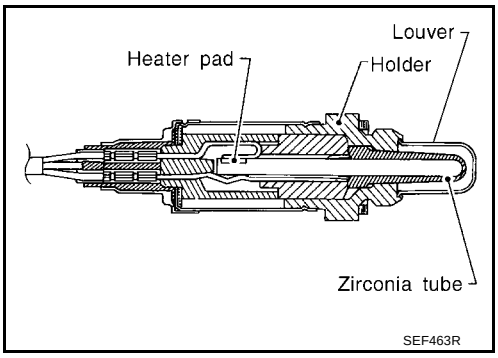
HO2S1

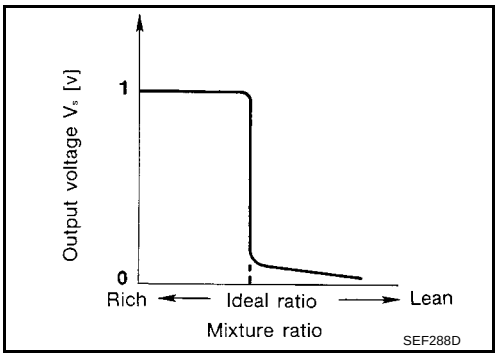
PFP:22690

Component Description

EBS00KKR

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00KKS

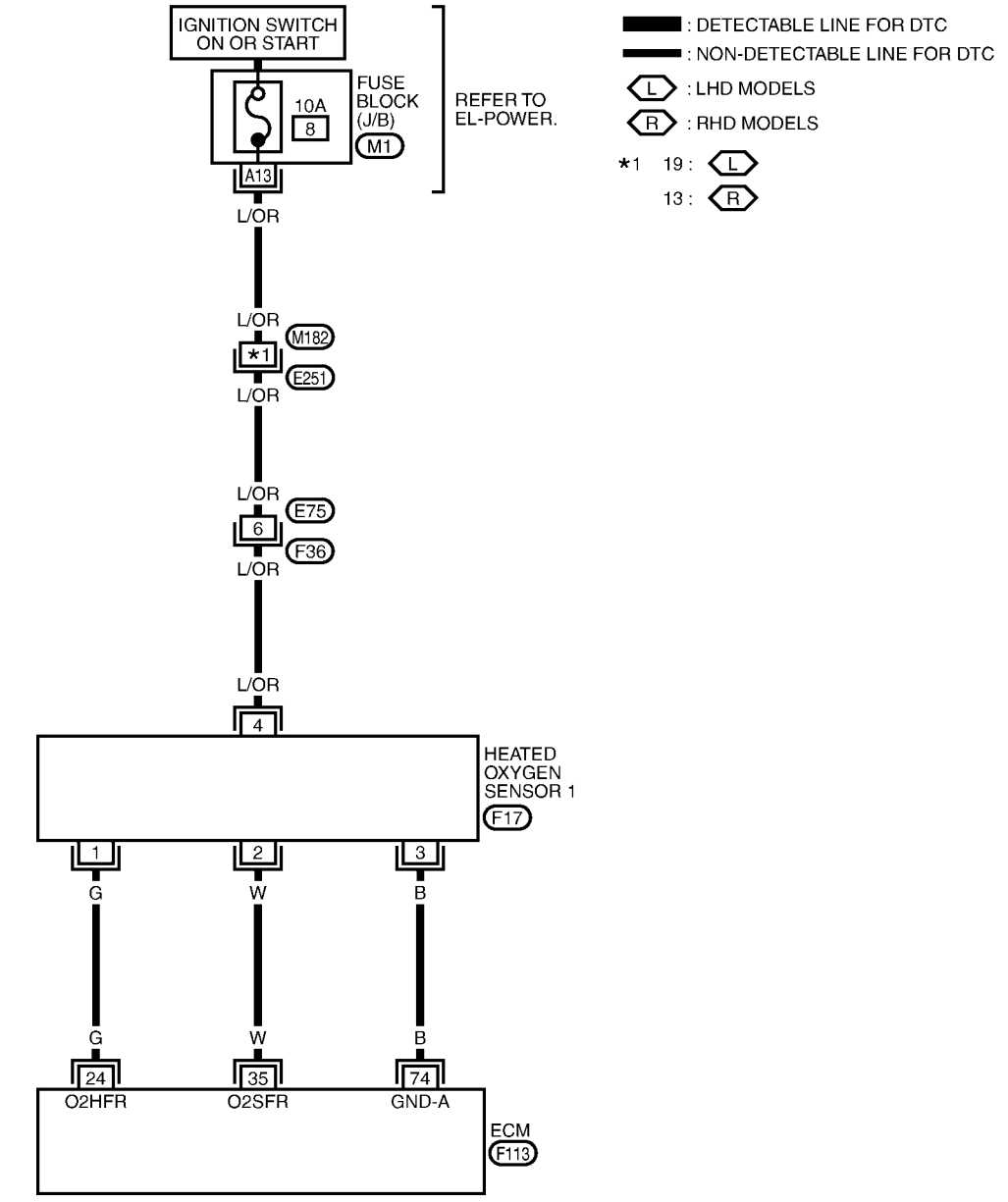
Specification data are reference values.

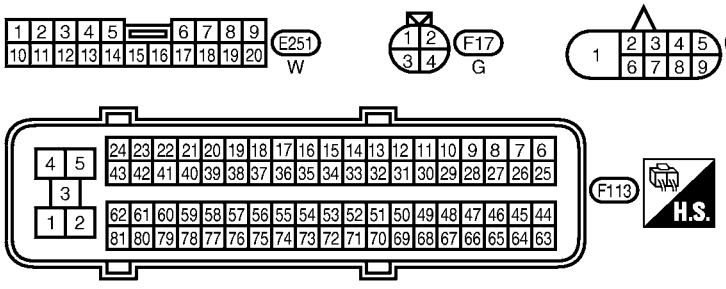
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

Wiring Diagram

EBS00KKT

EC-FRO2-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC314A

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)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00KKU

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

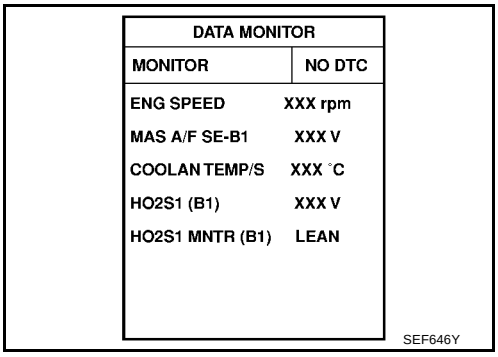
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 MNTR (B1)” in “DATA MONITOR” mode with CONSULT-II.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuate between LEAN and RICH more than five times in 10 seconds.

   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH



OK or NG

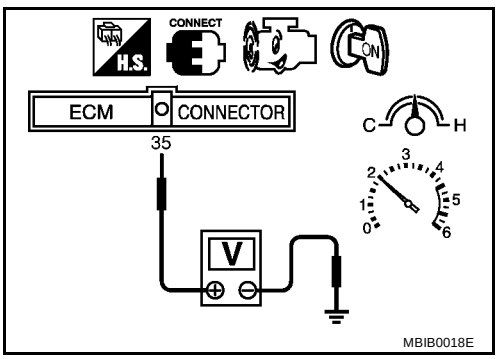
OK >> **INSPECTION END**
NG >> GO TO 4.

3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times in 10 seconds.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V



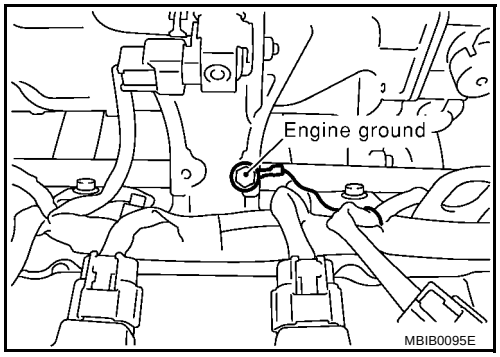
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 5.

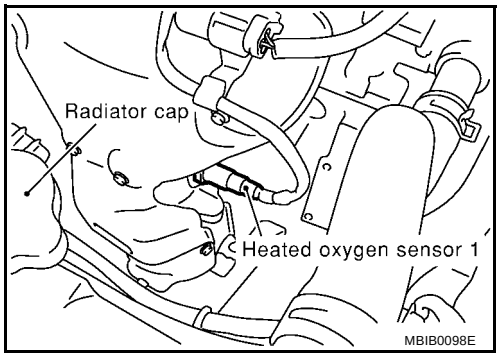


5. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

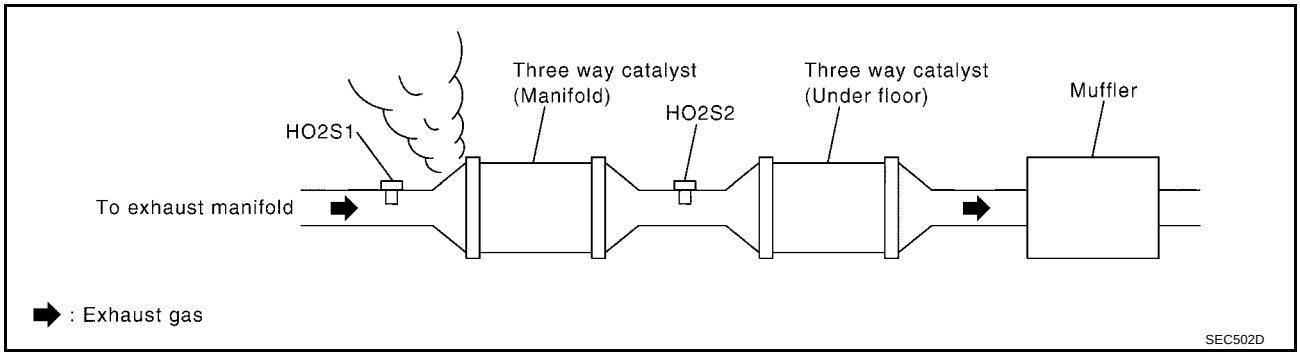
Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 6.



6. CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 7.
NG >> Repair or replace.

7. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

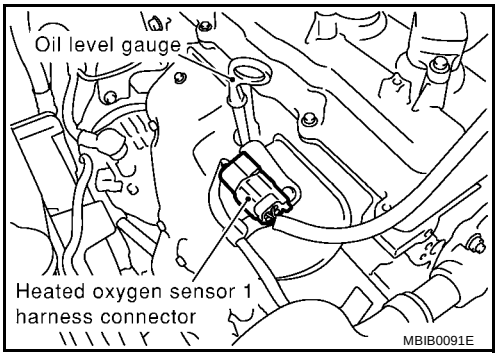
1. Turn ignition switch “OFF”.
2. Disconnect HO2S1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and 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 HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 10.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-637, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace malfunctioning heated oxygen sensor 1.

11. CHECK MASS AIR FLOW SENSOR

Refer to EC-500, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace mass air flow sensor.

12. CHECK PCV VALVE

Refer to EC-720, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace PCV valve.

13. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-652, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> Replace malfunctioning heated oxygen sensor 1.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KKV

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

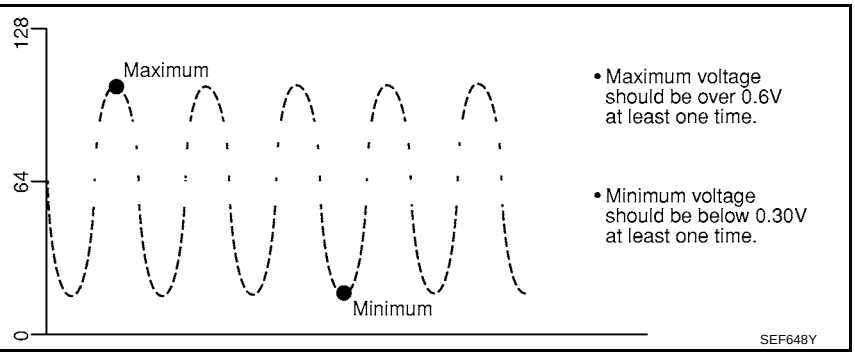
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

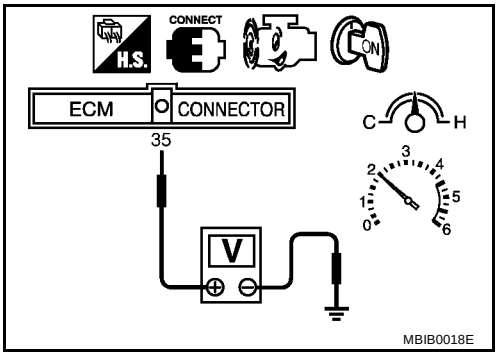
CAUTION:

- **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 normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



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

EBS00KKW

HEATED OXYGEN SENSOR 1

Refer to EM-19, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

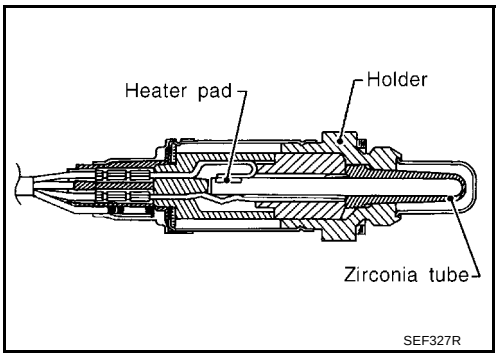
HO2S2

PFP:226A0

Component Description

EBS00KKX

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen 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

EBS00KKY

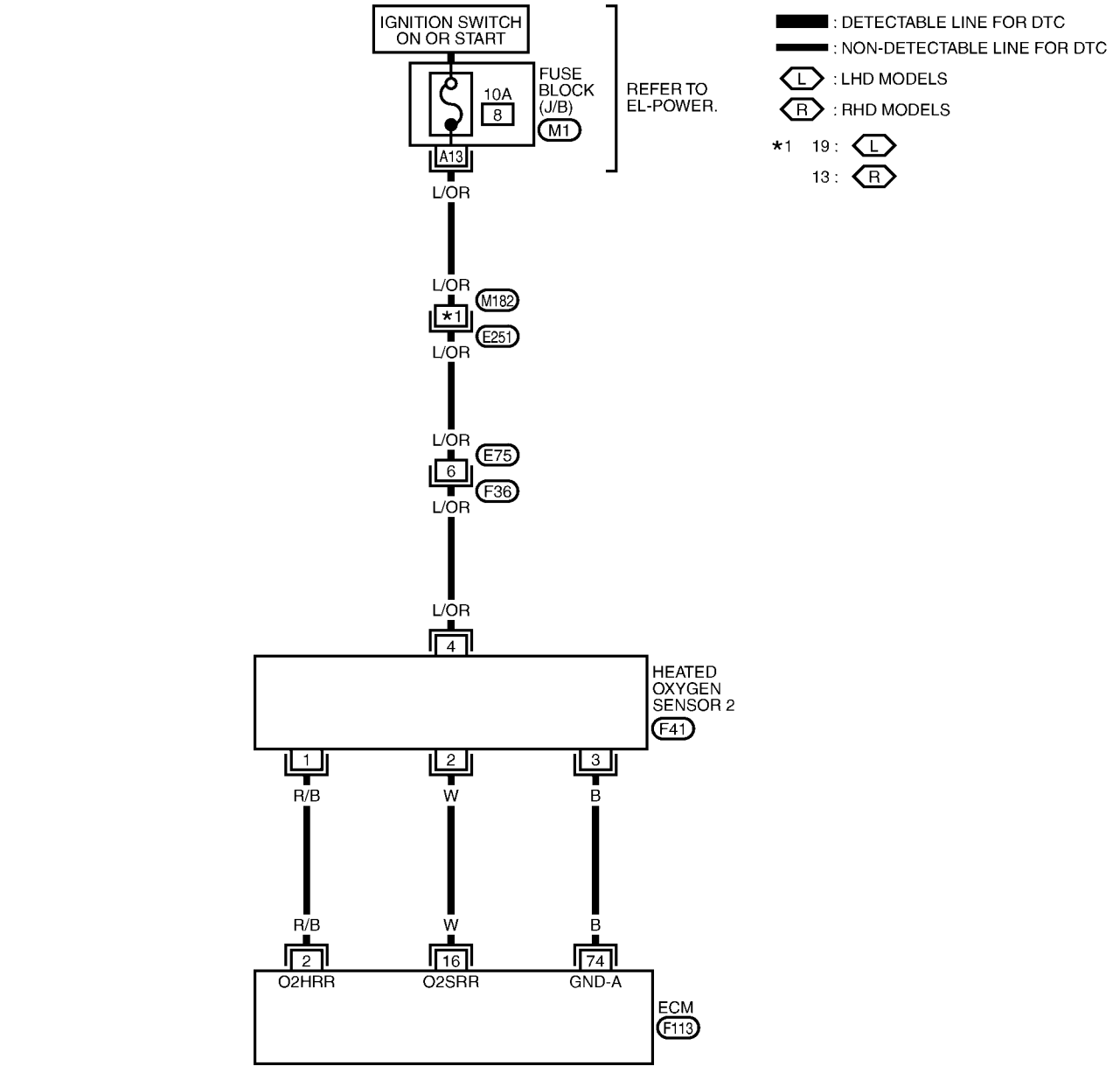
Specification data are reference values.

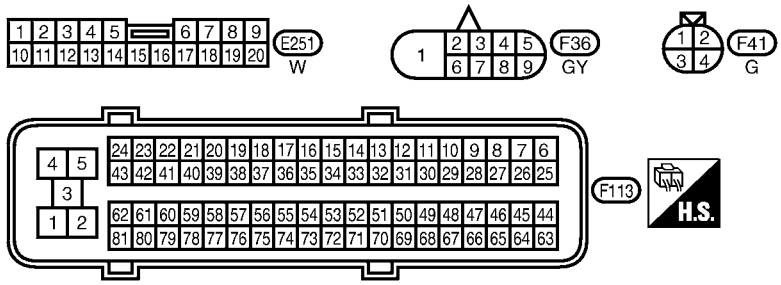
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming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

Wiring Diagram

EBS00KKZ

EC-RRO2-01





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC315A

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)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 3,000 rpm quicklyafter the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

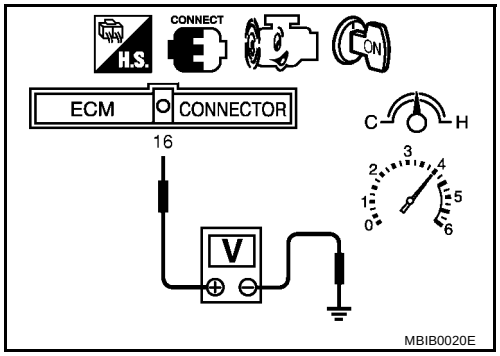
Diagnostic Procedure

EBS00KL0

1. CHECK OVERALL FUNCTION-I

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 one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and ground.
6. Check the voltage while revving up to 4,000 rpm under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)

The voltage does not remain in the range of 0.2 -0.4V



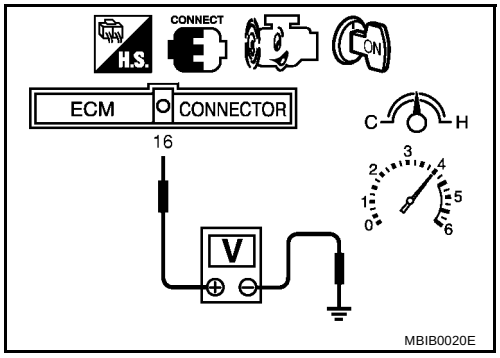
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK OVERALL FUNCTION-II

Keep engine at idle for 10 minutes, then check the voltage between ECM terminal 16 and ground, or check voltage when coasting 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T) 3rd gear position (M/T).

The voltage does not remain in the range of 0.2 -0.4V



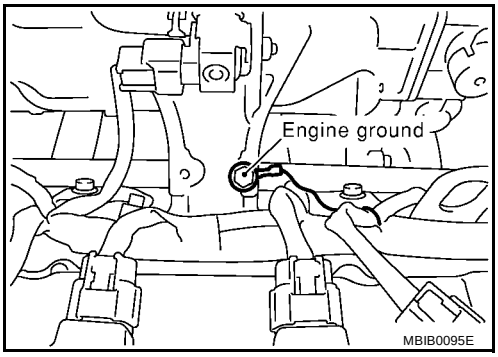
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 4.



4. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

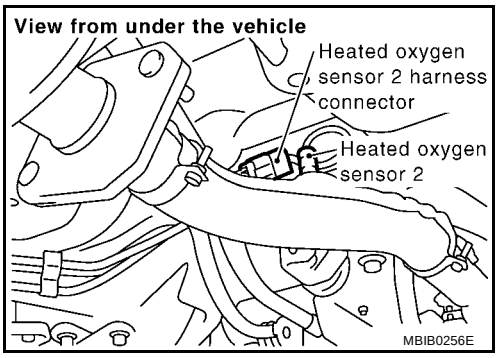
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

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

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-658, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00KL1

HEATED OXYGEN SENSOR 2

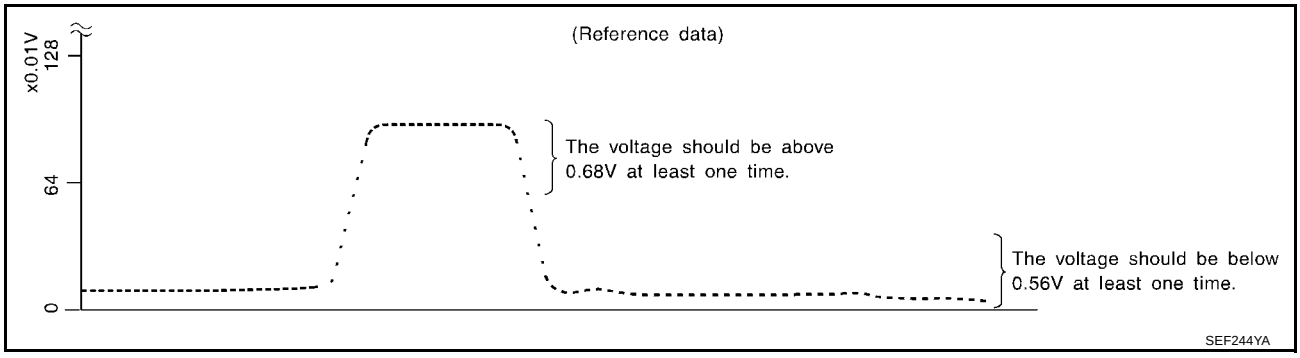
With CONSULT-II

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 one minute under no load.
4. Let engine idle for one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

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



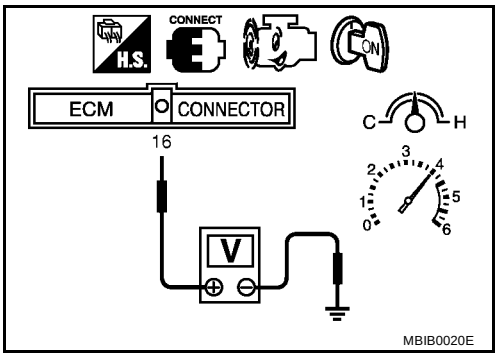
“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

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 one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine 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 0.68V at least once during this procedure.
   If the voltage is above 0.68V 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 3rd gear position.
   The voltage should be below 0.56V 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

EBS00KL2

HEATED OXYGEN SENSOR 2

Refer to FE-10.

IGNITION SIGNAL

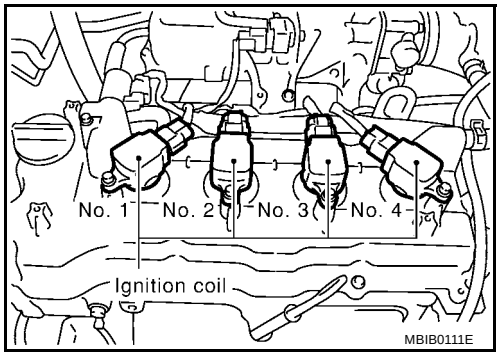
PFP:22448

Component Description

EBS00KL3

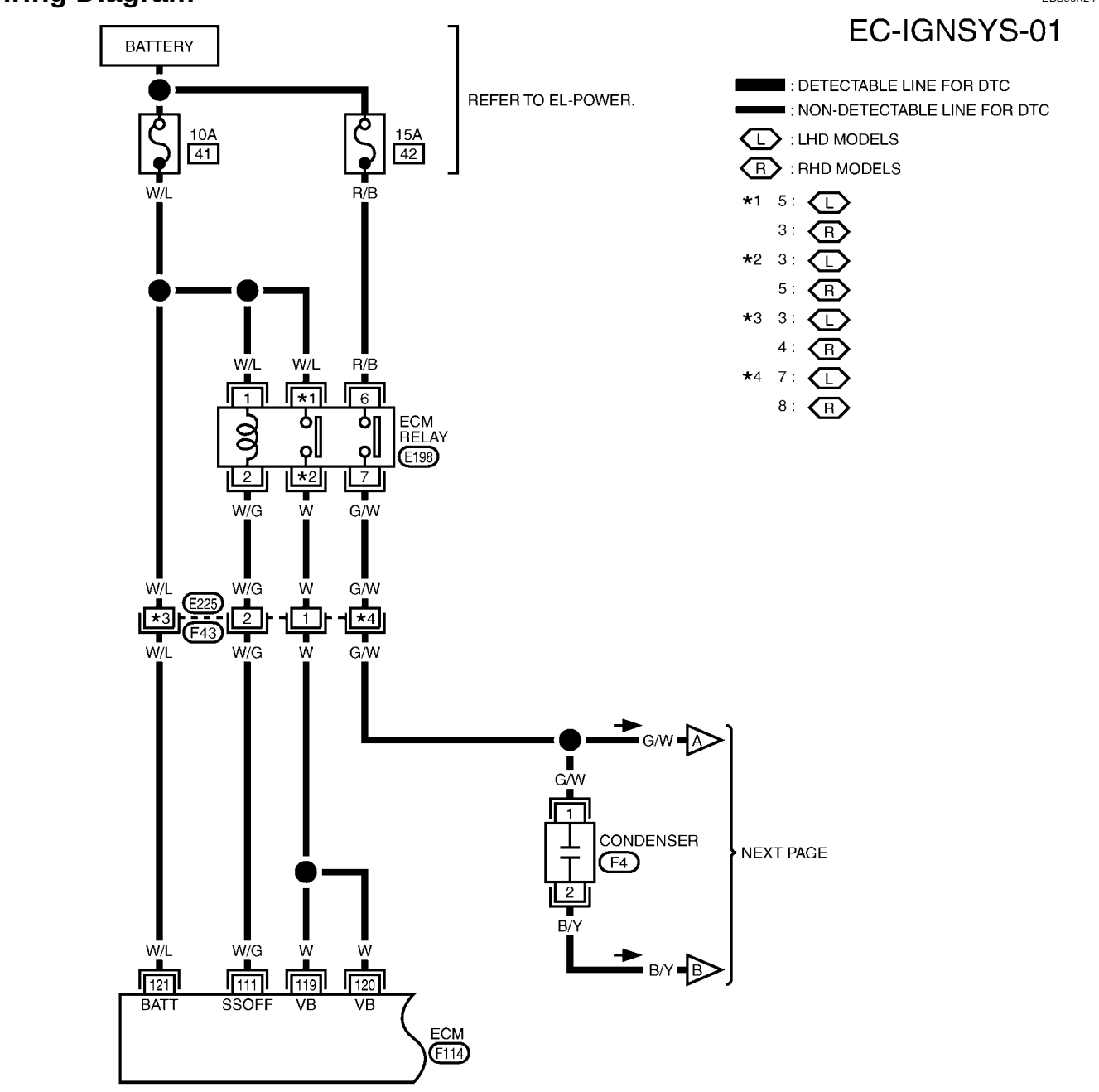
IGNITION COIL & POWER TRANSISTOR

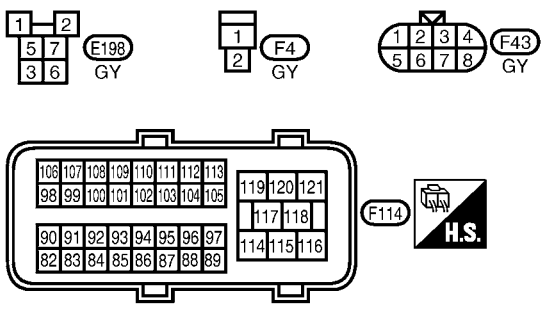
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.



Wiring Diagram

EBS00KL4





YEC306A

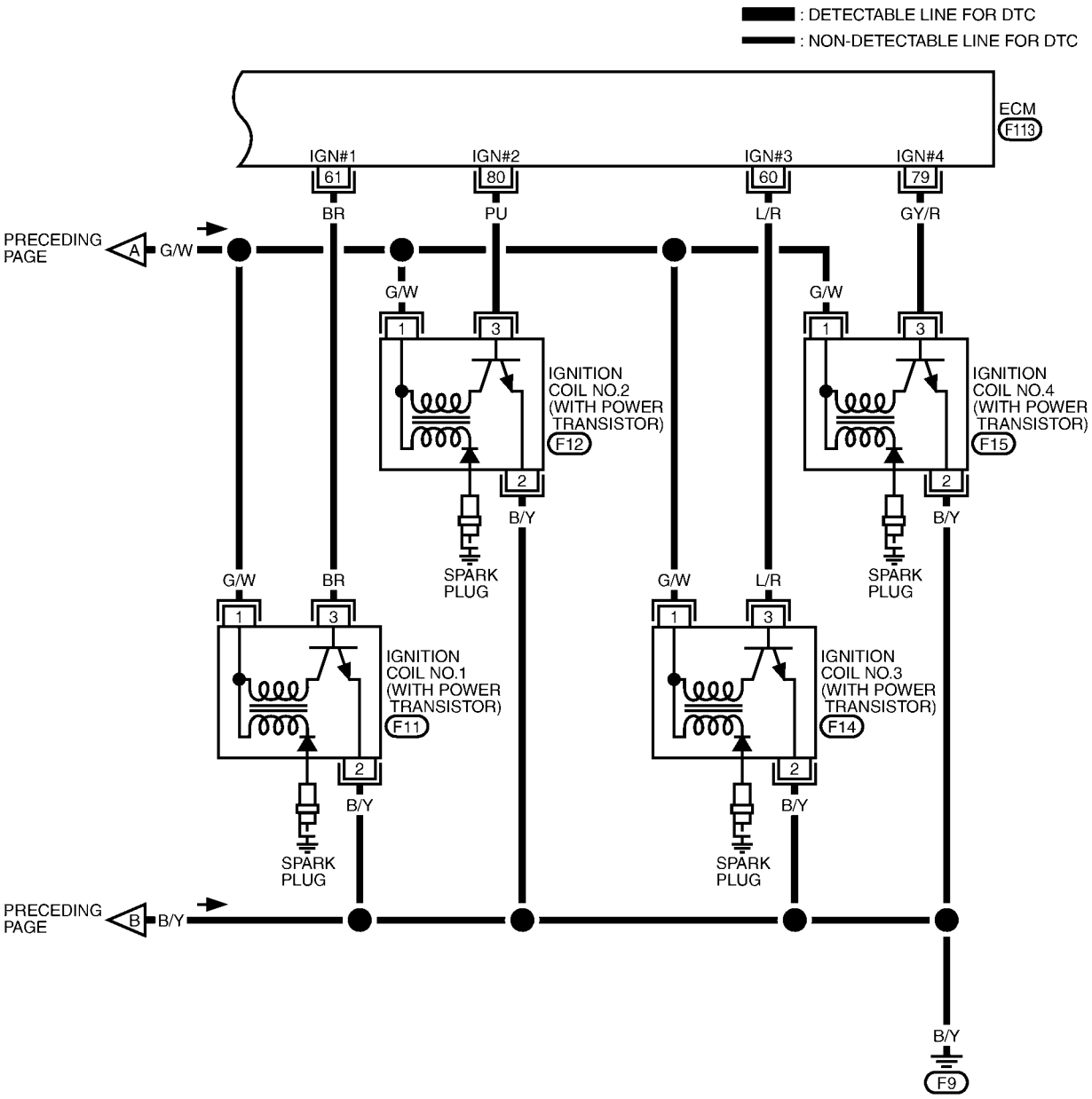
Specification data are reference values and are measured between each terminal and ground.

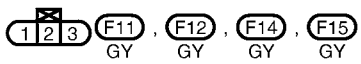
CAUTION:

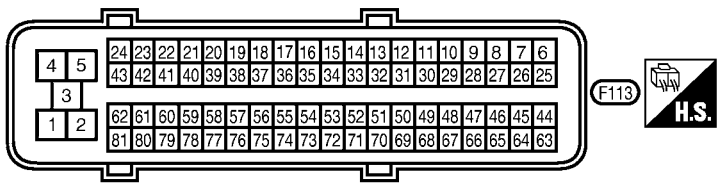
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF".	0 - 1.0V
			[Ignition switch "OFF"] ● More than a few seconds passed after turning ignition switch "OFF".	BATTERY VOLTAGE (11 - 14V)
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02





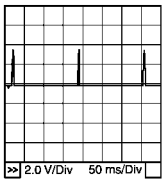
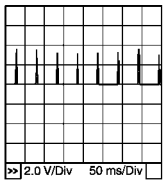


YEC307A

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)
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

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

Diagnostic Procedure

EBS00KL5

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.

Is engine running?

Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

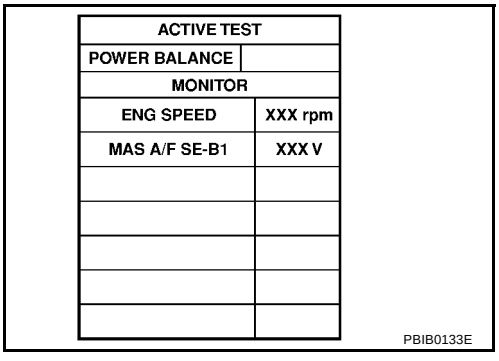
2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

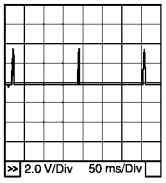


PBIB0133E

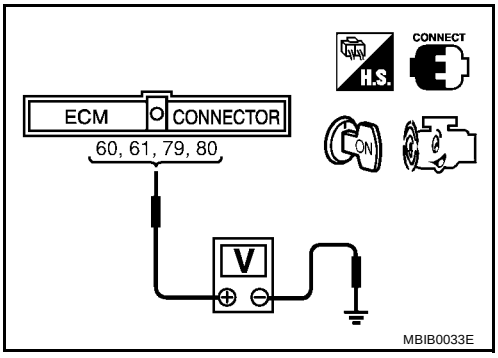
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 60, 61, 79, 80 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



MBIB0033E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

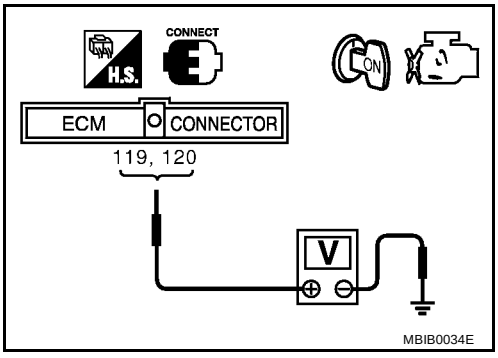
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-486, "POWER SUPPLY CIRCUIT FOR ECM"
.



MBIB0034E

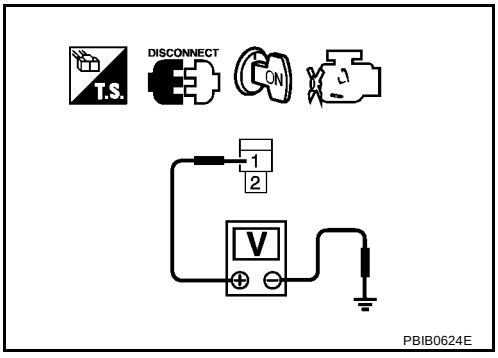
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 6.



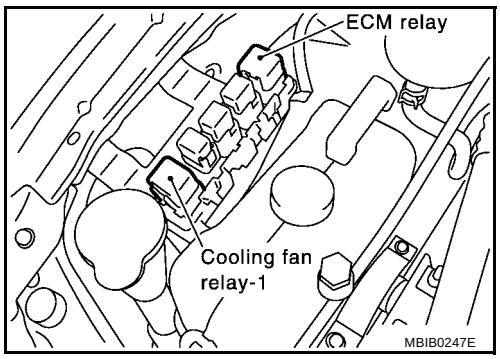
PBIB0624E

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1.
   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 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. DETECT MALFUNCTIONING PART

Check the following.

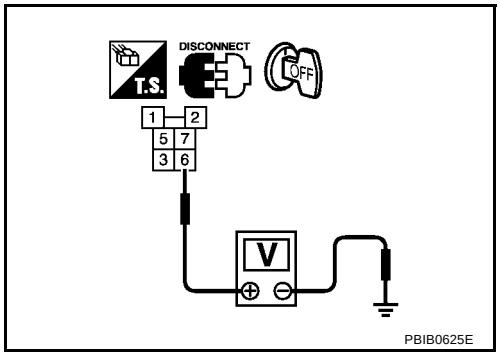
- Harness connectors E225, F43
- Harness for open or short between ECM relay and condenser

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

8. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between ECM relay and battery

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

10. CHECK ECM RELAY

Refer to EC-668, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace ECM relay.

11. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground. Refer to Wiring diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to power in harness or connector.

12. CHECK CONDENSER

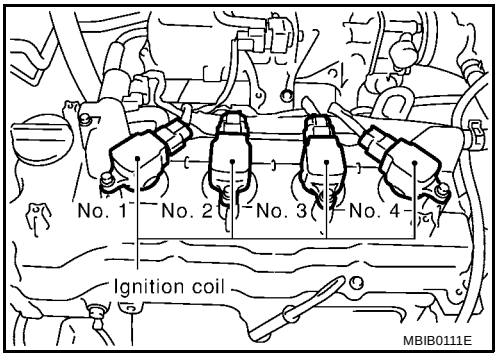
Refer to EC-668, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace condenser.

13. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch “ON”.

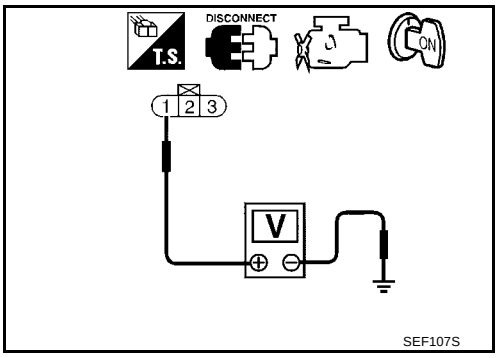


5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.



14. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ignition coil and ECM relay

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

15. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ignition coil terminal 2 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to power in harness or connectors.

16. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 60, 61, 79, 80 and ignition coil terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

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

OK or NG

OK >> GO TO 17.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-668, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace ignition coil with power transistor.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

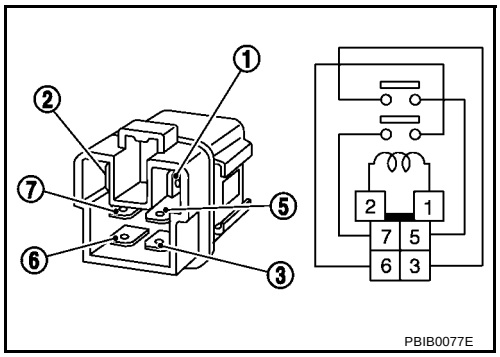
EBS00KL6

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

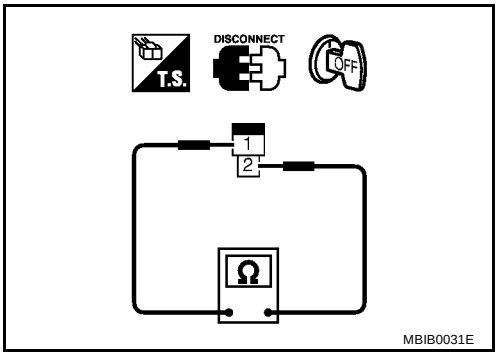
3. If NG, replace ECM relay.



CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals 1 and 2.

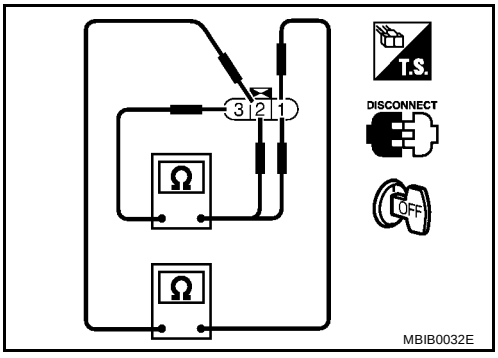
Resistance: Above 1 MΩ at 25°C (77°F)



IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
3 and 1	Except 0 or ∞
3 and 2	Except 0
1 and 2	



EBS00KL7

Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-24, "IGNITION COIL" .

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

EBS00KL8

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*1	Vehicle speed		

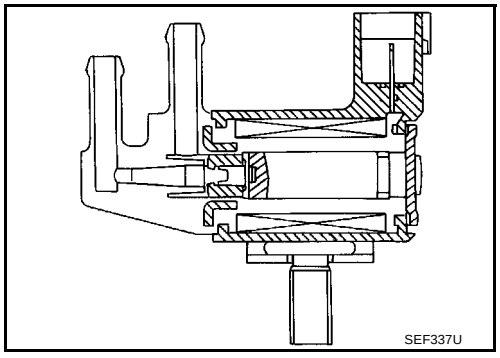
*: This signal is sent to the ECM through CAN communication line.

*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

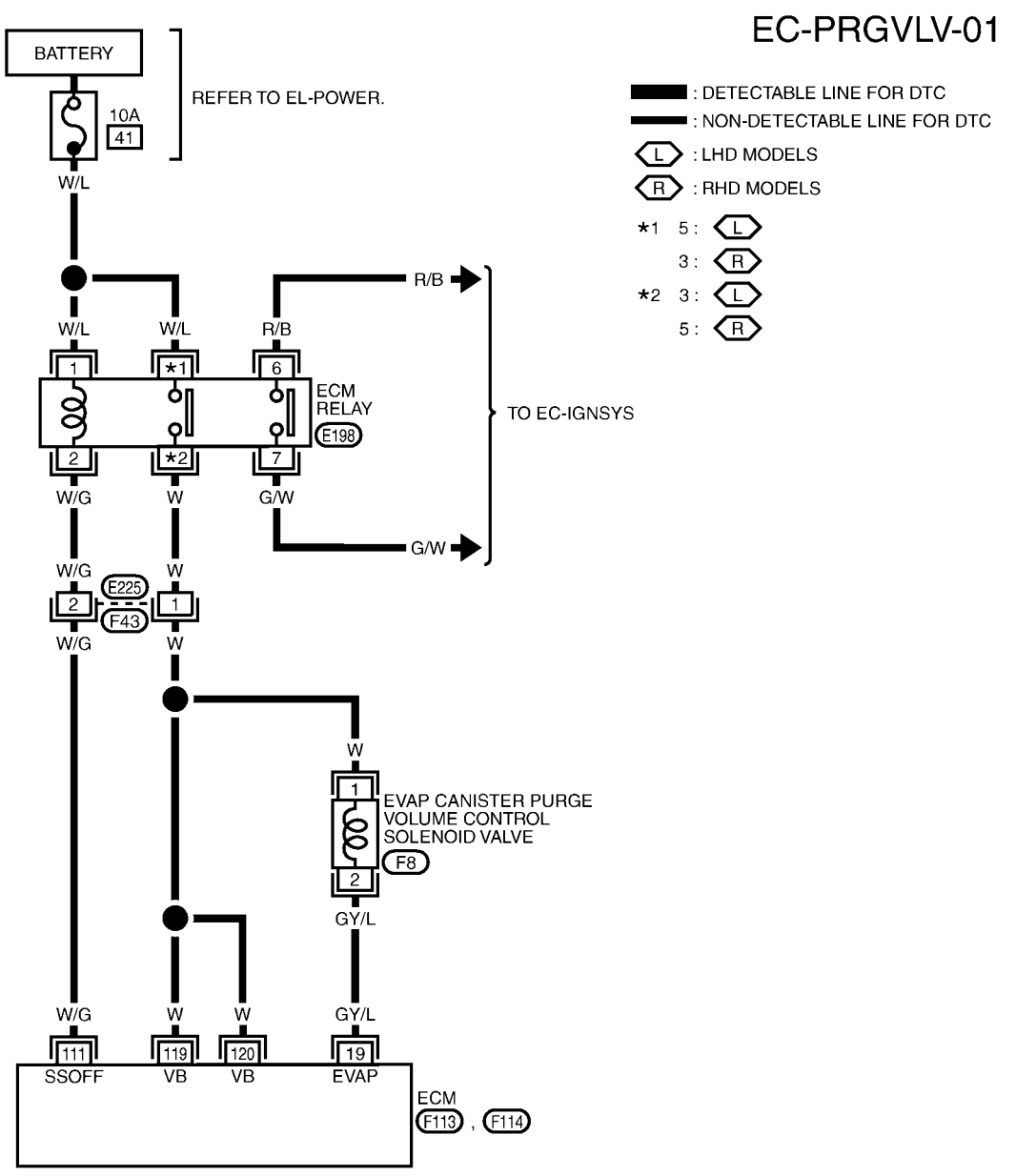
EBS00KL9

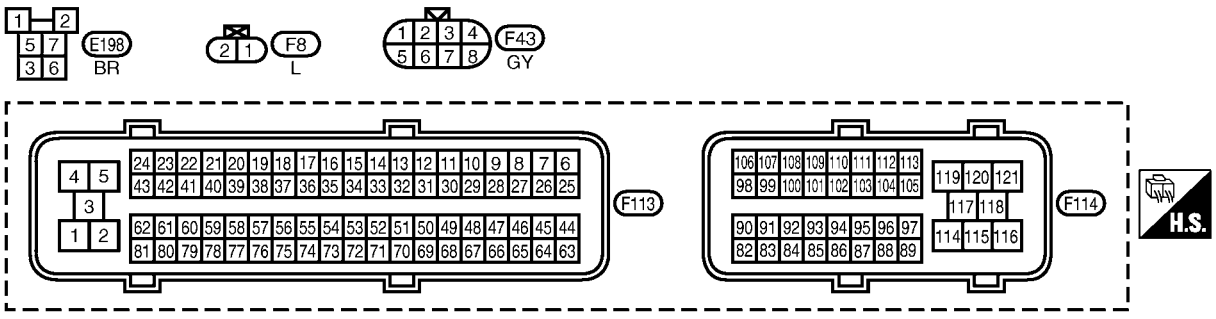
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%

Wiring Diagram

EBS00KLA



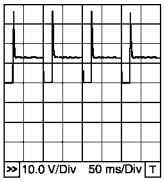


YEC316A

Specification data are reference values and are measured between each terminal and body 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)
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	Approximately 10V★  PBIB0520E

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

Diagnostic Procedure

EBS00KLB

1. CHECK OVERALL FUNCTION

With CONSULT-II

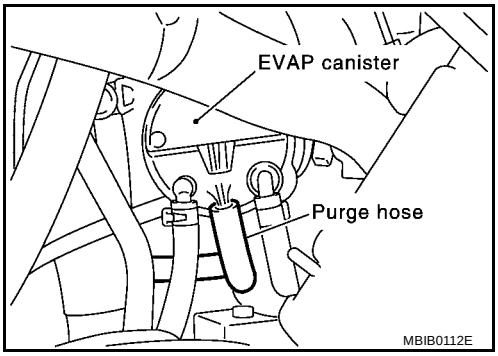
1. Turn ignition switch “OFF”.
2. Disconnect the EVAP purge hose connected to the EVAP canister.
3. Turn ignition switch “ON”.
4. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II.
5. Start engine and let it idle.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0569E

6. Change the valve opening percentage with touching “Qu” or “Qd” on CONSULT-II screen, and check for vacuum existence at the EVAP purge hose under the following conditions.

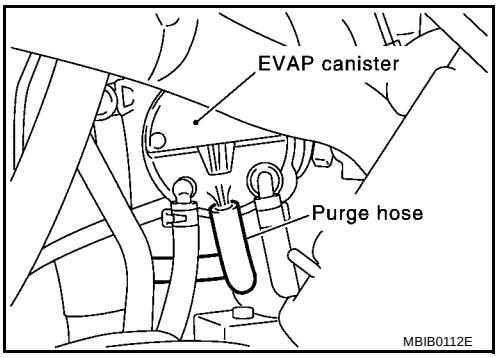
Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.



Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Disconnect the EVAP purge hose connected to the EVAP canister.
3. Start engine and let it idle for at least 80 seconds.
4. Check for vacuum existence at the EVAP purge hose under the following conditions.

Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.



OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK EVAP CANISTER

Refer to EC-719, "Component Inspection" .

OK or NG

OK >> **INSPECTION END**
NG >> Replace EVAP canister.

3. CHECK EVAP PURGE LINE

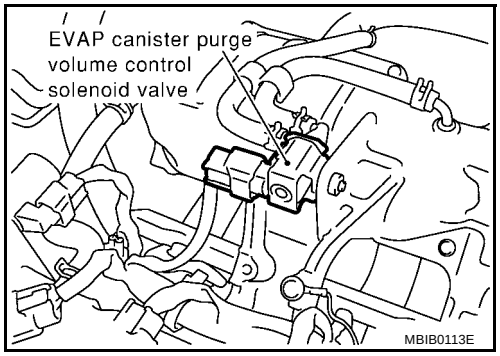
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-718, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 4.
NG >> Repair or reconnect the hose.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.

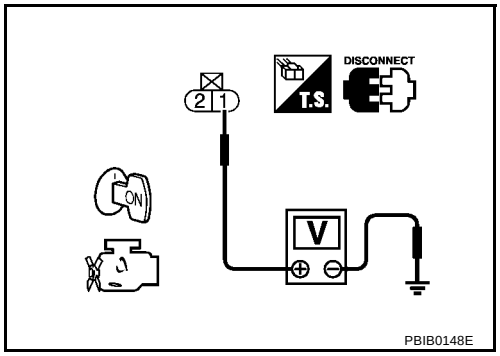


4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay

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

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 19 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

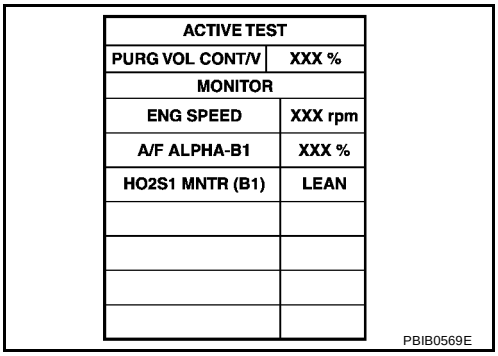
OK or NG

OK (With CONSULT-II)>>GO TO 7.
OK (Without CONSULT-II)>>GO TO 8.
NG >> Repair open circuit or short to ground and short to power in harness or connectors.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-676, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister purge volume control solenoid valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

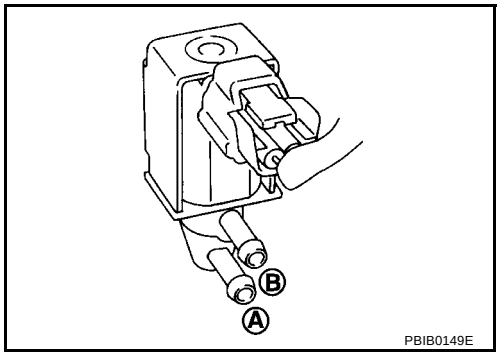
EBS00KLC

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

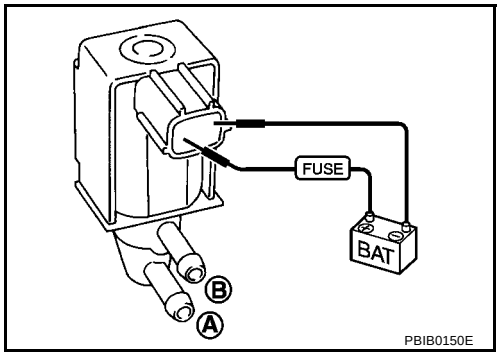
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



Removal and Installation

EBS00KLD

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-16, "INTAKE MANIFOLD" .

VSS

PFP:32702

Description

EBS00KLE

NOTE:
If DTC U1000 or U1001 is displayed, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-492, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
The vehicle speed signal is sent from vehicle speed sensor (models with ABS) or ABS actuator and electric unit (control unit) (models with ABS) to combination meter. The combination meter then sends a signal to the ECM through CAN communication line.

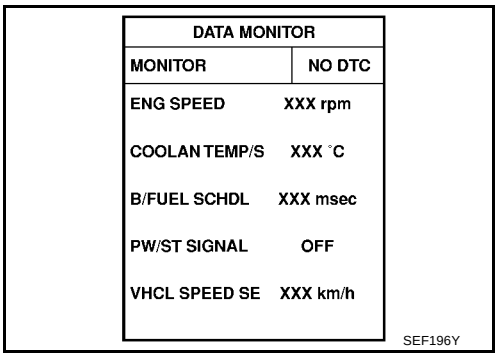
Diagnostic Procedure

EBS00KLF

1. CHECK VEHICLE SPEED SIGNAL OVERALL FUNCTION

With CONSULT-II

1. Lift up the vehicle.
2. Start engine.
3. Select “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II.
4. Make sure that “VHCL SPEED SE” indication exceeds 10 km/h (6 MPH) when rotating wheels with suitable gear position.



Without CONSULT-II

1. Lift up the vehicle.
2. Start engine.
3. Read vehicle speed with combination meter.
   Make sure that vehicle speed indication exceeds 10 km/h (6 MPH) when rotating wheels with suitable gear position.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK DTC WITH VEHICLE SPEED SONSOR (MODELS WITHOUT ABS) OR ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) (MODELS WITH ABS)

Refer to EL-123 (models without ABS) or EL-124 (models with ABS).

OK or NG

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

3. CHECK COMBINATION METER

Check combination meter function.
Refer to EL-112.

>> **INSPECTION END**

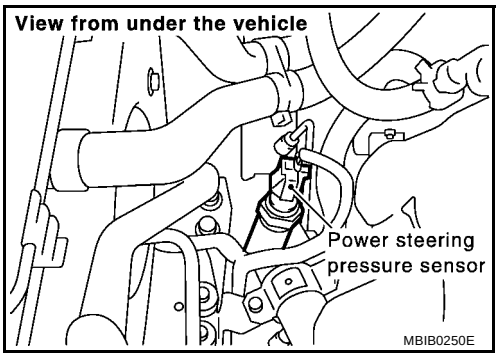
POWER STEERING PRESSURE SENSOR

PFP:49763

Component Description

EBS00KLG

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KLH

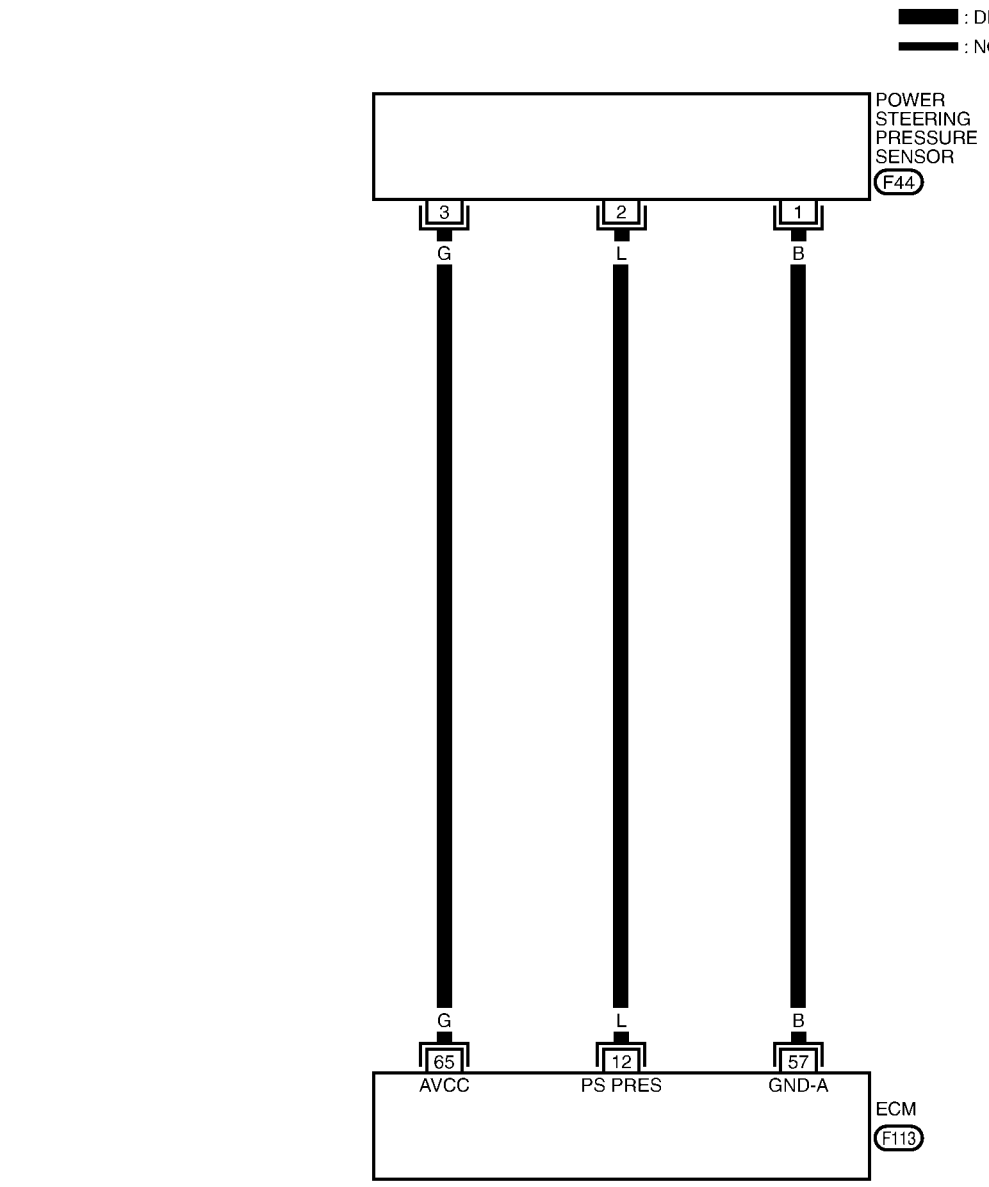
Specification data are reference values.

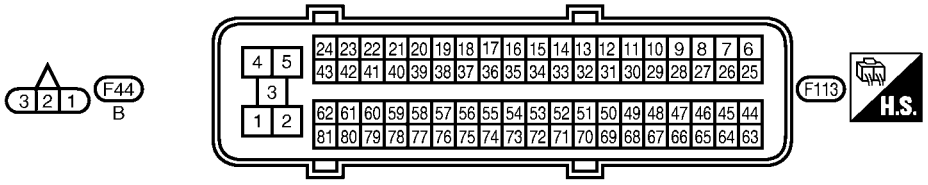
MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

Wiring Diagram

EBS00KLI

EC-PS/SEN-01





YEC294A

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)
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8V
57	B	Sensor ground (Power steering pressure sensor)	**[Engine is running]** ● Idle speed	Approximately 0V
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V

Diagnostic Procedure

EBS00KLJ

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

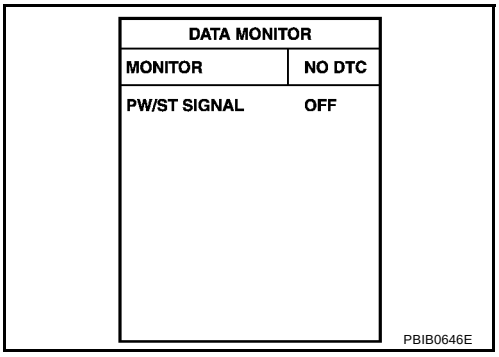
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK POWER STEERING PRESSURE SENSOR OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Steering in neutral position	OFF
Steering is turned	ON



OK or NG

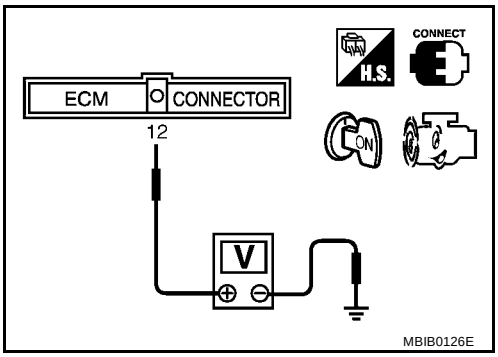
OK >> **INSPECTION END**
NG >> GO TO 4.

3. CHECK POWER STEERING PRESSURE SENSOR OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned.	0.5 - 4.0V
Steering wheel is not being turned.	0.4 - 0.8V



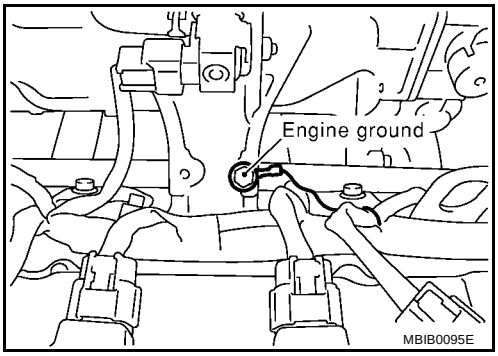
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. RETIGHTEN GROUND SCREWS

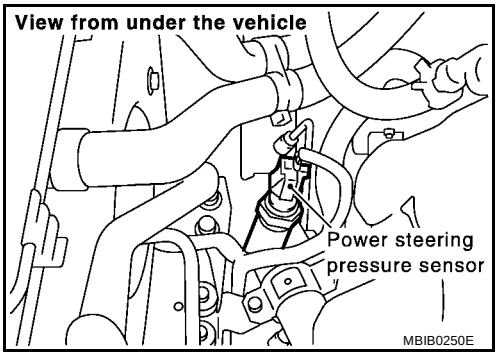
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 5.



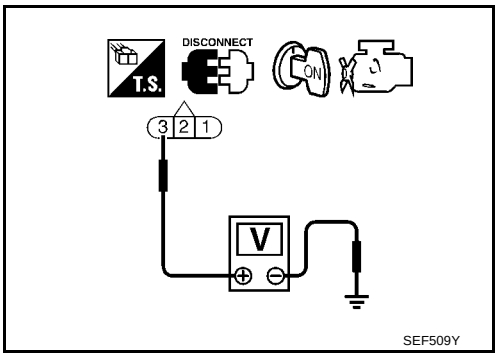
5. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between PSP sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and PSP sensor terminal 1.
   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 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

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

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK PSP SENSOR

Refer to EC-682, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace PSP sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

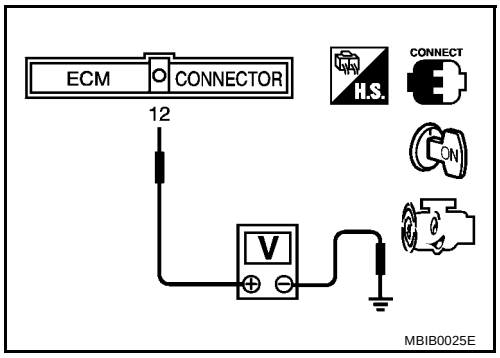
Component Inspection

EBS00KLK

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned fully.	0.5 - 4.0V
Steering wheel is not being turned.	0.4 - 0.8V



IVT CONTROL SOLENOID VALVE

PFP:23796

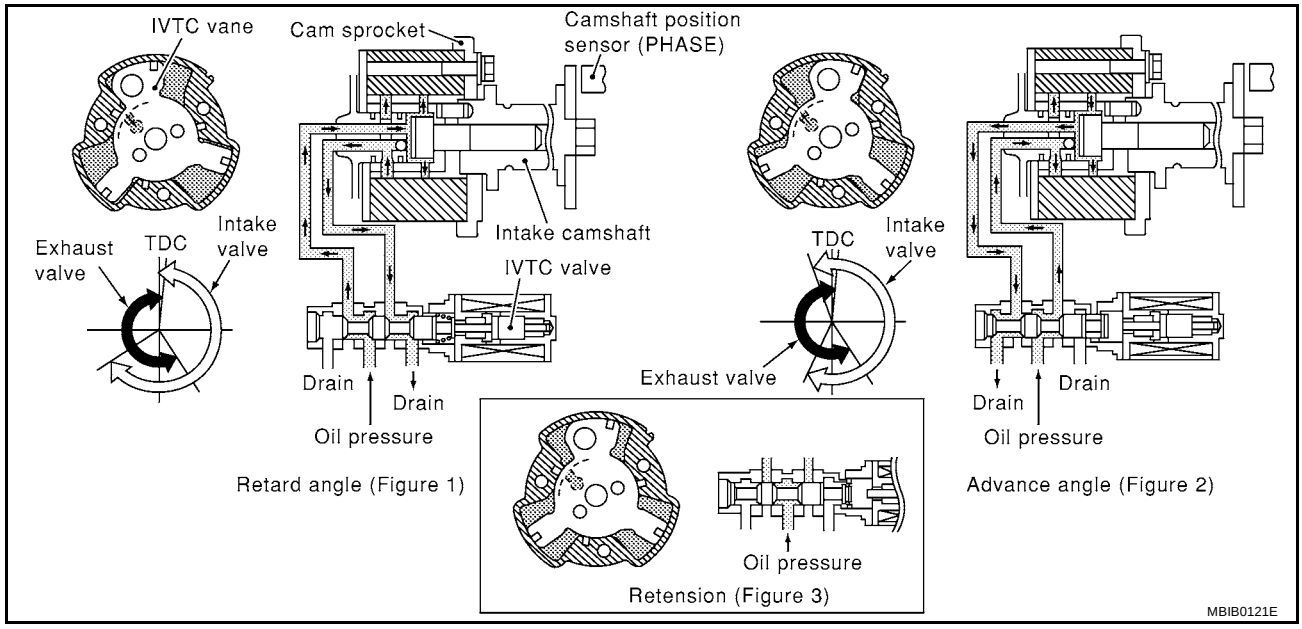
Description

EBS00KLL

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

COMPONENT DESCRIPTION

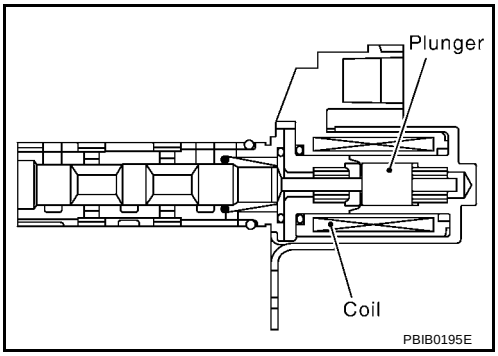
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

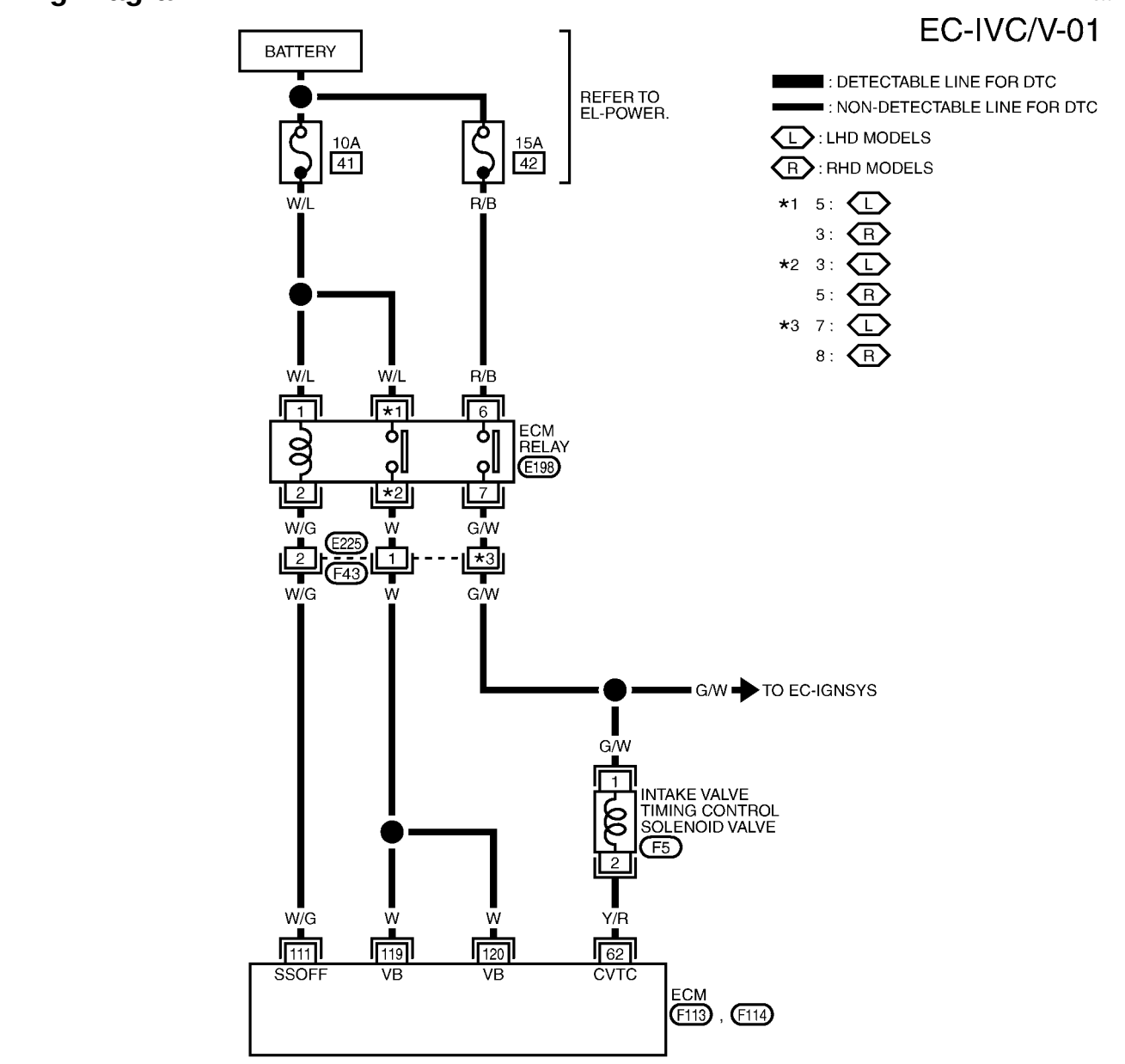
EBS00KLM

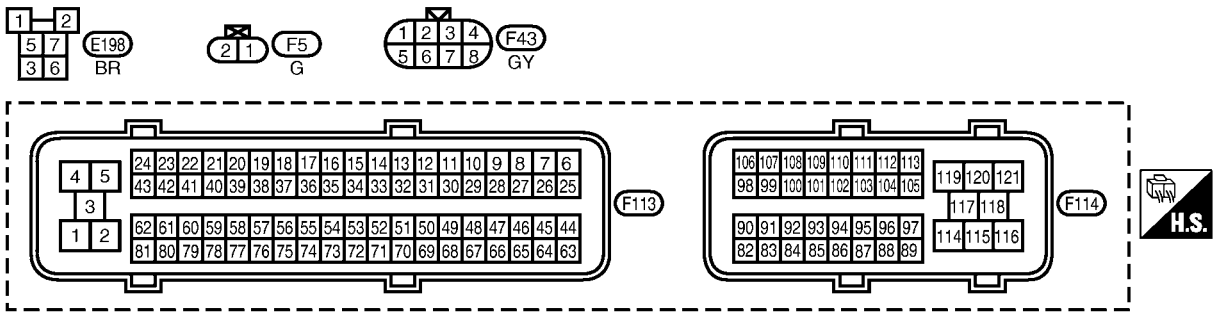
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%

Wiring Diagram

EBS00KLN



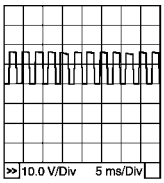


YEC318A

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)
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly.	7 - 10V★  PBIB0532E

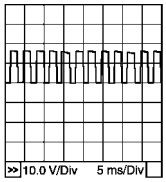
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

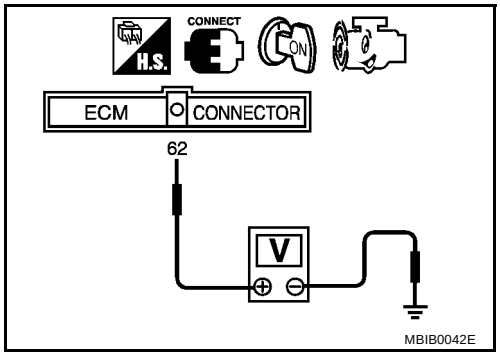
Diagnostic Procedure

EBS00KLO

1. CHECK IVT CONTROL SOLENOID VALVE OVERALL FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Set the tester probe between ECM terminals 62 (IVT control solenoid valve signal) and ground.
5. Start engine and let it idle.
6. Check the voltage under the following conditions.
   Verify that the oscilloscope screen shows the signal wave as shown below.

Conditions	Voltage
At idle	BATTERY VOLTAGE (11 - 14V)
When revving engine up to 2,000 rpm quickly	7 - 10V★  PBIB0532E



MBIB0042E

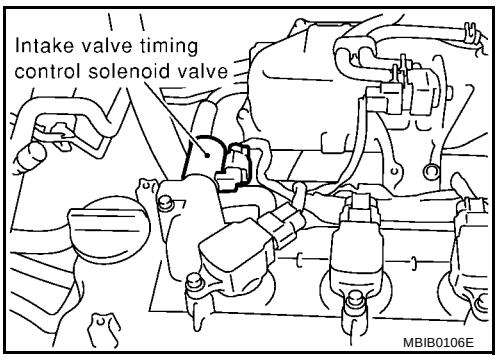
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

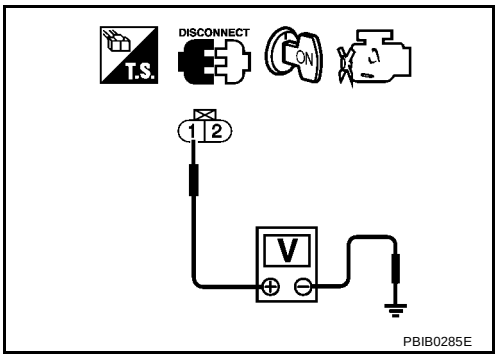
2. CHECK IVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCIUT

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between intake valve timing control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTION PART

Check the following.

- Harness connectors E225, F43
- Harness for open or short between intake valve timing control solenoid valve and ECM relay

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

4. CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 62 and intake valve timing control solenoid valve terminal 2. 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 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-688, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace intake valve timing control solenoid valve.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-559, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-566, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

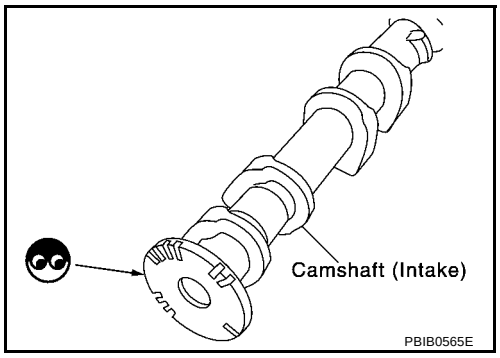
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

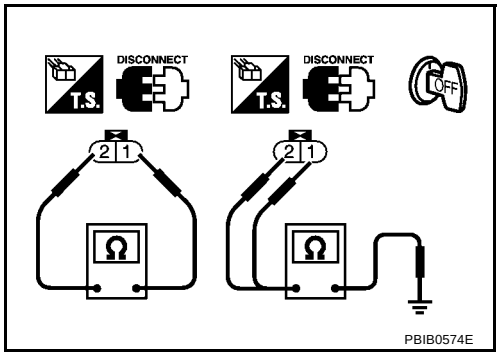
Component Inspection

EBS00KLP

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

EBS00KLQ

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-47, "TIMING CHAIN" .

PNP SWITCH

PFP:32006

Component Description

EBS00KLR

When the gear position is “P” (A/T models only) or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

EBS00KLS

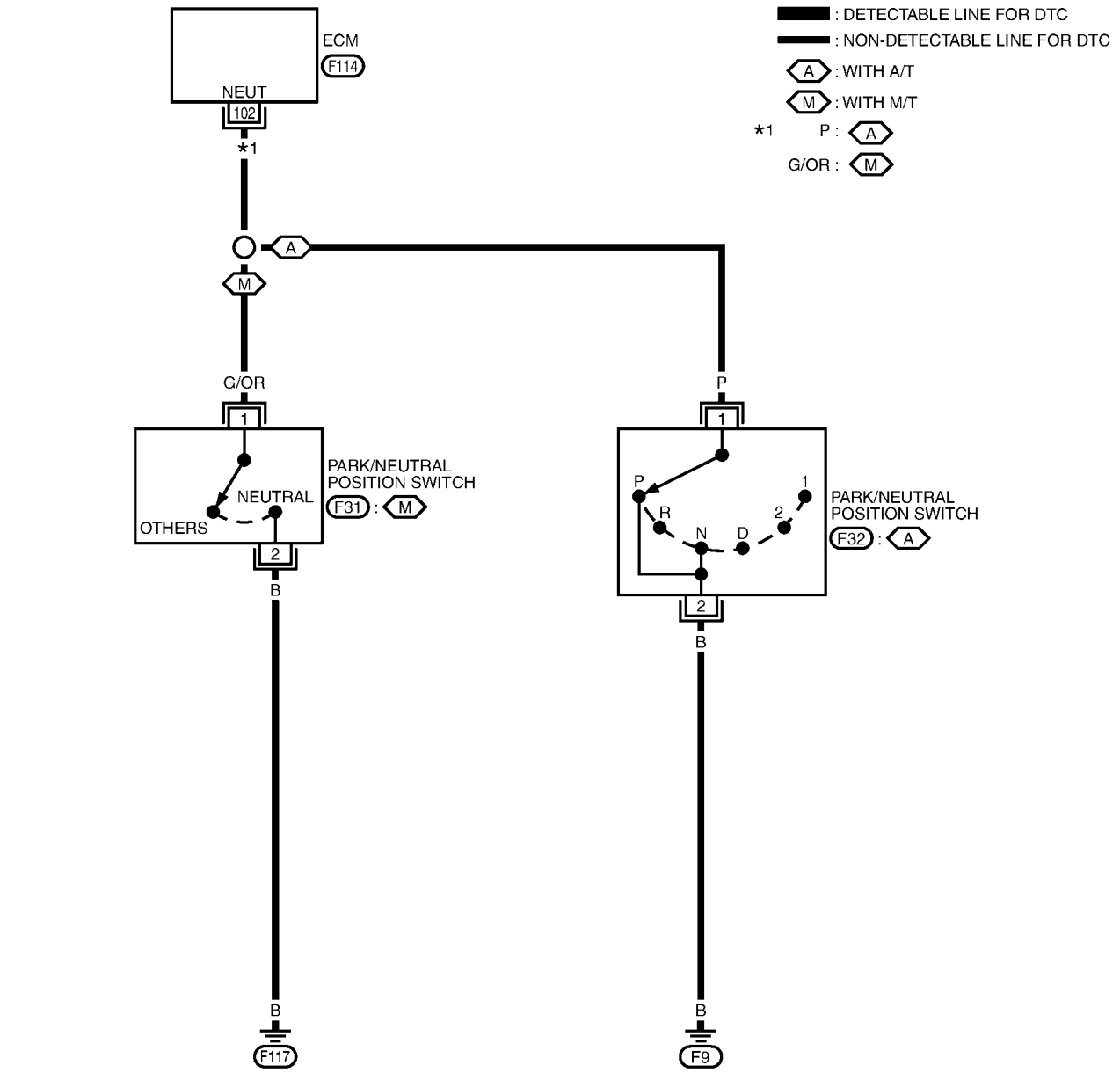
Specification data are reference values.

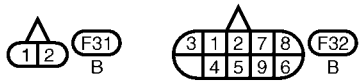
MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T models) Neutral (M/T models)	ON
		Shift lever: Except above	OFF

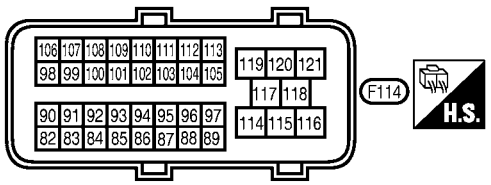
Wiring Diagram

EBS00KLT

EC-PNPSW1-01







YEC319A

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)
102	P (A/T) G/OR (M/T)	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models). ● Shift lever position is Neutral (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

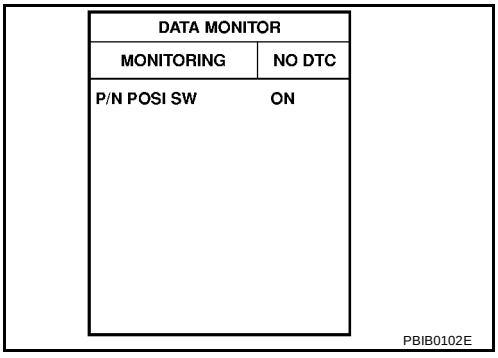
EBS00KLU

1. CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check the "P/N POSI SW" signal under the following conditions.

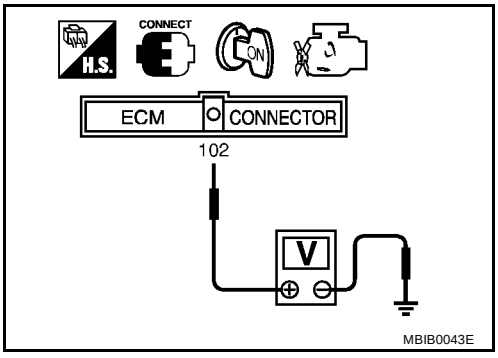
Selector lever position	P/N POSI SW signal
"P" (A/T models only) and "N" position	ON
Except the above position	OFF



Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 102 and ground under the following conditions.

Selector lever position	Voltage
"P" (A/T models only) and "N" position	Approximately 0V
Except the above position	A/T models: Battery voltage M/T models: Approximately 5V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

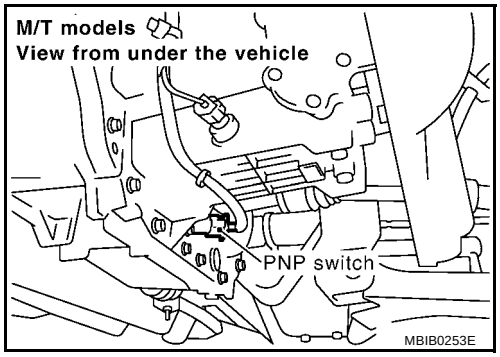
1. Turn ignition switch “OFF”.
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and body ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

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



3. CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and PNP switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and 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 PNP SWITCH

Refer to AT-406, "ON-VEHICLE SERVICE" (A/T models) or MT-21 (M/T models).

OK or NG

OK >> GO TO 5.
NG >> Replace PNP switch.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

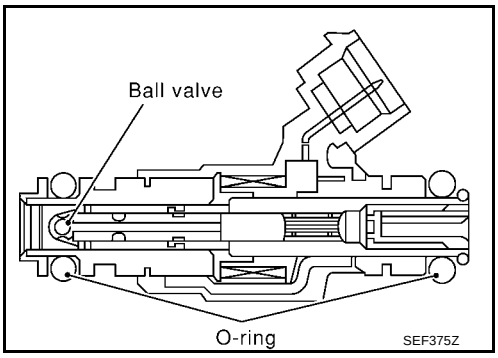
INJECTOR CIRCUIT

PFP:16600

Component Description

EBS00KLV

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

EBS00KLW

Specification data are reference values.

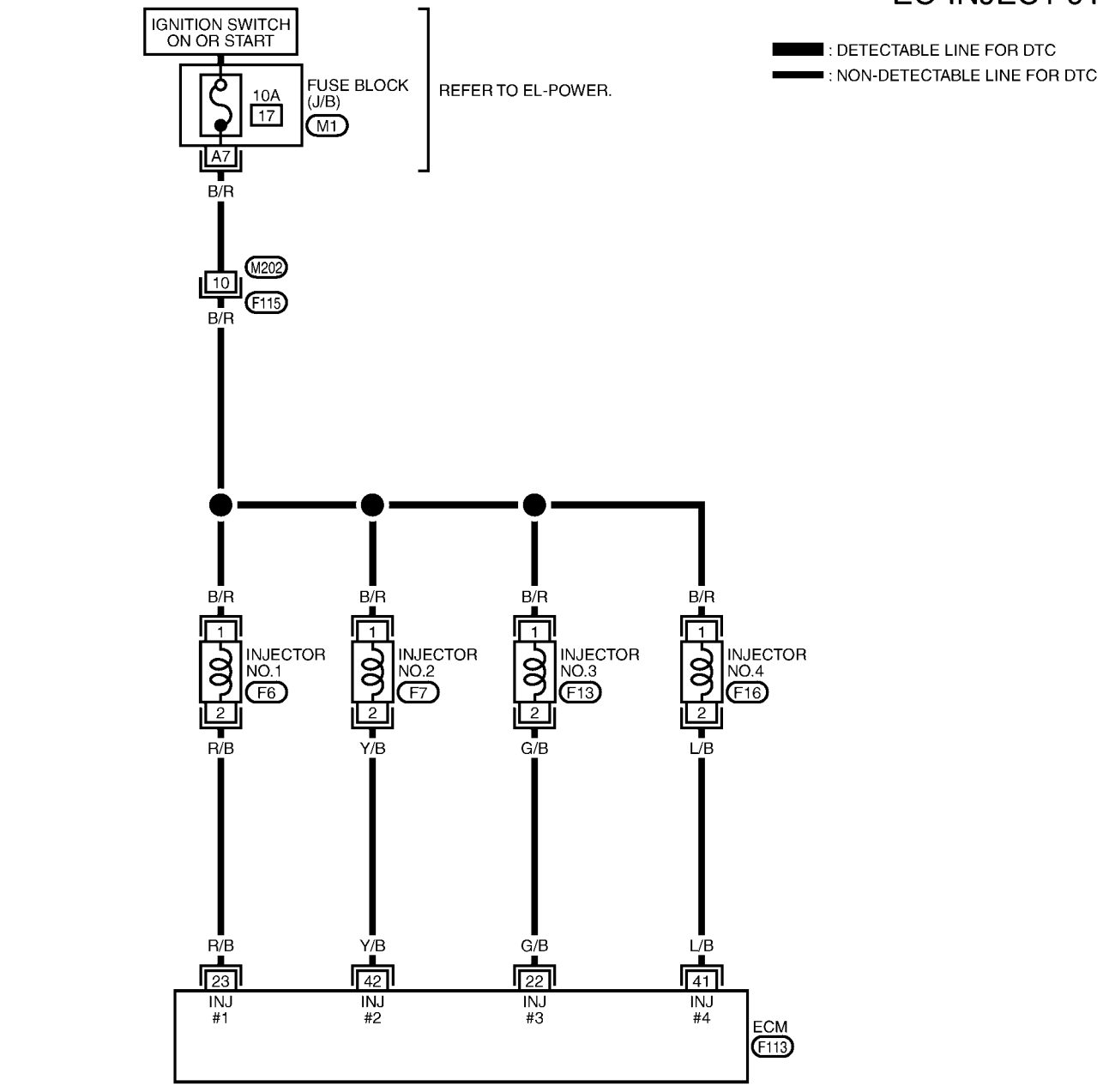
MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec

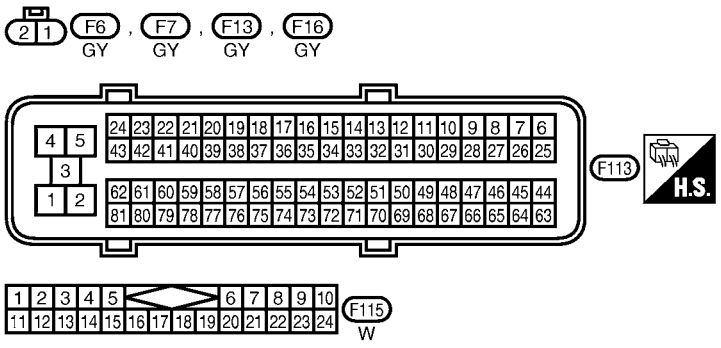
*: This item is displayed with QG18DE engine models.

Wiring Diagram

EBS00KLX

EC-INJECT-01





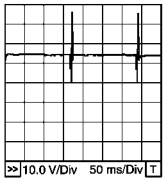
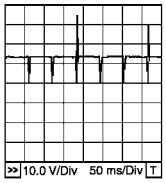
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC308A

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)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

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

Diagnostic Procedure

EBS00KLY

1. INSPECTION START

Turn ignition switch to “START”.

Is any cylinder ignited?

Yes or No

Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

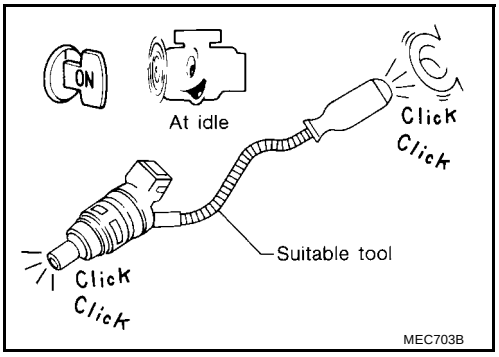
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.

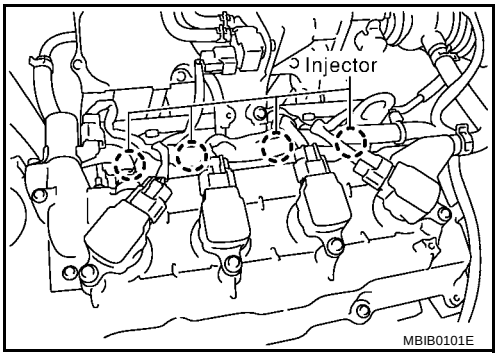


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.

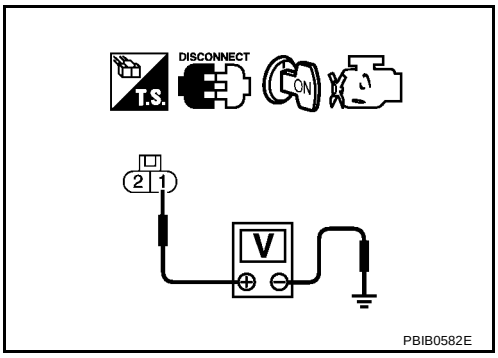


4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

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

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 22, 23, 41, 42. 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 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK INJECTOR

Refer to EC-698, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace injector.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

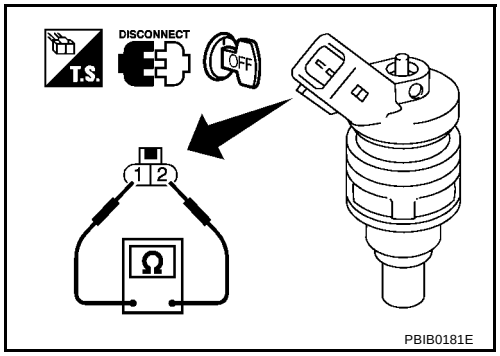
Component Inspection

EBS00KLZ

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 13.5 - 17.5Ω [at 20°C (68°F)]



Removal and Installation

EBS00KM0

INJECTOR

Refer to EM-26, "FUEL INJECTOR AND FUEL TUBE" .

FUEL PUMP CIRCUIT

PFP:17042

Description

EBS00KM1

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

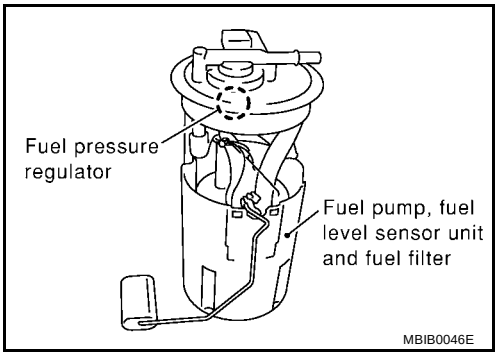
*: The ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

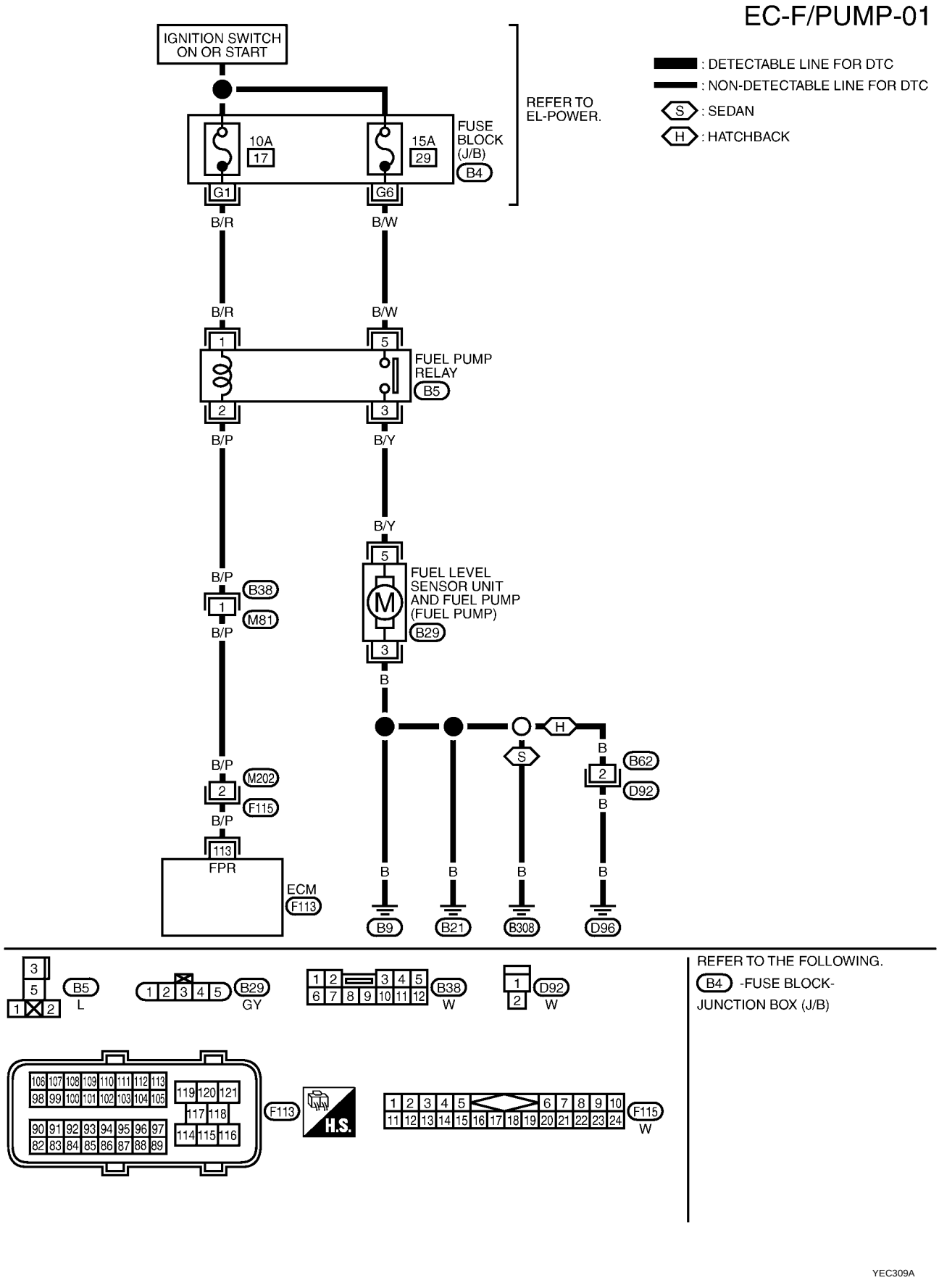
EBS00KM2

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

EBS00KM3



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.

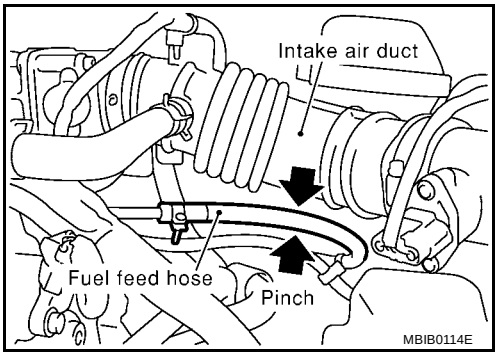
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON". **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00KM4

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned "ON".

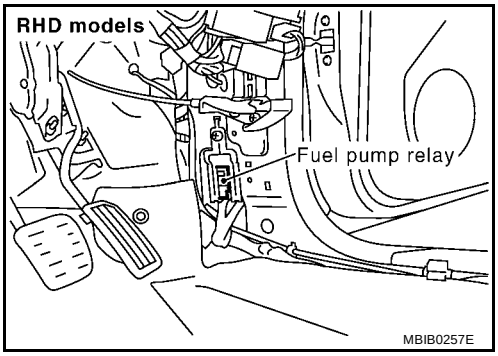


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

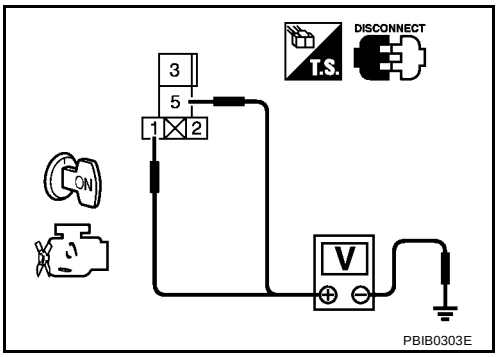
2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

   Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B4
- 10A fuse
- 15A fuse
- Harness for open or short between fuel pump relay and fuse

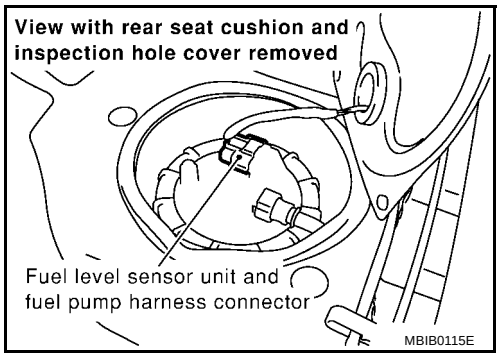
>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel level sensor unit and fuel pump terminal 5, fuel level sensor unit and fuel pump terminal 3 and body ground.
   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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B61, D91 (Hatchback models with power door lock)
- Harness connectors B62, D92 (Hatchback models without power door lock)
- Harness for open or short between fuel level sensor unit and fuel pump and fuel pump relay
- Harness for open or short between fuel level sensor unit and fuel pump and body ground

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

6. CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 113 and fuel pump relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M202, F115
- Harness connectors B38, M81
- Harness for open or short between ECM and fuel pump relay

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

8. CHECK FUEL PUMP RELAY

Refer to EC-703, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel pump relay.

9. CHECK FUEL PUMP

Refer to EC-703, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace fuel pump.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

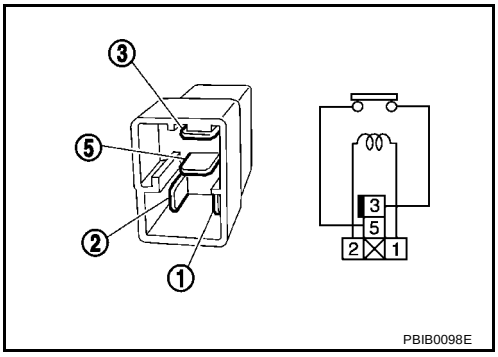
Component Inspection

EBS00KM5

FUEL PUMP RELAY

Check continuity between terminals 3 and 4, 3 and 5 under the following conditions.

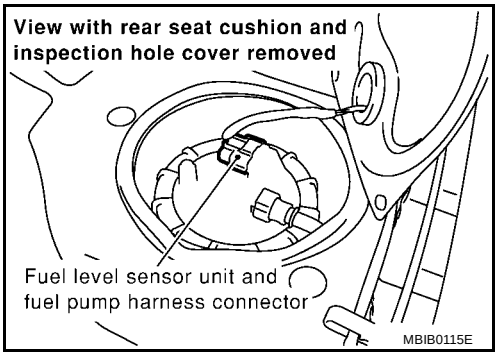
Conditions	Terminals	Continuity
12V direct current supply between terminals 1 and 2	3 and 4	No
	3 and 5	Yes
No current supply	3 and 4	Yes
	3 and 5	No



PBIB0098E

FUEL PUMP

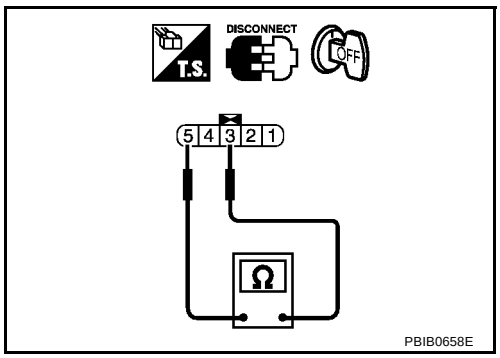
1. Disconnect fuel level sensor unit and fuel pump harness connector.



MBIB0115E

2. Check resistance between fuel level sensor unit and fuel pump terminals 3 and 5.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]



Removal and Installation

EBS00KM6

FUEL PUMP

Refer to FE-8.

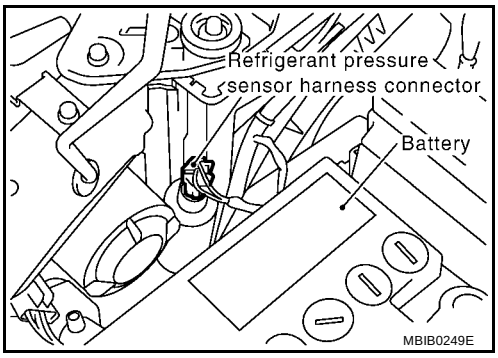
REFRIGERANT PRESSURE SENSOR

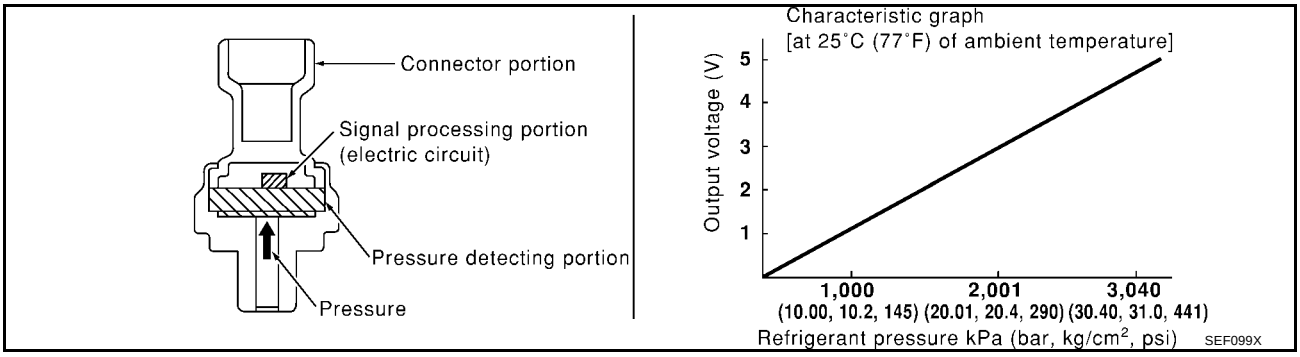
PFP:92136

Component Description

EBS00KM7

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

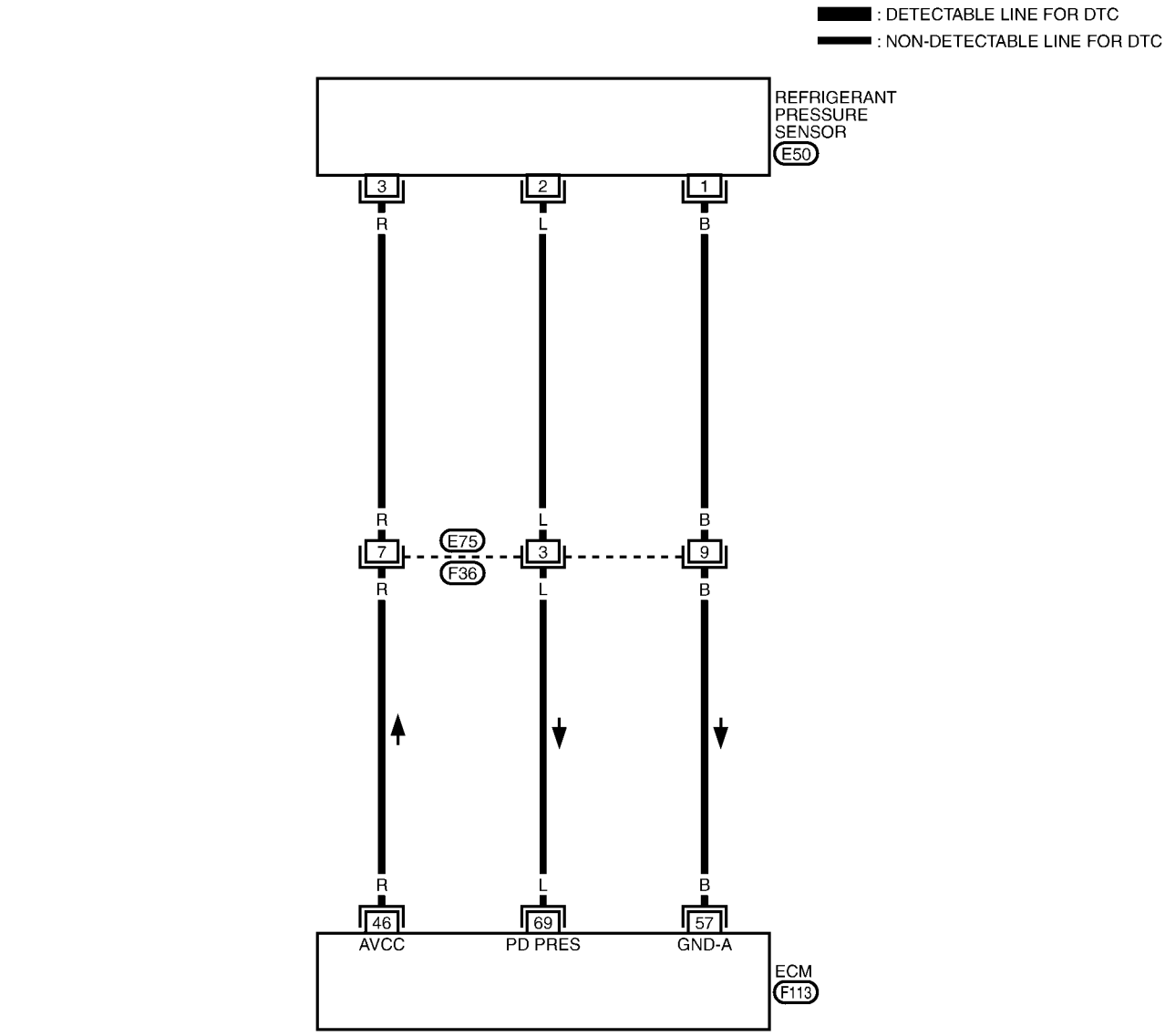


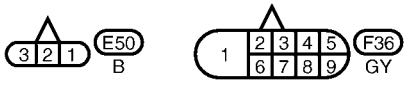


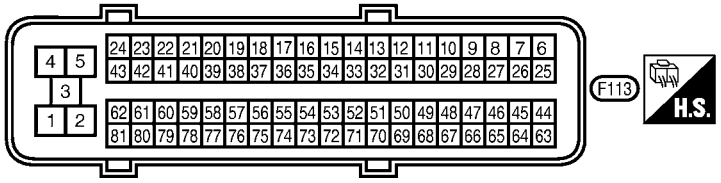
Wiring Diagram

EBS00KM8

EC-RP/SEN-01







YEC310A

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)
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
57	B	Sensor ground (Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

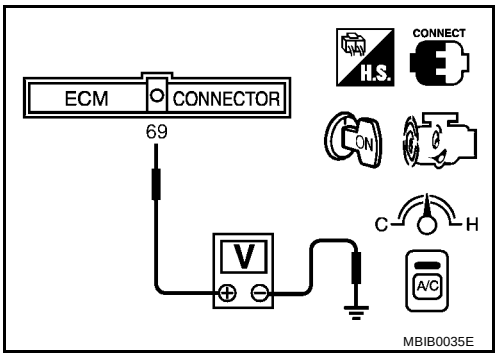
Diagnostic Procedure

EBS00KM9

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 69 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

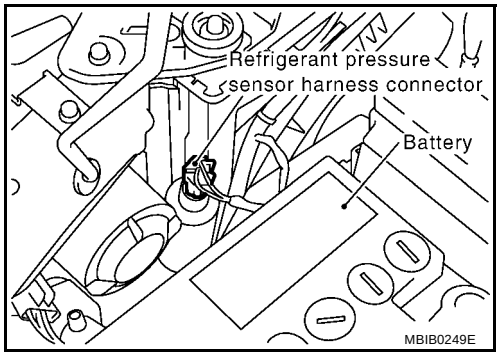


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

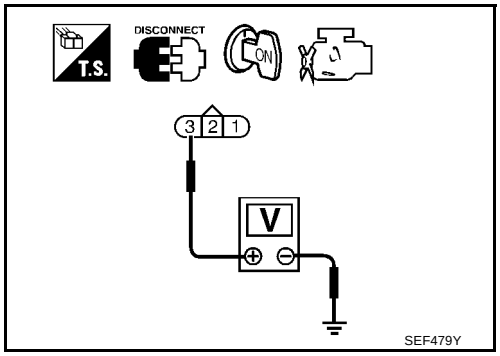
2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and refrigerant pressure sensor

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

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and refrigerant pressure sensor terminal 1. 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 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and refrigerant pressure sensor

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

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between ECM and refrigerant pressure sensor

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

8. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace.

Removal and Installation

EBS00KMA

REFRIGERANT PRESSURE SENSOR

Refer to ATC-132, "REFRIGERANT LINES" .

ELECTRICAL LOAD SIGNAL

PFP:25350

Description

EBS00KMB

The electrical load signals except headlamp switch signal are transferred through the CAN communication line.

CONSULT-II Reference Value in Data Monitor Mode

EBS00KMC

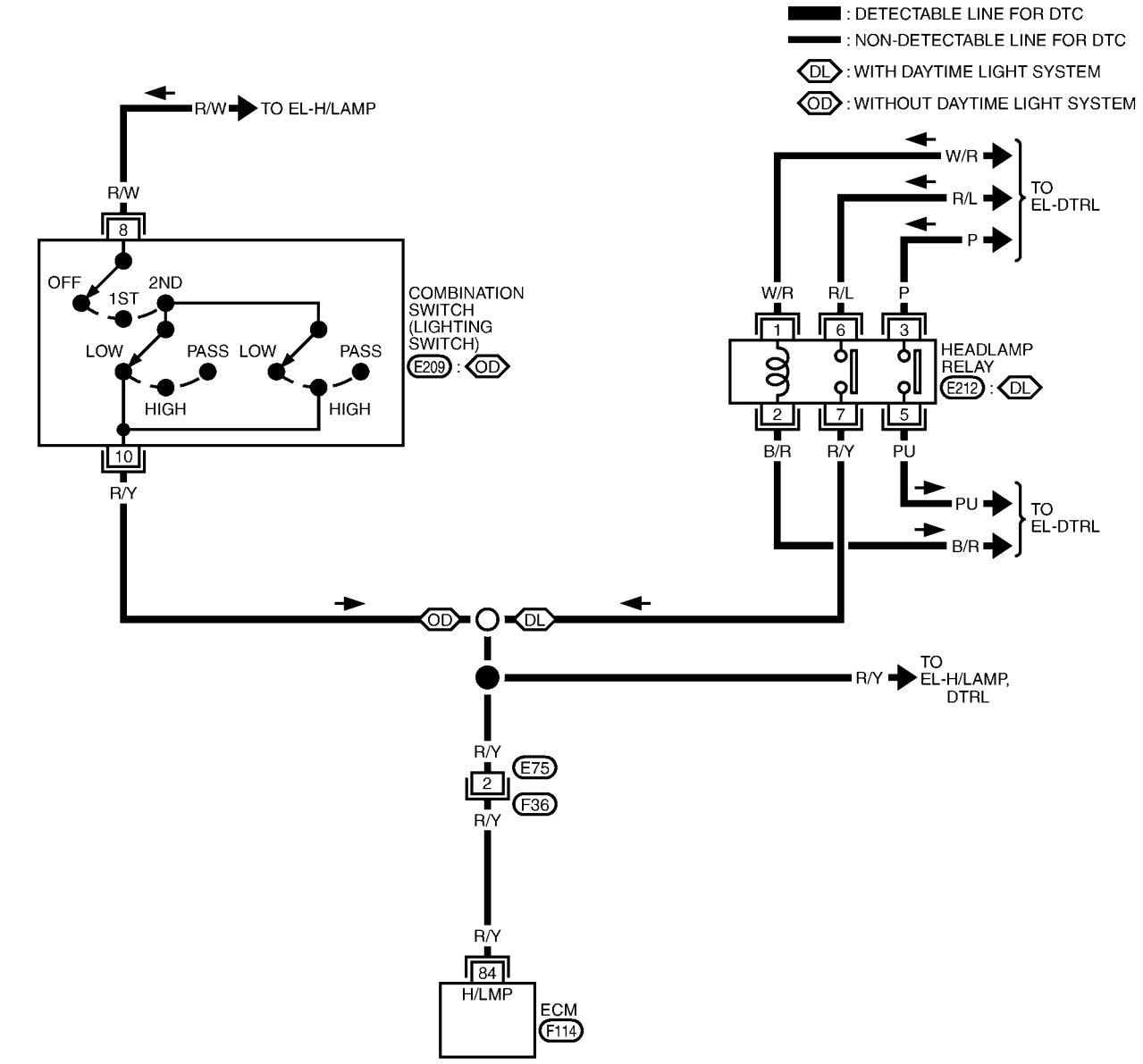
Specification data are reference values.

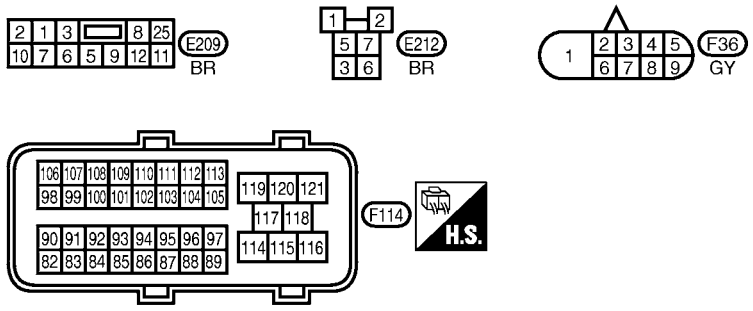
MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF

Wiring Diagram

EBS00KMD

EC-LOAD-01





YEC311A

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)
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2nd" position.	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF".	Approximately 0V

Diagnostic Procedure

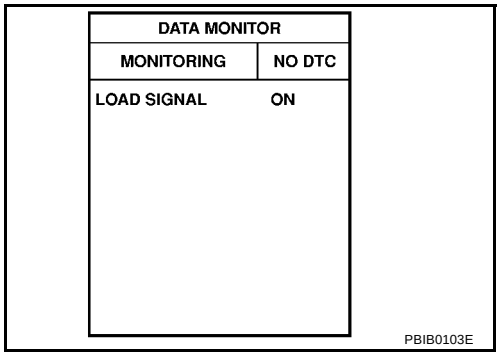
EBS00KME

1. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch "ON".
2. Connect CONSULT-II and select "DATA MONITOR" mode.
3. Select "LOAD SIGNAL" and check indication under the following conditions.

Condition	Indication
Rear window defogger switch "ON"	ON
Rear window defogger switch "OFF"	OFF



OK or NG

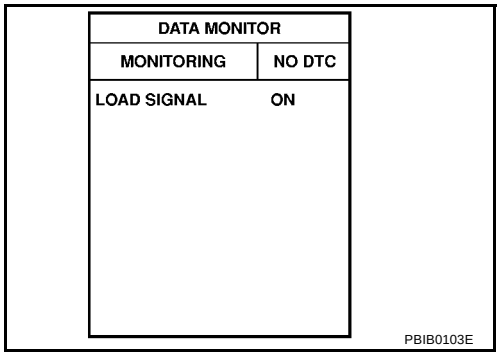
OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> GO TO 4.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

Check "LOAD SIGNAL" indication under the following conditions.

Condition	Indication
Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

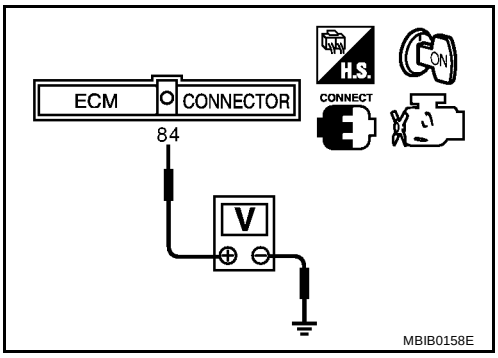
OK >> **INSPECTION END**
NG >> GO TO 5.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch “ON” at 2nd position	Battery voltage
Lighting switch “OFF”	Approximately 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

4. CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to EL-173.

>> **INSPECTION END**

5. CHECK HEADLAMP FUNCTION

1. Turn lighting switch “ON” at 2nd position.
2. Check that headlamps are illuminated.

OK or NG

OK >> GO TO 6.
NG >> Refer to EL-42 or EL-46.

6. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

WITHOUT DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connector.
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 10. Refer to Wiring Diagram.

Continuity should exist.

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

WITH DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect daytime light relay.
4. Check harness continuity between ECM terminal 84 and daytime light relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

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

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- harness for open and short between ECM and lighting switch
- harness for open and short between ECM and daytime light relay

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

8. CHECK INTERMITTENT INCIDENT

Refer to EC-485, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

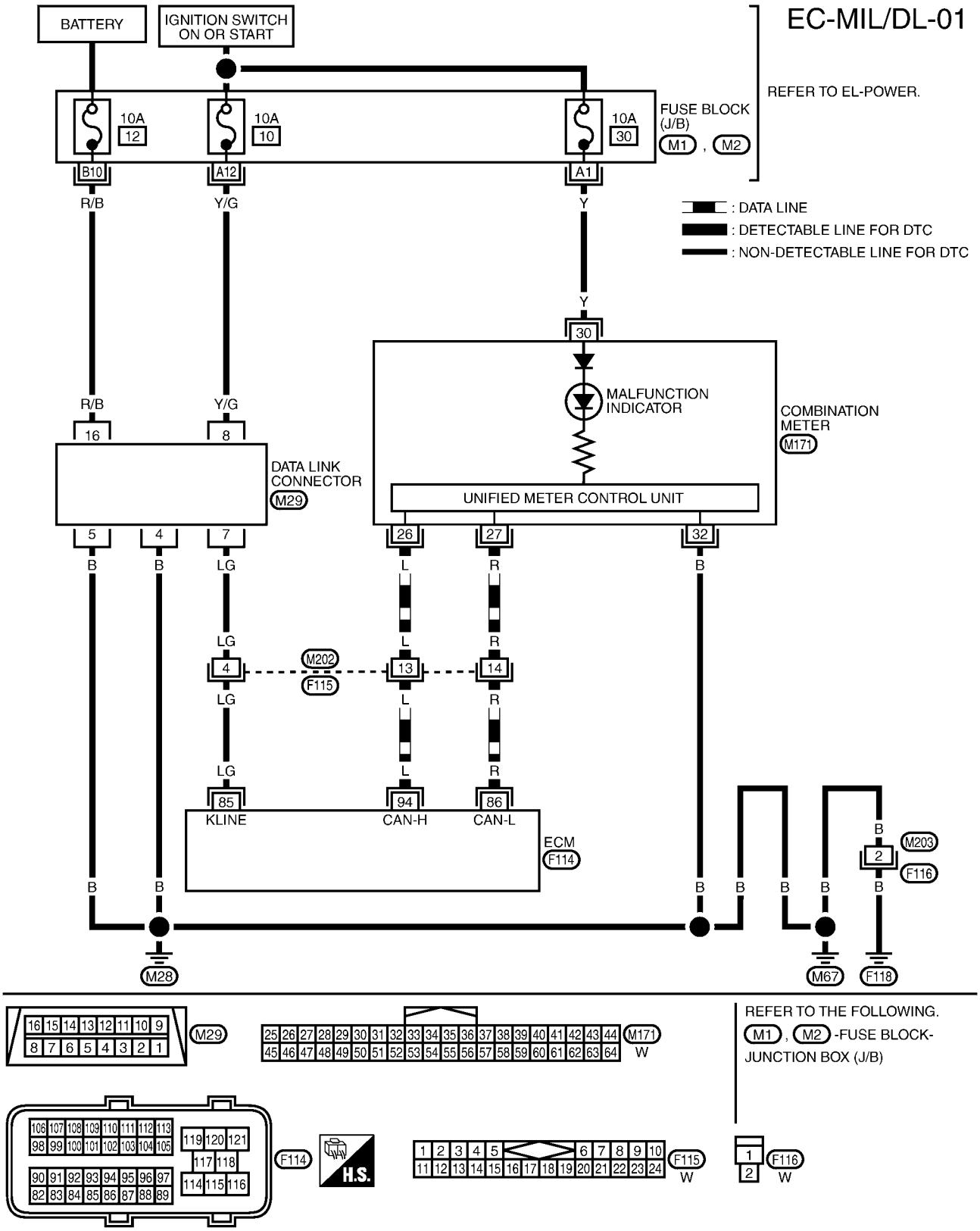
>> **INSPECTION END**

MI & DATA LINK CONNECTORS

PFP:24814

Wiring Diagram—LHD Models

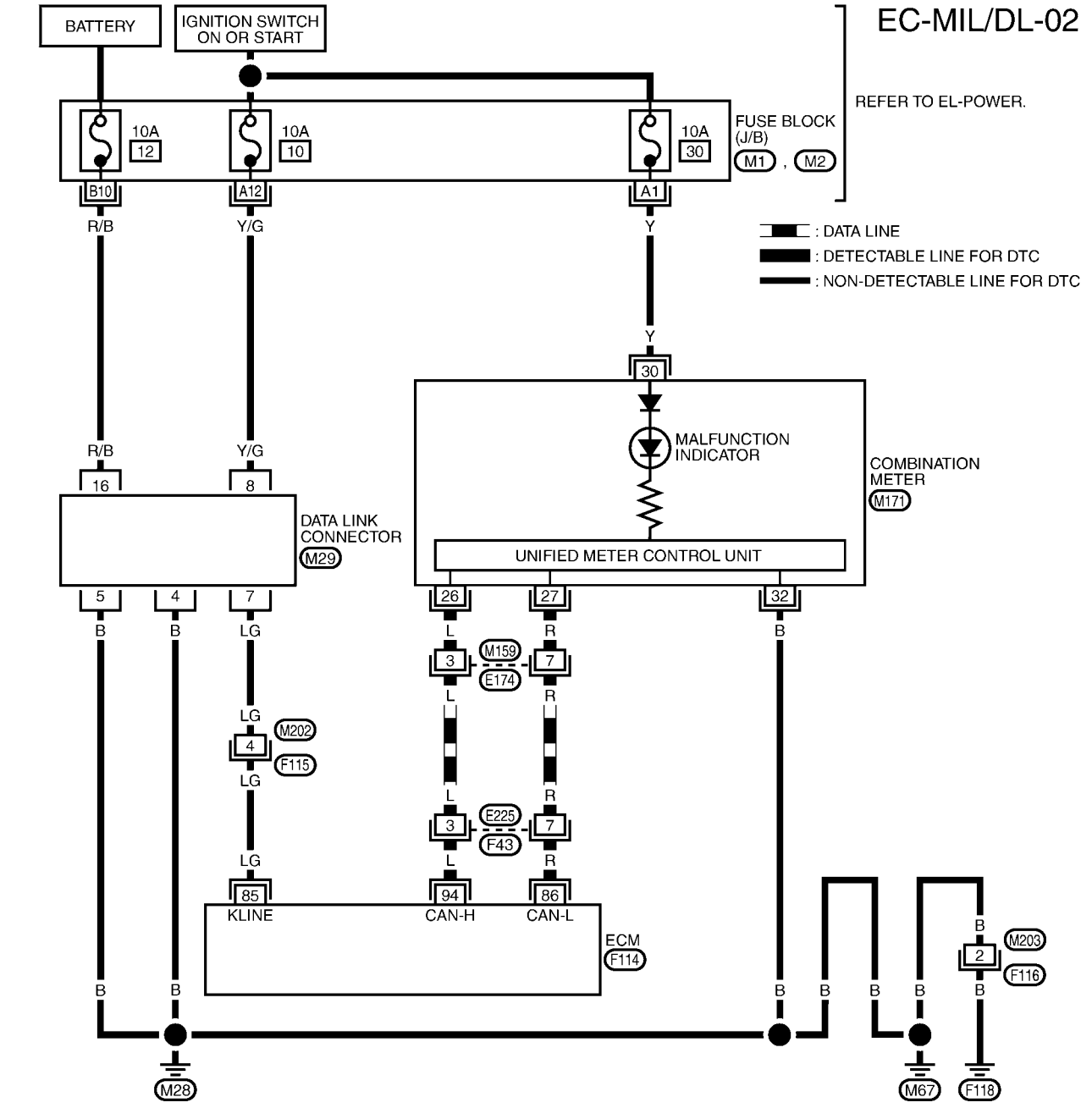
EBS00KMF

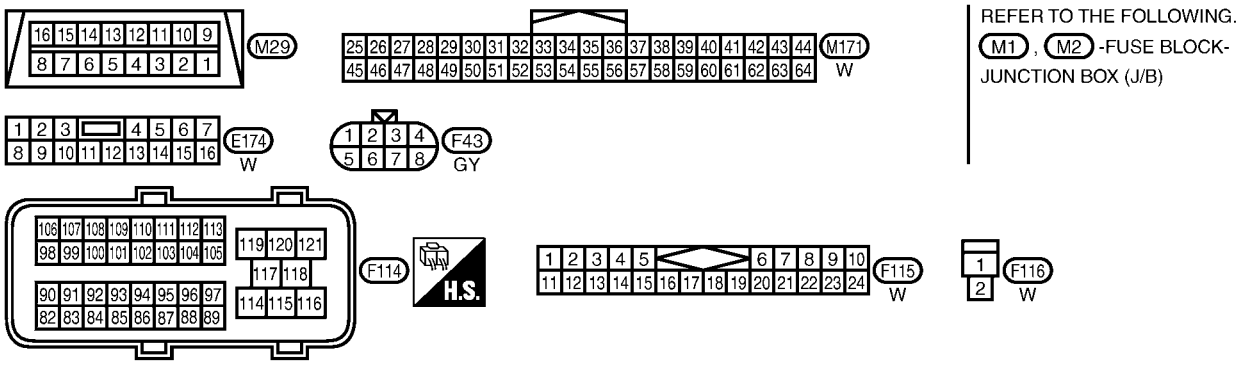


YEC312A

Wiring Diagram—RHD Models

EBS00KMG





REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK-JUNCTION BOX (J/B)

YEC313A

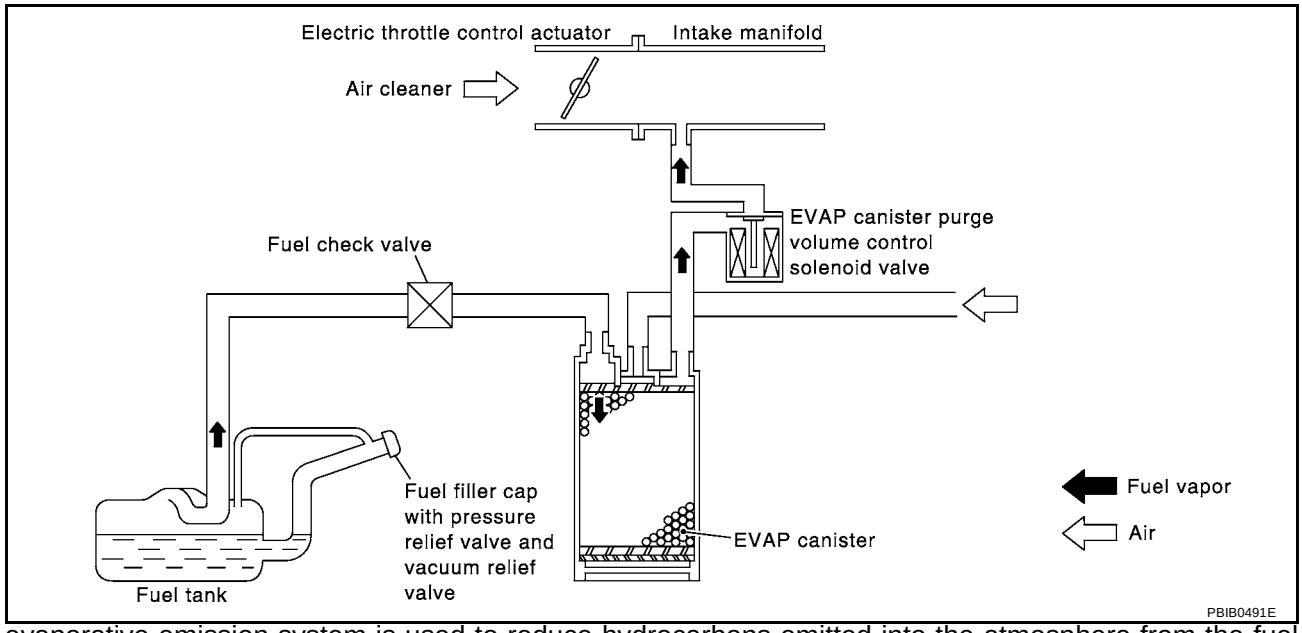
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

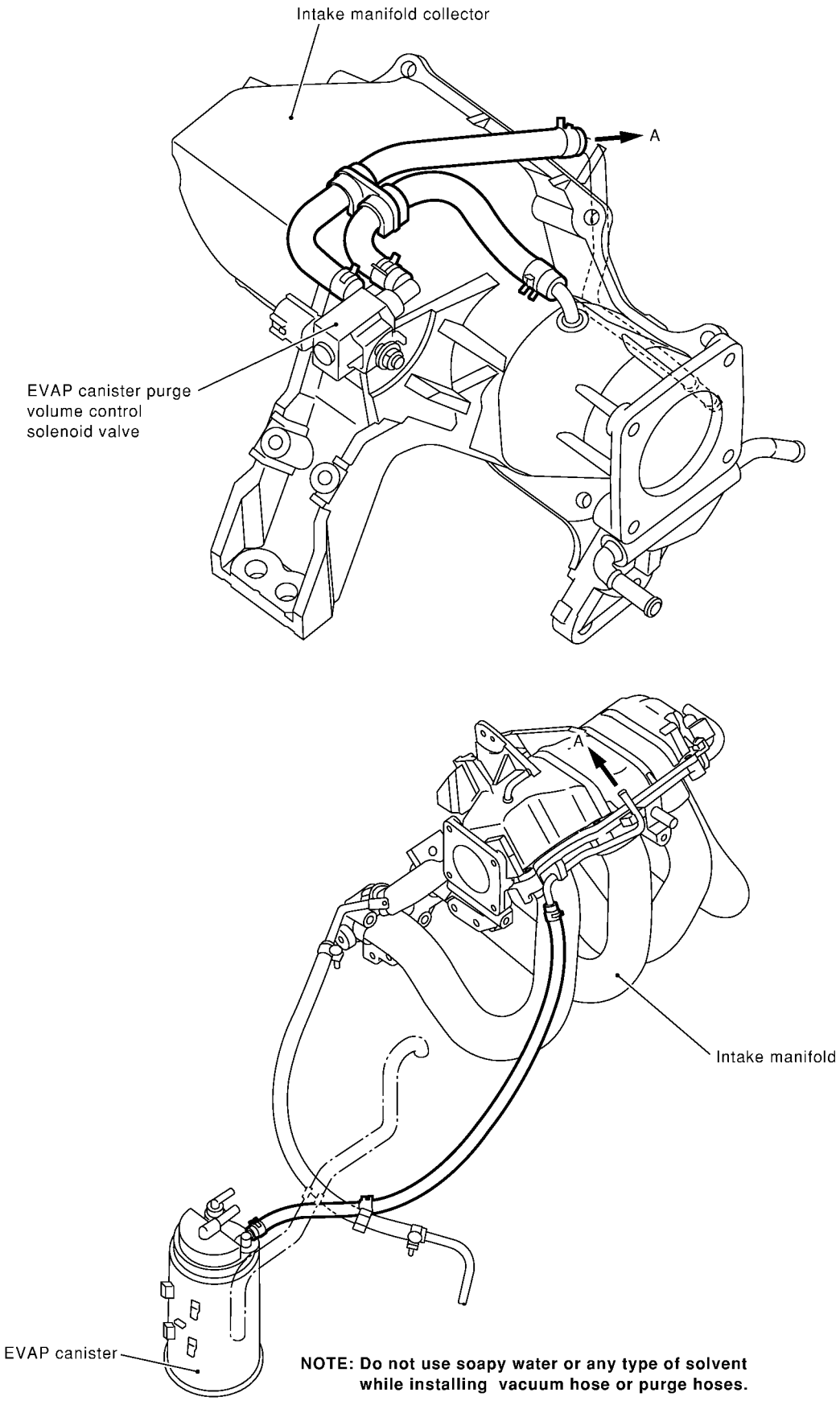
EBS00KMH

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING



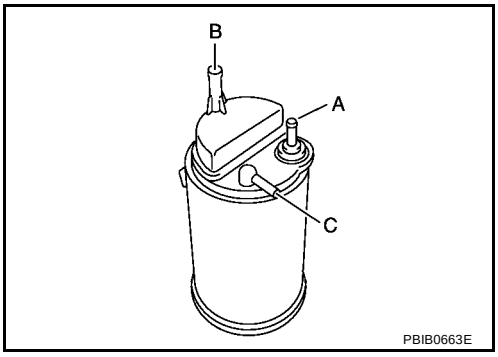
Component Inspection

EBS00KMI

EVAP CANISTER

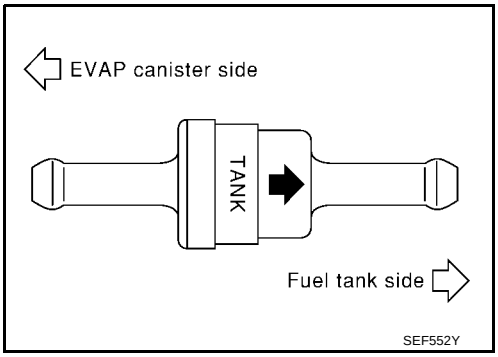
Check EVAP canister as follows:

1. Block port **B** . Orally blow air through port **A** . Check that air flows freely through port **C** .
2. Block port **A** . Orally blow air through port **B** . Check that air flows freely through port **C** .



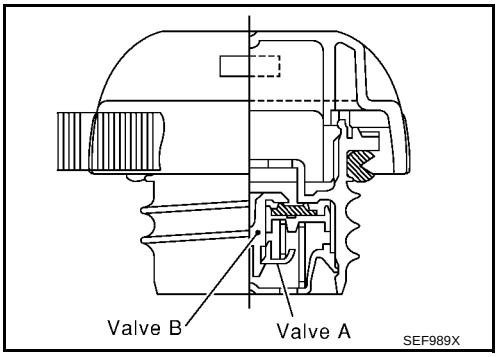
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side.
   Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

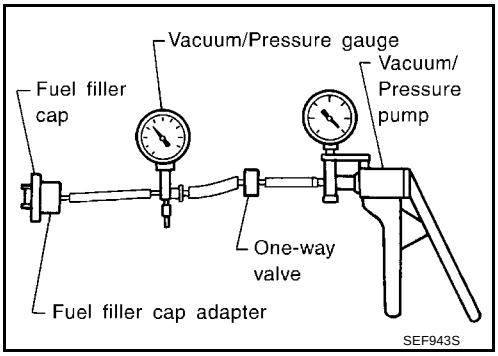
1. Wipe clean valve housing.



2. Check valve opening pressure and vacuum.

Pressure:	**15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)**
Vacuum:	**–6.0 to –3.3 kPa (–0.060 to –0.033 bar, –0.061 to –0.034 kg/cm^2 , –0.87 to –0.48 psi)**

3. If out of specification, replace fuel filler cap as an assembly.



EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-676, "Component Inspection" .

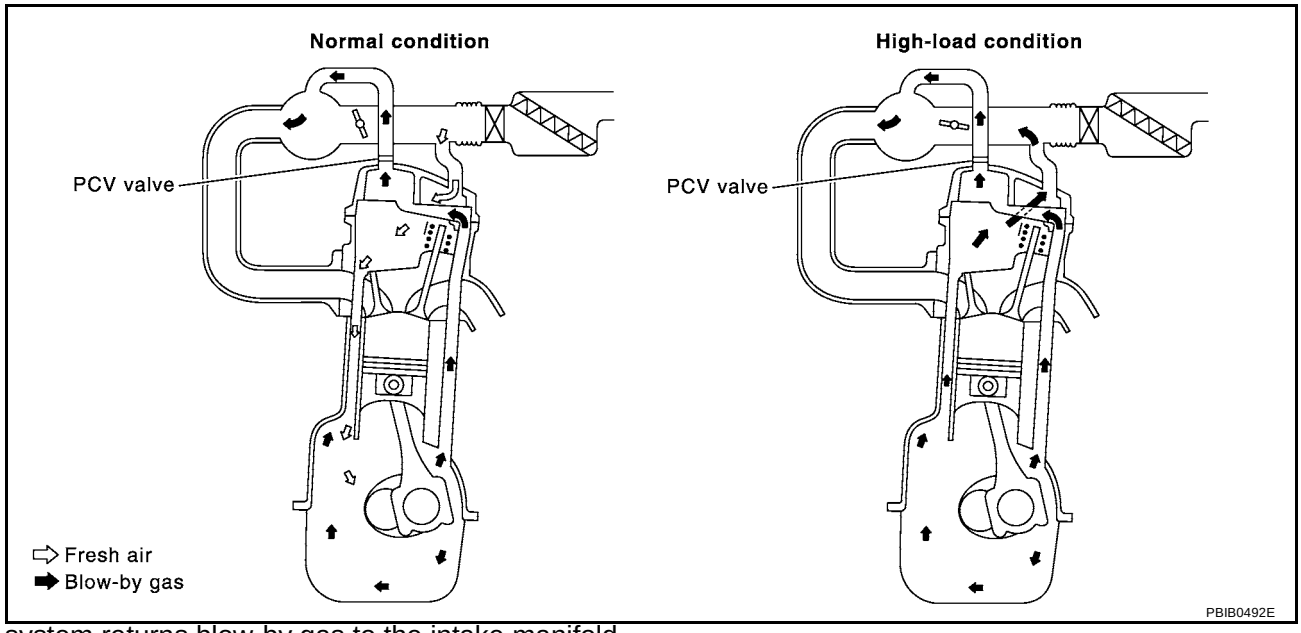
POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

EBS00KMJ

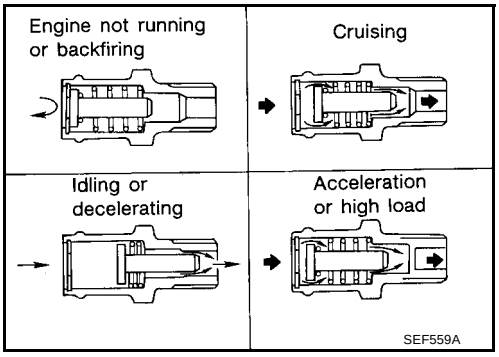
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

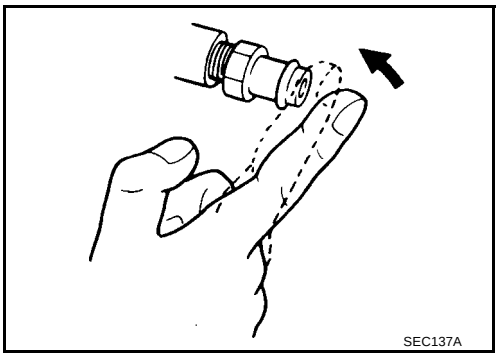


Component Inspection

EBS00KMK

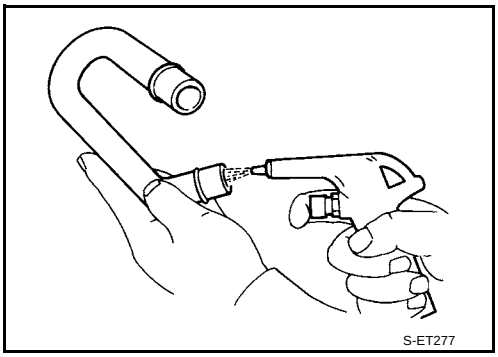
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

EBS00KML

Fuel pressure at idle	Approximately 350 kPa (3.5bar, 3.57kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

EBS00KMM

Target idle speed	No-load*1 (in “P” or N” position)	A/T: 800±50 rpm M/T: 700±50 rpm
Air conditioner: ON	In “P” or N” position	900 rpm or more
Ignition timing	In “P” or N” position	A/T: 10°±5° BTDC M/T: 8°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

EBS00KMN

	Calculated load value % (Using CONSULT-II)
At idle	10 - 35
At 2,500 rpm	10 - 35

Mass Air Flow Sensor

EBS00KMO

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	1.0 - 1.7*V
Mass air flow (Using CONSULT-II)	1.0 - 4.0 g·m/sec at idle* 5.0 - 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

EBS00KMP

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1
80 (176)	0.31 - 0.37

Engine Coolant Temperature Sensor

EBS00KMQ

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Heated Oxygen Sensor 1 Heater

EBS00KMR

Resistance [at 20°C (68°F)]	8 - 10Ω

Heated Oxygen sensor 2 Heater

EBS00KMS

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (POS)

EBS00KMT

Refer to EC-559, "Component Inspection" .

Camshaft Position Sensor (PHASE)

EBS00KMU

Refer to EC-566, "Component Inspection" .

Throttle Control Motor

EBS00KMV

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Injector

EBS00KMW

Resistance [at 20°C (68°F)]	13.5 - 17.5Ω

Fuel Pump

EBS00KMX

Resistance [at 25°C (77°F)]	Approximately 1.0Ω