ENGINE CONTROL SYSTEM

SECTION EC

CONTENTS

CONTENTS (Cont'd)

CONTENTS (Cont'd)

CONTENTS (Cont'd)

CONTENTS (Cont'd)

CONTENTS (Cont'd)

Alphabetical & P No. Index for DTC

NFEC0001

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-40, “IDENTIFICATION PLATE”.

Type approval number	Model
Available	With Euro-OBD system
Not available (blank).	Without Euro-OBD system

MODELS WITH EURO-OBD SYSTEM

Alphabetical Index for DTC

NFEC0001S03

NFEC0001S0301

Items (CONSULT-II screen terms)	DTC*1	Reference page
Unable to access ECM	—	EC-104
AIR TEMP SEN/CIRC	P0110	EC-141
A/T 1ST GR FNCTN	P0731	AT-144
A/T 2ND GR FNCTN	P0732	AT-150
A/T 3RD GR FNCTN	P0733	AT-156
A/T 4TH GR FNCTN	P0734	AT-162
A/T DIAG COMM LINE	P1605	EC-395
ATF TEMP SEN/CIRC	P0710	AT-128
CMP SEN/CIRCUIT	P0340	EC-303
CLOSED TP SW/CIRC	P0510	EC-333
COOLANT T SEN/CIRC*3	P0115	EC-146
CKP SENSOR (COG)	P1336	EC-387
CKP SEN/CIRCUIT	P0335	EC-295
CKP SEN (REF)/CIRC	P1335	EC-380
CYL 1 MISFIRE	P0301	EC-281
CYL 2 MISFIRE	P0302	EC-281
CYL 3 MISFIRE	P0303	EC-281
CYL 4 MISFIRE	P0304	EC-281
CYL 5 MISFIRE	P0305	EC-281
CYL 6 MISFIRE	P0306	EC-281
ECM	P0605	EC-341
ENGINE SPEED SIG	P0725	AT-139
ENG OVER TEMP	P1217	EC-351
FUEL SYS-LEAN/BK1	P0171	EC-261
FUEL SYS-LEAN/BK2	P0174	EC-261
FUEL SYS-RICH/BK1	P0172	EC-269
FUEL SYS-RICH/BK2	P0175	EC-269
FUEL TEMP SEN/CIRC	P0180	EC-276
HO2S1 (B1)	P0130	EC-158
HO2S1 (B1)	P0131	EC-168

Items (CONSULT-II screen terms)	DTC*1	Reference page
HO2S1 (B1)	P0132	EC-176
HO2S1 (B1)	P0133	EC-184
HO2S1 (B1)	P0134	EC-197
HO2S1 (B2)	P0150	EC-158
HO2S1 (B2)	P0151	EC-168
HO2S1 (B2)	P0152	EC-176
HO2S1 (B2)	P0153	EC-184
HO2S1 (B2)	P0154	EC-197
HO2S1 HTR (B1)	P0135	EC-205
HO2S1 HTR (B2)	P0155	EC-205
HO2S2 (B1)	P0137	EC-212
HO2S2 (B1)	P0138	EC-223
HO2S2 (B1)	P0139	EC-234
HO2S2 (B1)	P0140	EC-245
HO2S2 (B2)	P0157	EC-212
HO2S2 (B2)	P0158	EC-223
HO2S2 (B2)	P0159	EC-234
HO2S2 (B2)	P0160	EC-245
HO2S2 HTR (B1)	P0141	EC-254
HO2S2 HTR (B2)	P0161	EC-254
IACV/AAC VLV/CIRC	P0505	EC-324
KNOCK SEN/CIRC-B1	P0325	EC-289
L/PRES SOL/CIRC	P0745	AT-176
MAF SEN/CIRCUIT*3	P0100	EC-134
MULTI CYL MISFIRE	P0300	EC-281
NATS MALFUNCTION	P1610 - P1615*2	EL-291
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**—**
O/R CLTCH SOL/CIRC	P1760	AT-201
P-N POS SW/CIRCUIT	P1706	EC-398
PNP SW/CIRC	P0705	AT-122
PURG VOLUME CONT/V	P0443	EC-314
SFT SOL A/CIRC*3	P0750	AT-182
SFT SOL B/CIRC*3	P0755	AT-187
SWIRL CONT SOL/V	P1131	EC-344
TCC SOLENOID/CIRC	P0740	AT-171
TP SEN/CIRC A/T*3	P1705	AT-192

Items (CONSULT-II screen terms)	DTC*1	Reference page
TRTL POS SEN/CIRC*3	P0120	EC-151
TW CATALYST SYS-B1	P0420	EC-309
TW CATALYST SYS-B2	P0430	EC-309
VEH SPEED SEN/CIRC*4	P0500	EC-320
VEH SPD SEN/CIR A/T*4	P0720	AT-134

*1: 1st trip DTC No. is the same as DTC No.
*2: This DTC is displayed with CONSULT-II only.
*3: When the fail-safe operation occurs, the MI illuminates.
*4: The MI illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

NOTE:
Regarding A33 models, "-B1" and "BK1" indicate bank 1 and "-B2" and "BK2" indicate bank 2.

P No. Index for DTC

NFEC0001S0302

DTC*1	Items (CONSULT-II screen terms)	Reference page
—	Unable to access ECM	EC-104
P0000	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	**—**
P0100	MAF SEN/CIRCUIT*3	EC-134
P0110	AIR TEMP SEN/CIRC	EC-141
P0115	COOLANT T SEN/CIRC*3	EC-146
P0120	THRTL POS SEN/CIRC*3	EC-151
P0130	HO2S1 (B1)	EC-158
P0131	HO2S1 (B1)	EC-168
P0132	HO2S1 (B1)	EC-176
P0133	HO2S1 (B1)	EC-184
P0134	HO2S1 (B1)	EC-197
P0135	HO2S1 HTR (B1)	EC-205
P0137	HO2S2 (B1)	EC-212
P0138	HO2S2 (B1)	EC-223
P0139	HO2S2 (B1)	EC-234
P0140	HO2S2 (B1)	EC-245
P0141	HO2S2 HTR (B1)	EC-254
P0150	HO2S1 (B2)	EC-158
P0151	HO2S1 (B2)	EC-168
P0152	HO2S1 (B2)	EC-176
P0153	HO2S1 (B2)	EC-184
P0154	HO2S1 (B2)	EC-197
P0155	HO2S1 HTR (B2)	EC-205
P0157	HO2S2 (B2)	EC-212

DTC*1	Items (CONSULT-II screen terms)	Reference page
P0158	HO2S2 (B2)	EC-223
P0159	HO2S2 (B2)	EC-234
P0160	HO2S2 (B2)	EC-245
P0161	HO2S2 HTR (B2)	EC-254
P0171	FUEL SYS-LEAN/BK1	EC-261
P0172	FUEL SYS-RICH/BK1	EC-269
P0174	FUEL SYS-LEAN/BK2	EC-261
P0175	FUEL SYS-RICH/BK2	EC-269
P0180	FUEL TEMP SEN/CIRC	EC-276
P0300	MULTI CYL MISFIRE	EC-281
P0301	CYL 1 MISFIRE	EC-281
P0302	CYL 2 MISFIRE	EC-281
P0303	CYL 3 MISFIRE	EC-281
P0304	CYL 4 MISFIRE	EC-281
P0305	CYL 5 MISFIRE	EC-281
P0306	CYL 6 MISFIRE	EC-281
P0325	KNOCK SEN/CIRC-B1	EC-289
P0335	CKP SEN/CIRCUIT	EC-295
P0340	CMP SEN/CIRCUIT	EC-303
P0420	TW CATALYST SYS-B1	EC-309
P0430	TW CATALYST SYS-B2	EC-309
P0443	PURG VOLUME CONT/V	EC-314
P0500	VEH SPEED SEN/CIRC*4	EC-320
P0505	IACV/AAC VLV/CIRC	EC-324
P0510	CLOSED TP SW/CIRC	EC-333
P0605	ECM	EC-341
P0705	PNP SW/CIRC	AT-122
P0710	ATF TEMP SEN/CIRC	AT-128
P0720	VEH SPD SEN/CIR A/T*4	AT-134
P0725	ENGINE SPEED SIG	AT-139
P0731	A/T 1ST GR FNCTN	AT-144
P0732	A/T 2ND GR FNCTN	AT-150
P0733	A/T 3RD GR FNCTN	AT-156
P0734	A/T 4TH GR FNCTN	AT-162
P0740	TCC SOLENOID/CIRC	AT-171
P0745	L/PRESS SOL/CIRC	AT-176
P0750	SFT SOL A/CIRC*3	AT-182

DTC*1	Items (CONSULT-II screen terms)	Reference page
P0755	SFT SOL B/CIRC*3	AT-187
P1131	SWIRL CONT SOL/V	EC-344
P1217	ENG OVER TEMP	EC-351
P1335	CKP SEN (REF)/CIRC	EC-380
P1336	CKP SENSOR (COG)	EC-387
P1605	A/T DIAG COMM LINE	EC-395
P1610 - P1615*2	NATS MALFUNCTION	EL-291
P1705	TP SEN/CIRC A/T*3	AT-192
P1706	P-N POS SW/CIRCUIT	EC-398
P1760	O/R CLTCH SOL/CIRC	AT-201

*1: 1st trip DTC No. is the same as DTC No.

*2: This DTC is displayed with CONSULT-II only.

*3: When the fail-safe operation occurs, the MI illuminates.

*4: The MI illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

NOTE:

Regarding A33 models, "-B1" and "BK1" indicate bank 1 and "-B2" and "BK2" indicate bank 2.

MODELS WITHOUT EURO-OBD SYSTEM

Alphabetical Index for DTC

=NFEC0001S04

NFEC0001S0401

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC		Reference page
	CONSULT-II	ECM*1	
Unable to access ECM	—	—	EC-104
CMP SEN/CIRCUIT	P0340	0340	EC-303
COOLANT T SEN/CIRC	P0115	0115	EC-146
CKP SENSOR (COG)	P1336	1336	EC-387
CKP SEN (REF) CIRC	P1335	1335	EC-380
ECM	P0605	0605	EC-341
ENG OVER TEMP	P1217	1217	EC-351
HO2S1 (B1)	P0130	0130	EC-158
IGN SIGNAL-PRIMARY	P1320	1320	EC-369
KNOCK SEN/CIRC-B1	P0325	0325	EC-289
MAF SEN/CIRCUIT	P0100	0100	EC-134
NATS MALFUNCTION	P1610 - P1615	—	EL-291
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	**—**
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*2	EC-61
THRTL POS SEN/CIRC	P0120	0120	EC-151

NOTE:

Regarding A33 models, "-B1" indicates bank 1 and "-B2" indicates bank 2.

*1: In Diagnostic Test Mode II (Self-diagnostic results).

*2: While engine is running.

P No. Index for DTC

NFEC0001S0402

X: Applicable —: Not applicable

DTC		Items (CONSULT-II screen terms)	Reference page
CONSULT-II	ECM*1		
—	—	Unable to access ECM	EC-104
No DTC	Flashing*2	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	EC-61
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	**—**
P0100	0100	MAF SEN/CIRCUIT	EC-134
P0115	0115	COOLANT T SEN/CIRC	EC-146
P0120	0120	THRTL POS SEN/CIRC	EC-151
P0130	0130	HO2S1 (B1)	EC-158
P0325	0325	KNOCK SEN/CIRC-B1	EC-289

DTC		Items (CONSULT-II screen terms)	Reference page
CONSULT-II	ECM*1		
P0340	0340	CMP SEN/CIRCUIT	EC-303
P0605	0605	ECM	EC-341
P1217	1217	ENG OVER TEMP	EC-351
P1320	1320	IGN SIGNAL-PRIMARY	EC-369
P1335	1335	CKP SEN (REF)/CIRC	EC-380
P1336	1336	CKP SENSOR (COG)	EC-387
P1610 - P1615	—	NATS MALFUNCTION	EL-291

NOTE:
Regarding A33 models, "-B1" indicates bank 1 and "-B2" indicates bank 2.
*1: In Diagnostic Test Mode II (Self-diagnostic results).
*2: While engine is running.

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

NFEC0871

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER" used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL A33 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), satellite sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS 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 should be performed by an authorized NISSAN 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 RS 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 with yellow harness connector (and with yellow harness protector or yellow insulation tape before the harness connectors).**

Precautions for On Board Diagnostic (OBD) System of Engine

NFEC0003

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 negative battery terminal 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 section, "Description", "HARNESS CONNECTOR".**
- **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 erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.**

Engine Fuel & Emission Control System

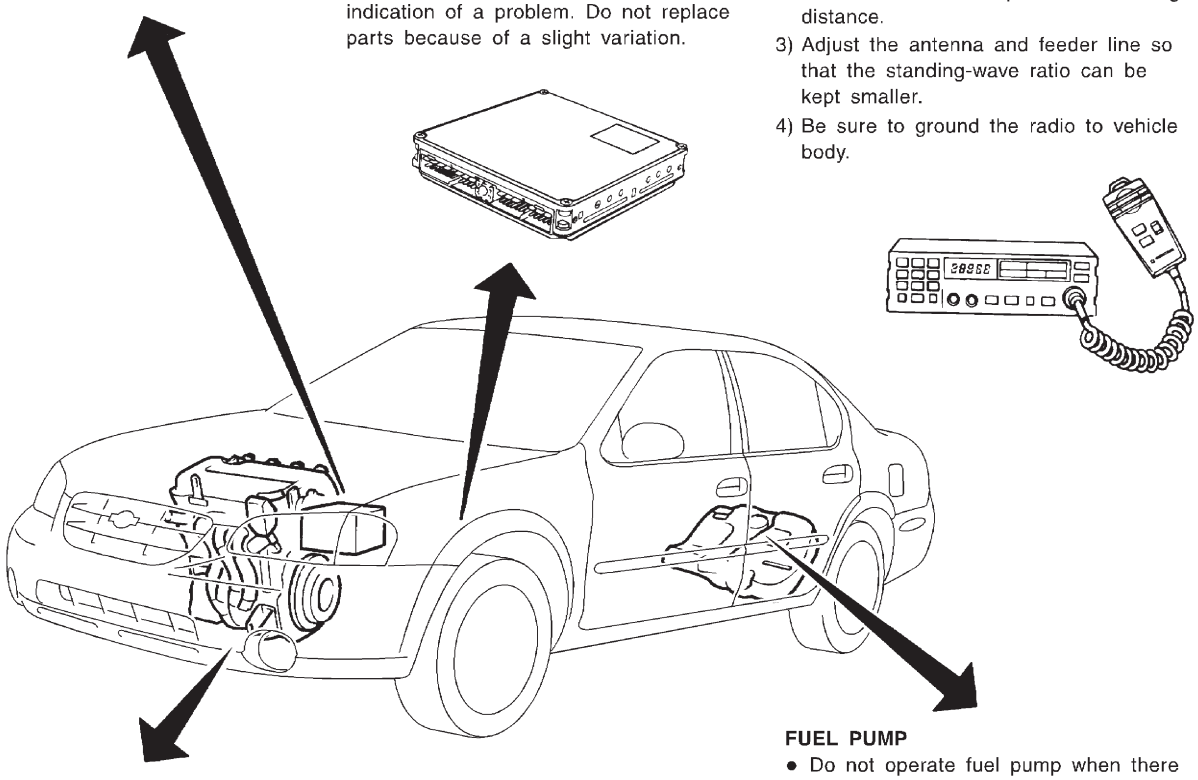
NFEC0004

BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

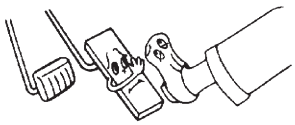
ECM
- Do not disassemble ECM.
- Do not turn dignosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value.
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

WIRELESS EQUIPMENT
- 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 its installation location.

1) Keep the antenna as far away as possible from the ECM.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Be sure to ground the radio to vehicle body.



ENGINE CONTROL PARTS HANDLING
- 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 IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor or crankshaft position sensor.

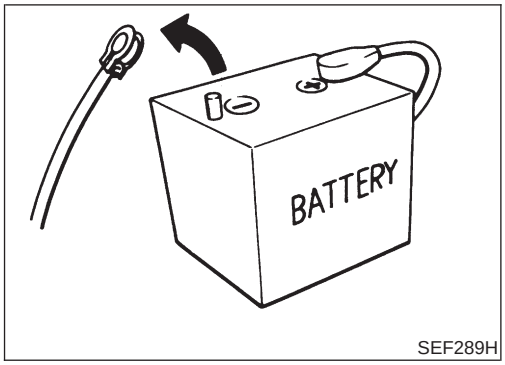


WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

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

ECM HARNESS HANDLING
- 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 ECM harness at least 10 cm (3.9 in) away from adjacent harnesses to prevent an ECM system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECM parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

SEF242XC

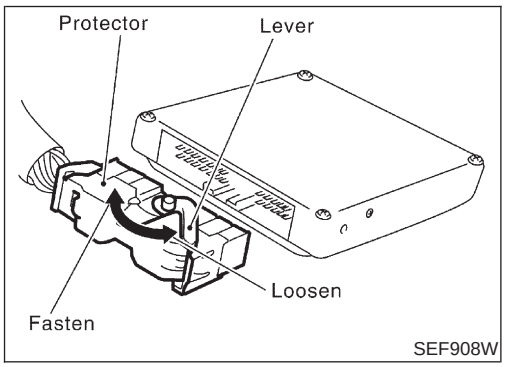


SEF289H

Precautions

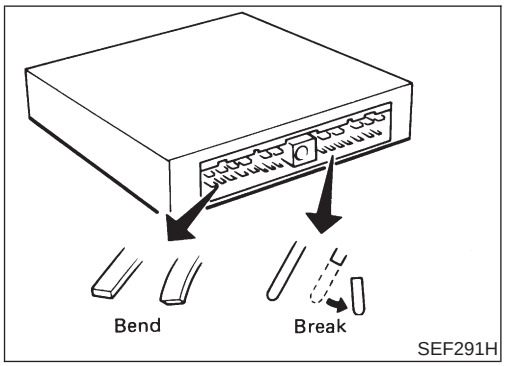
NFEC0005

- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**



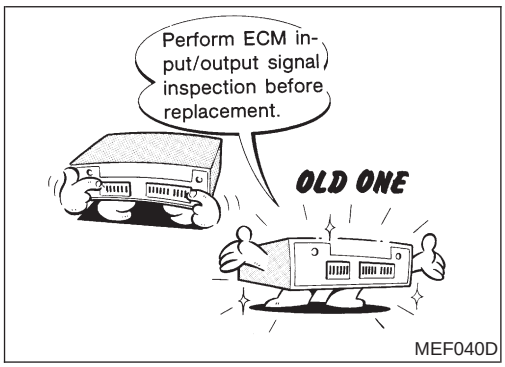
SEF908W

- **When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown at left.**



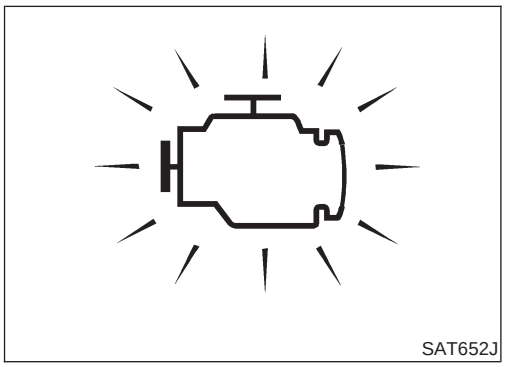
SEF291H

- **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.

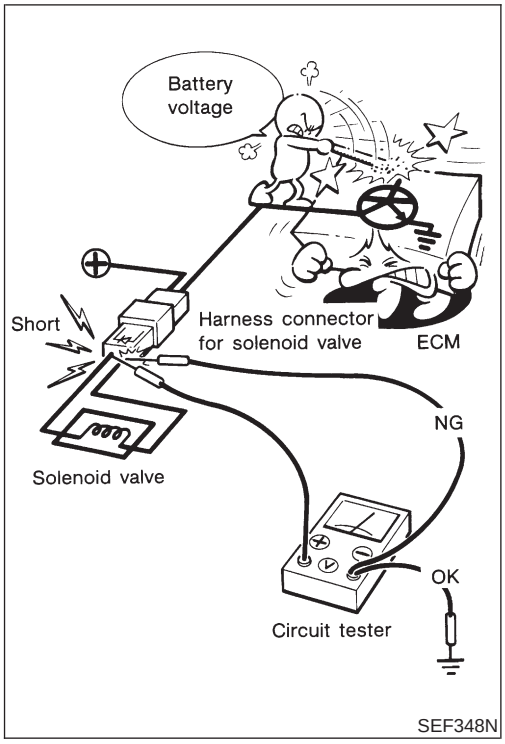


MEF040D

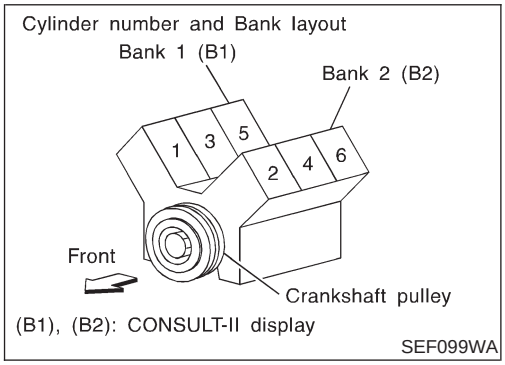
- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-114.**


SAT652J

- **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, 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.**



- **Regarding model A33, "Bank 1 (B1)" indicates cylinders number 1, 3, 5 and "Bank 2 (B2)" indicates cylinders number 2, 4, 6 as shown in the figure.**

Wiring Diagrams and Trouble Diagnosis

NFEC0006

When you read Wiring diagrams, refer to the following:

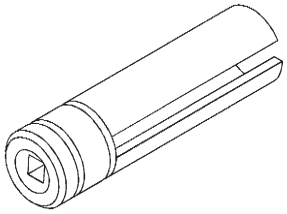
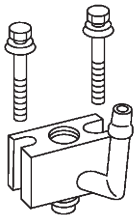
- GI-11, "HOW TO READ WIRING DIAGRAMS"
- EL-9, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

- GI-32, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-21, "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"

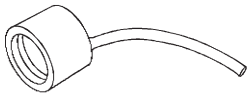
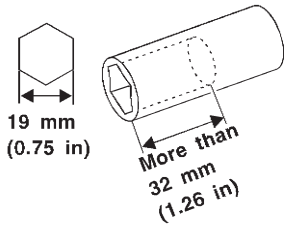
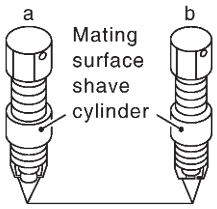
Special Service Tools

NFEC0007

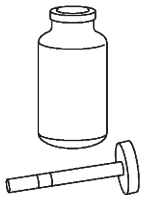
Tool number Tool name	Description	
KV10117100 Heated oxygen sensor 1 (front) wrench Heated oxygen sensor 2 (rear) wrench	 NT379	Loosening or tightening front and heated oxygen sensor 2 (rear)s with 22 mm (0.87 in) hexagon nut
KV10117600 Fuel pressure check adapter	 NT777	Checking fuel pressure with pressure gauge

Commercial Service Tools

NFEC0008

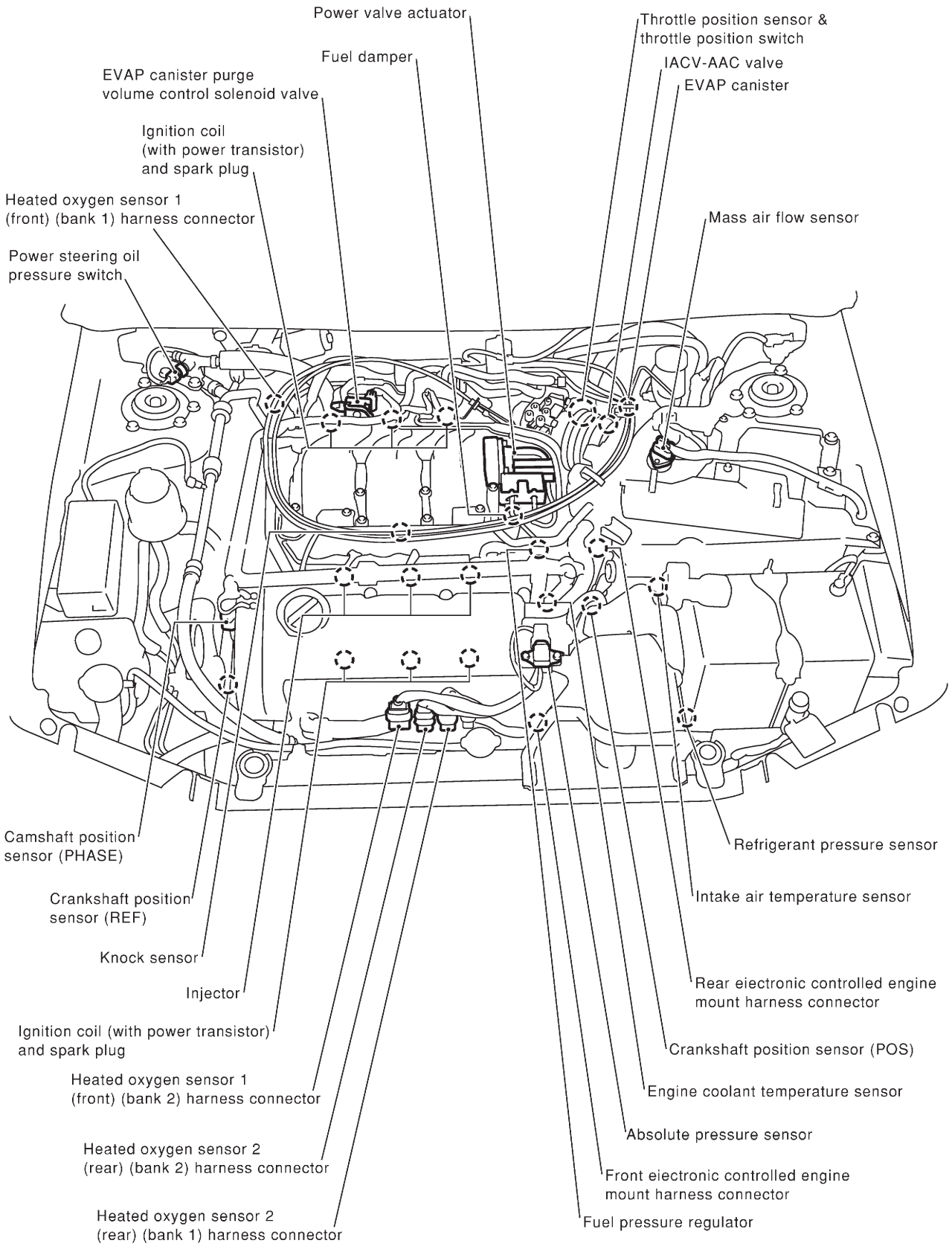
Tool name	Description	
Fuel filler cap adapter	 NT653	Checking fuel tank vacuum relief valve opening pressure
Socket wrench	 NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner	 NT778	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm dia. with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm dia. with pitch 1.25 mm for Titania Oxygen Sensor**

Commercial Service Tools (Cont'd)

Tool name	Description	
Anti-seize lubricant (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

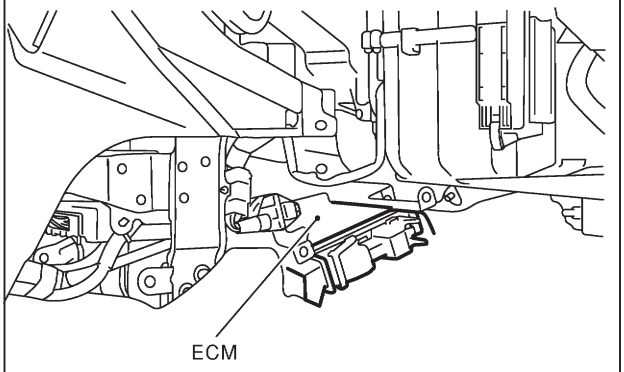
Engine Control Component Parts Location

NFEC0009

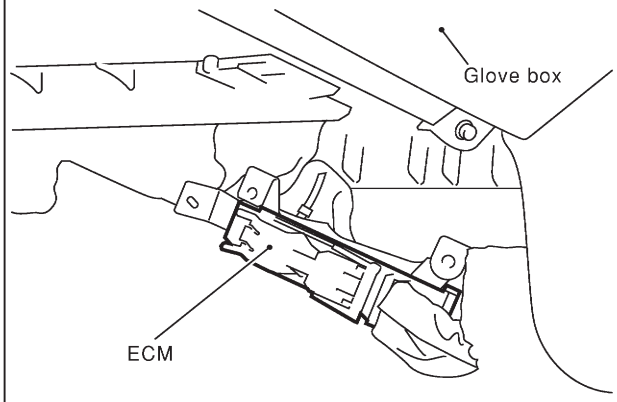


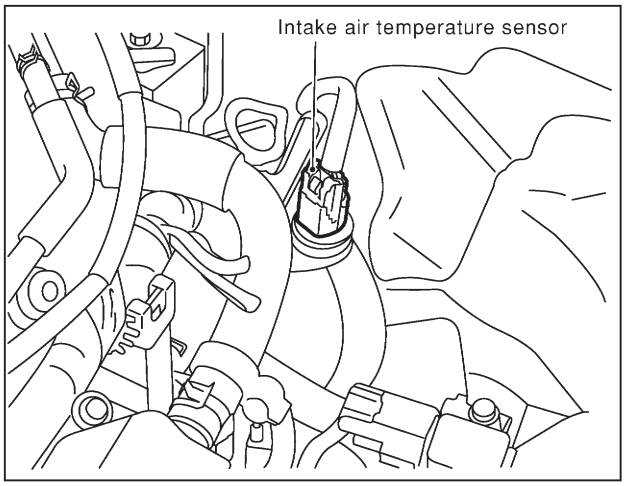
SEC121C

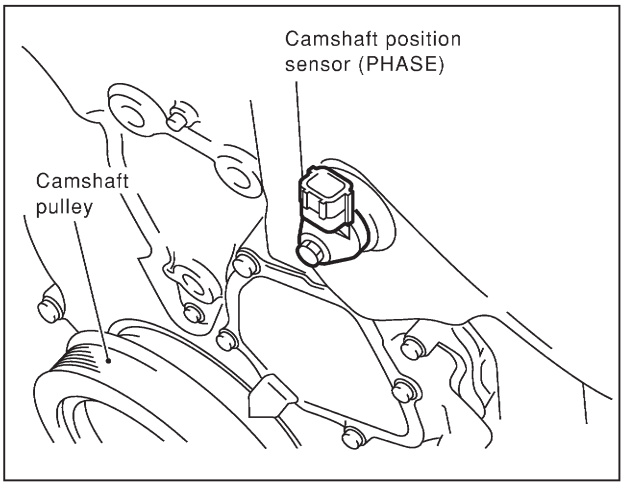
LHD models
View with glove box removed

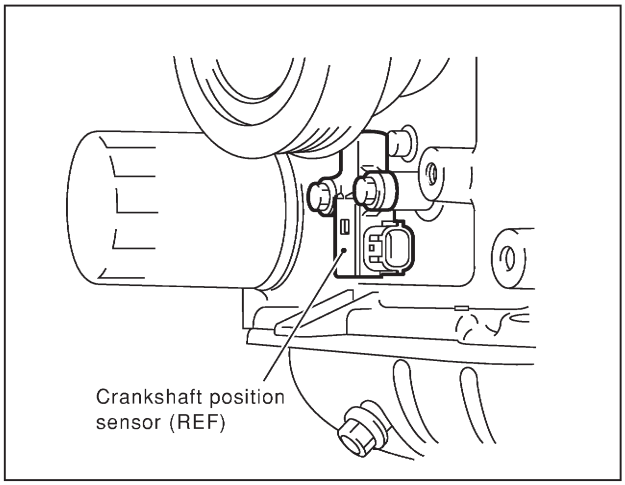


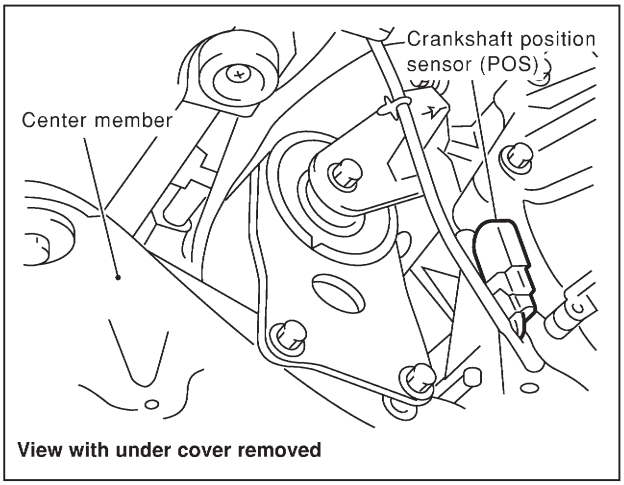
RHD models





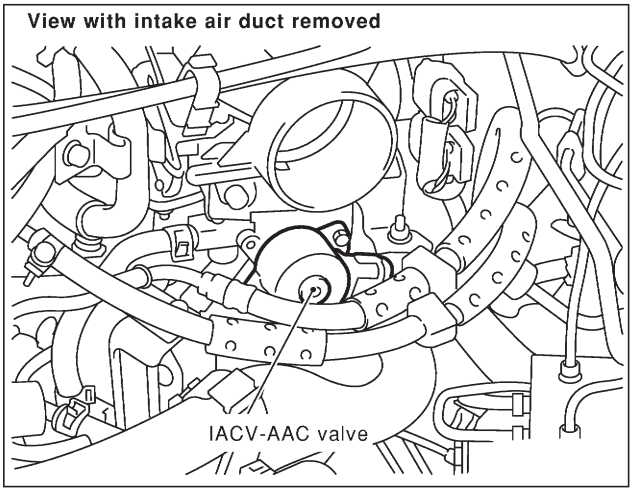


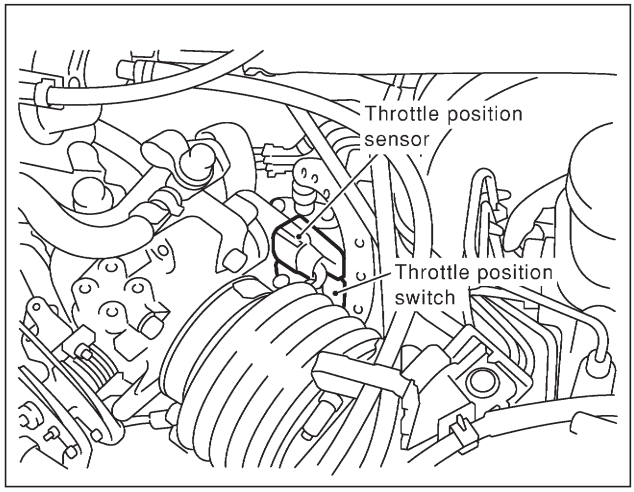


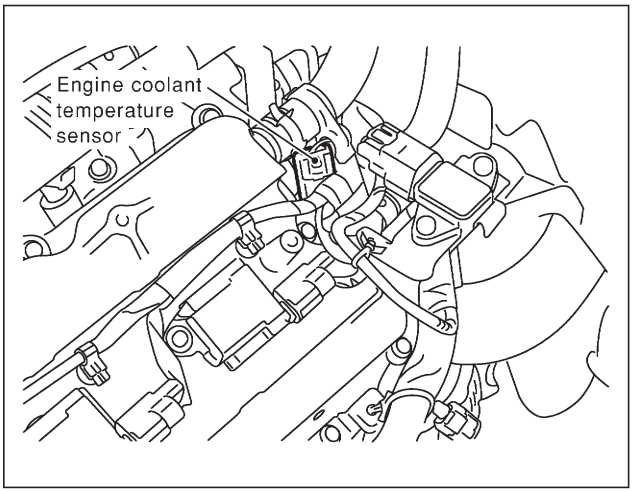


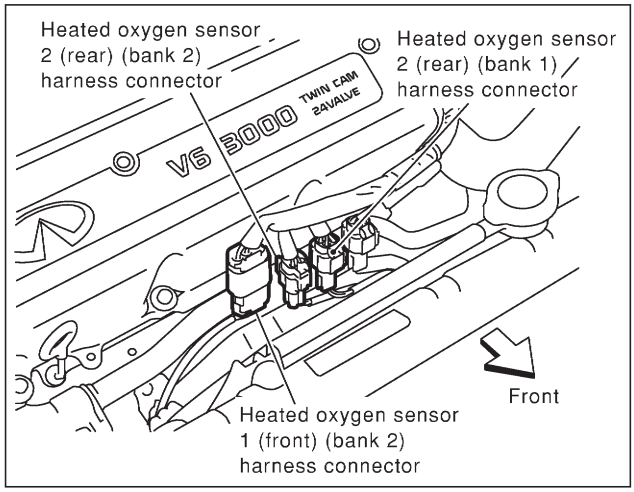
View with under cover removed

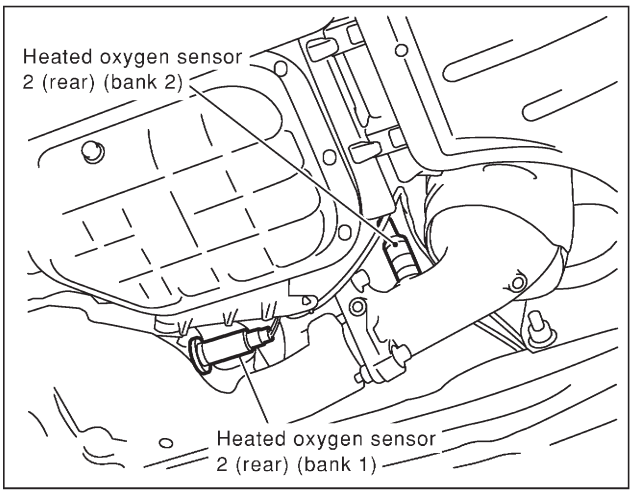
SEF981X

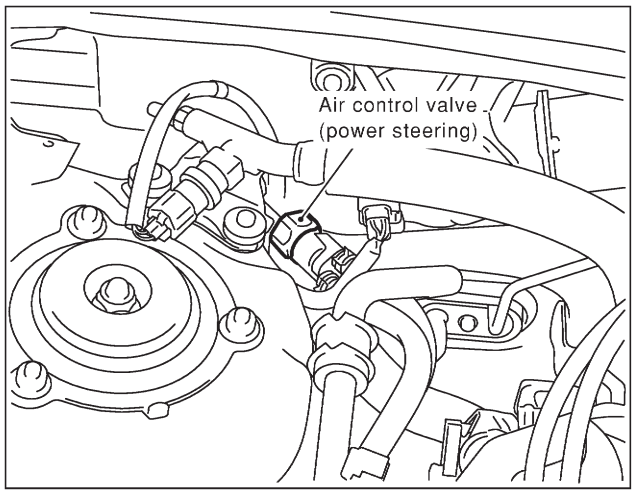

View with intake air duct removed
IACV-AAC valve


Throttle position sensor
Throttle position switch

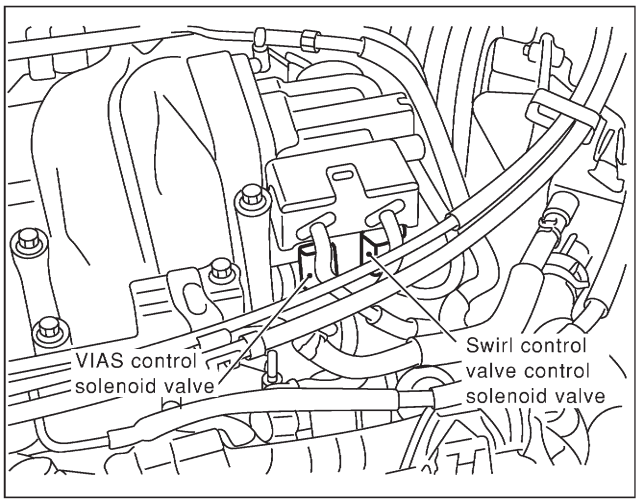

Engine coolant temperature sensor

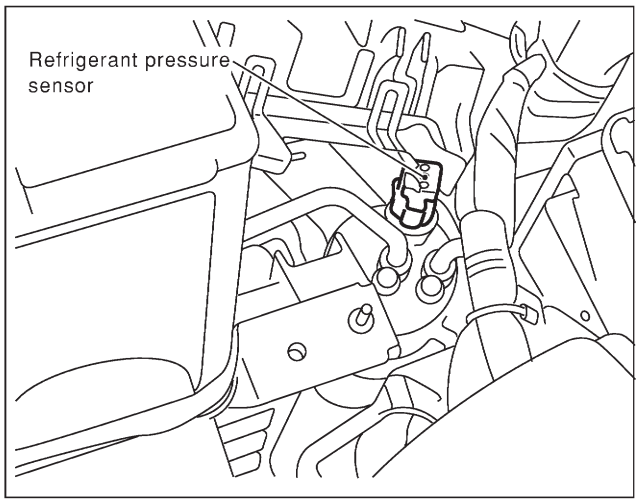

Heated oxygen sensor 2 (rear) (bank 2) harness connector
Heated oxygen sensor 2 (rear) (bank 1) harness connector
V6 3000 TWIN CAM 24VALVE
Front
Heated oxygen sensor 1 (front) (bank 2) harness connector

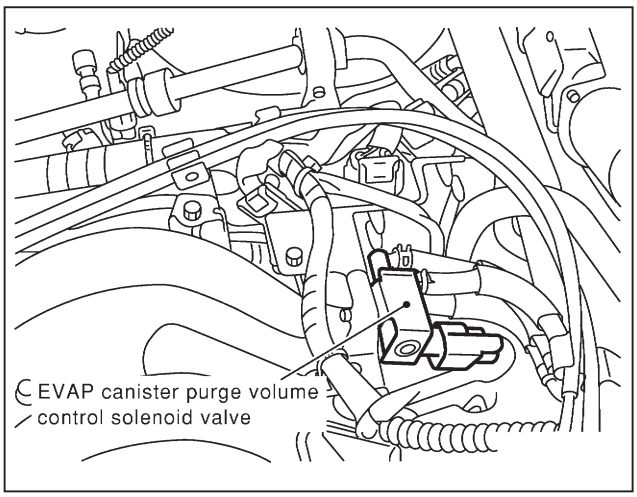

Heated oxygen sensor 2 (rear) (bank 2)
Heated oxygen sensor 2 (rear) (bank 1)


Air control valve (power steering)

SEC122C


VIAS control solenoid valve
Swirl control valve control solenoid valve

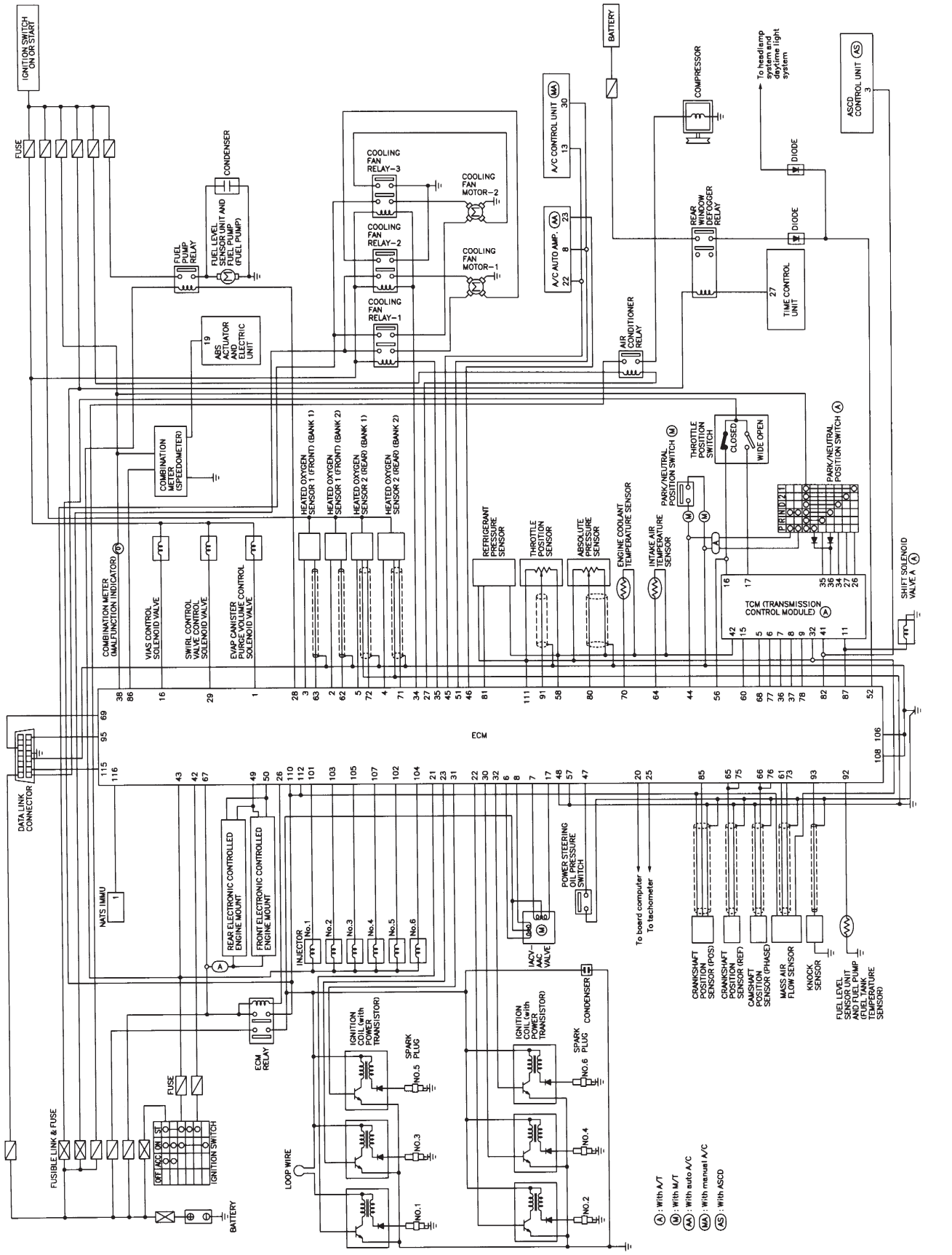

Refrigerant pressure sensor


EVAP canister purge volume control solenoid valve

SEF982X

Circuit Diagram

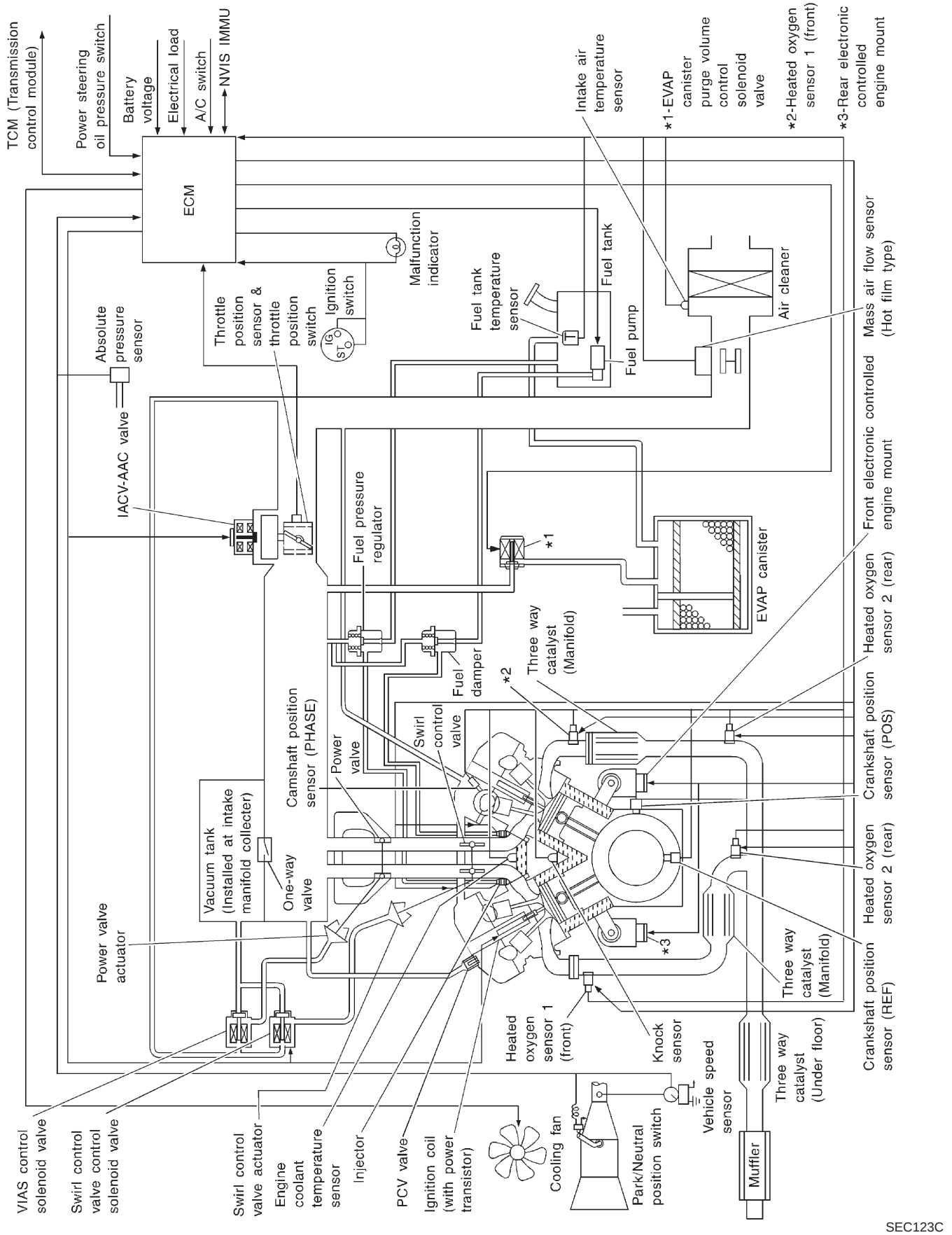
NFEC0010



MEC211D

System Diagram

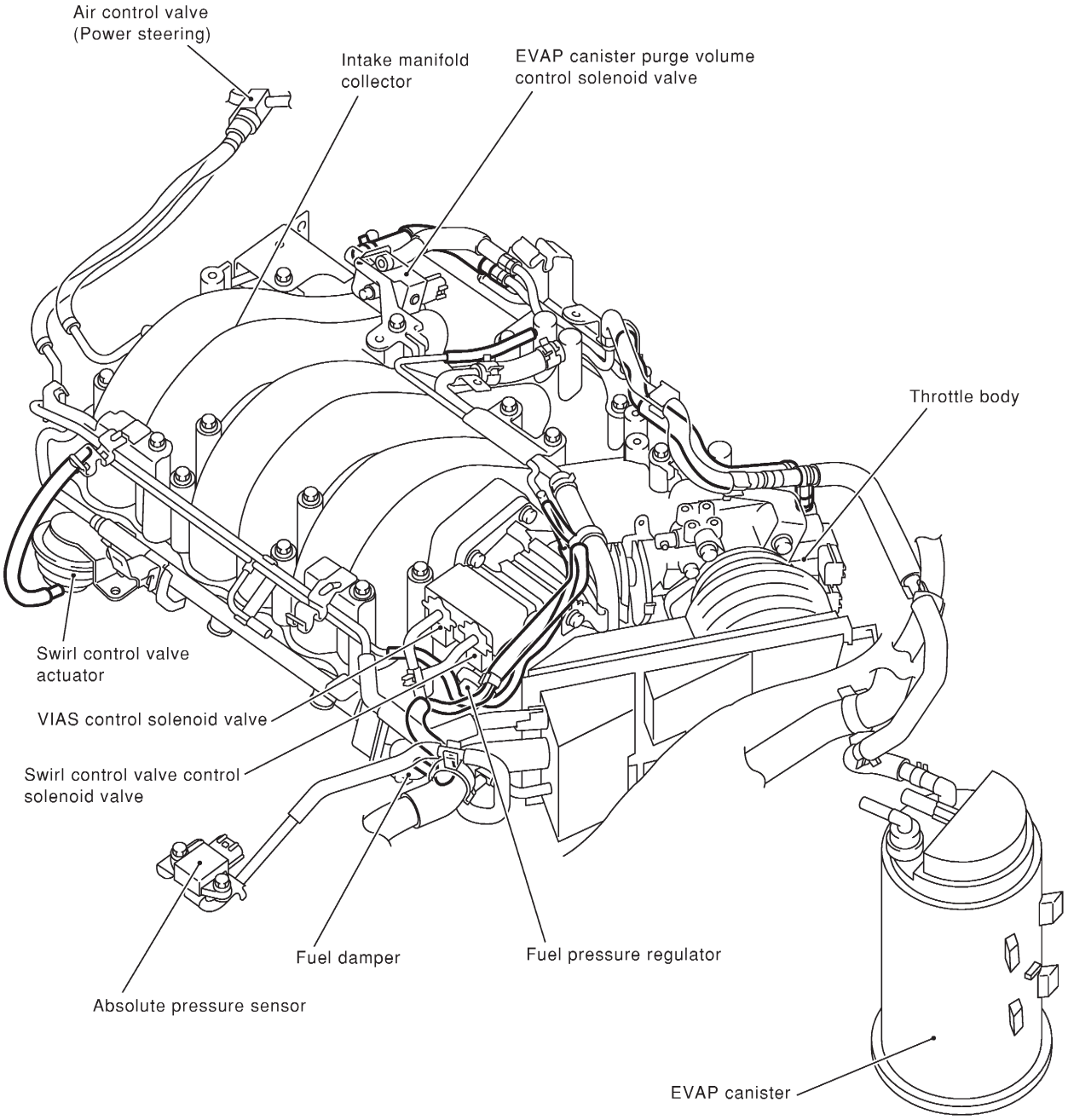
NFEC0011



SEC123C

Vacuum Hose Drawing

NFEC0012



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

SEC124C

Refer to “System Diagram”, EC-25 for Vacuum Control System.

System Chart

NFEC0013

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (REF) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 (front) ● Ignition switch ● Throttle position sensor ● Closed throttle position switch *3 ● Park/neutral position (PNP) switch ● Air conditioner switch ● Knock sensor ● Intake air temperature sensor ● Absolute pressure sensor ● Battery voltage ● Power steering oil pressure switch ● Vehicle speed sensor ● Fuel tank temperature sensor *1 ● Crankshaft position sensor (POS) ● Heated oxygen sensor 2 (rear) *2 ● TCM (Transmission control module) ● Refrigerant pressure sensor ● Electrical load	Fuel injection & mixture ratio control	Injectors
	Electronic ignition system	Power transistor
	Idle air control system	IACV-AAC valve
	Fuel pump control	Fuel pump relay
	On board diagnostic system	MI (On the instrument panel)
	Swirl control valve control	Swirl control valve control solenoid valve
	Power valve control	VIAS control solenoid valve
	Heated oxygen sensor 1 heater (front) control	Heated oxygen sensor 1 heater (front)
	Heated oxygen sensor 2 heater (rear) control	Heated oxygen sensor 2 heater (rear)
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay
	Cooling fan control	Cooling fan relays

*1: These sensors are not used to control the engine system.
*2: This sensor is not used to control the engine system under normal conditions.
*3: This switch will operate in place of the throttle position sensor if the sensor malfunctions.

Multiport Fuel Injection (MFI) System

DESCRIPTION

NFEC0014

Input/Output Signal Chart

NFEC0014S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Fuel injection & mixture ratio control	Injectors
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position Throttle valve idle position		
Park/neutral position (PNP) switch	Gear position		
Vehicle speed sensor	Vehicle speed		
Ignition switch	Start signal		
Air conditioner switch	Air conditioner operation		
Knock sensor	Engine knocking condition		
Battery	Battery voltage		
Absolute pressure sensor	Ambient air barometric pressure		
Power steering oil pressure switch	Power steering operation		
Heated oxygen sensor 2 (rear)*1	Density of oxygen in exhaust gas		

*1: Under normal conditions, this sensor is not for engine control operation.

Basic Multiport Fuel Injection System

NFEC0014S02

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 both the crankshaft position sensor and the mass air flow sensor.

Various Fuel Injection Increase/Decrease Compensation

NFEC0014S03

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

<Fuel increase>

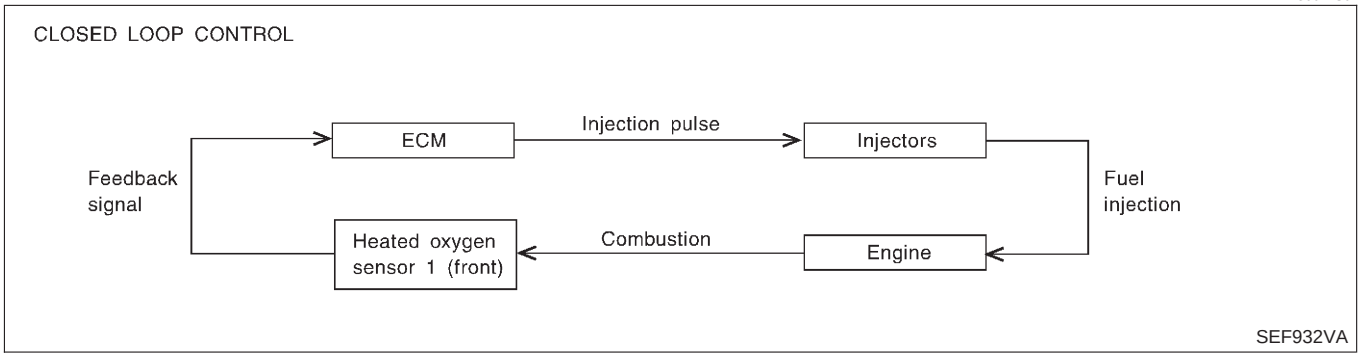
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D”
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

Mixture Ratio Feedback Control (Closed loop control)

NFEC0014S04



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (Mainfold) can then better reduce CO, HC and NOx emissions. This system uses a heated oxygen sensor 1 (front) 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 the heated oxygen sensor 1 (front), refer to EC-158. 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 (rear) is located downstream of the three way catalyst (Manifold). Even if the switching characteristics of the heated oxygen sensor 1 (front) shift, the air-fuel ratio is controlled to stoichiometric by the signal from the heated oxygen sensor 2 (rear).

Open Loop Control

NFEC0014S05

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 (front) or its circuit
- Insufficient activation of heated oxygen sensor 1 (front) at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from "N" to "D"
- When starting the engine

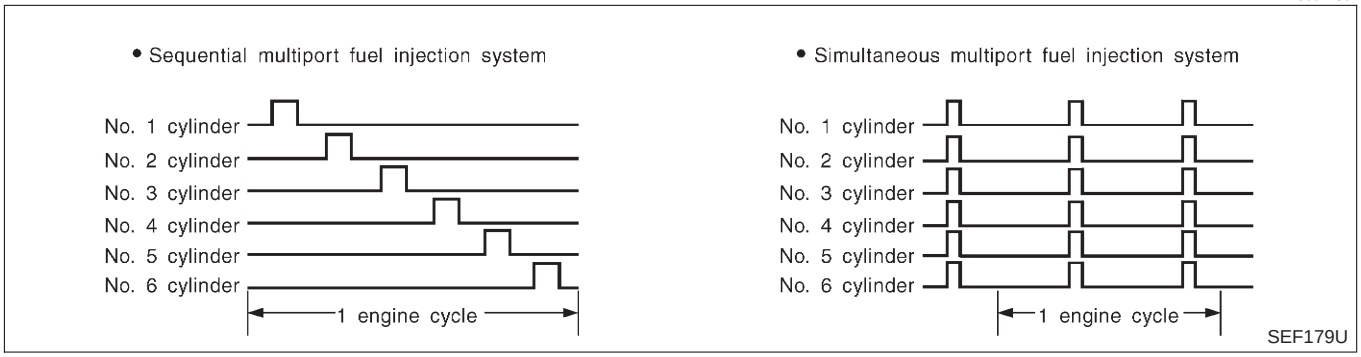
Mixture Ratio Self-learning Control

NFEC0014S06

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor 1 (front). 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 originally 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 the heated oxygen sensor 1 (front) 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

NFEC0014S07



Two types of systems are used.

Sequential Multiport Fuel Injection System

NFEC0014S0701

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

NFEC0014S0702

Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The six 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

NFEC0014S08

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

Electronic Ignition (EI) System

DESCRIPTION

NFEC0015

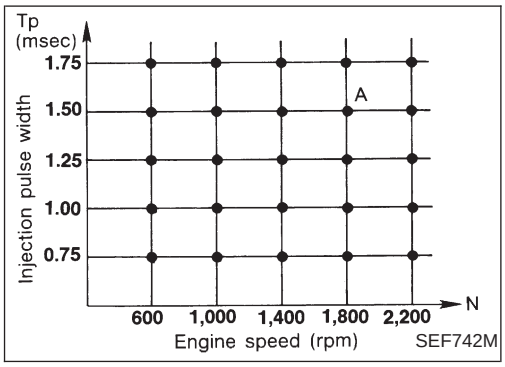
Input/Output Signal Chart

NFEC0015S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Ignition timing control	Power transistor
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position Throttle valve idle position		
Vehicle speed sensor	Vehicle speed		
Ignition switch	Start signal		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage		

System Description

NFEC0015S02



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

DESCRIPTION

NFEC0016

Input/Output Signal Chart

NFEC0016S01

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner "ON" signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Vehicle speed sensor	Vehicle speed		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering oil pressure switch	Power steering operation		

System Description

NFEC0016S02

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.

Air Conditioning Cut Control (Cont'd)

- 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 & high engine speed)

DESCRIPTION

NFEC0017

Input/Output Signal Chart

NFEC0017S01

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Fuel cut control	Injectors
Park/neutral position (PNP) switch	Neutral position		
Throttle position sensor	Throttle position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		

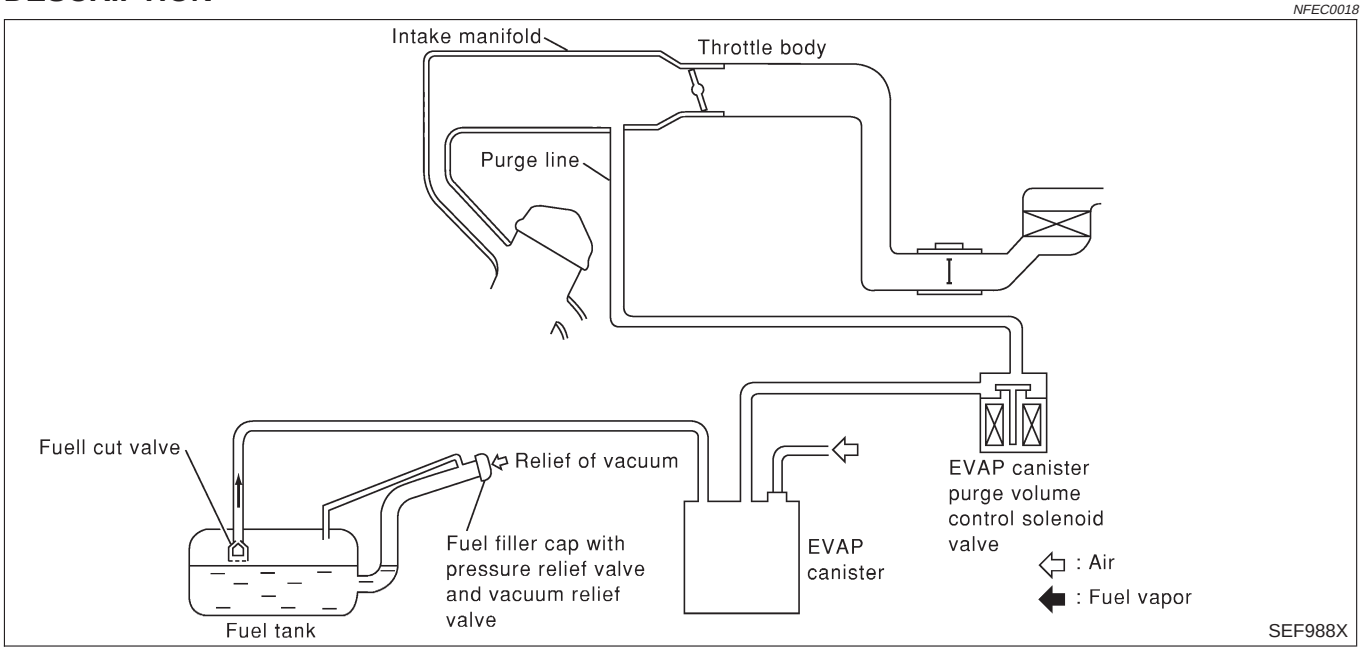
If the engine speed is above 1,800 rpm with no load (for example, in neutral and engine speed over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-28.

Evaporative Emission System

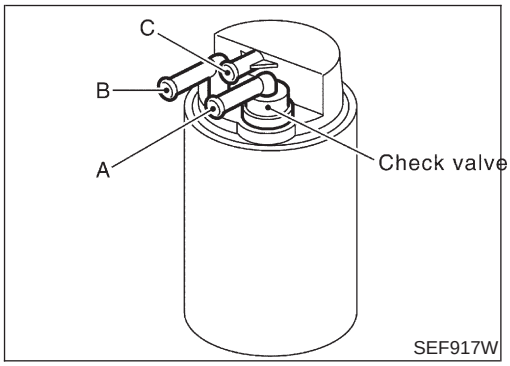
DESCRIPTION

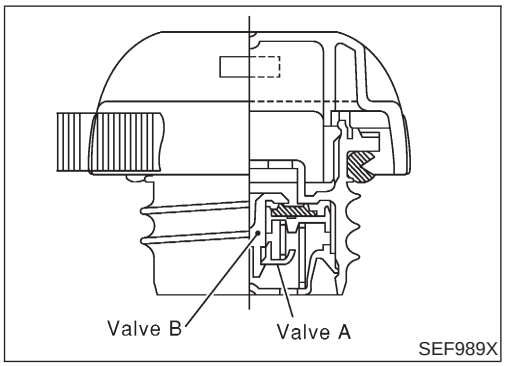
NFEC0018

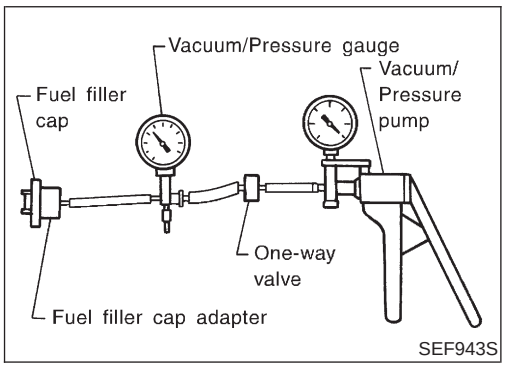


The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon 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.







INSPECTION

NFEC0019

EVAP Canister

NFEC0019S01

Check EVAP canister as follows:

1. Block port B. Blow air through port A orally. Check that air flows freely through port C with check valve resistance.
2. Block port A. Blow air through port B orally. Check that air flows freely through port C.

Fuel Tank Vacuum Relief Valve (Built into fuel filler cap)

NFEC0019S03

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.

   Pressure:

   15.3 - 20.0 kPa (0.1530 - 0.2001 bar, 0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)

   Vacuum:

   −6.0 to −3.4 kPa (−0.0598 to −0.0343 bar, −0.061 to −0.035 kg/cm^2, −0.87 to −0.50 psi)
3. If out of specification, replace fuel filler cap as an assembly.

CAUTION:

Use only a genuine fuel filler cap as a replacement.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve

NFEC0019S05

Refer to EC-314 and EC-459.

Fuel Tank Temperature Sensor

NFEC0019S06

Refer to EC-276 and EC-447.

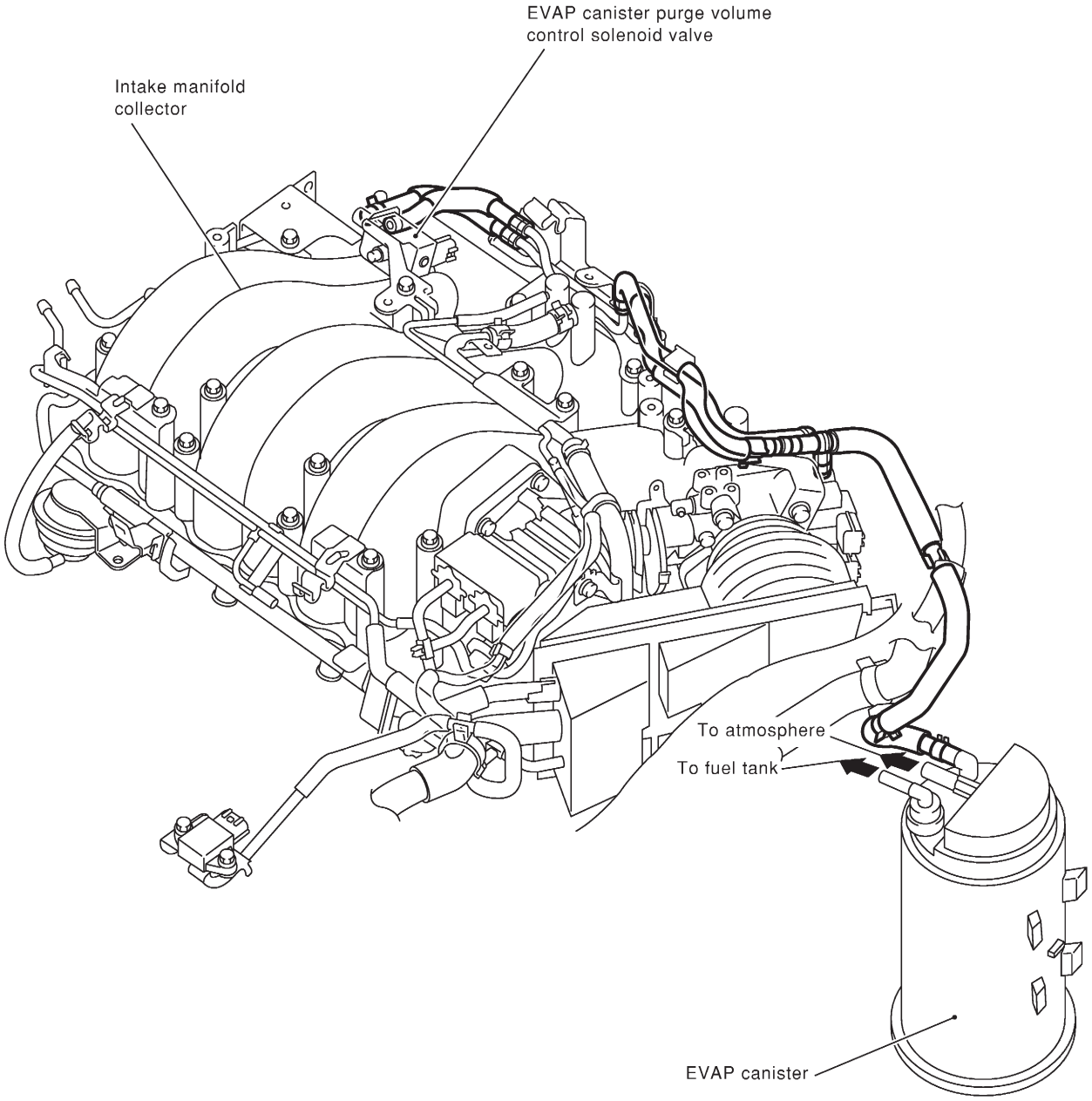
Checking EVAP Vapor Lines

NFEC0019S11

1. Visually inspect vapor lines for leaks, cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc. Refer to next page.

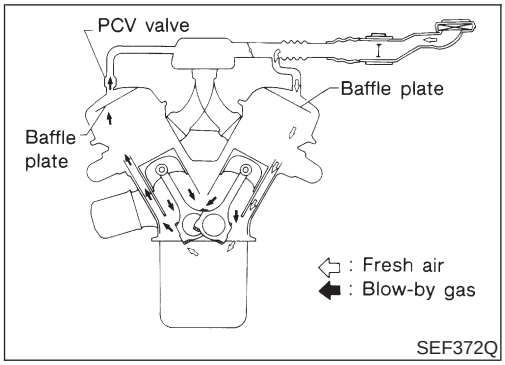
EVAPORATIVE EMISSION LINE DRAWING

NFEC0020

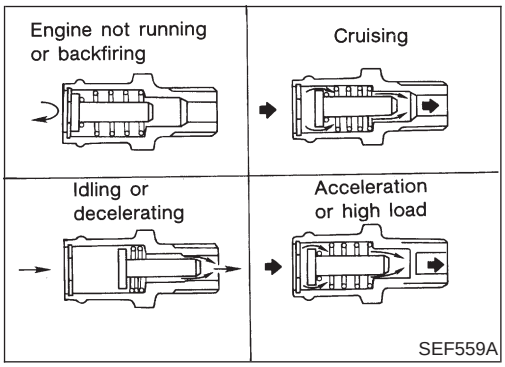


NOTE:
Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

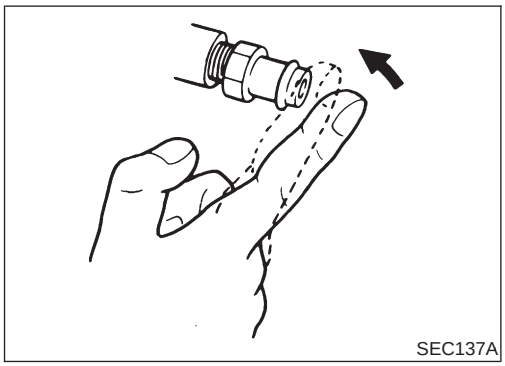
SEC125C

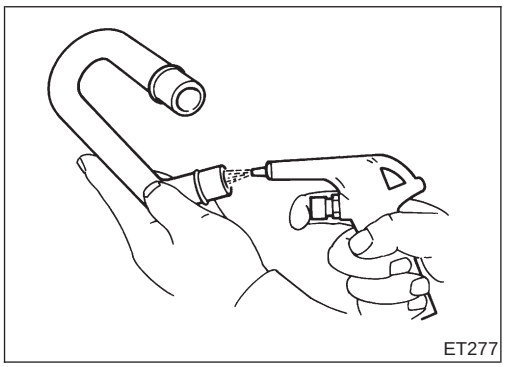


SEF372Q



SEF559A


SEC137A


ET277

Positive Crankcase Ventilation

DESCRIPTION

NFEC0021

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.

INSPECTION

NFEC0022

PCV (Positive Crankcase Ventilation) Valve

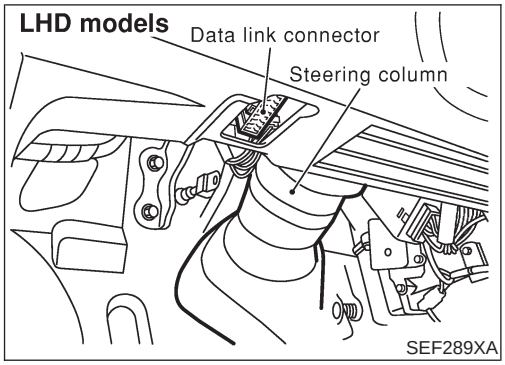
NFEC0022S01

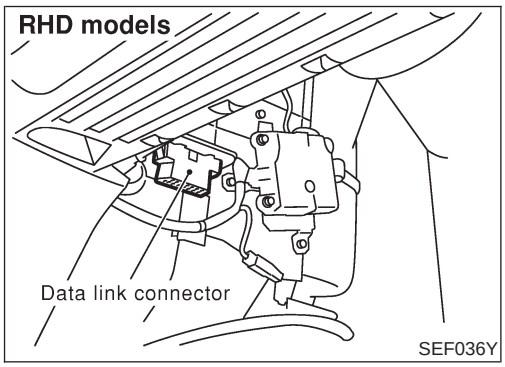
With engine running at idle, remove PCV valve ventilation hose from PCV valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

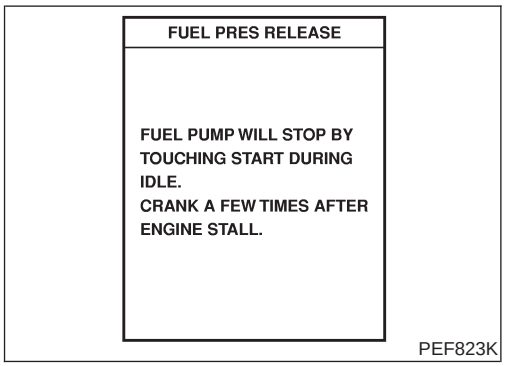
PCV Valve Ventilation Hose

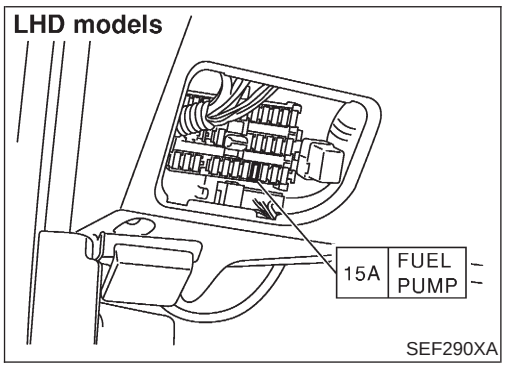
NFEC0022S02

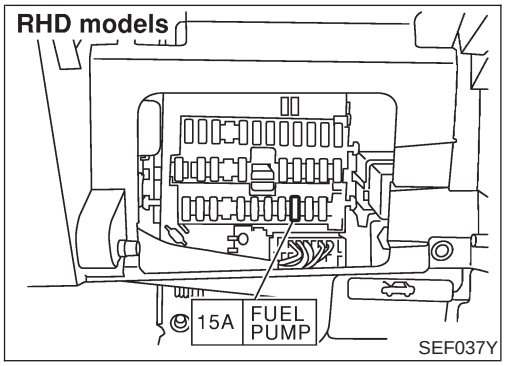
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.











Fuel Pressure Release

NFEC0023

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

WITH CONSULT-II

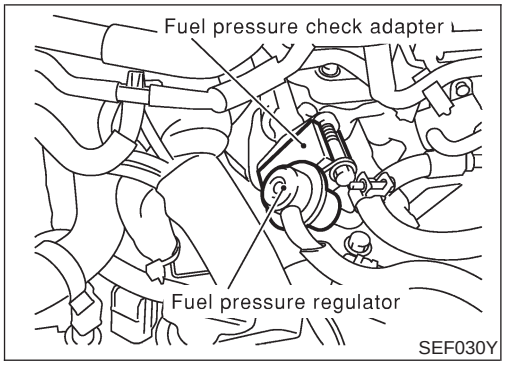
NFEC0023S01

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

NFEC0023S02

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.

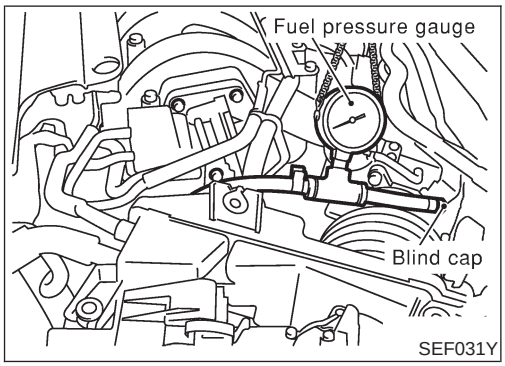


Fuel Pressure Check

NFEC0024

- **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.**
- **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**

1. Release fuel pressure to zero.
2. Disconnect fuel tube joint between fuel pressure regulator and injector tube and set fuel pressure check adapter (J44321).



3. Install pressure gauge to the fuel pressure check adapter as shown in the figure.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

At idling:

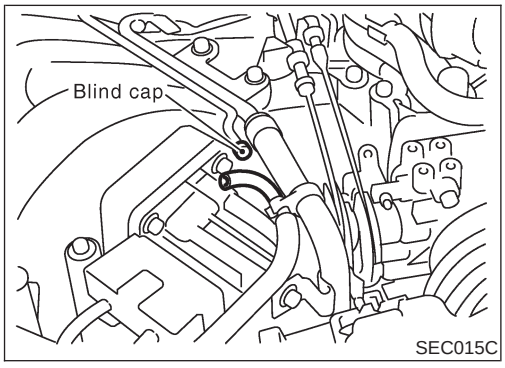
With vacuum hose connected

Approximately 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)

With vacuum hose disconnected

Approximately 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)

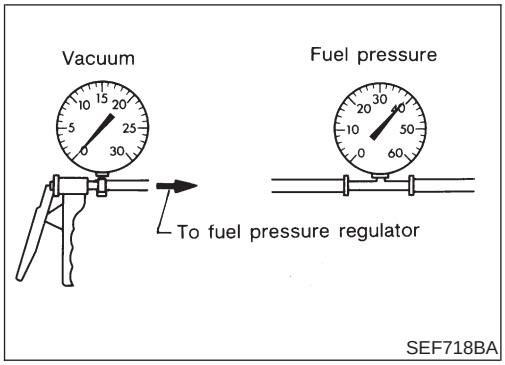
If results are unsatisfactory, perform Fuel Pressure Regulator Check.



Fuel Pressure Regulator Check

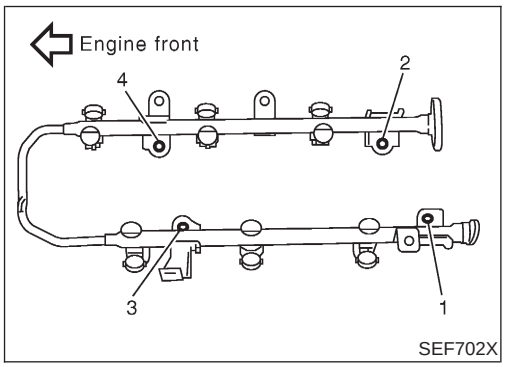
NFEC0025

1. Stop engine and disconnect fuel pressure regulator vacuum hose from vacuum gallery.
2. Plug vacuum gallery with a blind cap.
3. Connect variable vacuum source to fuel pressure regulator.



4. Start engine and read indication of fuel pressure gauge as vacuum is changed.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.



Injector

REMOVAL AND INSTALLATION

NFEC0026

1. Release fuel pressure to zero.
2. Remove intake manifold collector. Refer to EM-18, "TIMING CHAIN".
3. Remove fuel tube assemblies in numerical sequence as shown in the figure at left.
4. Expand and remove clips securing fuel injectors.
5. Extract fuel injectors straight from fuel tubes.

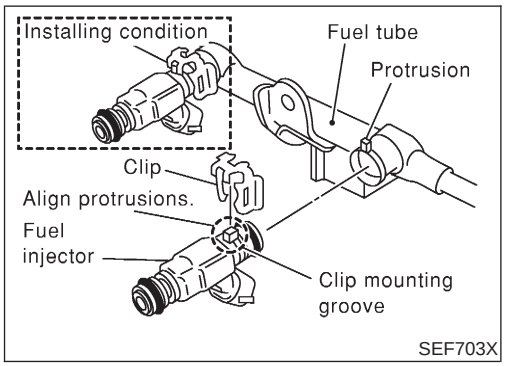
- **Be careful not to damage injector nozzles during removal.**
- **Do not bump or drop fuel injectors.**
- **Do not disassemble or adjust fuel injectors.**

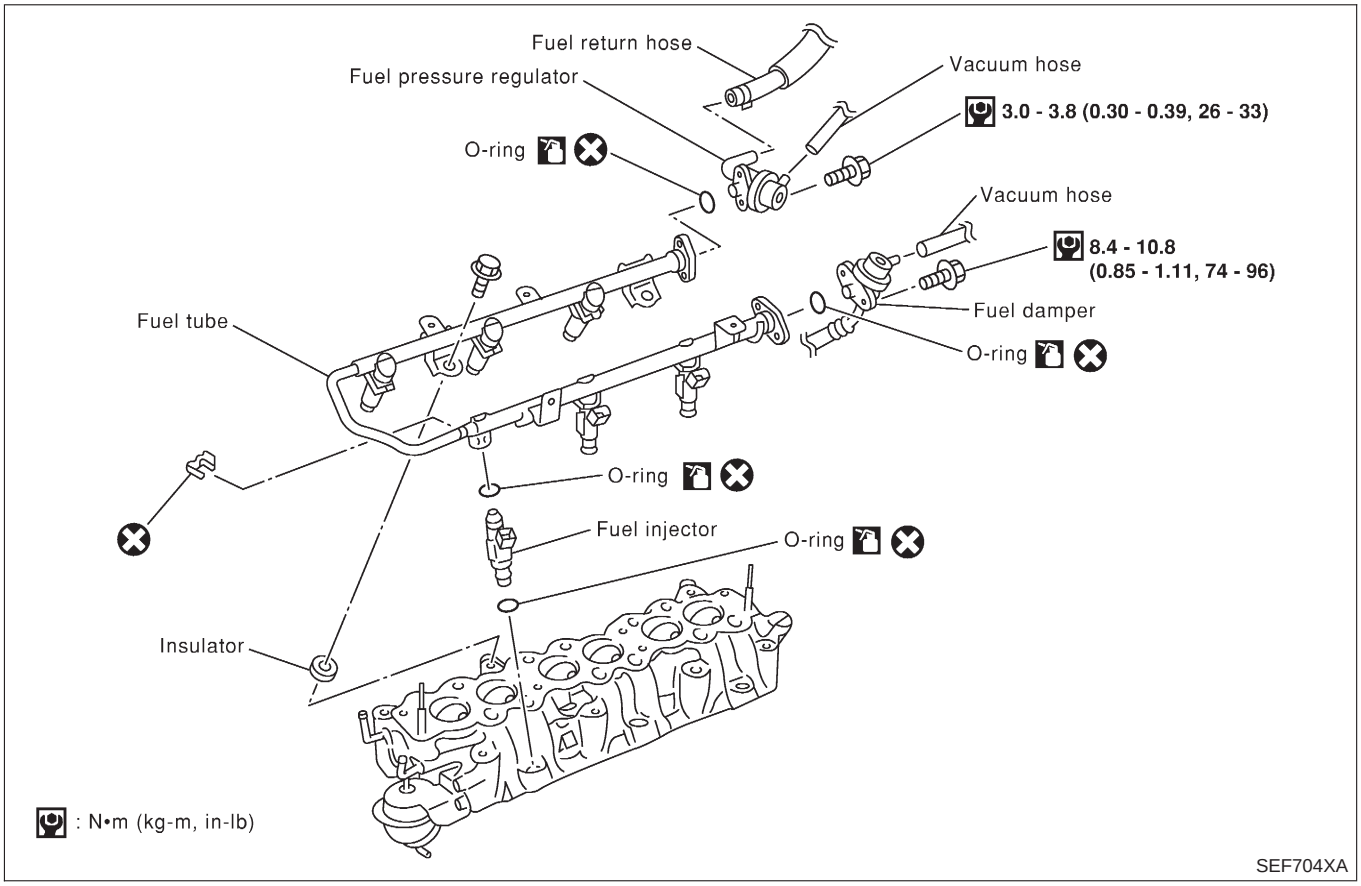
6. Carefully install O-rings, including the one used with the pressure regulator.

- **Lubricate O-rings with a smear of engine oil.**
- **Be careful not to damage O-rings with service tools, finger nails or clips. Do not expand or twist O-rings. If stretched, do not insert them into fuel tubes immediately after stretching.**
- **Discard old clips; replace with new ones.**

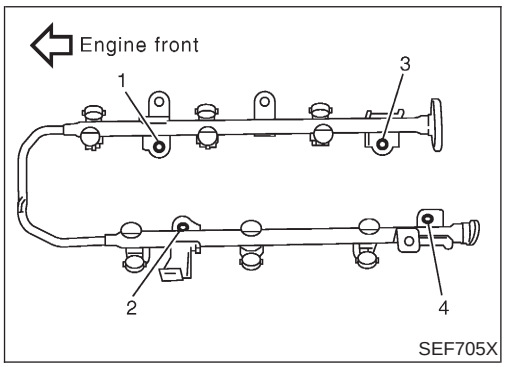
7. Position clips in grooves on fuel injectors.

- **Make sure that protrusions of fuel injectors are aligned with cutouts of clips after installation.**



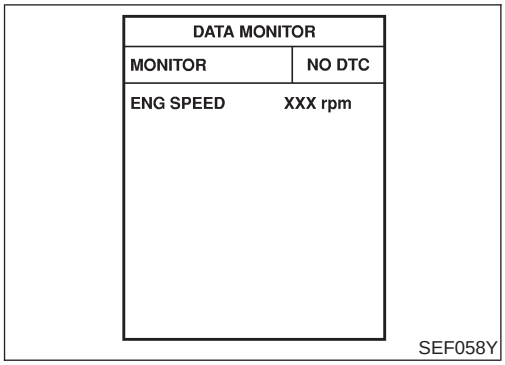


8. Align protrusions of fuel tubes with those of fuel injectors. Insert fuel injectors straight into fuel tubes.
9. After properly inserting fuel injectors, check to make sure that fuel tube protrusions are engaged with those of fuel injectors, and that flanges of fuel tubes are engaged with clips.



10. Tighten fuel tube assembly mounting nuts in numerical sequence (indicated in the figure at left) and in two stages.
    : Tightening torque N·m (kg-m, ft-lb)
    1st stage:
    9.3 - 10.8 (1.0 - 1.1, 6.9 - 7.9)
    2nd stage:
    20.6 - 26.5 (2.1 - 2.7, 16 - 19)
11. Install all parts removed in reverse order of removal.

CAUTION:
After properly connecting fuel tube assembly to injector and fuel hose, check connection for fuel leakage.



How to Check Idle Speed and Ignition Timing

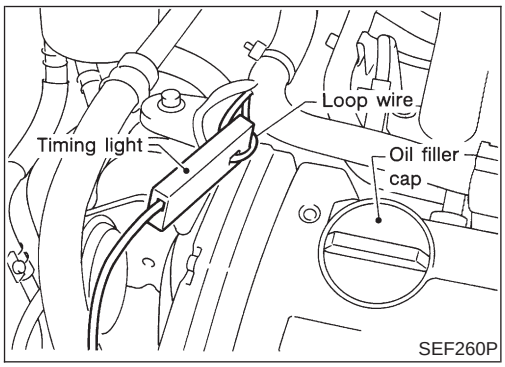
NFEC0607

IDLE SPEED

NFEC0607S01

- **Using CONSULT-II**

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



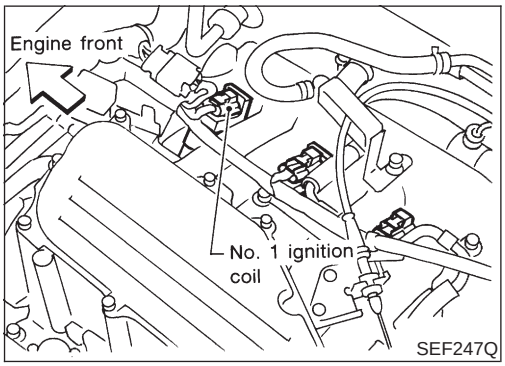
IGNITION TIMING

NFEC0607S02

Any of following two methods may be used.

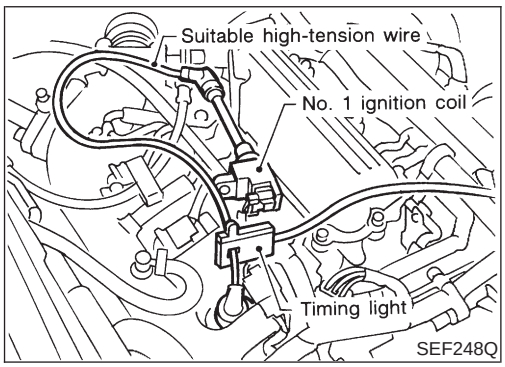
- **Method A**

a) Attach timing light to loop wire as shown.
b) Check ignition timing.

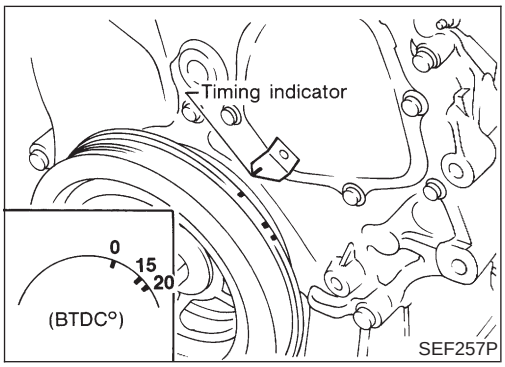


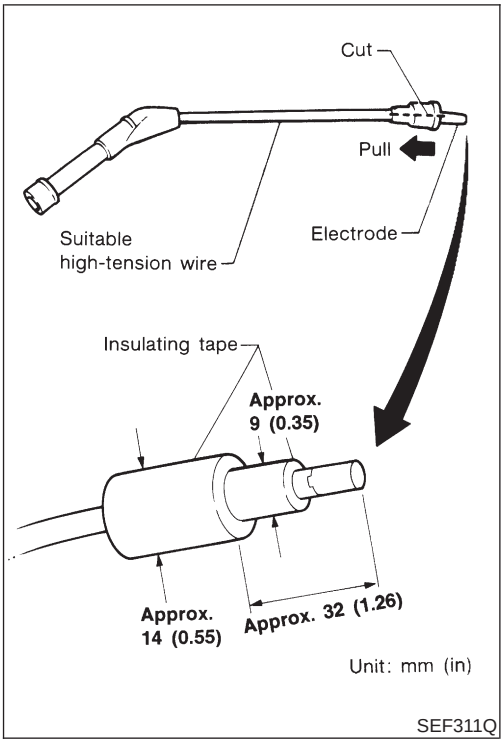
- **Method B**

a) Remove No. 1 ignition coil.



b) 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.
c) Check ignition timing.





SEF311Q

SELECT WORK ITEM
XXXXXXXXXX
XXXXXXXXXX
IDLE AIR VOL LEARN
XXXXXXXXXX
XXXXXXXXXX
XXXXXXXXXX

SEF217Z

WORK SUPPORT	
IDLE AIR VOL LEARN	
MONITOR	
ENG SPEED	XXX rpm
START	

SEF454Y

WORK SUPPORT	
IDLE AIR VOL LEARN	CMPLT
MONITOR	
ENG SPEED	XXX rpm
START	

Result appears.
CMPLT: successful
INCMP: unsuccessful

SEF455Y

Idle Air Volume Learning

NFEC0642

DESCRIPTION

NFEC0642S01

"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 IACV-AAC valve, throttle body or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PRE-CONDITIONING

NFEC0642S02

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 - 99°C (158 - 210°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.

- Cooling fan motor: Not operating
- 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

NFEC0642S03

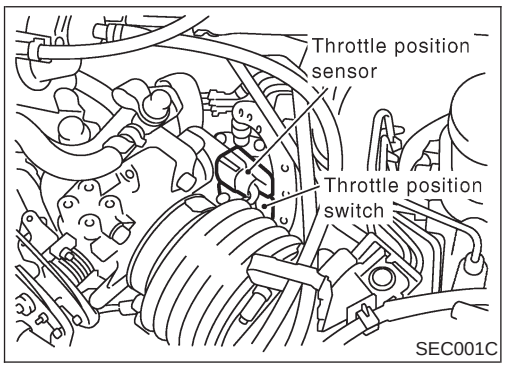
With CONSULT-II

NFEC0642S0301

1. Turn ignition switch "ON" and wait at least 1 second.
2. Turn ignition switch "OFF" and wait at least 10 seconds.

3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic "PRE-CONDITIONING" (previously mentioned) are in good order.
5. Turn ignition switch "OFF" and wait at least 10 seconds.
6. Start the engine and let it idle for at least 30 seconds.
7. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
8. Touch "START" and wait 20 seconds.
9. Make sure that "CMPLT" is displayed on CONSULT-II screen. If "INCMP" is displayed, "Idle Air Volume Learning" will not be carried out successfully. In this case, find the cause of the problem by referring to the NOTE below.
10. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

ITEM	SPECIFICATION	
Idle speed	VQ20DE	M/T: 675±50 rpm A/T: 700±50 rpm (in "P" or "N" position)
	VQ30DE	M/T: 625±50 rpm A/T: 700±50 rpm (in "P" or "N" position)
Ignition timing	VQ20DE	M/T: 9°±5° BTDC A/T: 9°±5° BTDC (in "P" or "N" position)
	VQ30DE	M/T: 15°±5° BTDC A/T: 15°±5° BTDC (in "P" or "N" position)



Without CONSULT-II

NFEC0642S0302

1. Turn ignition switch "ON" and wait at least 1 second.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic "PRE-CONDITIONING" (previously mentioned) are in good order.
5. Turn ignition switch "OFF" and wait at least 10 seconds.
6. Start the engine and let it idle for at least 30 seconds.
7. Disconnect throttle position sensor harness connector (brown), then reconnect it within 5 seconds.
8. Wait 20 seconds.
9. Make sure that idle speed is within specifications. If not, the result will be incomplete. In this case, find the cause of the problem by referring to the NOTE below.
10. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

ITEM	SPECIFICATION	
Idle speed	VQ20DE	M/T: 675±50 rpm A/T: 700±50 rpm (in "P" or "N" position)
	VQ30DE	M/T: 625±50 rpm A/T: 700±50 rpm (in "P" or "N" position)
Ignition timing	VQ20DE	M/T: 9°±5° BTDC A/T: 9°±5° BTDC (in "P" or "N" position)
	VQ30DE	M/T: 15°±5° BTDC A/T: 15°±5° BTDC (in "P" or "N" position)

NOTE:
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) **Adjust closed throttle position switch and reset memory. (Refer to Basic Inspection, EC-90.)**
5) **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
   It is useful to perform "TROUBLE DIAGNOSIS — SPECIFICATION VALUE", EC-122.
6) **If any of the following conditions occur after the engine has started, eliminate the cause of the problem and perform "Idle air volume learning" all over again:**

- **Engine stalls.**
- **Erroneous idle.**
- **Blown fuses related to the IACV-AAC valve system.**

Introduction

NFEC0029

MODELS WITH EURO-OBD SYSTEM

NFEC0029S02

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:

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.

X: Applicable —: Not applicable

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

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.

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-104.)

MODELS WITHOUT EURO-OBD SYSTEM

NFEC0029S01

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:

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.

X: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data
CONSULT-II	X	X	X	X
ECM	X	X*1	—	—

*1: When the DTC and the 1st trip DTC appear on the display simultaneously, it is difficult to clearly distinguish one from the other.

Two Trip Detection Logic

NFEC0030

MODELS WITH EURO-OBD SYSTEM

NFEC0030S01

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.

Two Trip Detection Logic (Cont'd)

X: 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 - P0306 is being detected	X	—	—	—	—	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 is being detected	—	—	X	—	—	X	—	—
Fail-safe items (Refer to EC-104.)	—	X	—	—	X*1	—	X*1	—
Except above	—	—	—	X	—	X	X	—

*1: Except "ECM".

MODELS WITHOUT EURO-OBD SYSTEM

NFEC0030S02

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. <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. <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 the fail-safe mode (Refer to EC-104), the DTC is stored in the ECM memory even in the 1st trip.

Emission-related Diagnostic Information

NFEC0031

MODELS WITH EURO-OBD SYSTEM

NFEC0031S09

DTC and 1st Trip DTC

NFEC0031S0901

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 "How to Erase Emission-related Diagnostic Information". Refer to EC-56.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-54. 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 problem. 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 page EC-88. Then perform "DTC Confirmation Procedure" or "Overall Function Check" to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

How to read DTC and 1st Trip DTC

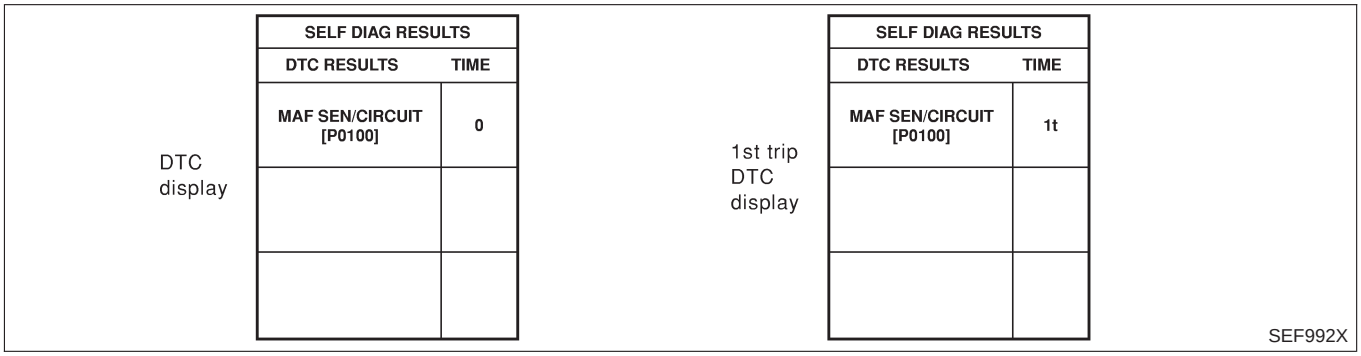
DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II
With GST

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P1320, P0705, P0750, etc.
These DTCs are prescribed by ISO 15031-6.
(CONSULT-II also displays the malfunctioning component or system.)

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, Mode II and GST 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 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]".



Freeze Frame Data and 1st Trip Freeze Frame Data

NFEC0031S0902

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, absolute throttle position, 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-75.
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 - P0306 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175
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 "How to Erase Emission-related Diagnostic Information". Refer to EC-56.

System Readiness Test (SRT) Code

NFEC0031S0903

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15051-5.
As part of an 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

NFEC0031S0907

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	3	Three way catalyst function	P0420, P0430
HO2S	3	Heated oxygen sensor 1 (front) (circuit)	P0130, P0150
		Heated oxygen sensor 1 (front) (lean shift monitoring)	P0131, P0151
		Heated oxygen sensor 1 (front) (rich shift monitoring)	P0132, P0152
		Heated oxygen sensor 1 (front) (response monitoring)	P0133, P0153
		Heated oxygen sensor 1 (front) (high voltage)	P0134, P0154
		Heated oxygen sensor 2 (rear) (min. voltage monitoring)	P0137, P0157
		Heated oxygen sensor 2 (rear) (max. voltage monitoring)	P0138, P0158
		Heated oxygen sensor 2 (rear) (response monitoring)	P0139, P0159
		Heated oxygen sensor 2 (rear) (high voltage)	P0140, P0160
HO2S HTR	3	Heated oxygen sensor 1 heater (front)	P0135, P0155
		Heated oxygen sensor 2 heater (rear)	P0141, P0161

*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

NFEC0031S0908

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.

Emission-related Diagnostic Information (Cont'd)

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 of each self-diagnosis to be executed twice (Case 3) for the following reasons:

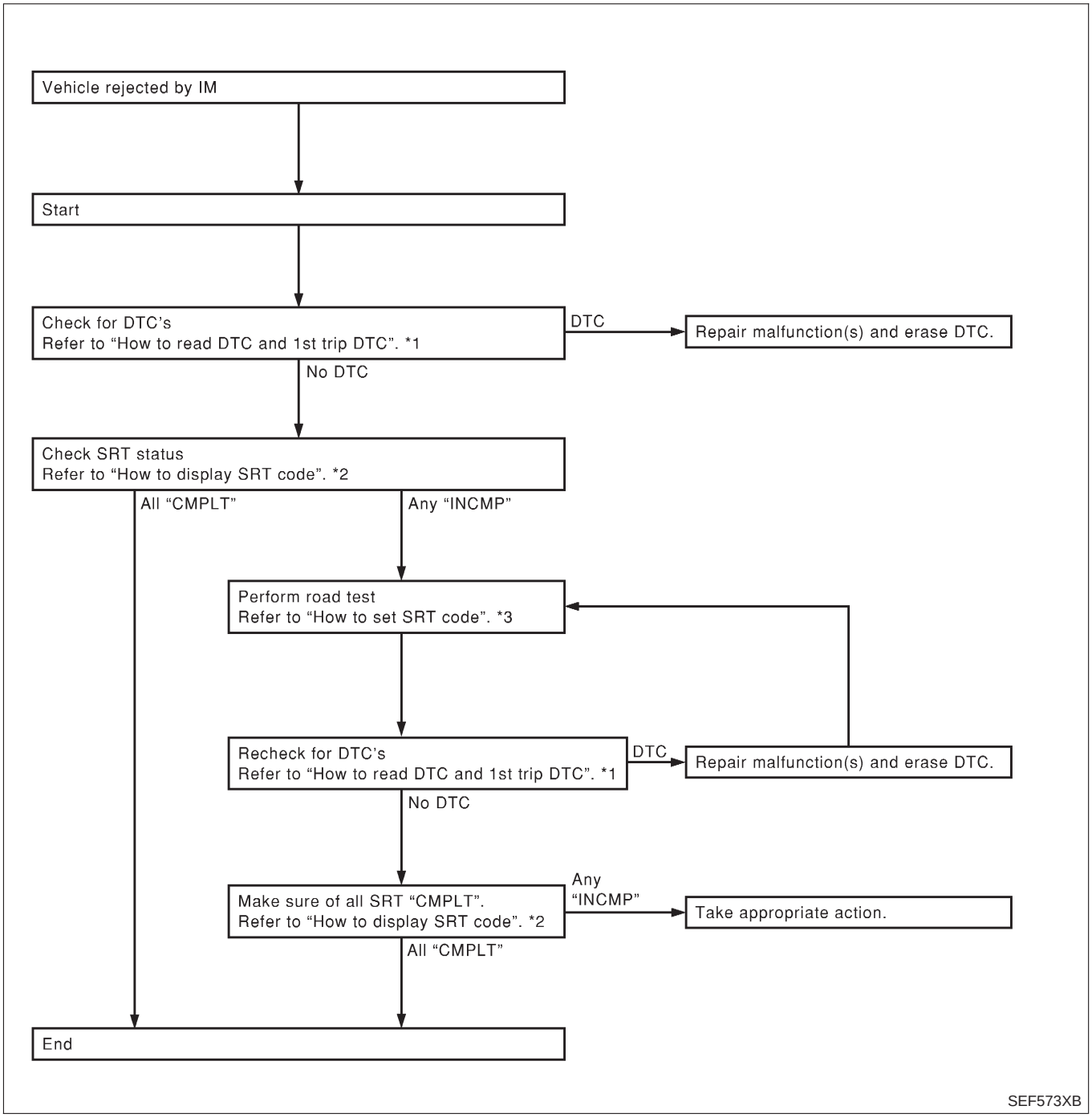
- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory 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

NFEC0031S0909

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.



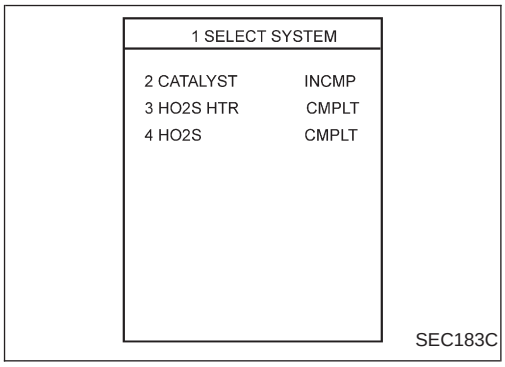
*1 EC-45 *2 EC-49 *3 EC-50

How to Display SRT Code

NFEC0031S0910

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 as shown below.



With GST
Selecting Mode 1 with GST (Generic Scan Tool)

How to Set SRT Code

NFEC0031S0911

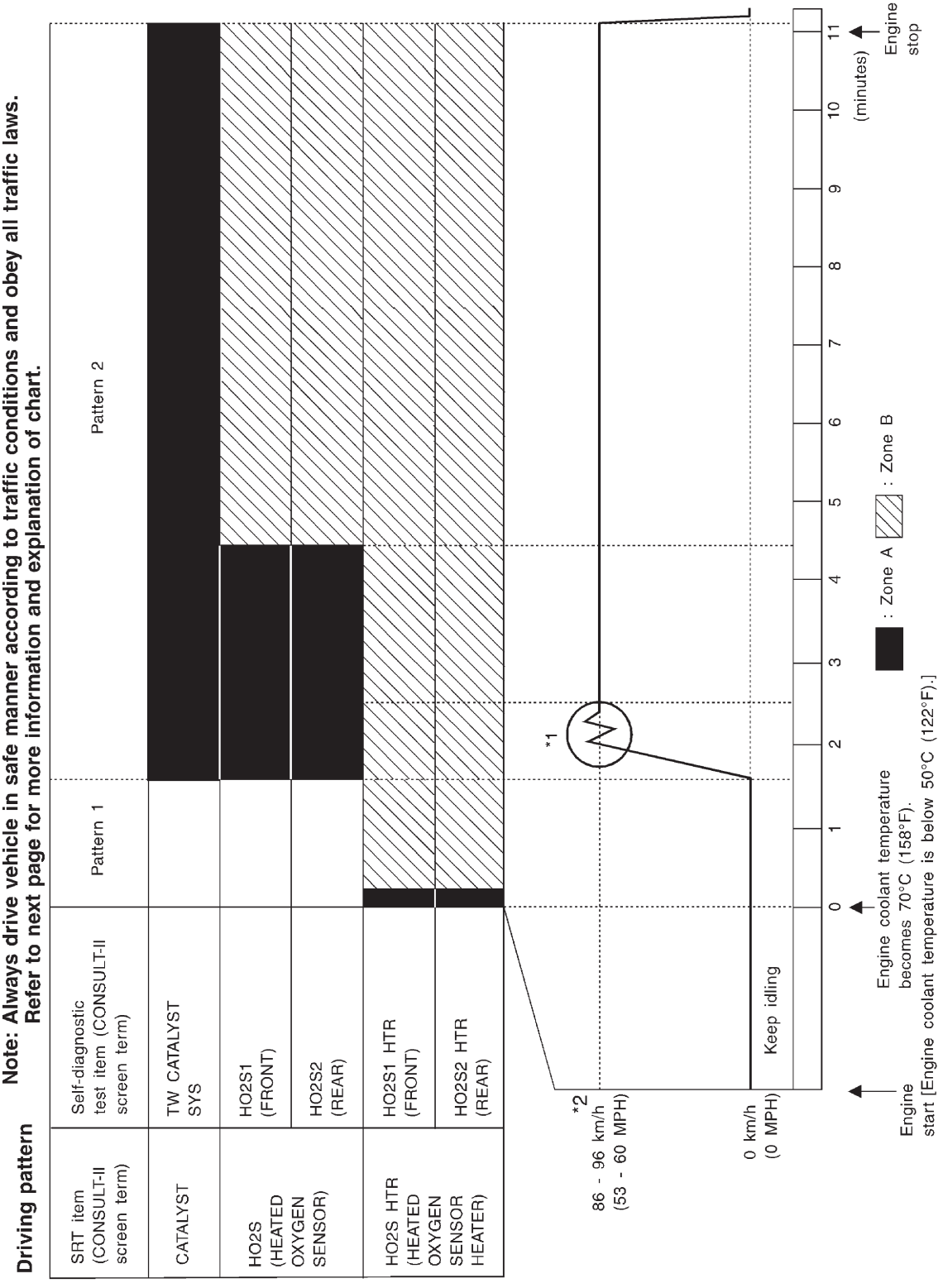
To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

With CONSULT-II
Perform corresponding DTC Confirmation Procedure one by one based on "Performance Priority" in the table on EC-47.

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

=NFEC0031S0912



SEC184C

- 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 70 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 70 and ground is lower than 1.4V).**
- **The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 92 and ground is less than 4.1V).**

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.

Pattern 3:

- The driving pattern outlined in *2 must be repeated at least 3 times.

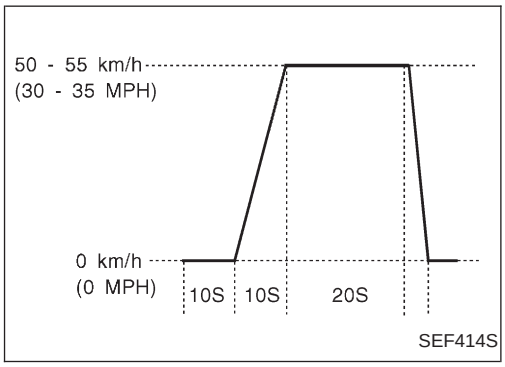
Pattern 4:

- Tests are performed after the engine has been operated for at least 17 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.

*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: Operate the vehicle in the following driving pattern.

1) Decelerate vehicle to 0 km/h (0 MPH) and let engine idle.
2) Repeat driving pattern shown below at least 10 times.

- **During acceleration, hold the accelerator pedal as steady as possible.**



*3: 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.
Suggested upshift speeds for M/T models
Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:		For quick acceleration in low altitude areas and high altitude areas [over 1,219 m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)	km/h (MPH)
1st to 2nd	21 (13)	21 (13)	24 (15)
2nd to 3rd	37 (23)	26 (16)	40 (25)
3rd to 4th	53 (33)	44 (27)	64 (40)
4th to 5th	63 (39)	58 (36)	72 (45)

Suggested Maximum Speed in Each Gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.
Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted speed limits and drive according to the road conditions to ensure safe operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

Gear	km/h (MPH)
1st	50 (30)
2nd	89 (55)
3rd	128 (80)
4th	—
5th	—

Test Value and Test Limit (GST Only — not Applicable to CONSULT-II)

NFEC0031S0904

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 (26 test 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.

X: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function (bank 1)	01H	01H	Max.	X
	Three way catalyst function (bank 2)	03H	02H	Max.	X

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
O2 SENSOR	Heated oxygen sensor 1 (front) (bank 1)	09H	04H	Max.	X
		0AH	84H	Min.	X
		0BH	04H	Max.	X
		0CH	04H	Max.	X
		0DH	04H	Max.	X
	Heated oxygen sensor 1 (front) (bank 2)	11H	05H	Max.	X
		12H	85H	Min.	X
		13H	05H	Max.	X
		14H	05H	Max.	X
		15H	05H	Max.	X
	Heated oxygen sensor 2 (rear) (bank 1)	19H	86H	Min.	X
		1AH	86H	Min.	X
		1BH	06H	Max.	X
		1CH	06H	Max.	X
	Heated oxygen sensor 2 (rear) (bank 2)	21H	87H	Min.	X
		22H	87H	Min.	X
		23H	07H	Max.	X
		24H	07H	Max.	X
O2 SENSOR HEATER	Heated oxygen sensor 1 heater (front) (bank 1)	29H	08H	Max.	X
		2AH	88H	Min.	X
	Heated oxygen sensor 1 heater (front) (bank 2)	2BH	09H	Max.	X
		2CH	89H	Min.	X
	Heated oxygen sensor 2 heater (rear) (bank 1)	2DH	0AH	Max.	X
		2EH	8AH	Min.	X
	Heated oxygen sensor 2 heater (rear) (bank 2)	2FH	0BH	Max.	X
		30H	8BH	Min.	X

Emission-related Diagnostic Information Items

NFEC0031S0905

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	—	—	—	—
MAF SEN/CIRCUIT	P0100	—	—	X	EC-134
AIR TEMP SEN/CIRC	P0110	—	—	X	EC-141
COOLANT T SEN/CIRC	P0115	—	—	X	EC-146
THRTL POS SEN/CIRC	P0120	—	—	X	EC-151

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
HO2S1 (B1)	P0130	X	X	X*2	EC-158
HO2S1 (B1)	P0131	X	X	X*2	EC-168
HO2S1 (B1)	P0132	X	X	X*2	EC-176
HO2S1 (B1)	P0133	X	X	X*2	EC-184
HO2S1 (B1)	P0134	X	X	X*2	EC-197
HO2S1 HTR (B1)	P0135	X	X	X*2	EC-205
HO2S2 (B1)	P0137	X	X	X*2	EC-212
HO2S2 (B1)	P0138	X	X	X*2	EC-223
HO2S2 (B1)	P0139	X	X	X*2	EC-234
HO2S2 (B1)	P0140	X	X	X*2	EC-245
HO2S2 HTR (B1)	P0141	X	X	X*2	EC-254
HO2S1 (B2)	P0150	X	X	X*2	EC-158
HO2S1 (B2)	P0151	X	X	X*2	EC-168
HO2S1 (B2)	P0152	X	X	X*2	EC-176
HO2S1 (B2)	P0153	X	X	X*2	EC-184
HO2S1 (B2)	P0154	X	X	X*2	EC-197
HO2S1 HTR (B2)	P0155	X	X	X*2	EC-205
HO2S2 (B2)	P0157	X	X	X*2	EC-212
HO2S2 (B2)	P0158	X	X	X*2	EC-223
HO2S2 (B2)	P0159	X	X	X*2	EC-234
HO2S2 (B2)	P0160	X	X	X*2	EC-245
HO2S2 HTR (B2)	P0161	X	X	X*2	EC-254
FUEL SYS-LEAN/BK1	P0171	—	—	X	EC-261
FUEL SYS-RICH/BK1	P0172	—	—	X	EC-269
FUEL SYS-LEAN/BK2	P0174	—	—	X	EC-261
FUEL SYS-RICH/BK2	P0175	—	—	X	EC-269
FUEL TEMP SEN/CIRC	P0180	—	—	X	EC-276
MULTI CYL MISFIRE	P0300	—	—	X	EC-281
CYL 1 MISFIRE	P0301	—	—	X	EC-281
CYL 2 MISFIRE	P0302	—	—	X	EC-281
CYL 3 MISFIRE	P0303	—	—	X	EC-281
CYL 4 MISFIRE	P0304	—	—	X	EC-281
CYL 5 MISFIRE	P0305	—	—	X	EC-281
CYL 6 MISFIRE	P0306	—	—	X	EC-281
KNOCK SEN/CIRC-B1	P0325	—	—	—	EC-289
CKP SEN/CIRCUIT	P0335	—	—	X	EC-295
CMP SEN/CIRCUIT	P0340	—	—	X	EC-303

Emission-related Diagnostic Information (Cont'd)

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
TW CATALYST SYS-B1	P0420	X	X	X*2	EC-309
TW CATALYST SYS-B2	P0430	X	X	X*2	EC-309
PURG VOLUME CONT/V	P0443	—	—	X	EC-314
VEH SPEED SEN/CIRC	P0500	—	—	X	EC-320
IACV/AAC VLV/CIRC	P0505	—	—	X	EC-324
CLOSED TP SW/CIRC	P0510	—	—	X	EC-333
ECM	P0605	—	—	X	EC-341
PNP SW/CIRC	P0705	—	—	X	AT-122
ATF TEMP SEN/CIRC	P0710	—	—	X	AT-128
VEH SPD SEN/CIR AT	P0720	—	—	X	AT-134
ENGINE SPEED SIG	P0725	—	—	X	AT-139
A/T 1ST GR FNCTN	P0731	—	—	X	AT-144
A/T 2ND GR FNCTN	P0732	—	—	X	AT-150
A/T 3RD GR FNCTN	P0733	—	—	X	AT-156
A/T 4TH GR FNCTN	P0734	—	—	X	AT-162
TCC SOLENOID/CIRC	P0740	—	—	X	AT-171
L/PRESS SOL/CIRC	P0745	—	—	X	AT-176
SFT SOL A/CIRC	P0750	—	—	X	AT-182
SFT SOL B/CIRC	P0755	—	—	X	AT-187
SWIRL CONT SOL/V	P1131	—	—	X	EC-344
ENG OVER TEMP	P1217	—	—	X	EC-351
CKP SEN (REF)/CIRC	P1335	—	—	X	EC-380
CKP SENSOR (COG)	P1336	—	—	X	EC-387
A/T DIAG COMM LINE	P1605	—	—	X	EC-395
TP SEN/CIRC A/T	P1705	—	—	X	AT-192
P-N POS SW/CIRCUIT	P1706	—	—	X	EC-398
O/R CLTCH SOL/CIRC	P1760	—	—	X	AT-201

*1: 1st trip DTC No. is the same as DTC No.

*2: These are not displayed with GST.

NOTE:

Regarding A33 models, "-B1" and "BK1" indicate bank 1 and "-B2" and "BK2" indicate bank 2.

How to Erase Emission-related Diagnostic Information

NFEC0031S0906

How to Erase DTC (With CONSULT-II)

NOTE:

If the DTC is not for A/T related items (see EC-7), skip steps 2 through 4.

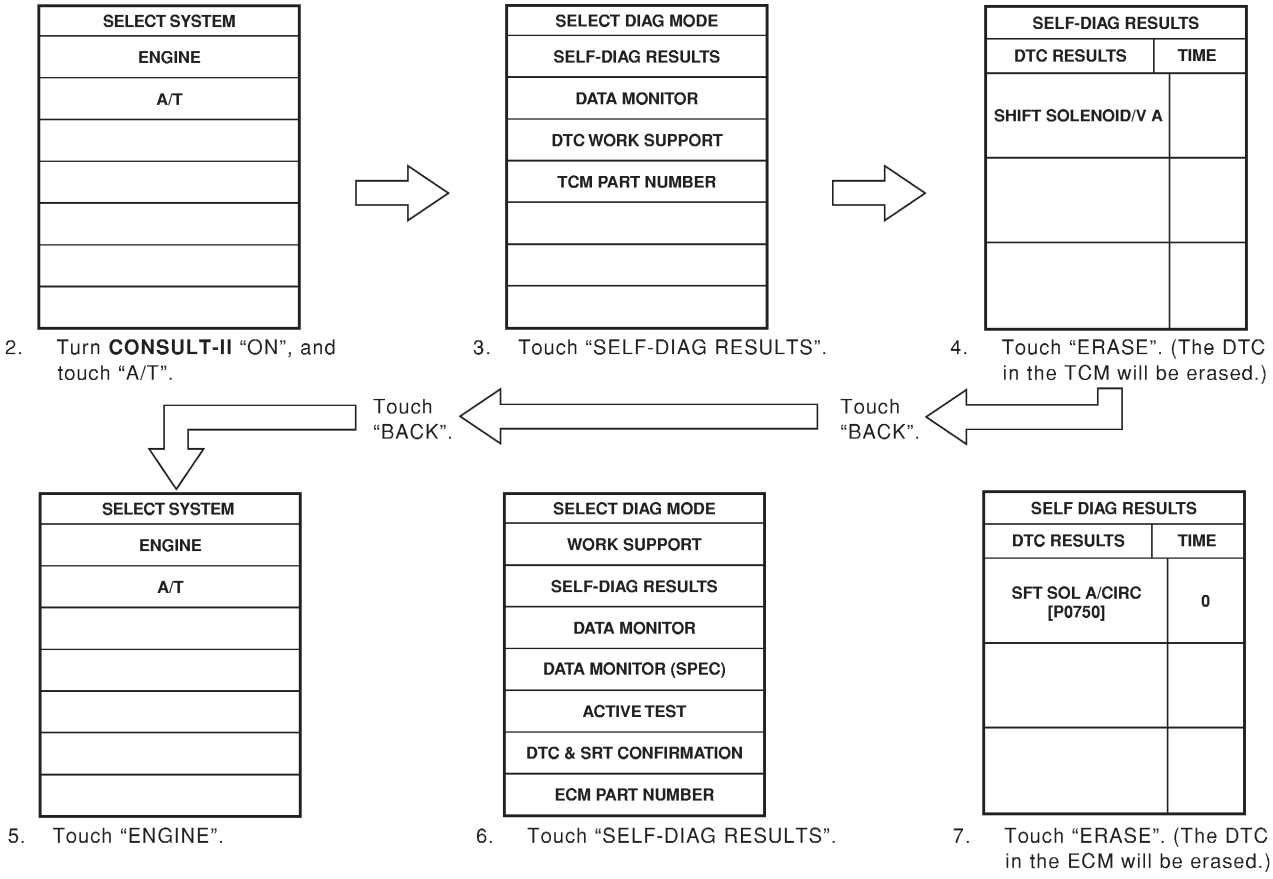
1) If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
2) Turn CONSULT-II "ON" and touch "A/T".
3) Touch "SELF-DIAG RESULTS".
4) Touch "ERASE". [The DTC in the TCM (Transmission control 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.)

- 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).

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" (engine stopped) again.



SEF823YA

The emission related diagnostic information in the ECM can be erased by selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT-II.

How to Erase DTC (GST With GST)

NOTE:
If the DTC is not for A/T related items (see EC-7), 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).

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

- **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.**

1) Diagnostic trouble codes
2) 1st trip diagnostic trouble codes
3) Freeze frame data
4) 1st trip freeze frame data

5) System readiness test (SRT) codes
6) Test values
7) Distance traveled while MI is activated
8) 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.

MODELS WITHOUT EURO-OBD SYSTEM

NFEC0031S10

DTC and 1st Trip DTC

NFEC0031S1001

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. 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. In other words, the DTC is stored in the ECM memory 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 "How to Erase Emission-related Diagnostic Information", EC-59

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-88. Then perform "DTC Confirmation Procedure" or "Overall Function Check" to try to duplicate the problem. 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.

Without CONSULT-II

ECM displays the DTC by a set of four digit numbers with MI illumination in the diagnostic test mode II (Self-diagnostic results). Example: 0100, 0115, 0340, 1335, etc.

With CONSULT-II

CONSULT-II displays the DTC in "SELF-DIAG RESULTS" mode. Examples: P0100, P0115, P0340, P1335, etc.

(CONSULT-II also displays the malfunctioning component or system.)

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, ECM in the diagnostic test mode II (Self-diagnostic results) 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, the use of CONSULT-II (if available) is recommended.**

A sample CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in the 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
MAF SEN/CIRCUIT [P0100]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
MAF SEN/CIRCUIT [P0100]	1t

SEF992X

Freeze Frame Data and 1st Trip Freeze Frame Data

NFEC0031S1002

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, throttle valve opening, 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-75.
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 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.
If freeze frame data is stored in the ECM memory and another freeze frame data 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 "How to Erase Emission-related Diagnostic Information", EC-59.

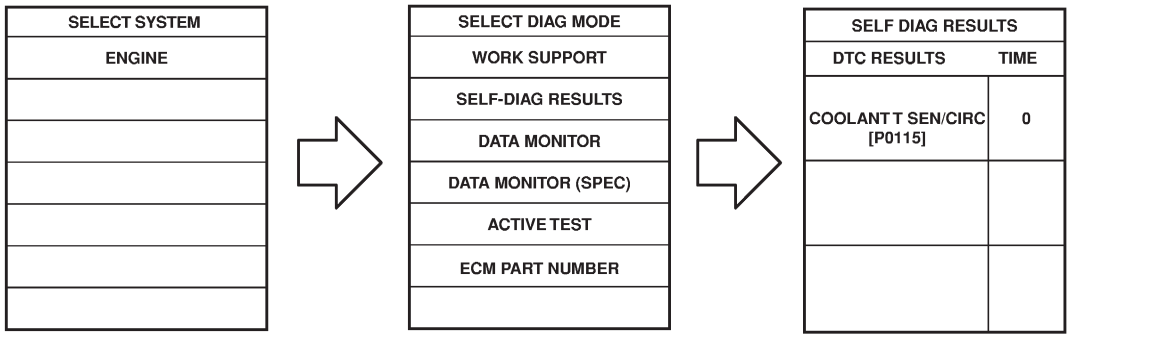
How to Erase Emission-related Diagnostic Information

NFEC0031S1003

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" (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.)

SEC074C

The emission related diagnostic information in the ECM can be erased by selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT-II.

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. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
2) Change the diagnostic test mode from Mode II to Mode I by using the data link connector. (See EC-62.)

The emission related diagnostic information in the ECM can be erased by changing the diagnostic test mode.

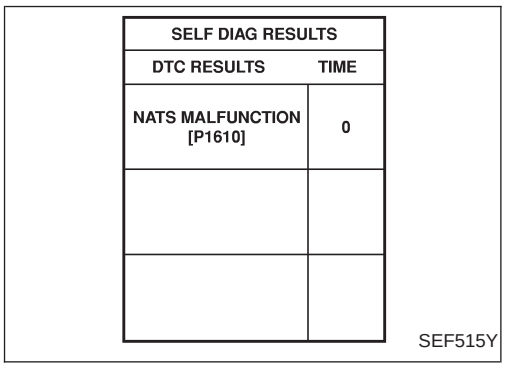
- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **Erasing the emission-related diagnostic information using CONSULT-II is easier and quicker than switching the diagnostic test mode using the data link connector.**
- **The following data are 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

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.

NVIS (Nissan Vehicle Immobilizer System — NATS)

NFEC0649

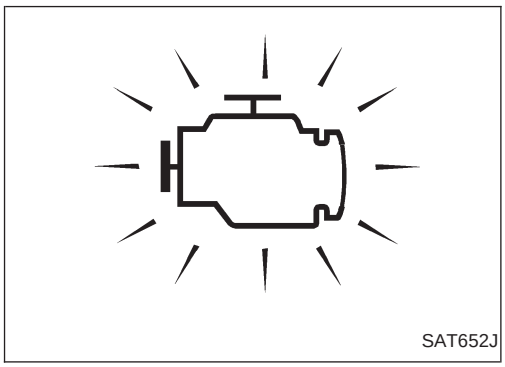


- **If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to "NVIS (Nissan Vehicle Immobilizer System — NATS)" in EL section.**
- **Confirm no self-diagnostic results of NVIS (NATS) is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NVIS (NATS) system and registration of all NVIS (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 NVIS (NATS) initialization and NVIS (NATS) ignition key ID registration, refer to CONSULT-II operation manual, IVIS/NVIS.

Malfunction Indicator (MI)

DESCRIPTION

NFEC0032



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-145, WARNING LAMPS or see EC-558.
2. When the engine is started, the MI should go off.
   If the MI remains on, the ECM's CPU is malfunctioning.

On Board Diagnostic System Function

=NFEC0032S01

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. (See EC-558.)
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When the ECM's CPU is malfunctioning, the MI will light up to inform the driver that a malfunction has been detected.
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 (FRONT)	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1 (front), to be read.

MI Flashing without DTC

NFEC0032S0102

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode following "How to Switch Diagnostic Test Modes", EC-62.

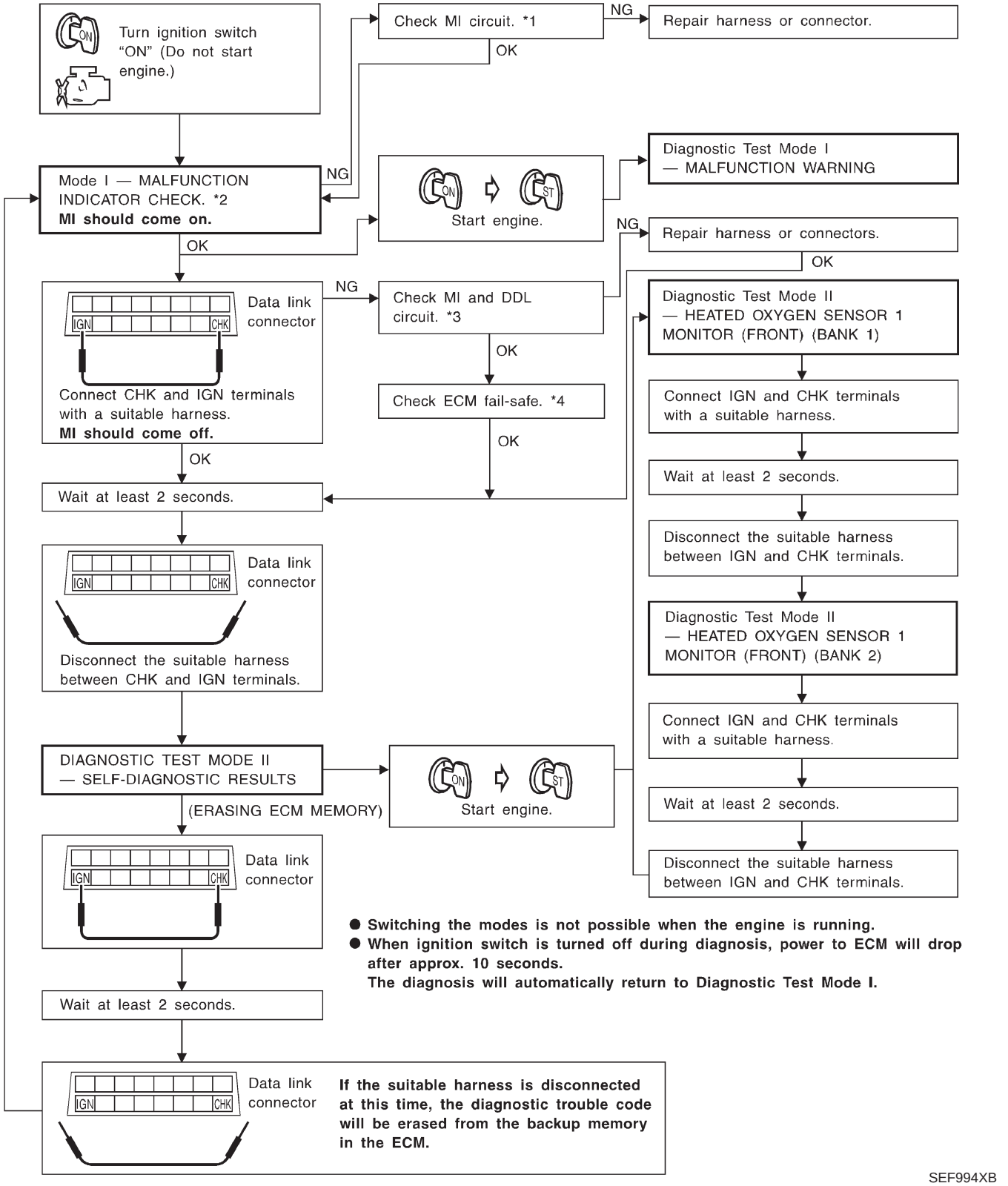
How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-63.)

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) System readiness test (SRT) code
6) Test values
7) Distance traveled while MI is activated
8) Others

How to Switch Diagnostic Test Modes

NFEC0032S07



- **Switching the modes is not possible when the engine is running.**
- **When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 10 seconds.**
  The diagnosis will automatically return to Diagnostic Test Mode I.

SEF994XB

*1 EC-558
*2 EC-61
*3 EC-558
*4 EC-104

Diagnostic Test Mode I — Bulb Check

NFEC0032S03

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL-145, "WARNING LAMPS" or see EC-558.

Diagnostic Test Mode I — Malfunction Warning

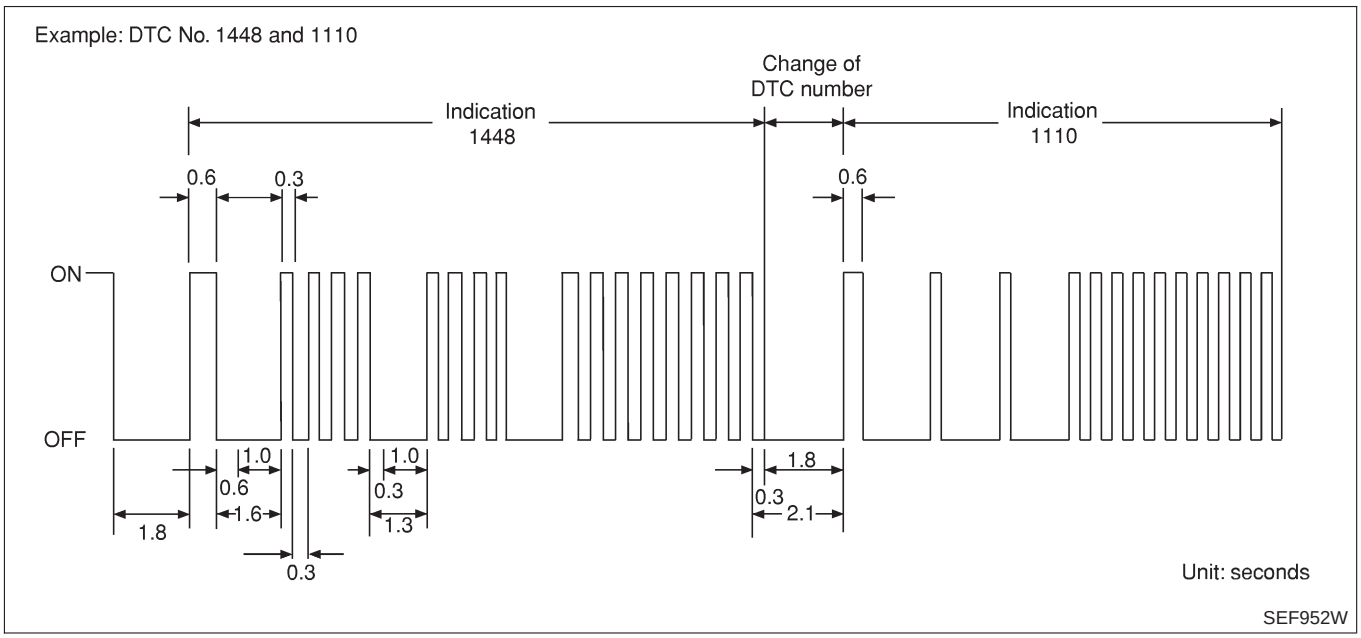
NFEC0032S04

MI	Condition
ON	When the ECM's CPU is malfunctioning.
OFF	No malfunction.

Diagnostic Test Mode II — Self-diagnostic Results

NFEC0032S08

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI.
A DTC will be used as an example for how to read a code.



A particular DTC 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 1000th-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 latter numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one DTC 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 TROUBLE DIAGNOSIS — INDEX, EC-7.)

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

NFEC0032S0801

The DTC can be erased from the backup memory in the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "How to Switch Diagnostic Test Modes", EC-62.)

- **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.**

Malfunction Indicator (MI) (Cont'd)

Diagnostic Test Mode II — Heated Oxygen Sensor 1 Monitor (front)

=NFEC0032S09

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

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.

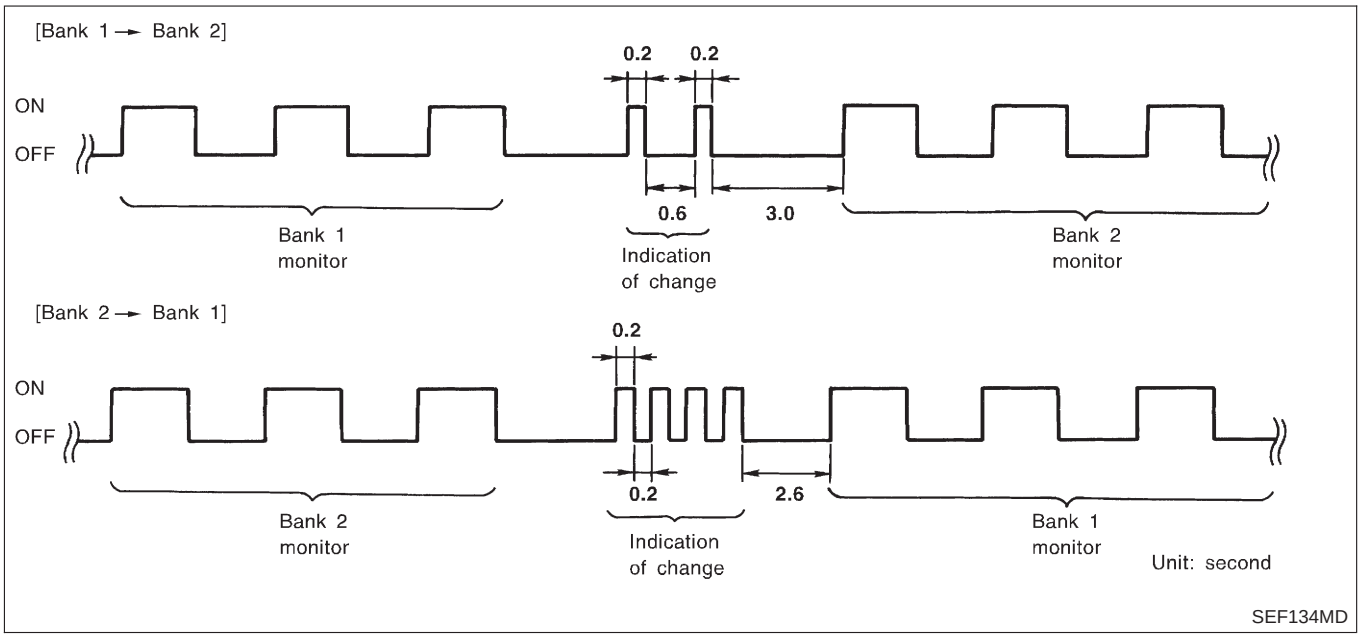
To check the heated oxygen sensor 1 (front) function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.
ECM will start heated oxygen sensor 1 (front) (B1) monitoring.

How to Switch Monitored Sensor from Bank 1 to Bank 2 or Vice Versa

NFEC0032S0901

- **The following procedure should be performed while the engine is running.**

1. Connect CHK and IGN terminals of data link connector with a suitable harness.
2. Wait at least 2 seconds.
3. Disconnect the suitable harness between CHK and IGN terminals of data link connector.



OBD System Operation Chart (Models with Euro-OBD System)

NFEC0650

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

NFEC0650S01

- 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 "Two Trip Detection Logic" on EC-44.
- 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

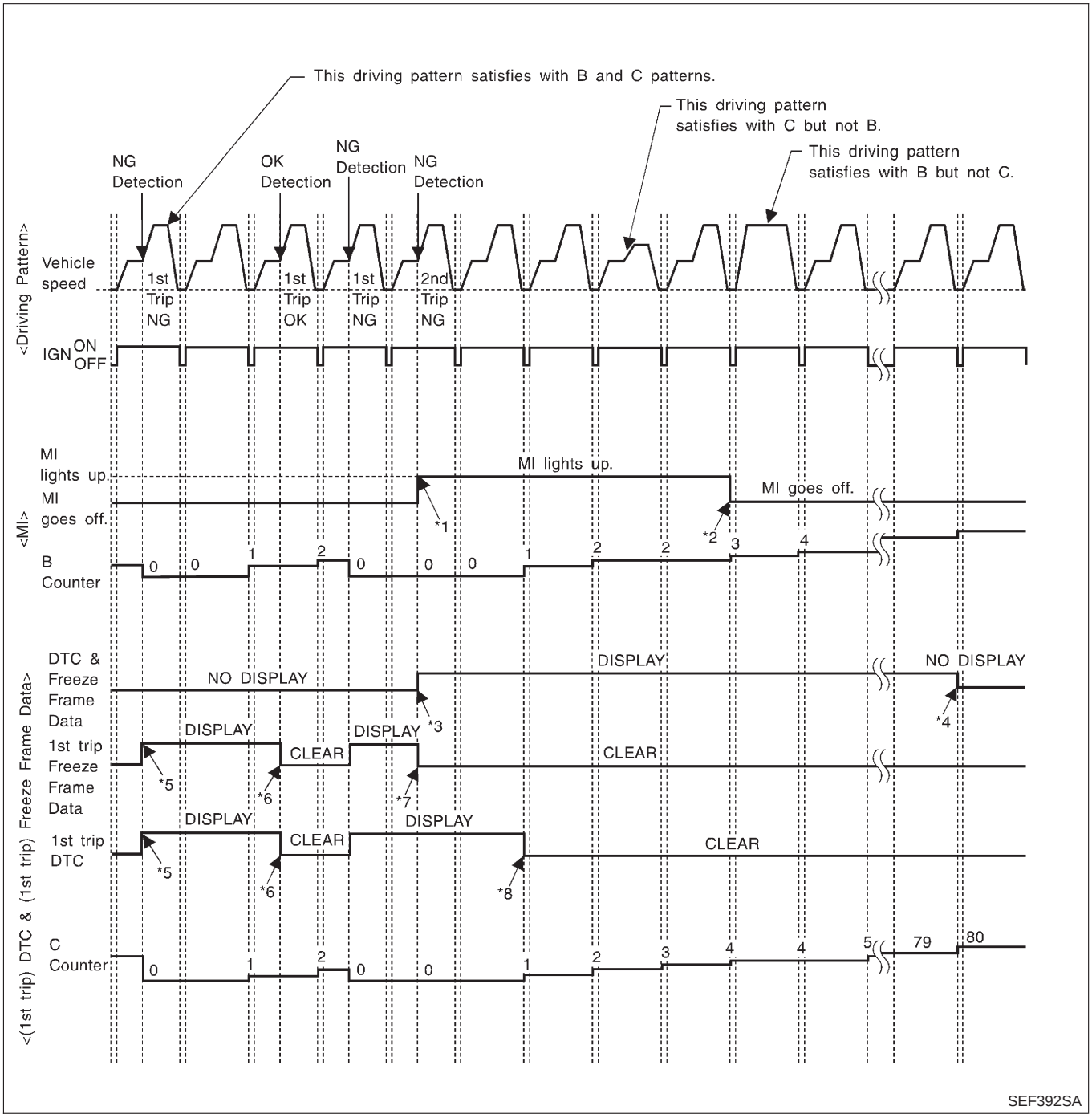
NFEC0650S02

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-67.
For details about patterns "A" and "B" under "Other", see EC-69.
*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"

NFEC0650S03



*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"

NFEC0650S04

Driving Pattern B

NFEC0650S0401

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 EC-66)

Driving Pattern C

NFEC0650S0402

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) × (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).

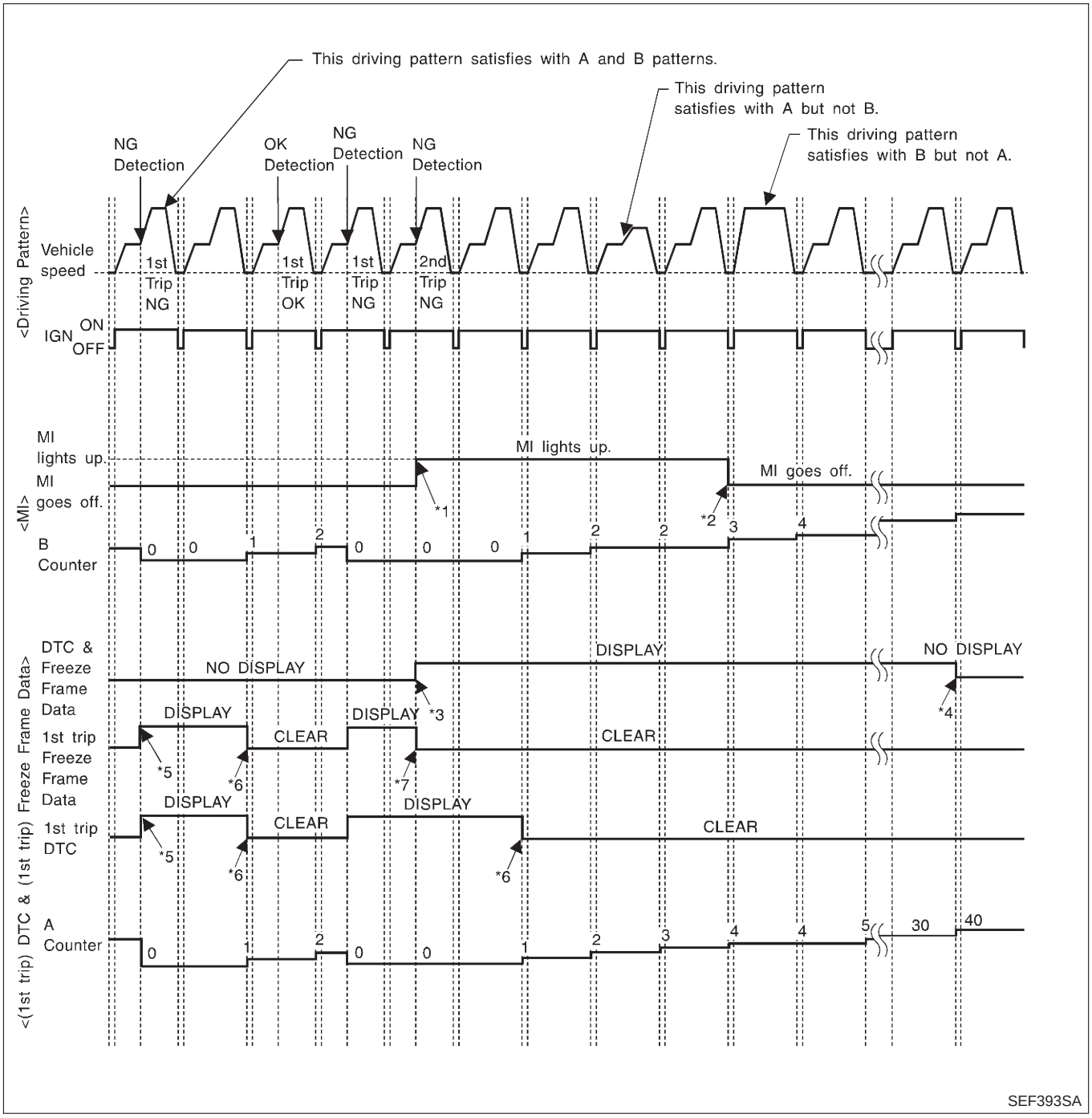
Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 -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

- The C counter will be cleared when the malfunction is detected regardless of driving pattern C.
- The C counter will be counted up when driving pattern C 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.

OBD System Operation Chart (Models with Euro-OBD System) (Cont'd)

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

NFEC0650S05



*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.

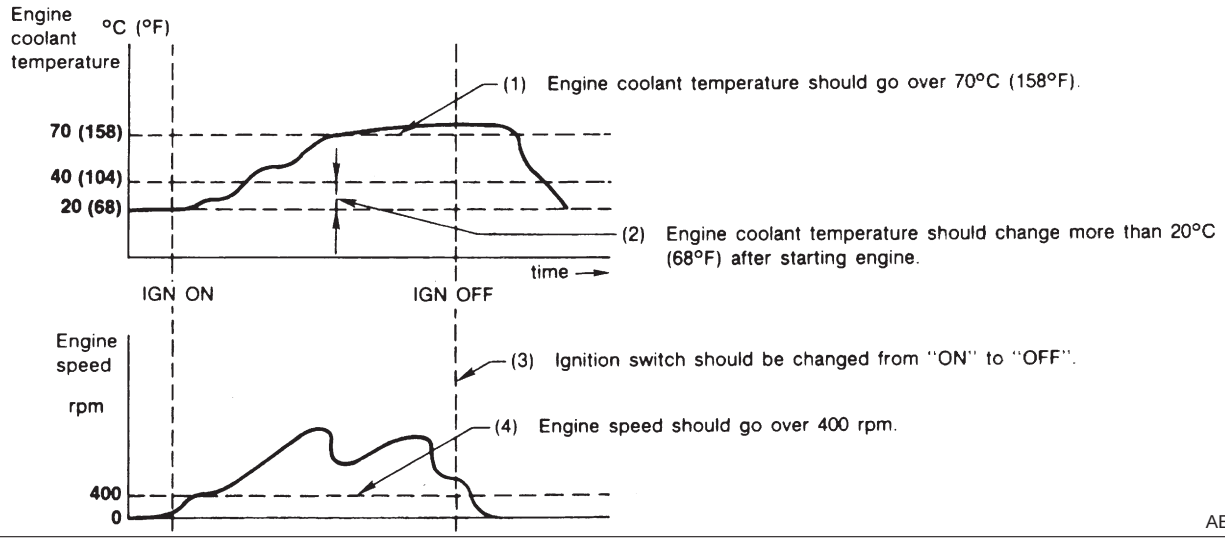
*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

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

NFEC0650S06

Driving Pattern A

NFEC0650S0601



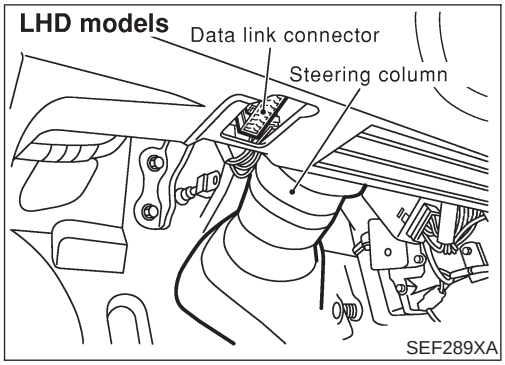
- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

Driving Pattern B

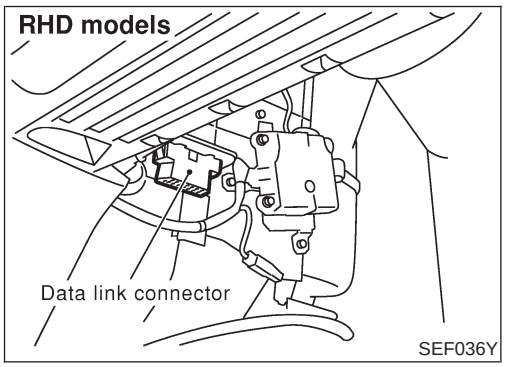
NFEC0650S0602

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 EC-68).



SEF289XA



SEF036Y

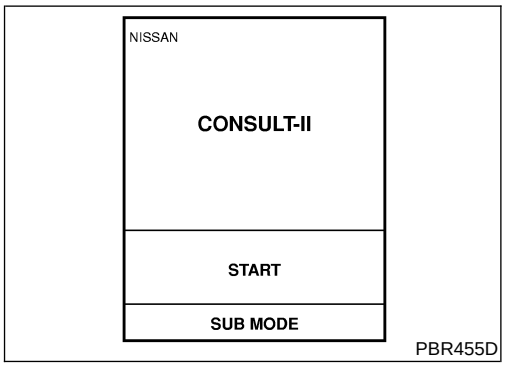
CONSULT-II

=NFEC0034

CONSULT-II INSPECTION PROCEDURE

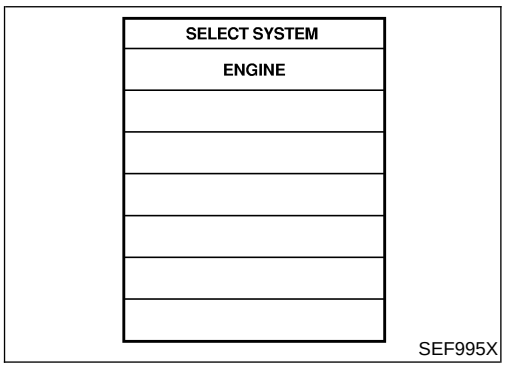
NFEC0034S01

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located under drivers side dash panel.



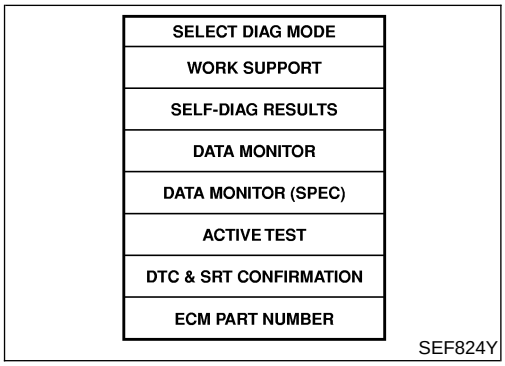
PBR455D

3. Turn ignition switch ON.
4. Touch “START”.



SEF995X

5. Touch “ENGINE”.



SEF824Y

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

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

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Models with Euro-OBD System

NFEC0034S02

NFEC0034S0201

		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)		X	X	X	X			
		Crankshaft position sensor (REF)		X		X	X			
		Mass air flow sensor		X		X	X			
		Engine coolant temperature sensor		X	X	X	X	X		
		Heated oxygen sensor 1 (front)		X		X	X		X	X
		Heated oxygen sensor 2 (rear)		X		X	X		X	X
		Vehicle speed sensor		X	X	X	X			
		Throttle position sensor		X		X	X			
		Fuel tank temperature sensor		X		X	X			
		Absolute pressure sensor				X	X			
		Intake air temperature sensor		X		X	X			
		Knock sensor		X						
		Ignition switch (start signal)				X	X			
		Closed throttle position switch		X		X	X			
		Closed throttle position switch (throttle position sensor signal)				X	X			
		Air conditioner switch				X	X			
		Park/neutral position (PNP) switch		X		X	X			
		Power steering oil pressure switch				X	X			
		Battery voltage				X	X			
		Ambient air temperature switch				X	X			
		Load signal				X	X			

CONSULT-II (Cont'd)

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	OUTPUT	Injectors				X	X	X		
		Power transistor (Ignition timing)				X	X	X		
		IACV-AAC valve		X		X	X	X		
		EVAP canister purge volume control solenoid valve		X		X	X	X		X
		Air conditioner relay				X	X			
		Fuel pump relay	X			X	X	X		
		Cooling fan		X		X	X	X		
		Heated oxygen sensor 1 heater (front)		X		X	X		X	
		Heated oxygen sensor 2 heater (rear)		X		X	X		X	
		Swirl control valve control solenoid valve		X		X	X	X		
		Electronic controlled engine mount				X	X	X		
		Calculated load value			X	X	X			

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-46.

CONSULT-II (Cont'd)

Models without Euro-OBD System

NFEC0034S0202

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)		X	X	X	X	
		Crankshaft position sensor (REF)		X	X	X	X	
		Mass air flow sensor		X		X	X	
		Engine coolant temperature sensor		X	X	X	X	X
		Heated oxygen sensor 1 (front)		X		X	X	
		Heated oxygen sensor 2 (rear)				X	X	
		Vehicle speed sensor			X	X	X	
		Throttle position sensor		X	X	X	X	
		Fuel tank temperature sensor				X	X	
		Absolute pressure sensor				X	X	
		Intake air temperature sensor			X	X	X	
		Knock sensor		X				
		Ignition switch (start signal)				X	X	
		Closed throttle position switch (throttle position sensor signal)				X	X	
		Air conditioner switch				X	X	
		Park/neutral position (PNP) switch				X	X	
		Power steering oil pressure switch				X	X	
		Battery voltage				X	X	
		Ambient air temperature switch				X	X	
		Load signal				X	X	

CONSULT-II (Cont'd)

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	OUTPUT	Injectors				X	X	X
		Power transistor (Ignition timing)		X (Ignition signal)		X	X	X
		IACV-AAC valve				X	X	X
		EVAP canister purge volume control solenoid valve				X	X	X
		Air conditioner relay				X	X	
		Fuel pump relay	X			X	X	X
		Cooling fan		X		X	X	X
		Heated oxygen sensor 1 heater (front)				X	X	
		Heated oxygen sensor 2 heater (rear)				X	X	
		Swirl control valve control solenoid valve				X	X	X
		VIAS control solenoid valve				X	X	X
		Electronic controlled engine mount				X	X	X
		Calculated load value			X	X	X	

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-59.

FUNCTION

NFEC0034S03

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 specifications of the 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.
DTC confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECM part number	ECM part numbers can be read.

*1 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) System readiness test (SRT) codes
6) Test values
7) Distance traveled while MI is activated.

8) Others

WORK SUPPORT MODE

NFEC0034S04

WORK ITEM	CONDITION	USAGE
TP SW/TP SEN IDLE POSI ADJ	● FOLLOW THE BASIC INSPECTION INSTRUCTION IN THE SERVICE MANUAL.	When adjusting the idle throttle position
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 clear the coefficient of self-learnign control value
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGNITION TIMING 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-DIAGNOSTIC MODE

NFEC0034S05

DTC and 1st Trip DTC

NFEC0034S0501

Regarding items of "DTC and 1st trip DTC", refer to "TROUBLE DIAGNOSIS — INDEX" (See EC-7.)

Freeze Frame Data and 1st Trip Freeze Frame Data

NFEC0034S0502

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 "TROUBLE DIAGNOSIS — INDEX", EC-7.)
FUEL SYS-B1*2	● "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
FUEL SYS-B2*2	
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.
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.
S-FUEL TRIM-B2 [%]	
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.
L-FUEL TRIM-B2 [%]	
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.
ABSOL TH·P/S [%] or [degree]	● The throttle valve opening at the moment a malfunction is detected is displayed.

CONSULT-II (Cont'd)

Freeze frame data item*1	Description
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.
*2: Regarding A33 model, "-B1" indicates bank 1 and "-B2" indicates bank 2.

CONSULT-II (Cont'd)

DATA MONITOR MODE

=NFEC0034S06

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	○	○	● Indicates the engine speed computed from the REF signal (120° signal) of the crankshaft position sensor (REF).	
CKPS·RPM (POS) [rpm]	○		● Indicates the engine speed computed from the POS signal (1° signal) of the crankshaft position sensor (POS).	● 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.
POS COUNT	○		● Indicates the number of signal plate (Flywheel/Drive Plate) cogs (tooth) during one revolution of the engine.	
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.
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 (front) is displayed.	
HO2S1 (B2) [V]	○	○		
HO2S2 (B1) [V]	○	○	● The signal voltage of the heated oxygen sensor 2 (rear) is displayed.	
HO2S2 (B2) [V]	○	○		
HO2S1 MNTR (B1) [RICH/LEAN]	○		● Display of heated oxygen sensor 1 (front) 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.
HO2S1 MNTR (B2) [RICH/LEAN]	○			
HO2S2 MNTR (B1) [RICH/LEAN]	○		● Display of heated oxygen sensor 2 (rear) 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.
HO2S2 MNTR (B2) [RICH/LEAN]	○			
VHCL SPEED SE [km/h] or [mph]	○	○	● The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	○	○	● The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	○	○	● The throttle position sensor signal voltage is displayed.	
FUEL T/TMP SE [°C] or [°F]	○		● The fuel temperature judged from the fuel tank temperature sensor signal voltage is displayed.	

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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 from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL/P SW [ON/OFF]	○		● Indicates mechanical contact [ON/OFF] condition of the closed throttle position switch.	
CLSD THL POS [ON/OFF]	○	○	● Indicates idle position [ON/OFF] computed by ECM according to the throttle 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 determined by the power steering oil pressure signal is indicated.	
AMB TEMP SW [ON/OFF]	○		● Indicates [ON/OFF] condition from the ambient air temperature switch signal.	
IGNITION SW [ON/OFF]	○		● Indicates [ON/OFF] condition from ignition switch.	
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.
INJ PULSE-B2 [msec]				
B/FUEL SCHDL [msec]		○	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
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.
IACV-AAC/V [step]		○	● Indicates the IACV-AAC valve control value computed by ECM according to the input signals.	
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.	
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.
A/F ALPHA-B2 [%]		○		
AIR COND RLY [ON/OFF]		○	● The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
FUEL PUMP RLY [ON/OFF]			● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
COOLING FAN [ON/OFF]			● Indicates the control condition of the cooling fan (determined by ECM according to the input signal). HIGH ... High speed operation LOW ... Low speed operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater (front) determined by ECM according to the input signals.	
HO2S1 HTR (B2) [ON/OFF]				
HO2S2 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater (rear) determined by ECM according to the input signals.	
HO2S2 HTR (B2) [ON/OFF]				
CAL/LD VALUE [%]			● "Calculated load value" indicates the value of the current airflow divided by peak airflow.	
ABSOL TH·P/S [%]			● "Absolute throttle position sensor" indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor.	
MASS AIRFLOW [g·m/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor.	
ABSOL PRES/SE [V]	○		● The signal voltage of the absolute pressure sensor is displayed.	
SWRL CONT S/V [ON/OFF]			● The control condition of the swirl control valve control solenoid valve (determined by ECM according to the input signals) is indicated. ● ON ... Swirl control valve is closed. OFF ... Swirl control valve is opened.	
LOAD SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the electrical load signal and/or lighting switch. ON ... rear defogger is operating and/or lighting switch is on. OFF ... rear defogger is not operating and lighting switch is not on.	
TRVL AFTER MIL [km] or [Mile]			● Distance traveled while MI is activated	
FPCM DR VOLT [V]			● This item is not available. A certain value is indicated.	

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
VIAS S/V [ON/OFF]			● The control condition of the VIAS control solenoid valve (determined by ECM according to the input signal) is indicated. ● OFF ... VIAS control solenoid valve is not operating. ON ... VIAS control solenoid valve is operating.	
ENGINE MOUNT [IDLE/TRVL]			● The control condition of the electronic controlled engine mount (computed by ECM according to the input signals) is indicated. ● IDLE ... Idle condition ● TRVL ... Driving condition	
IDL A/V LEAN			● 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. INCMP ... Idle air volume learning has not been performed successfully.	
Voltage [V]			● Voltage measured by the voltage probe.	
Frequency [msec] or [Hz] or [%]			● Pulse width, frequency or duty cycle measured by the pulse 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.

NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
- Regarding A33 model, "-B1" indicates bank 1 and "-B2" indicates bank 2.

DATA MONITOR (SPEC) MODE

NFEC0034S11

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
MAS A/F SE-B1 [V]	○	○	● The signal voltage of the mass air flow sensor specification is displayed.	● When the 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 the engine is running, specification range is indicated.
A/F ALPHA-B1 [%]		○	● Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	● When the engine is running, specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]		○		

NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
- Regarding A33 model, "B1" indicates bank 1 and "B2" indicates bank 2.

ACTIVE TEST MODE

NFEC0034S07

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 connector ● Fuel injectors ● Heated oxygen sensor 1 (front)
IACV-AAC/V OPENING	● Engine: After warming up, idle the engine. ● Change the IACV-AAC valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connector ● IACV-AAC valve
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 connector ● Engine coolant temperature sensor ● Fuel injectors
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.	● Adjust initial ignition timing
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch "OFF" ● Shift lever "N" ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan "ON" and "OFF" using CONSULT-II.	Cooling fan moves and stops.	● Harness and connector ● Cooling fan motor ● Cooling fan relay
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 connector ● 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 connector ● Solenoid valve
SWIRL CONT SOL VALVE	● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with CONSULT-II and listen for operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
VIAS SOL VALVE	● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with CONSULT-II and listen for operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
ENGINE MOUNTING	● Engine: After warming up, run engine at idle speed. ● Gear position: "D"' range (Vehicle stopped) ● Turn electronic controlled engine mount "IDLE" and "RAVEL" with the CONSULT-II.	Body vibration changes according to the electronic controlled engine mount condition.	● Harness and connector ● Electronic controlled engine mount

DTC & SRT CONFIRMATION MODE

NFEC0034S12

SRT STATUS Mode

NFEC0034S1201

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-47.

SRT Work Support Mode

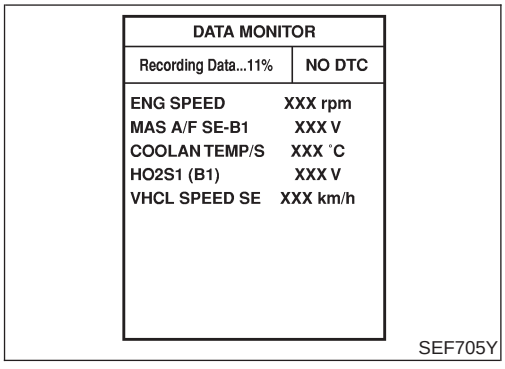
NFEC0034S1202

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

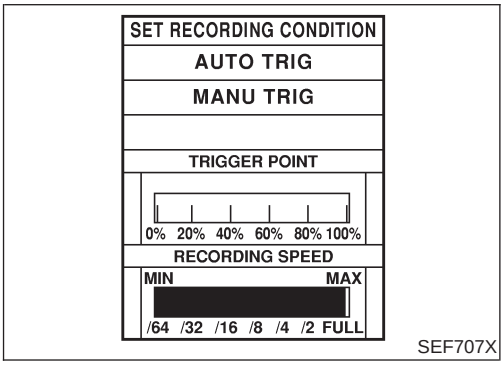
DTC Work Support Mode

NFEC0034S1203

Test mode	Test item	Condition	Reference page
HO2S1	HO2S1 (B1) P0130	Refer to corresponding trouble diagnosis for DTC.	EC-158
	HO2S1 (B1) P0131		EC-168
	HO2S1 (B1) P0132		EC-176
	HO2S1 (B1) P0133		EC-184
	HO2S1 (B2) P0150		EC-158
	HO2S1 (B2) P0151		EC-168
	HO2S1 (B2) P0152		EC-176
	HO2S1 (B2) P0153		EC-184
HO2S2	HO2S2 (B1) P0137		EC-212
	HO2S2 (B1) P0138		EC-223
	HO2S2 (B1) P0139		EC-234
	HO2S2 (B2) P0157		EC-212
	HO2S2 (B2) P0158		EC-223
	HO2S2 (B2) P0159		EC-234



SEF705Y



SEF707X

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

NFEC0034S10

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 left, 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.

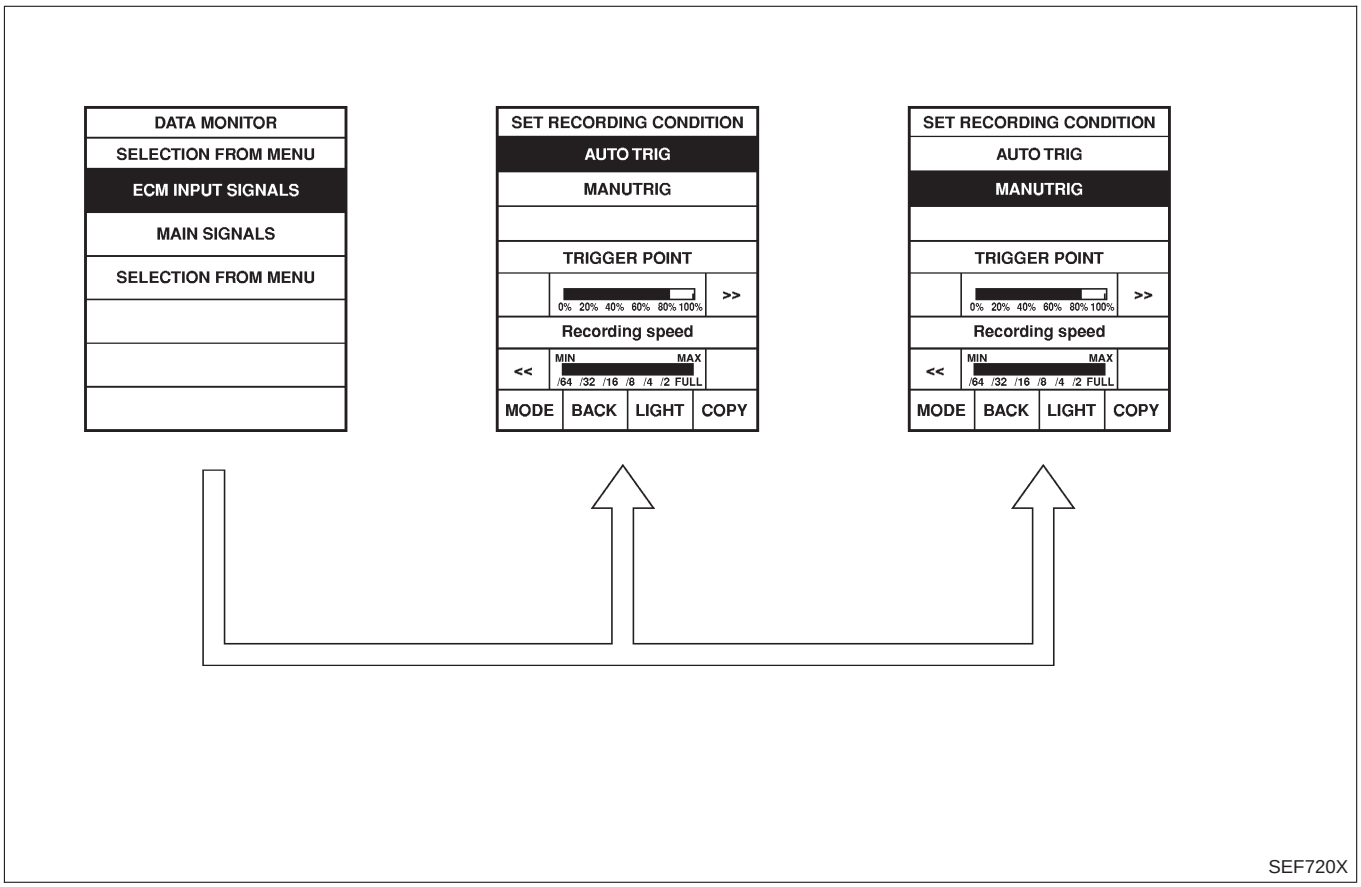
Use these triggers as follows:

1) "AUTO TRIG"

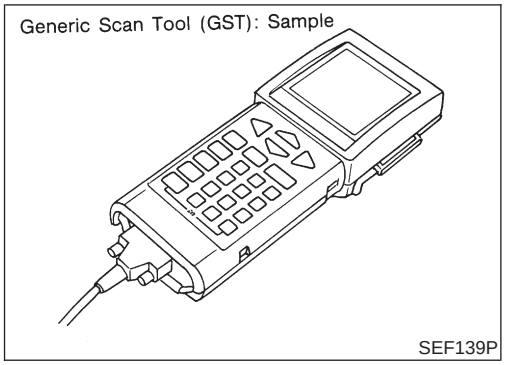
- While trying to detect the DTC/1st trip DTC by performing the "DTC Confirmation Procedure", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO 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 GI-22, "Incident Simulation Tests".

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.



SEF720X



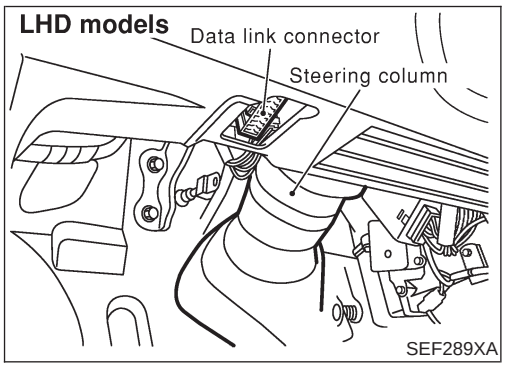
Generic Scan Tool (GST)

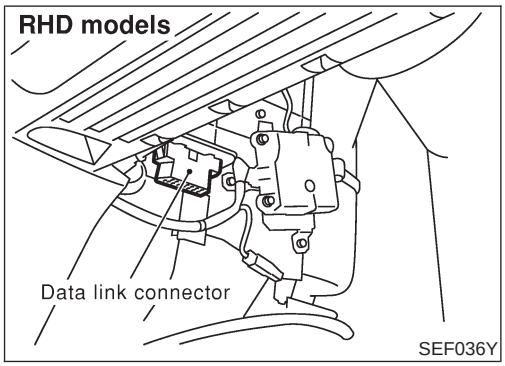
=NFEC0866

DESCRIPTION

NFEC0866S01

Generic Scan Tool (OBDII scan tool) complying with ISO15031-4 has 8 different functions explained on the next page.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.

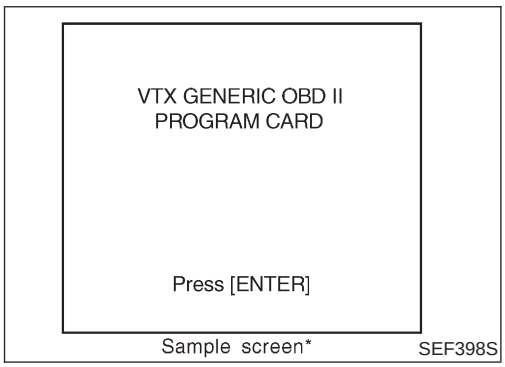




GST INSPECTION PROCEDURE

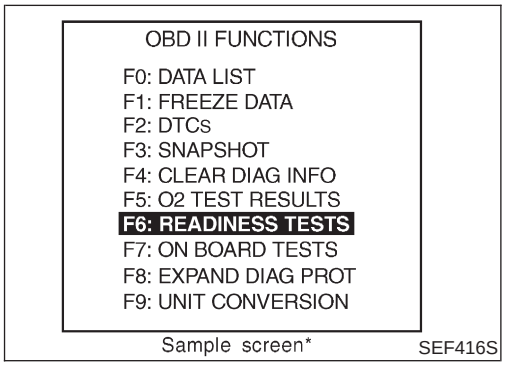
NFEC0866S02

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



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.)



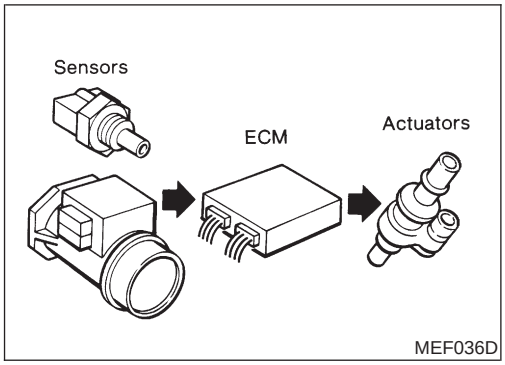
5. Perform each diagnostic mode according to each service procedure.

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

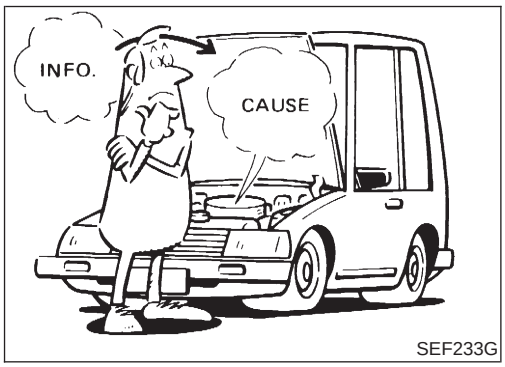
FUNCTION

NFEC0866S03

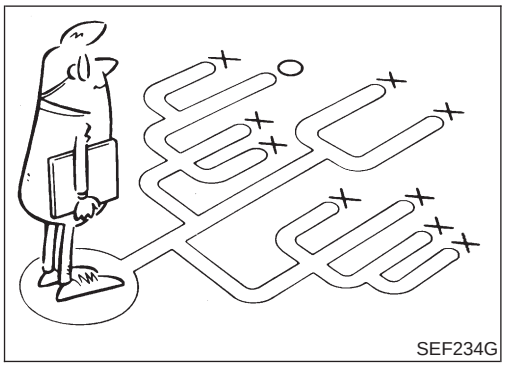
Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, distance traveled while MI is activated and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. (For details, refer to "Freeze Frame Data", EC-46.)
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 (External test equipment) to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.



MEF036D



SEF233G


SEF234G

KEY POINTS

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

SEF907L

Introduction

NFEC0036

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 problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems 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 problems. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the “Work Flow” on EC-88.

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 problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on next page should be used.

Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.

DIAGNOSTIC WORKSHEET

NFEC0036S01

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make trouble-shooting faster and more accurate.

In general, each customer feels differently about a problem. 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.

Worksheet Sample

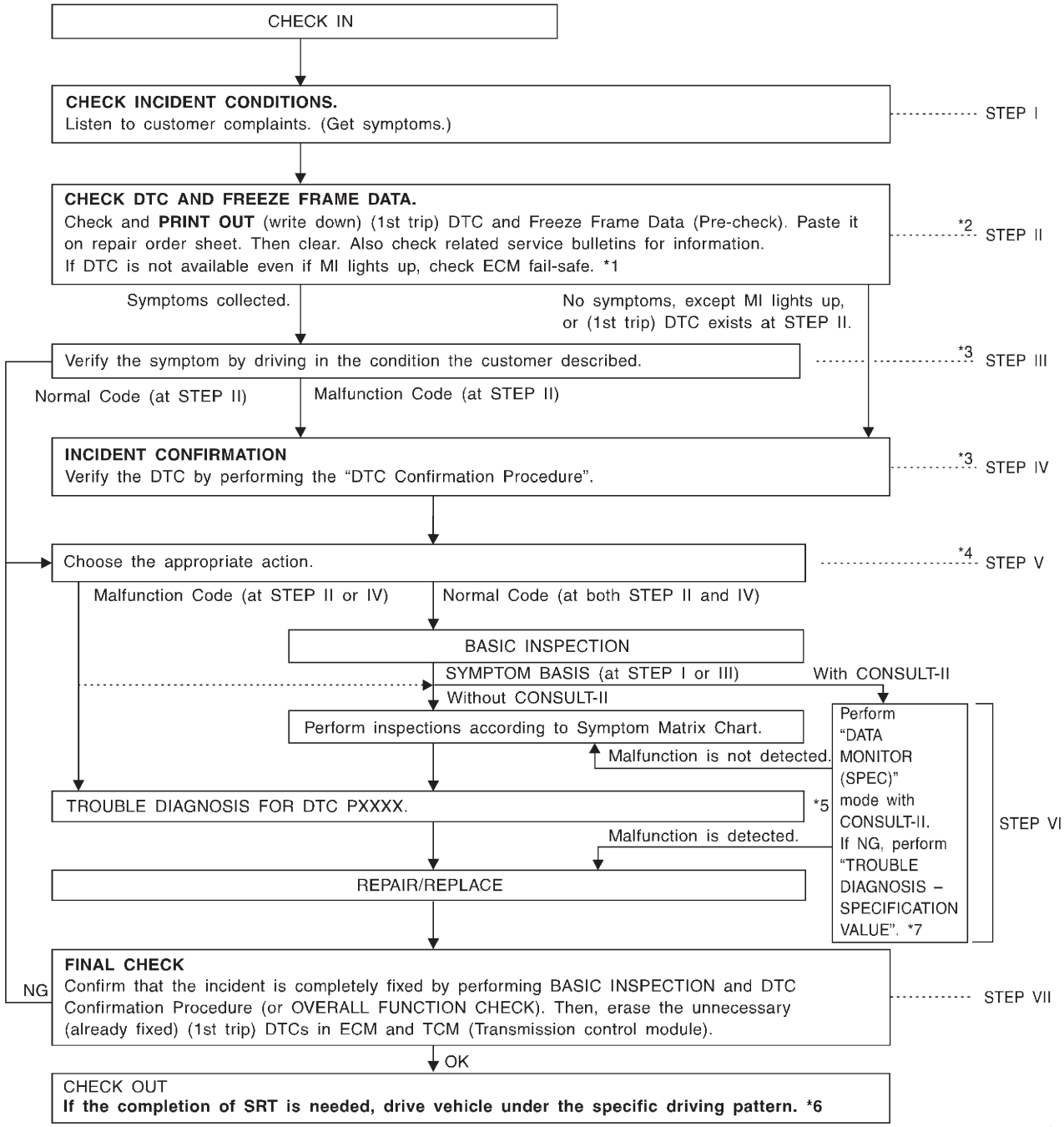
NFEC0036S0101

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel		☐ Vehicle ran out of fuel causing misfire	
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 20 40 60 80 100 120 Km/h	
Malfunction indicator		☐ Turned on ☐ Not turned on	

MTBL0513

Work Flow

NFEC0651



SEF510ZD

*1 EC-104

*2 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

*3 If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

*4 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-127.

*5 If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

*6 EC-51

*7 EC-122

DESCRIPTION FOR WORK FLOW

NFEC0651S01

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-86.
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 to EC-56, EC-59.) 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 "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126. 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-105.) 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 "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126. 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 "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126. 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 refer to "Basic Inspection", EC-90. If CONSULT-II is available, perform "DATA MONITOR (SPEC)" mode with CONSULT-II and proceed to the "TROUBLE DIAGNOSIS — SPECIFICATION VALUE". (Refer to EC-122.) (If malfunction is detected, proceed to "REPAIR/REPLACE".) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-105.)
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-109, EC-114. 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 GI-24, "Circuit Inspection". Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.
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 different method 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-56, EC-59.)

Basic Inspection

NFEC0038

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

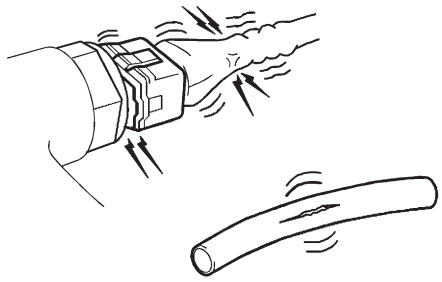
- Headlamp switch is OFF,
- Air conditioner switch is OFF,
- Rear window defogger switch is OFF,
- Steering wheel is in the straight-ahead position, etc.

On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.

1	INSPECTION START

1. Check service records for any recent repairs that may indicate a related problem, or a current need for scheduled maintenance.
2. Open engine hood and check the following:

- Harness connectors for improper connections
- Vacuum hoses for splits, kinks and improper connections
- Wiring for improper connections, pinches and cuts
- Air cleaner clogging
- Hoses and ducts for leaks

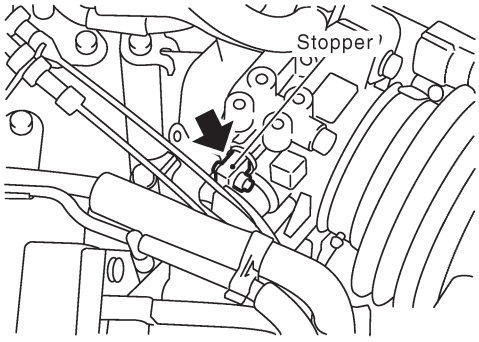


SEF983U

▶	GO TO 2.

2	CHECK THROTTLE DRUM OPERATION

Confirm that throttle drum is in contact with the stopper.



SEC016C

OK or NG

OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 9.
NG	▶	GO TO 3.

3	CHECK ACCELERATOR WIRE INSTALLATION	
Check accelerator wire for slack.		
OK or NG		
OK	▶	GO TO 4.
NG	▶	Adjust accelerator wire. Refer to FE-3, "Adjusting Accelerator Wire".

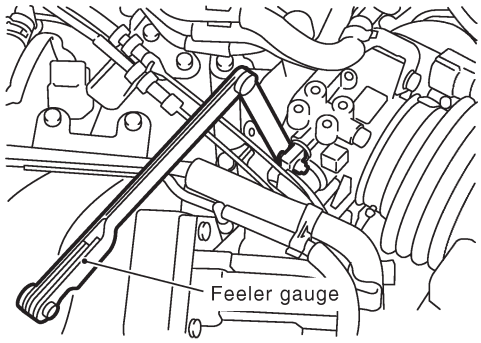
4	CHECK THROTTLE VALVE OPERATION	
1. Remove intake air ducts. 2. Check throttle valve operation when moving throttle drum by hand.		
OK or NG		
OK	▶	Retighten the throttle drum fixing nuts.
NG	▶	Clean the throttle body and throttle valve.

5	CHECK THROTTLE POSITION SWITCH CLOSED POSITION	

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT-II.
3. Read "CLSD THL/P SW" signal under the following conditions.

- Insert a 0.05 mm (0.0020 in) and 0.15 mm (0.0059 in) feeler gauge alternately between stopper and throttle drum as shown in the figure and check the signal.



SEC017C

DATA MONITOR	
MONITOR	NO DTC
CLSD THL/P SW	ON

SEF173Y

"CLSD THL/P SW" signal should remain "ON" while inserting 0.05 mm (0.0020 in) feeler gauge.
"CLSD THL/P SW" signal should remain "OFF" while inserting 0.15 mm (0.0059 in) feeler gauge.

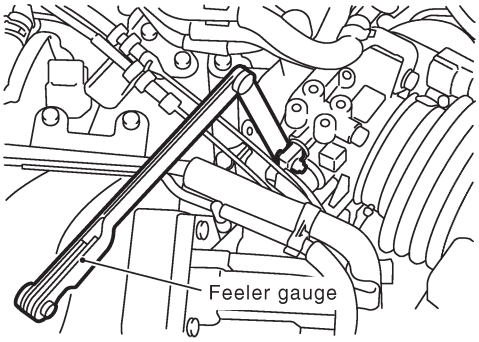
OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 6.

6	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

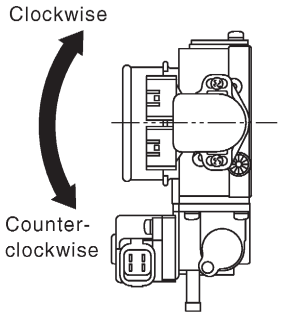
With CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.



SEC017C

3. Turn throttle position sensor body counterclockwise until "CLSD THL/P SW" signal switches to "OFF".



SEC018C

DATA MONITOR	
MONITOR	NO DTC
CLSD THL/P SW	OFF

SEF305Y

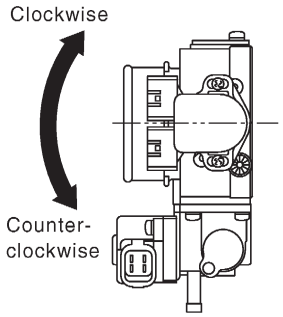
▶	GO TO 7.

7	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-II

With CONSULT-II

1. Temporarily tighten sensor body fixing bolts as follows.

- **Gradually move the sensor body clockwise and stop it when "CLSD THL/P SW" signal switches from "OFF" to "ON", then temporarily tighten sensor body fixing bolts.**



SEC018C

2. Make sure two or three times that the signal is "ON" when the throttle valve is closed and "OFF" when it is opened.
3. Remove 0.05 mm (0.0020 in) feeler gauge then insert 0.15 mm (0.0059 in) feeler gauge.
4. Make sure two or three times that the signal remains "OFF" when the throttle valve is closed.
5. Tighten throttle position sensor.
6. Check the "CLSD THL/P SW" signal again.
   The signal remains "OFF" while closing throttle valve.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 6.

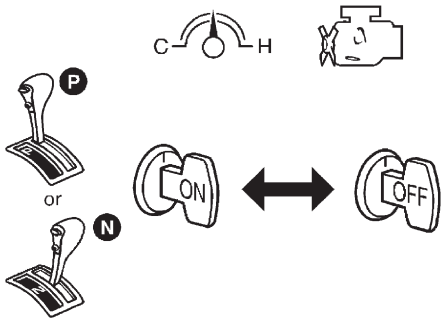
8	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

With CONSULT-II

NOTE:

Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly.

1. Remove feeler gauge.
2. Start engine.
3. Warm up engine to normal operating temperature.
4. Select "CLSD THL POS" in "DATA MONITOR" mode.
5. Stop engine. (Turn ignition switch "OFF".)
6. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

7. Turn ignition switch "OFF" and wait at least 10 seconds.
8. Repeat steps 6 and 7 until "CLSD THL POS" signal changes to "ON".

DATA MONITOR	
MONITOR	NO DTC
CLSD THL POS	ON

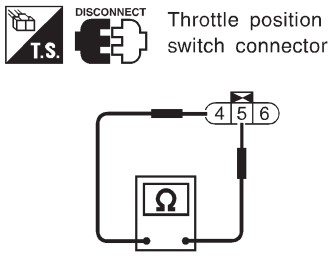
SEF061Y

▶	GO TO 13.

9	CHECK THROTTLE POSITION SWITCH CLOSED POSITION

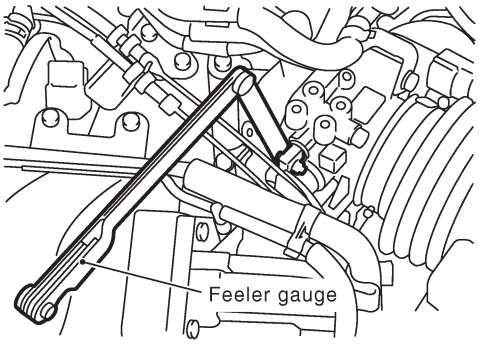
Without CONSULT-II

1. Disconnect closed throttle position switch harness connector.
2. Check continuity between closed throttle position switch terminals **4** and **5** under the following conditions.



SEF711X

- Insert the 0.05 mm (0.0020 in) and 0.15 mm (0.0059 in) feeler gauge alternately between the stopper and throttle drum as shown in the figure.



SEC017C

"Continuity should exist" while inserting 0.05 mm (0.0020 in) feeler gauge.
"Continuity should not exist" while inserting 0.15 mm (0.0059 in) feeler gauge.

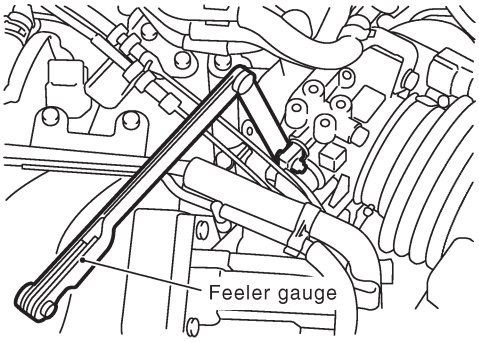
OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 10.

10	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

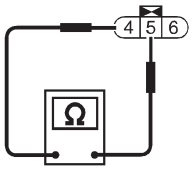
Without CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.

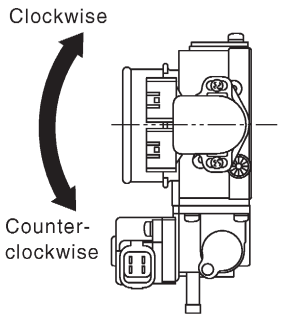


SEC017C

3. Turn throttle position sensor body counterclockwise until continuity does not exist.



SEF711X



SEC018C

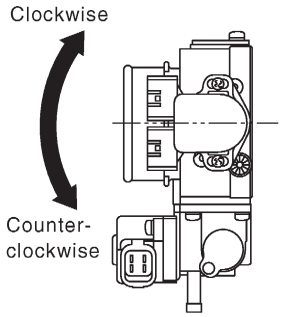
▶	GO TO 11.

11	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-II

Without CONSULT-II

1. Temporarily tighten sensor body fixing bolts as follows.

- **Gradually move the sensor body clockwise and stop it when the continuity comes to exist, then temporarily tighten sensor body fixing bolts.**



SEC018C

2. Make sure two or three times that the continuity exists when the throttle valve is closed and continuity does not exist when it is opened.
3. Remove 0.05 mm (0.0020 in) feeler gauge then insert 0.15 mm (0.0059 in) feeler gauge.
4. Make sure two or three times that the continuity does not exist when the throttle valve is closed.
5. Tighten throttle position sensor.
6. Check the continuity again.

Continuity does not exist while closing the throttle valve.

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 10.

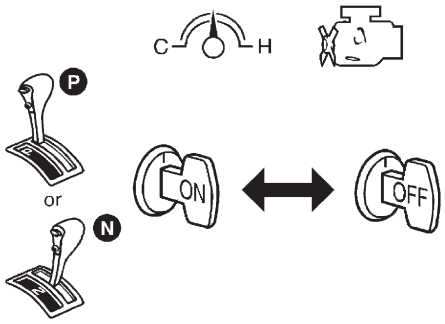
12	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

Without CONSULT-II

NOTE:

Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly.

1. Remove feeler gauge.
2. Reconnect throttle position switch harness connector.
3. Start engine.
4. Warm up engine to normal operating temperature.
5. Stop engine. (Turn ignition switch "OFF".)
6. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

7. Turn ignition switch "OFF" and wait at least 10 seconds.
8. Repeat steps 6 and 7, 20 times.

	▶	GO TO 13.

13	CHECK (1ST TRIP) DTC
1. Start engine and warm it up to normal operating temperature. 2. Rev (2,000 to 3,000 rpm) two or three times. 3. Make sure no (1st trip) DTC is displayed with CONSULT-II or GST. **OK or NG**	
OK ▶	GO TO 15.
NG ▶	GO TO 14.

14	REPAIR MALFUNCTION
Repair or replace components as necessary according to corresponding "Diagnostic Procedure".	
▶	GO TO 13.

15	CHECK TARGET IDLE SPEED
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 625±50 rpm (VQ30DE engine)** **M/T: 675±50 rpm (VQ20DE engine)** **A/T: 700±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: 625±50 rpm (VQ30DE engine)** **M/T: 675±50 rpm (VQ20DE engine)** **A/T: 700±50 rpm (in "P" or "N" position)** **OK or NG**	
OK ▶	GO TO 25.
NG ▶	GO TO 16.

16	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-41. **Which is the result CMPLT or INCMP?** **CMPLT or INCMP**	
CMPLT ▶	GO TO 17.
INCMP ▶	1. Follow the construction of "Idle Air Volume Leaning". 2. GO TO 16.

17	CHECK TARGET IDLE SPEED AGAIN
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 625±50 rpm (VQ30DE engine)** **M/T: 675±50 rpm (VQ20DE engine)** **A/T: 700±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: 625±50 rpm (VQ30DE engine)** **M/T: 675±50 rpm (VQ20DE engine)** **A/T: 700±50 rpm (in "P" or "N" position)**	
OK or NG	
OK ▶	GO TO 23.
NG (Models with Euro-OBD system) ▶	GO TO 19.
NG (Models without Euro-OBD system) ▶	GO TO 18.

18	CHECK IACV-AAC VALVE CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check IACV-AAC valve circuit for open and short. Refer to "Diagnostic Procedure", EC-472.	
OK or NG	
OK ▶	GO TO 19.
NG ▶	1. Repair or replace. 2. GO TO 20.

19	REPLACE IACV-AAC VALVE
Replace IACV-AAC valve.	
▶	GO TO 20.

20	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-41. **Which is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	GO TO 21.
INCMP ▶	1. Follow the construction of "Idle Air Volume Learning". 2. GO TO 16.

21	CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

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

M/T: 625±50 rpm (VQ30DE engine)
M/T: 675±50 rpm (VQ20DE engine)
A/T: 700±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: 625±50 rpm (VQ30DE engine)
M/T: 675±50 rpm (VQ20DE engine)
A/T: 700±50 rpm (in "P" or "N" position)

OK or NG

OK	▶	GO TO 23.
NG	▶	GO TO 22.

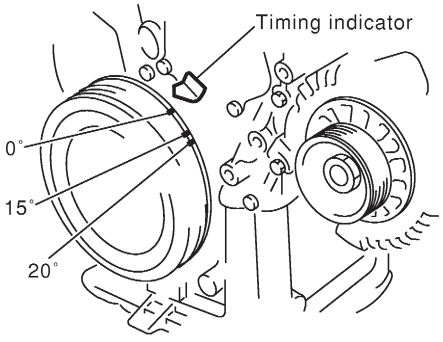
22	CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is rarely the case.)
2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)", EC-60.

	▶	GO TO 16.

23	CHECK IGNITION TIMING

1. Start engine and warm it up to normal operating temperature.
2. Check ignition timing at idle using a timing light.



SEF572X

Ignition timing:

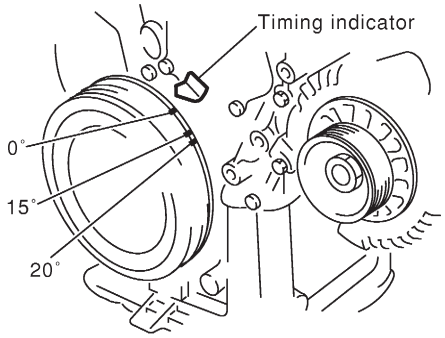
M/T 15°±5° BTDC (VQ30DE engine)
M/T 9°±5° BTDC (VQ20DE engine)
A/T 15°±5° BTDC (in "P" or "N" position) (VQ30DE engine)
A/T 9°±5° BTDC (in "P" or "N" position) (VQ20DE engine)

OK or NG

OK	▶	GO TO 31.
NG	▶	GO TO 24.

24	CHECK TIMING CHAIN INSTALLATION
Check timing chain installation. Refer to EM-28, "Installation".	
OK or NG	
OK ▶	GO TO 22.
NG ▶	1. Repair the timing chain installation. 2. GO TO 16.

25	CHECK IGNITION TIMING
1. Start engine and let it idle. 2. Check ignition timing at idle using a timing light.	



SEF572X

Ignition timing:
M/T 15°±5° BTDC (VQ30DE engine)
M/T 9°±5° BTDC (VQ20DE engine)
A/T 15°±5° BTDC (in "P" or "N" position) (VQ30DE engine)
A/T 9°±5° BTDC (in "P" or "N" position) (VQ20DE engine)

OK or NG

OK ▶	GO TO 31.
NG ▶	GO TO 26.

26	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-41. **Which is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	GO TO 27.
INCMP ▶	1. Follow the construction of "Idle Air volume Learning". 2. GO TO 26.

27	CHECK TARGET IDLE SPEED AGAIN
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 625±50 rpm (VQ30DE engine)** **M/T: 675±50 rpm (VQ20DE engine)** **A/T: 700±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: 625±50 rpm (VQ30DE engine)** **M/T: 675±50 rpm (VQ20DE engine)** **A/T: 700±50 rpm (in "P" or "N" position)**	
OK or NG	
OK ▶	GO TO 29.
NG ▶	GO TO 28.

28	CHECK ECM FUNCTION
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is rarely the case.) 2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)", EC-60.	
▶	GO TO 26.

29	CHECK IGNITION TIMING AGAIN
Check ignition timing again. Refer to Test No. 25.	
OK or NG	
OK ▶	GO TO 31.
NG ▶	GO TO 30.

30	CHECK TIMING CHAIN INSTALLATION
Check timing chain installation. Refer to EM-28, "Installation".	
OK or NG	
OK ▶	GO TO 28.
NG ▶	1. Repair the timing chain installation. 2. GO TO 26.

31	ERASE UNNECESSARY DTC
After this inspection, unnecessary DTC No. might be displayed. Erase the stored memory in ECM and TCM (Transmission control module). Refer to "How to Erase Emission-Related Diagnostic Information", EC-56 and AT-38, "HOW TO ERASE DTC".	
▶	**INSPECTION END**

DTC Inspection Priority Chart

NFEC0652

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

Priority	Detected items (DTC)
1	● P0100 Mass air flow sensor ● P0110 Intake air temperature sensor ● P0115 Engine coolant temperature sensor ● P0120 Throttle position sensor ● P0180 Fuel tank temperature sensor ● P0325 Knock sensor ● P0335 P1336 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0500 Vehicle speed sensor ● P0605 ECM ● P1320 Ignition signal ● P1335 Crankshaft position sensor (REF) ● P1605 A/T diagnosis communication line ● P1706 Park/Neutral position (PNP) switch
2	● P0130-P0134, P0150-P0154 Heated oxygen sensor 1 (front) ● P0135 P0155 Heated oxygen sensor 1 heater (front) ● P0137-P0140, P0157-P0160 Heated oxygen sensor 2 (rear) ● P0141 P0161 Heated oxygen sensor 2 heater (rear) ● P0443 EVAP canister purge volume control solenoid valve ● P0510 Closed throttle position switch ● P0705-P0755 P1705 P1760 A/T related sensors, solenoid valves and switches
3	● P0171 P0172 P0174 P0175 Fuel injection system function ● P0306 - P0300 Misfire ● P0420 P0430 Three way catalyst function ● P0505 IACV-AAC valve ● P0731-P0734 A/T function ● P1131 Swirl control valve control solenoid valve

Fail-safe Chart

=NFEC0653

The ECM enters fail-safe mode, if any of the following malfunctions is detected due to the open or short circuit. When the ECM enters the fail-safe mode of ECM, the MI illuminates.

DTC No.	Detected items	Engine operating condition in fail-safe mode	
P0100	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.	
P0115	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)
P0120	Throttle position sensor circuit	Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor.	
		Condition	Driving condition
		When engine is idling	Normal
		When accelerating	Poor acceleration
P1335	Crankshaft position sensor (REF) circuit	Compression TDC signal (120° signal) is controlled by camshaft position sensor (PHASE) signal and crankshaft position sensor (POS) signal. Ignition timing will be delayed 0° to 2°.	
Unable to access ECM	ECM	**ECM fail-safe activating condition** The computing function of the ECM was judged to be malfunctioning. When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MI on the instrument panel lights to warn the driver. However it is not possible to access ECM and DTC cannot be confirmed. **Engine control with fail-safe** When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.	
			ECM fail-safe operation
		Engine speed	**Engine speed will not rise more than 3,000 rpm**
		Fuel injection	Simultaneous multiport fuel injection system
		Ignition timing	Ignition timing is fixed at the preset valve
		Fuel pump	Fuel pump relay is “ON” when engine is running and “OFF” when engine stalls
		IACV-AAC valve	Full open
		Cooling fans	Cooling fan relay “ON” (High speed condition) when engine is running, and “OFF” when engine stalls.
		Replace ECM, if ECM fail-safe condition is confirmed.	

Symptom Matrix Chart

SYSTEM — BASIC ENGINE CONTROL SYSTEM

NFEC0041

NFEC0041S01

		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-533
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-37
	Injector circuit	1	1	2	3	2		2	2			2			EC-523
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-32
Air	Positive crankcase ventilation system												1		EC-35
	Incorrect idle speed adjustment						1	1	1	1		1			EC-90
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-324, 469
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-90
	Ignition circuit	1	1		2	2		2	2			2			EC-369, EC-495
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-127
Air conditioner circuit							3			3				2	HA section

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

(continued on next page)

Symptom Matrix Chart (Cont'd)

		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	
Engine control	Crankshaft position sensor (REF) circuit	2	2												EC-380
	Crankshaft position sensor (POS) circuit														EC-295, 451, 387
	Camshaft position sensor (PHASE) circuit	3													EC-303
	Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-134
	Heated oxygen sensor 1 (front) circuit				3										EC-158, 415
	Engine coolant temperature sensor circuit	1					3			3					EC-146
	Throttle position sensor circuit						2			2					EC-151
	Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-90
	Vehicle speed sensor circuit		2	3		3						3			EC-320, 465
	Knock sensor circuit			2											EC-289
	ECM	2	2	3	3	3	3	3	3	3	3				EC-104, 341
	Start signal circuit	2													EC-529
	Park/Neutral position switch circuit			3		3		3	3			3			EC-398, 510
	Power steering oil pressure switch circuit		2												EC-543
	Electronic controlled engine mount control circuit														EC-539
	Electrical load signal circuit														EC-552

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

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE MECHANICAL & OTHER

NFEC0041S02

		SYMPTOM													Reference section
		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 section
	Fuel piping			5	5	5		5	5			5			—
	Vapor lock														
	Valve deposit	5		5	5	5		5	5			5			
	Poor fuel (Heavy weight gasoline, Low octane)														
Air	Air duct	5	5	5	5	5	5	5	5	5		5			
	Air cleaner														
	Air leakage from air duct (Mass air flow sensor — throttle body)														
	Throttle body, Throttle wire														FE section
	Air leakage from intake manifold/ Collector/Gasket														—
Cranking	Battery	1	1	1		1		1	1			1		1	EL section
	Alternator circuit														
	Starter circuit	3													
	Flywheel/Drive plate	6													EM section
	PNP switch	4													AT section

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

(continued on next page)

Symptom Matrix Chart (Cont'd)

		SYMPTOM													Reference section
		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	
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM section
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			
	Camshaft														
	Intake valve												3		
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5	5	5		5					FE section
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			MA, EM, LC section
	Oil level (Low)/Filthy oil														LC section
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			
	Thermostat									5					
	Water pump														
	Water gallery														
	Cooling fan									5					EC section
	Coolant level (low)/Contaminated coolant														MA section

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

Symptom Matrix Chart (Cont'd)

	SYMPTOM													Reference section
	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	
NVIS (NISSAN Vehicle Immobilizer System — NATS)	1	1												EC-60 or EL section

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

CONSULT-II Reference Value in Data Monitor Mode

NFEC0042

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.
- If the real-time diagnosis results are NG and the on board diagnostic system results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED CKPS·RPM (POS)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
POS COUNT	• Engine: Running		179 - 181
MAS A/F SE-B1	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	1.2 - 1.8V
		2,500 rpm	1.6 - 2.2V
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1) HO2S1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 (B1) HO2S2 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION
VHCL 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
THRTL POS SEN	● Engine: After warming up, idle the engine	Throttle valve: fully closed	0.15 - 0.85V
	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	3.5 - 4.7V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/P SW CLSD THL POS	● Engine: After warming up, idle the engine	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	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
		Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
AMB TEMP SW	● Ignition switch: ON ● Compare ambient air temperature with the following:	Below 19°C (66°F)	OFF
		Above 25°C (77°F)	ON
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
INJ PULSE-B2 INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 2.8 msec
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	2.0 - 3.2 msec
		2,000 rpm	1.4 - 2.6 msec
IGN TIMING	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	9°±5° BTDC (VQ20DE) 15°±5° BTDC (VQ30DE)
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	2 - 10 step
		2,000 rpm	—
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	0 %
		2,000 rpm	—
A/F ALPHA-B2 A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	54 - 155%
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking		ON
	Except as shown above		OFF
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: "OFF"	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	Low
		Engine coolant temperature is 105°C (221°F) or more	HIGH
HO2S1 HTR (B1) HO2S1 HTR (B2)	● Engine speed: Below 3,600 rpm		ON
	● Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1) HO2S2 HTR (B2)	● Ignition switch: ON (Engine stopped) ● Engine speed: Above 3,600 rpm		OFF
	● Engine speed: Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]		ON
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	14.0 - 33.0%
		2,500 rpm	12.0 - 25.0%
ABSOL TH·P/S	● Engine: After warming up	Throttle valve: fully closed	0.0%
	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	Approx. 80%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	2.0 - 6.0 g·m/s
		2,500 rpm	7.0 - 20.0 g·m/s
ABSOL PRES/SE	● Ignition switch: ON		Approx. 4.4V
SWRL CONT S/V	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON
		Engine coolant temperature is above 50°C (122°F).	OFF
ENGINE MOUNT	● Engine: Running	Idle	"IDLE"
		2,000 rpm	"TRVL"

Major Sensor Reference Graph in Data Monitor Mode

NFEC0043

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

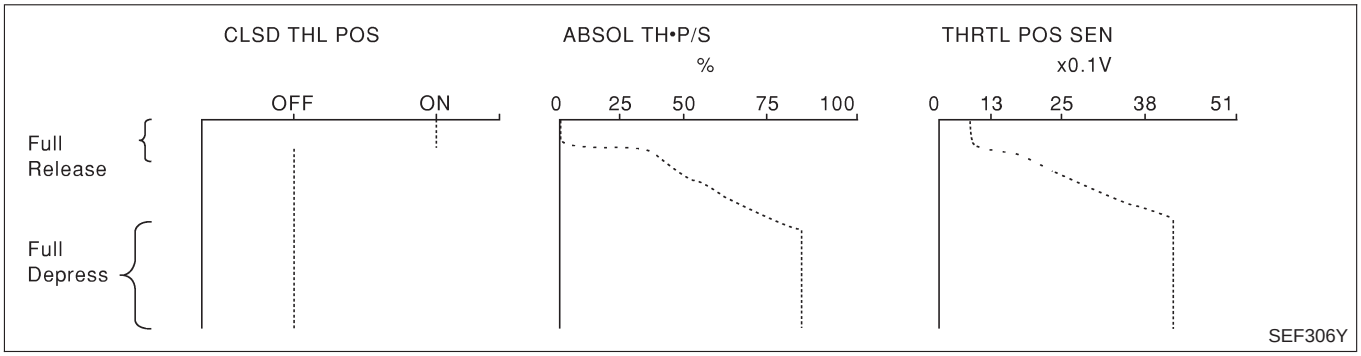
THRTL POS SEN, ABSOL TH·P/S, CLSD THL POS

NFEC0043S01

Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL POS" when depressing the accelerator pedal with the ignition switch "ON".

The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL POS" is changed from "ON" to "OFF".

Major Sensor Reference Graph in Data Monitor Mode (Cont'd)

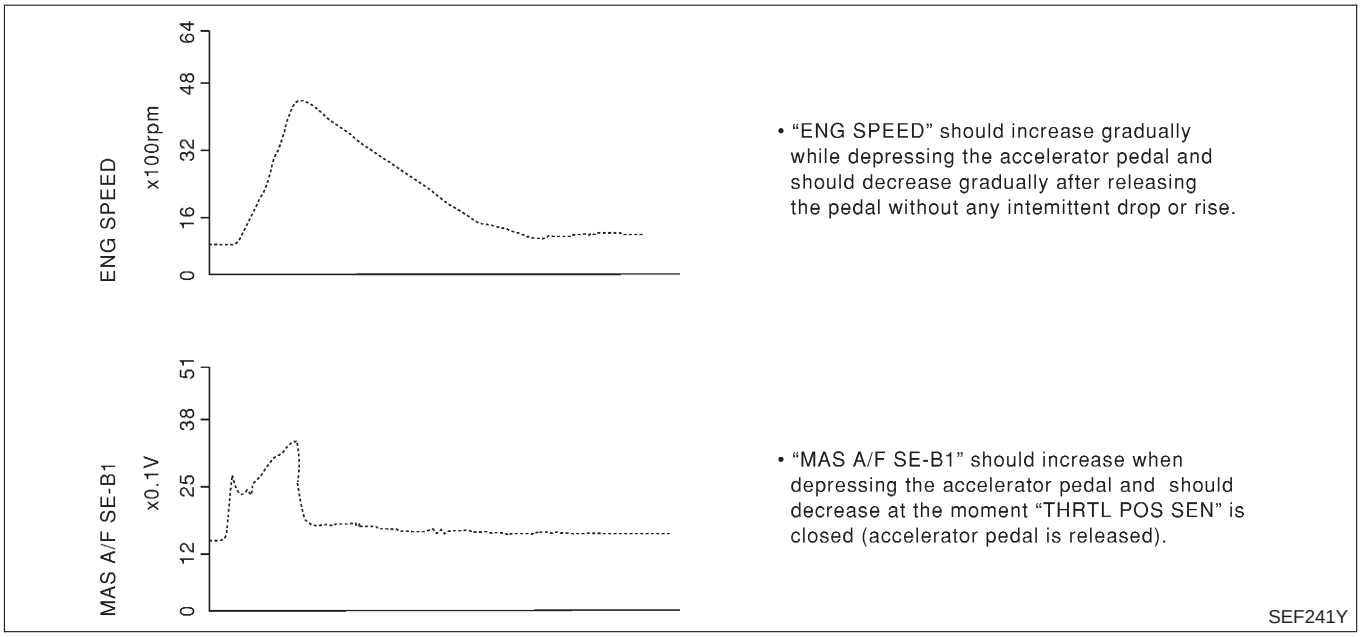


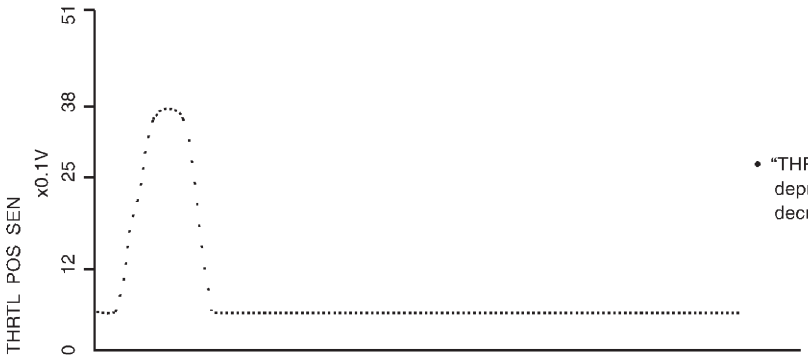
ENG SPEED, MAS A/F SE-B1, THRTL POS SEN, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

NFEC0043S02

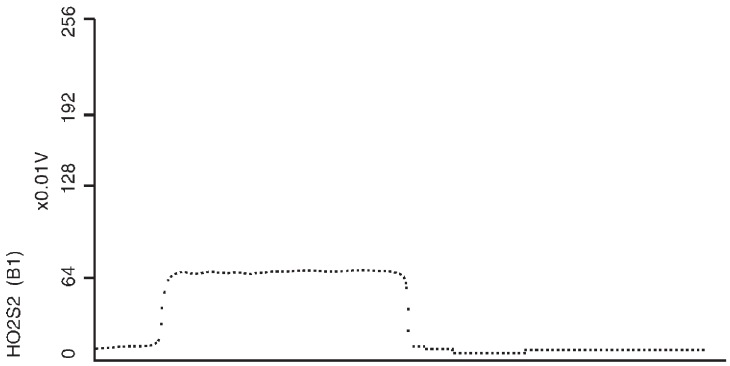
Below is the data for "ENG SPEED", "MAS A/F SE-B1", "THRTL POS SEN", "HO2S2 (B1)", "HO2S1 (B1)" and "INJ PULSE-B1" when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

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

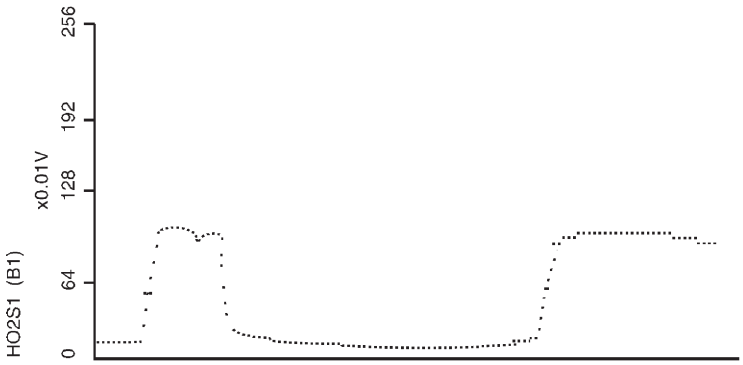




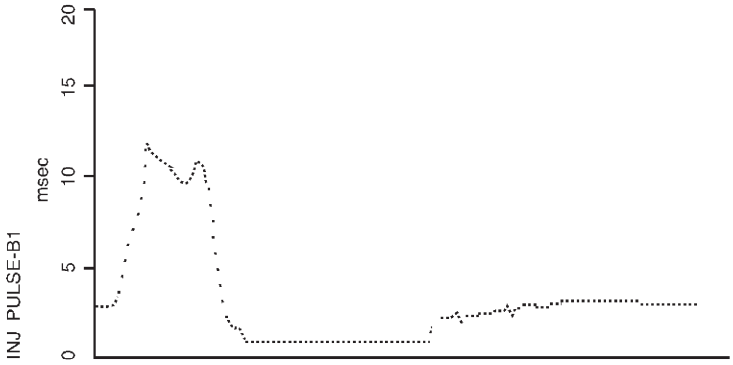
- "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



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

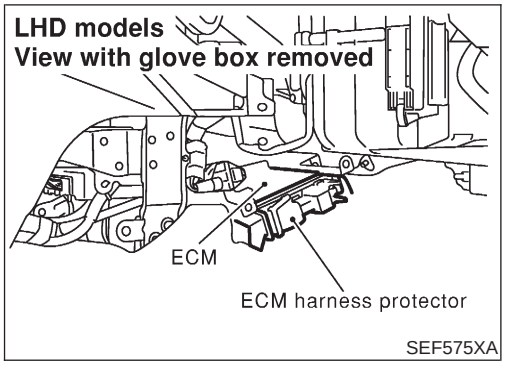


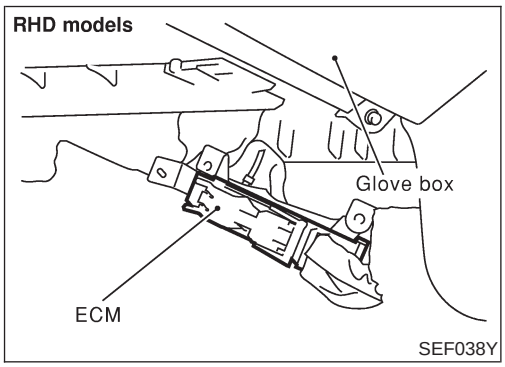
- "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.

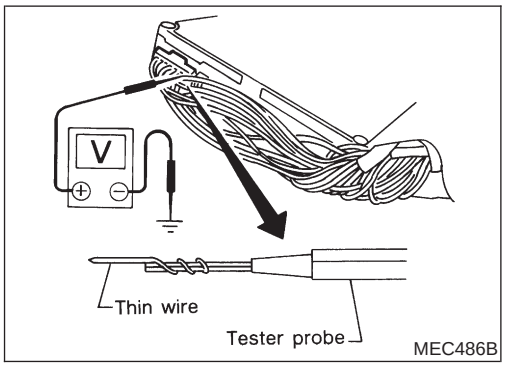


- "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

SEF242YC







ECM Terminals and Reference Value

NFEC0044

PREPARATION

NFEC0044S01

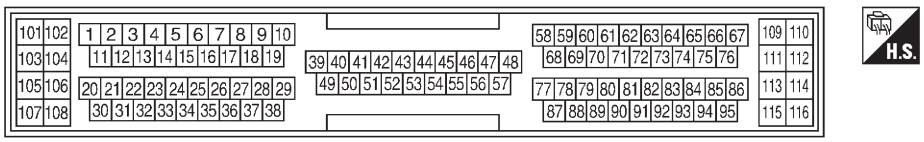
1. ECM is located behind the instrument lower cover. For this inspection, remove instrument lower cover.

2. Remove ECM harness protector.

3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
- Open harness securing clip to make testing easier.
- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.

ECM HARNESS CONNECTOR TERMINAL LAYOUT

NFEC0044S02



SEF970W

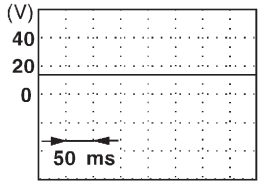
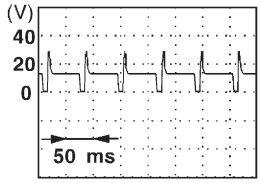
ECM INSPECTION TABLE

NFEC0044S03

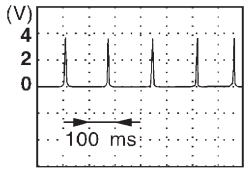
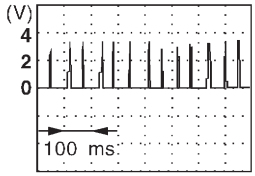
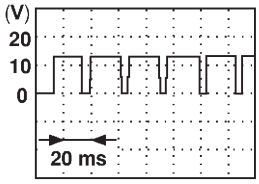
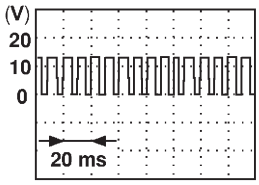
Specification data are reference values and are measured between each terminal and ground.

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.

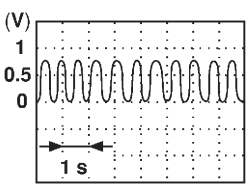
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	PU/R	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF994U
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	BATTERY VOLTAGE (11 - 14V)  SEF995U
2	R/L	Heated oxygen sensor 1 heater (front) (bank 2)	**[Engine is running]** ● Engine speed is below 3,600 rpm.	0 - 1.0V
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
3	OR/L	Heated oxygen sensor 1 heater (front) (bank 1)	**[Engine is running]** ● Engine speed is below 3,600 rpm.	0 - 1.0V
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
4	R/L	Heated oxygen sensor 2 heater (rear) (bank 2)	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
5	P/B	Heated oxygen sensor 2 heater (rear) (bank 1)	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
6 7 8 17	W/PU Y/B Y GY/L	IACV-AAC valve	**[Engine is running]** ● Idle speed	0.1 - 14V
16	Y/G	VIAS control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is above 5,000 rpm.	0 - 1.0V

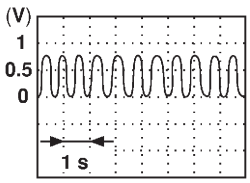
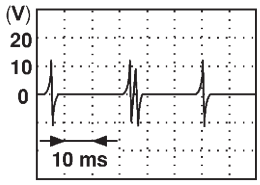
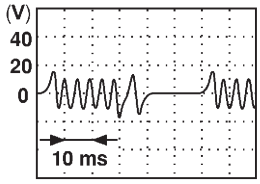
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22 23 30 31 32	Y/R G/R L/R GY PU/W GY/R	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 3 Ignition signal No. 4 Ignition signal No. 5 Ignition signal No. 6	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.2V★  SEF399T
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	0.1 - 0.3V★  SEF645T
25	W/G	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	9 - 11V★  SEF579X
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	9 - 11V★  SEF580X
26	W/B	ECM relay (Self shutt-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.5V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
27	B/R	Air conditioner relay	**[Engine is running]** ● Both A/C switch and blower switch are "ON" (Compressor is operating).	0 - 1.0V
			[Engine is running] ● A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
28	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.5V
			[Ignition switch "ON"] ● 1 second passed after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

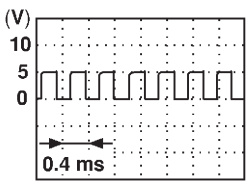
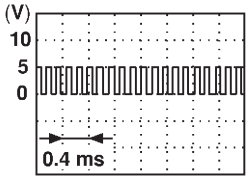
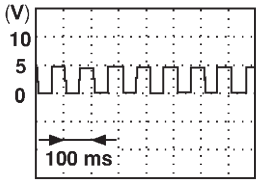
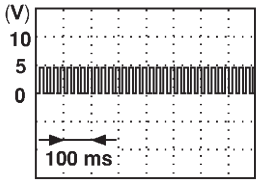
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
29	G	Swirl control valve control solenoid valve	**[Engine is running]** ● Idle speed ● Engine coolant temperature is between 15 to 50°C (59 to 122°F).	0 - 1.0V
			[Engine is running] ● Idle speed ● Engine coolant temperature is above 50°C (122°F).	BATTERY VOLTAGE (11 - 14V)
34	LG	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is operating at high speed.	0 - 1.0V
			[Engine is running] ● Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
35	BR/R	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is operating.	0 - 1.0V
			[Engine is running] ● Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
36	Y	A/T signal No. 3	**[Engine is running]** ● Idle speed	Approximately 0 - 5V Output voltage fluctuates periodically.
37	LG	A/T signal No. 5	**[Engine is running]** ● Idle speed	Approximately 0 - 5V Output voltage fluctuates periodically.
38	LG/B	MI	**[Ignition switch "ON"]**	0 - 1.0V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
42	BR/W	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V
43	R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
44	G/OR (A/T) G/W (M/T)	PNP switch	**[Ignition switch "ON"]** ● Gear position is "Neutral position" (M/T models). ● Gear position is "P" or "N" (A/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)
45	G/B	Air conditioner switch signal	**[Engine is running]** ● Both A/C switch and blower switch are "ON".	Approximately 0V
			[Engine is running] ● A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
46	W/L	Ambient air temperature switch signal	**[Engine is running]** ● Idle speed ● Ambient air temperature is above 25°C (77°F). ● Air conditioner is operating.	0V
			[Engine is running] ● Idle speed ● Ambient air temperature is above 25°C (77°F). ● Air conditioner is not operating.	Approximately 5V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned.	0 - 1.0V
			[Engine is running] ● Steering wheel is not being turned.	BATTERY VOLTAGE (11 - 14V)
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
49	W	Electronic controlled engine mount-1	**[Engine is running]** ● Idle speed	0 - 1.0V
			[Engine is running] ● Except the above	BATTERY VOLTAGE (11 - 14V)
50	W/R	Electronic controlled engine mount-2	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Except the above	0 - 1.0V
51	PU	A/C cut signal	**[Engine is running]** ● Air conditioner is operating.	0 - 0.5V
52	W/G	Electrical load signal	**[Engine is running]** ● Rear window defogger: ON ● Hi-beam headlamp: ON	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Electrical load: OFF	0V
56	GY/L	Throttle position switch (Closed position)	**[Engine is running]** ● Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Accelerator pedal depressed	Approximately 0V
57	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60	BR/W	A/T diagnosis communication line	**[Engine is running]** ● Idle speed	Approximately 0 - 2.0V Output voltage fluctuates periodically.
61	W	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.2 - 1.8V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.2V
62	W	Heated oxygen sensor 1 (front) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63	W	Heated oxygen sensor 1 (front) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V
64	Y/G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
65 75	W W	Crankshaft position sensor (REF)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.3V★ (AC voltage)  SEF581X
66 76	W W	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 4.2V★ (AC voltage)  SEF582X
67	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
68	BR	A/T signal No. 1	**[Engine is running]** ● Idle speed	Approximately 0 - 5V Output voltage fluctuates periodically.
69	GY	Data link connector	**[Ignition switch "ON"]** ● CONSULT-II is turned "ON".	Approximately 0V
70	Y	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
71	W	Heated oxygen sensor 2 (rear) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
72	W	Heated oxygen sensor 2 (rear) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
73	B	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
77	GY	A/T signal No. 2	**[Engine is running]** ● Idle speed	Approximately 0 - 5V Output voltage fluctuates periodically.
78	OR	A/T signal No. 4	**[Engine is running]** ● Idle speed	Approximately 0 - 5V Output voltage fluctuates periodically.
80	W	Absolute pressure sensor	**[Ignition switch "ON"]**	Approximately 4.4V
81	W	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	0.36 - 3.88V
82	W	Throttle position sensor signal output	**[Engine is running]** ● **Warm-up condition** ● Accelerator pedal fully released	Approximately 0.4V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	Approximately 4V
85	W	Crankshaft position sensor (POS)	**[Engine is running]** ● Idle speed	Approximately 2.4V  SEF057V
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 2.3V  SEF058V
86	P/L	Vehicle speed sensor	**[Engine is running]** ● Jack up front wheels. ● In 1st gear position ● 10 km/h (6 MPH)	Approximately 2.5V  SEF583X
			[Engine is running] ● Jack up front wheels. ● In 2nd gear position ● 30 km/h (19 MPH)	Approximately 2.0V  SEF584X

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
91	L/W	Throttle position sensor	**[Engine is running]** ● **Warm-up condition** ● Accelerator pedal fully released	0.15 - 0.85V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.5 - 4.7V
92	P/L	Fuel tank temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature.
93	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
95	BR	Data link connector	[**Ignition switch "ON"]** ● CONSULT-II is turned "ON".	Approximately 0V
101 102 103 104 105 107	R/B L/W R/W PU/R R/Y R/L	Injector No. 1 Injector No. 5 Injector No. 2 Injector No. 6 Injector No. 3 Injector No. 4	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
106 108	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
111	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
115	OR	Data link connector	**[Ignition switch "ON"]** ● CONSULT-II is turned "ON".	Approximately 2 - 11V

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

Description

NFEC0872

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/B2 (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)

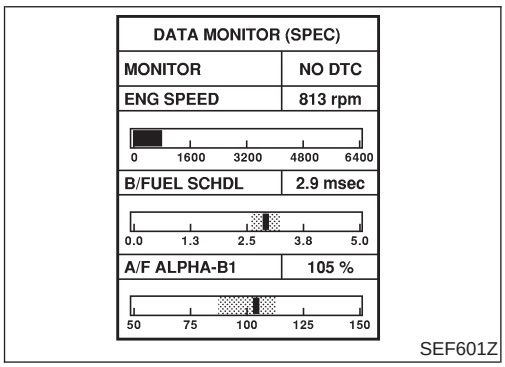
Testing Condition

NFEC0873

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.9836 - 1.0435 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 or CVT models, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T or CVT fluid temperature sensor signal) indicates less than 0.9V. For M/T models, drive vehicle for 5 minutes after the engine is warmed up to normal operating temperature.

*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Cooling fans are not operating. Steering wheel is straight ahead.



Inspection Procedure

NFEC0874

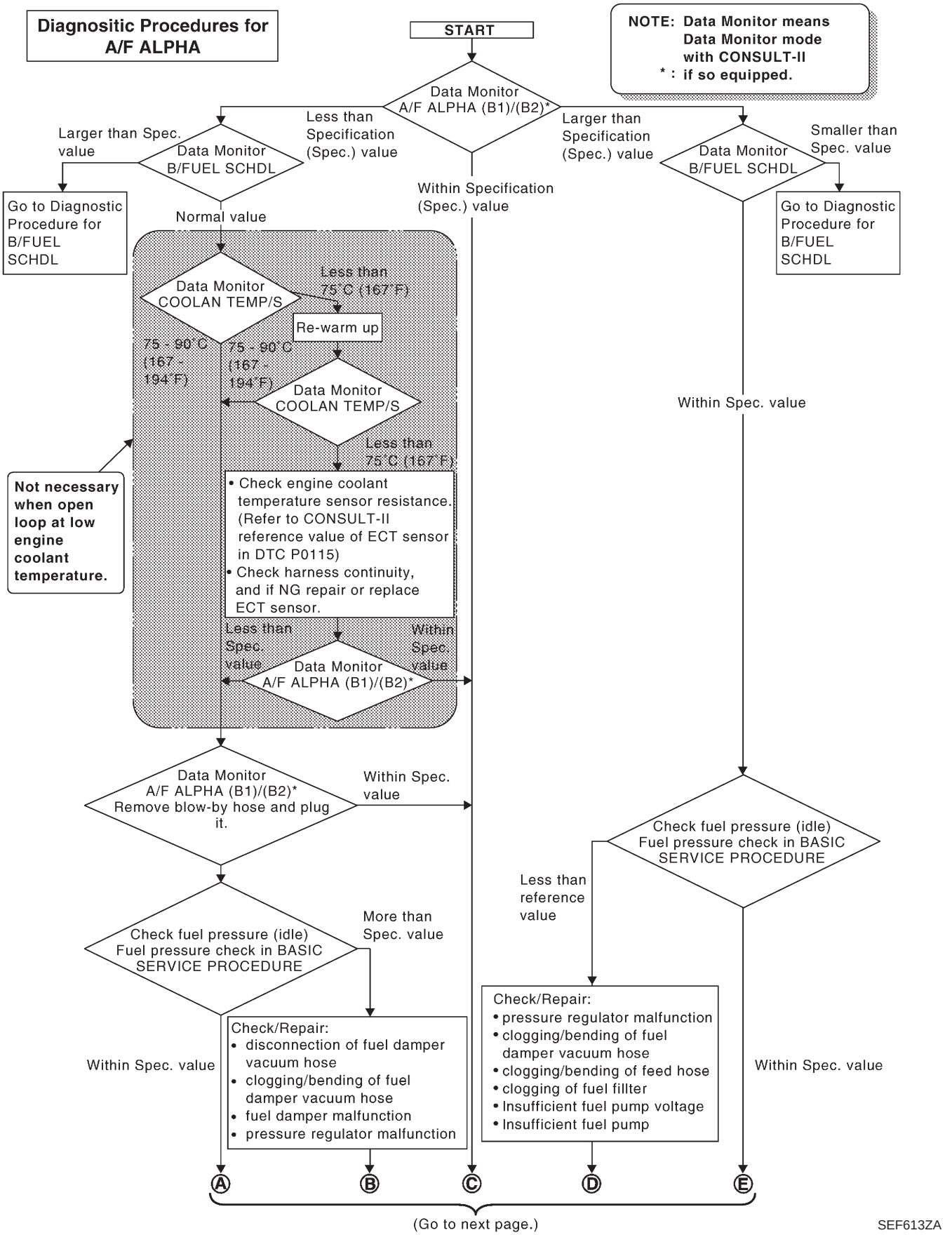
NOTE:

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

1. Perform “Basic Inspection”, EC-90.
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 “Diagnostic Procedure”, EC-123.

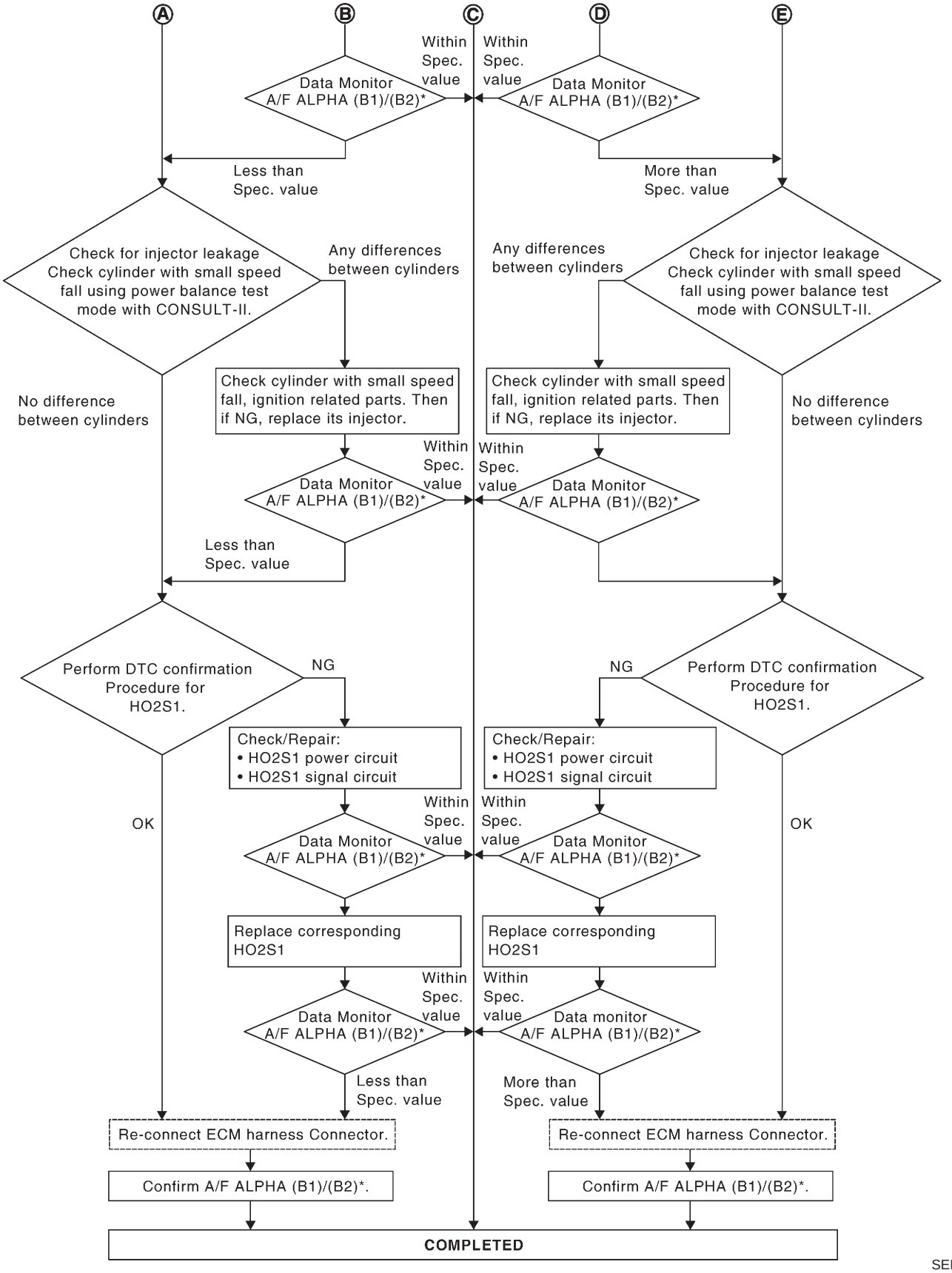
Diagnostic Procedure

NFEC0875

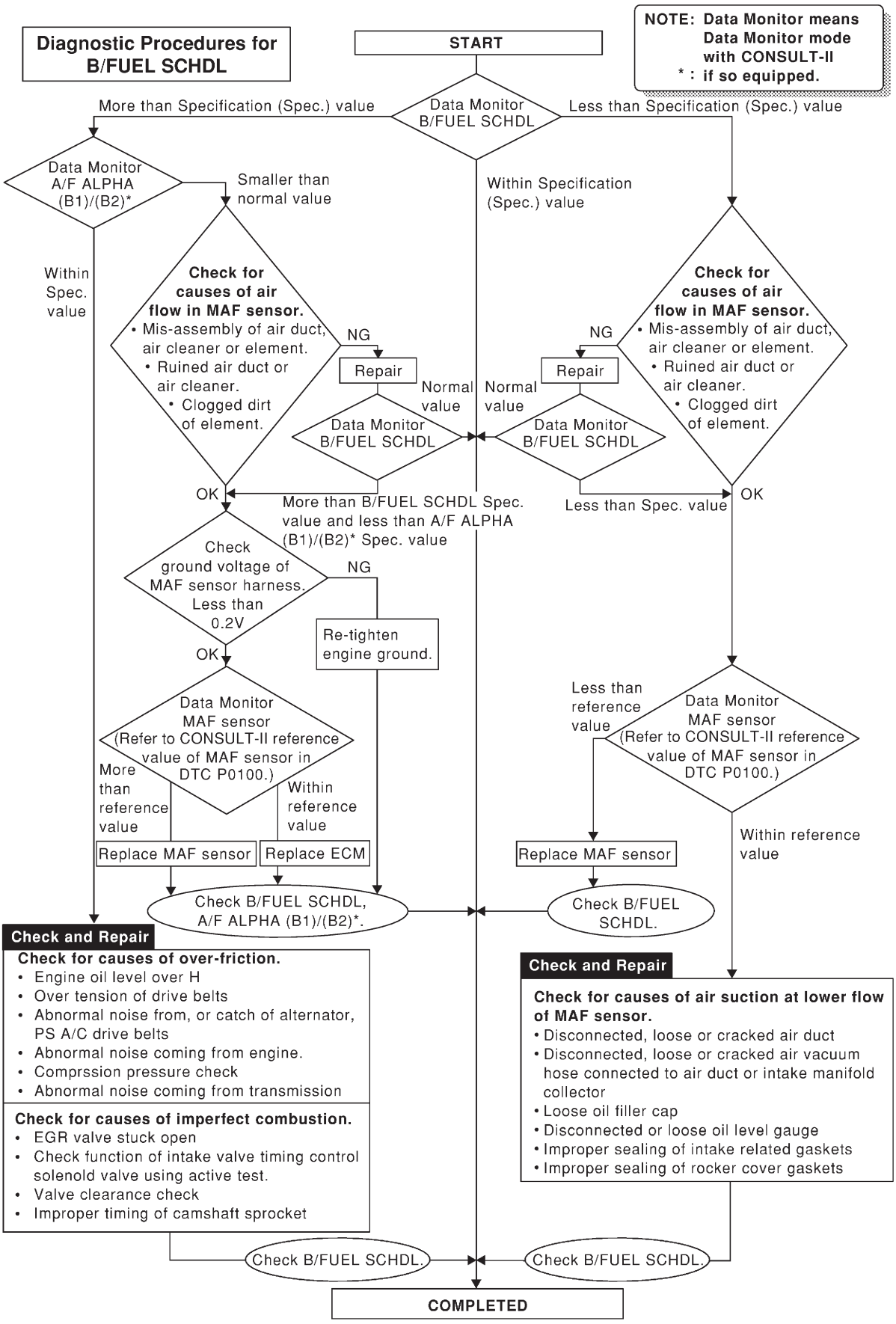


SEF613ZA

Diagnostic Procedure (Cont'd)



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 in DTC P0100.)
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
SEF615Z

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

Description

NFEC0654

Intermittent incidents (I/I) may occur. In many cases, the problem 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 problem area.

COMMON I/I REPORT SITUATIONS

NFEC0654S01

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 problem area.

Diagnostic Procedure

NFEC0655

1	**INSPECTION START**
Erase (1st trip) DTCs. Refer to "How to Erase Emission-related Diagnostic Information", EC-56, EC-59.	
▶	GO TO 2.

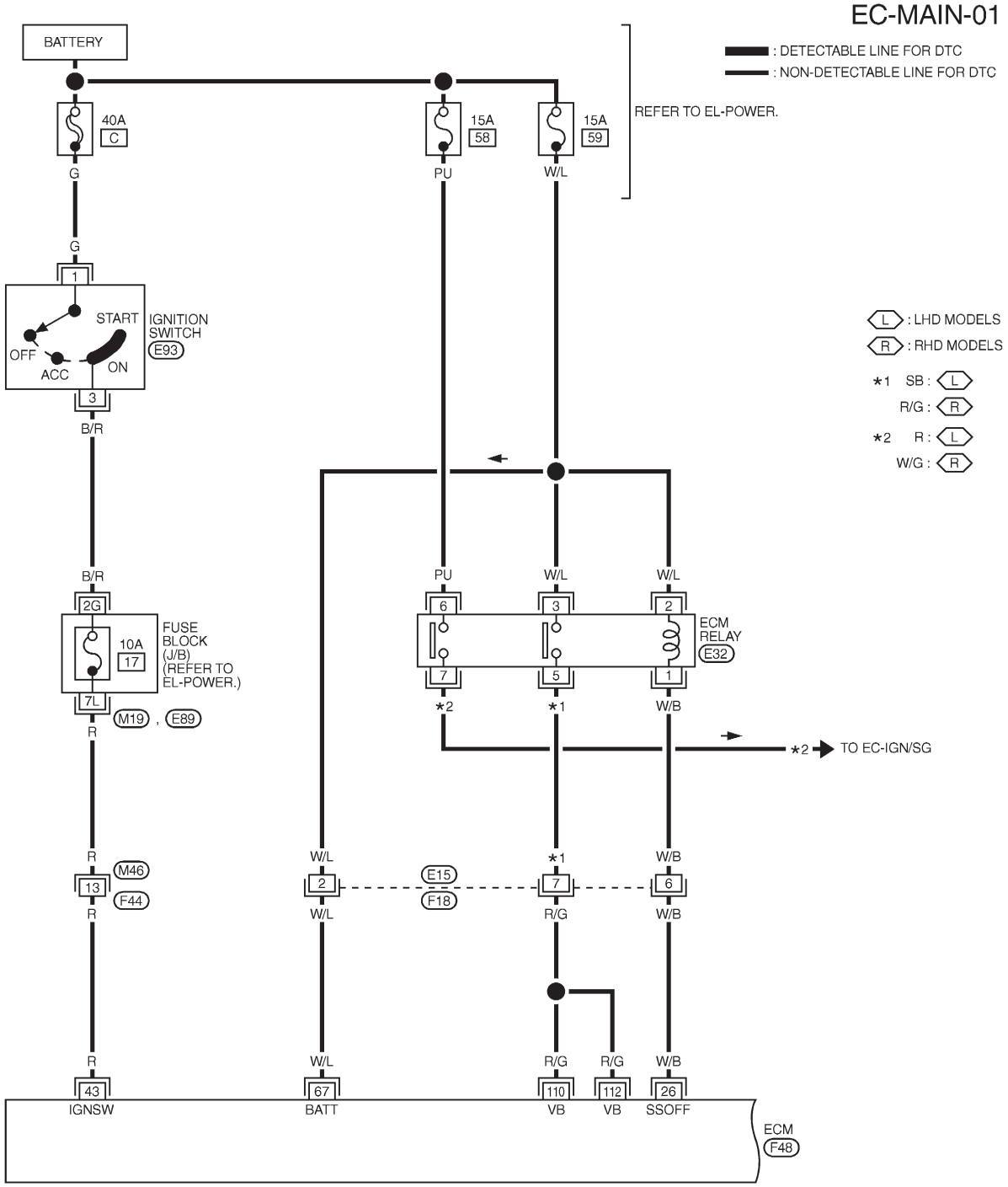
2	**CHECK GROUND TERMINALS**
Check ground terminals for corroding or loose connection. Refer to GI-27, "GROUND INSPECTION".	
OK or NG	
OK ▶	GO TO 3.
NG ▶	Repair or replace.

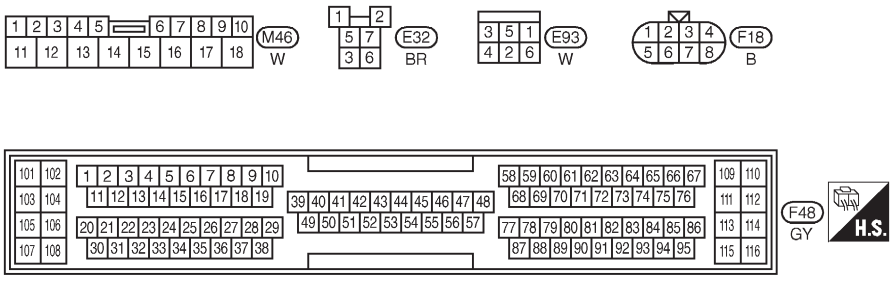
3	**SEARCH FOR ELECTRICAL INCIDENT**
Perform GI-22, "Incident Simulation Tests".	
OK or NG	
OK ▶	**INSPECTION END**
NG ▶	Repair or replace.

Main Power Supply and Ground Circuit

WIRING DIAGRAM

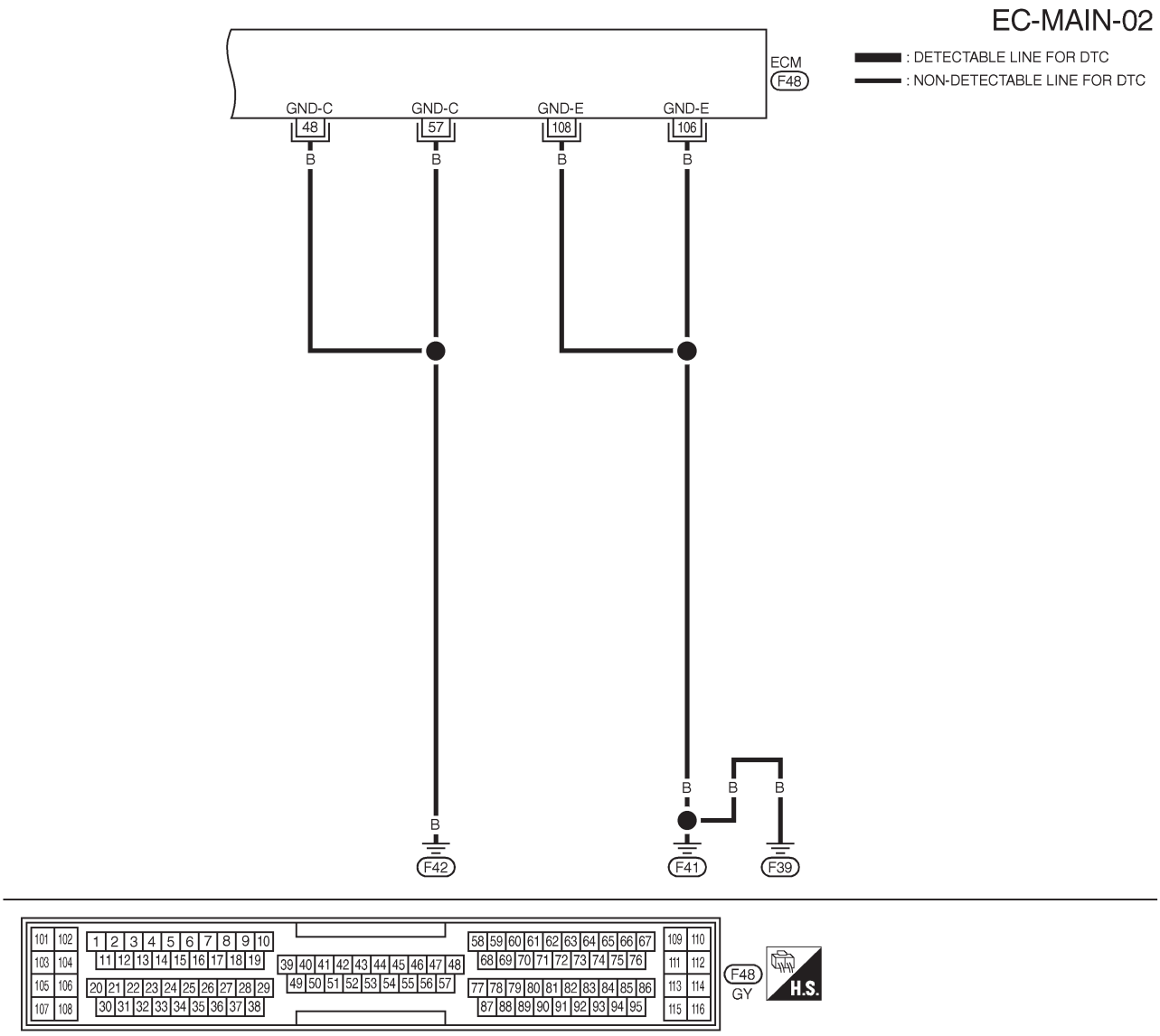
NFEC0047





REFER TO THE FOLLOWING.
M19 , E89 -FUSE BLOCK-JUNCTION BOX (J/B)

MEC834C



MEC717C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
26	W/B	ECM RELAY (SELF-SHUTOFF)	ENGINE RUNNING FOR A FEW SECONDS AFTER TURNING IGN OFF	0 - 1.5V
			A FEW SECONDS PASSED AFTER TURNING IGN OFF	BATTERY VOLTAGE
43	R	IGN	IGN OFF	0V
			IGN ON	BATTERY VOLTAGE
48	B	ECM GROUND	ENGINE RUNNING AT IDLE SPEED	ENGINE GROUND
57	B			
67	W/L	POWER SUPPLY (BACK-UP)	IGN OFF	BATTERY VOLTAGE
106	B	ECM GROUND	ENGINE RUNNING AT IDLE SPEED	ENGINE GROUND
108	B			
110	R/G	POWER SUPPLY FOR ECM	IGN ON	BATTERY VOLTAGE
112	R/G			

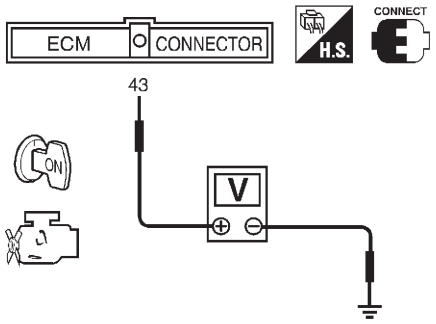
SEF366Z

DIAGNOSTIC PROCEDURE

NFEC0049

1	INSPECTION START
Start engine. **Is engine running?** **Yes or No**	
Yes ▶	GO TO 9.
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 43 and ground with CONSULT-II or tester.	



Voltage: Battery voltage

SEF291X

OK or NG

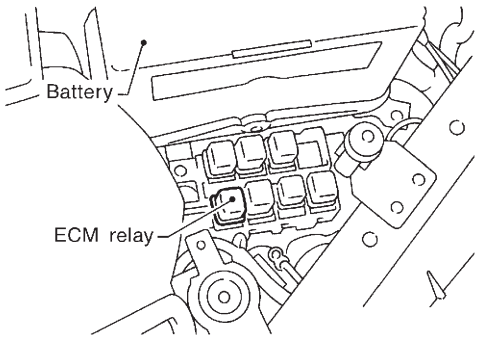
OK ▶	GO TO 4.
NG ▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M46, F44 ● Fuse block (J/B) connector M19, E89 ● 10A fuse ● Harness for open or short between ECM and ignition switch	
▶	Repair 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 48, 57, 106, 108 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.

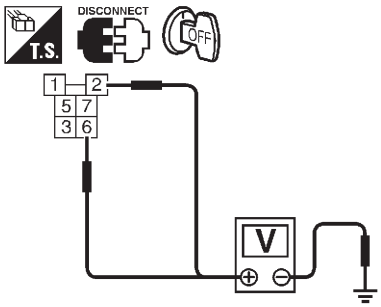
5	CHECK POWER SUPPLY-II

1. Disconnect ECM relay.



SEF589PB

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



Voltage: Battery voltage

SEF292X

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuses
- 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 26 and ECM relay terminal 1.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK (Models with Euro-OBD system)	▶	Go to "IGNITION SIGNAL", EC-495.
OK (Models without Euro-OBD system)	▶	Go to "DTC P1320 IGNITION SIGNAL", EC-369.
NG	▶	GO TO 8.

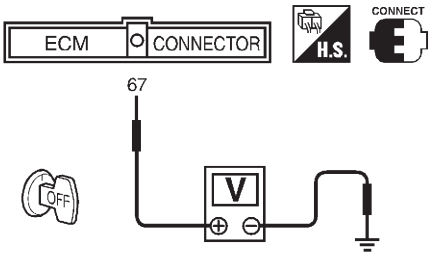
8	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E15, F18
- Harness for open or short between ECM relay and ECM

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

9	CHECK ECM POWER SUPPLY CIRCUIT-II

1. Stop engine.
2. Check voltage between ECM terminal 67 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF293X

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

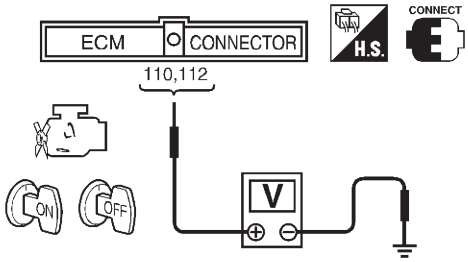
10	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E15, F18
- Harness for open or short between ECM and fuse

	▶	Repair harness or connectors.

11	CHECK ECM POWER SUPPLY CIRCUIT-III

1. Turn ignition switch "ON" and then "OFF".
2. Check voltage between ECM terminals 110, 112 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.

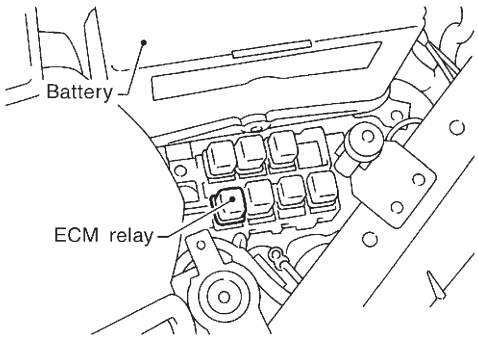
SEF294X

OK or NG

OK	▶	GO TO 17.
NG (Battery voltage does not exist.)	▶	GO TO 12.
NG (Battery voltage exists for more than a few seconds.)	▶	GO TO 14.

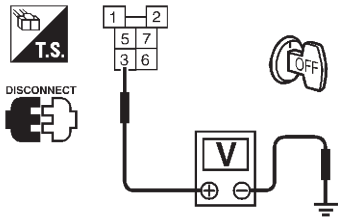
12	CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



SEF589PB

2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF295X

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM relay and 15A fuse

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

14	CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM FOR OPEN AND SHORT

1. Check harness continuity between ECM terminals 110, 112 and ECM relay terminal 5.
   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 16.
NG	▶	GO TO 15.

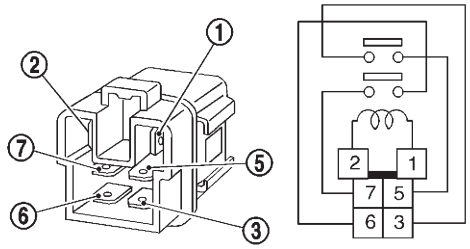
15	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E15, F18
- 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.

16	CHECK 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

SEF296X

OK or NG

OK	▶	GO TO 17.
NG	▶	Replace ECM relay.

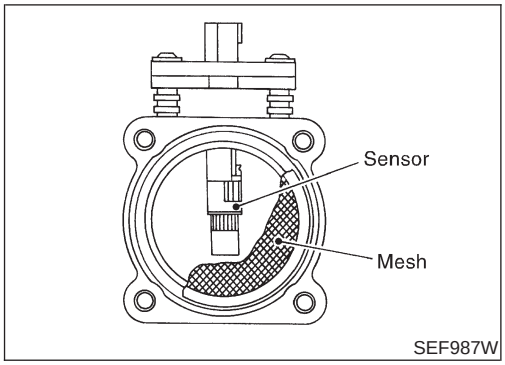
17	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 48, 57, 106, 108 and engine ground.
   Refer to WIRING DIAGRAM.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 18.
NG	▶	Repair open circuit or short to power in harness or connectors.

18	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0050

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 wire that is supplied with electric current from the ECM. The temperature of the hot wire is controlled by the ECM a certain amount. The heat generated by the hot wire 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 wire as air flow increases. The ECM detects the air flow by means of this current change.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0051

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” ● No-load	Idle	1.2 - 1.8V
		2,500 rpm	1.6 - 2.2V
CAL/LD VALUE	ditto	Idle	14.0 - 33.0%
		2,500 rpm	12.0 - 25.0%
MASS AIRFLOW	ditto	Idle	2.0 - 6.0 g·m/s
		2,500 rpm	7.0 - 20.0 g·m/s

On Board Diagnosis Logic

NFEC0053

Malfunction is detected when
(Malfunction A) an excessively high voltage from the sensor is sent to ECM when engine is not running,
(Malfunction B) an excessively low voltage from the sensor is sent to ECM when engine is running,
(Malfunction C) a voltage from the sensor is constantly approx. 1.0V when engine is running.

FAIL-SAFE MODE

NFEC0053S02

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

Possible Cause

NFEC0426

MALFUNCTION A

NFEC0426S01

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Mass air flow sensor

MALFUNCTION B OR C

NFEC0426S02

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Intake air leaks
- Mass air flow sensor

DTC Confirmation Procedure

NFEC0054

Perform "PROCEDURE FOR MALFUNCTION A" first.
If the 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B AND 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.

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION A

NFEC0054S01

With CONSULT-II

NFEC0054S0101

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 6 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-138.

With GST

NFEC0054S0103

Follow the procedure "With CONSULT-II" above.

No Tools

NFEC0054S0102

1) Turn ignition switch "ON", and wait at least 6 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 1st trip DTC is detected, go to "Diagnostic Procedure", EC-138.

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION B AND C

NFEC0054S02

With CONSULT-II

NFEC0054S0201

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and wait 5 seconds at most.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-138.

With GST

NFEC0054S0203

Follow the procedure "With CONSULT-II" above.

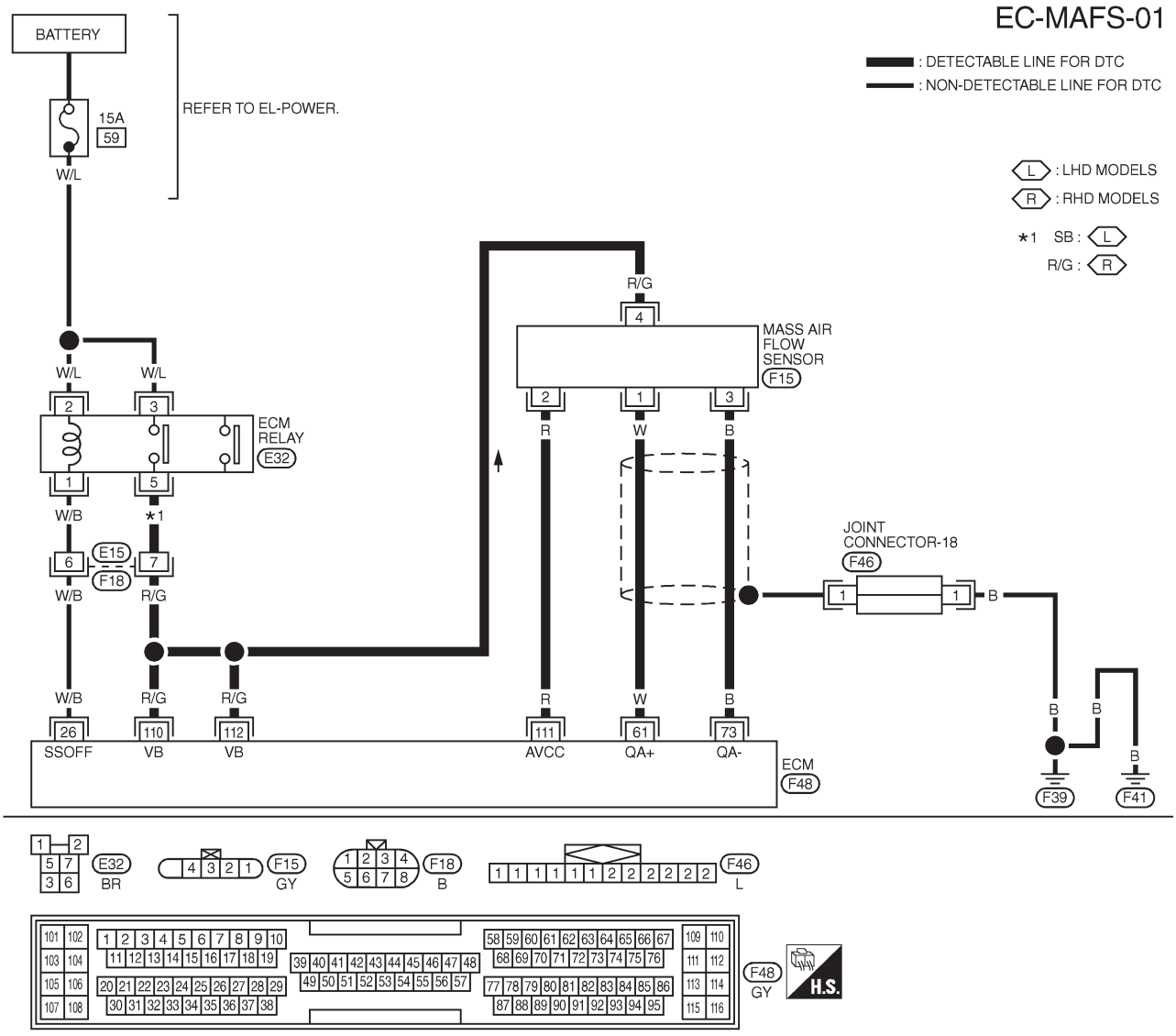
No Tools

NFEC0054S0202

1) Start engine and wait 5 seconds at most.
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 "Diagnostic Procedure", EC-138.

Wiring Diagram

=NFEC0056



MEC835C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
61	W	MASS AIR FLOW SENSOR	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	1.2 - 1.8V
			ENGINE RUNNING AT 2,500 RPM UNDER WARM-UP CONDITION	1.6 - 2.2V
73	B	MASS AIR FLOW SENSOR GROUND	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 0V
111	R	SENSORS' POWER SUPPLY	IGN ON	APPROX. 5V

SEF650XB

Diagnostic Procedure

=NFEC0057

1	INSPECTION START

Which malfunction (A, B or C) is duplicated?

MALFUNCTION	Type
A	I
B and/or C	II

MTBL0399

Type I or Type II

Type I	▶	GO TO 3.
Type II	▶	GO TO 2.

2	CHECK INTAKE SYSTEM

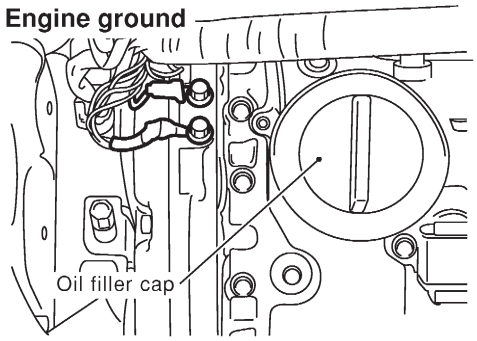
Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold collector

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.

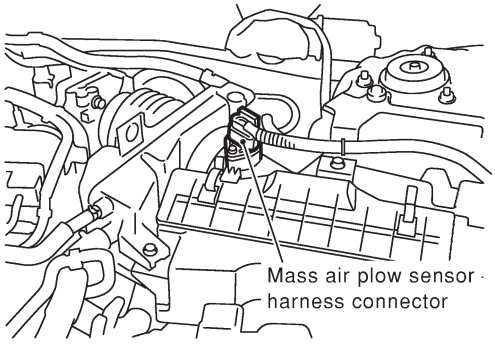


SEF255X

	▶	GO TO 4.

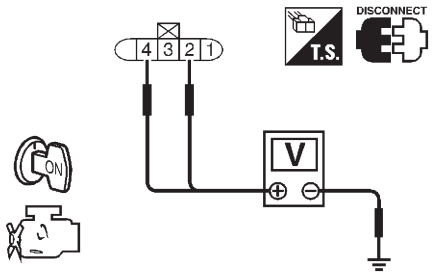
4	CHECK MAFS POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor (MAFS) harness connector.



SEC139C

2. Turn ignition switch "ON".
3. Check voltage between MAFS terminals 2, 4 and ground with CONSULT-II or tester.



Terminal	Voltage
2	Approximately 5
4	Battery voltage

SEF297X

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

	▶	Repair harness or connectors.

6	CHECK MAFS GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between MAFS terminal 3 and ECM terminal 73.
   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.

Diagnostic Procedure (Cont'd)

7	CHECK MAFS INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

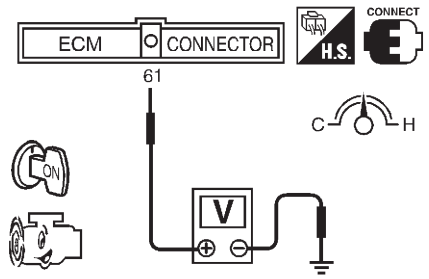
1. Check harness continuity between MAFS terminal 1 and ECM terminal 61.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

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

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 61 (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.)	1.2 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.2
Idle to about 4,000 rpm*	1.2 - 1.8 to Approx. 4.0

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

SEF298X

4. If the voltage is out of specification, disconnect MAFS harness connector and connect it again.
   Then repeat above check.

OK or NG

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

9	CHECK MAFS SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-18.
3. Check the following.

- Continuity between joint connector terminal 1 and ground
  Refer to Wiring Diagram.
- Joint connector-18
  (Refer to EL-377, "HARNESS LAYOUT".)
  Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-18.

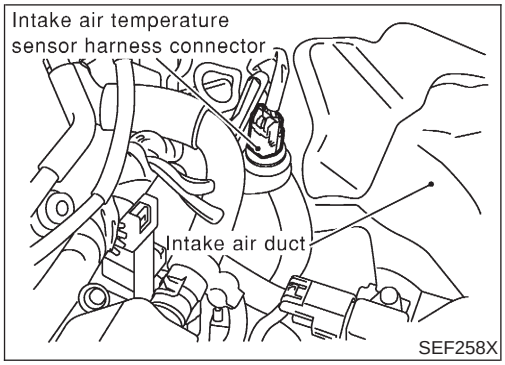
OK or NG

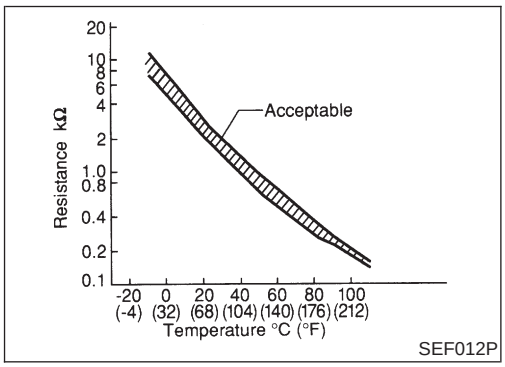
OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**





Component Description

NFEC0656

The intake air temperature sensor is mounted to the air duct housing. 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
20 (68)	3.5	2.1 - 2.9
80 (176)	1.23	0.27 - 0.38

*: These data are reference values and are measured between ECM terminal 64 (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

NFEC0657

Malfunction is detected when

(Malfunction A) an excessively low or high voltage from the sensor is sent to ECM,

(Malfunction B) rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.

Possible Cause

NFEC0658

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Intake air temperature sensor

DTC Confirmation Procedure

NFEC0659

Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".

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.

DTC Confirmation Procedure (Cont'd)

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

5

DATA MONITOR	
MONITOR	NO DTC
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF176Y

PROCEDURE FOR MALFUNCTION A

NFEC0659S01

With CONSULT-II

NFEC0659S0101

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 "Diagnostic Procedure", EC-144.

With GST

NFEC0659S0102

Follow the procedure "With CONSULT-II" above.

PROCEDURE FOR MALFUNCTION B

NFEC0659S02

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

This test 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

NFEC0659S0201

1) Wait until engine coolant temperature is less than 90°C (194°F).

a) Turn ignition switch "ON".
b) Select "DATA MONITOR" mode with CONSULT-II.
c) Check the engine coolant temperature.
d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.

- Perform the following steps before engine coolant temperature is above 90°C (194°F).

2) Turn ignition switch "ON".
3) Select "DATA MONITOR" mode with CONSULT-II.
4) Start engine.
5) Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-144.

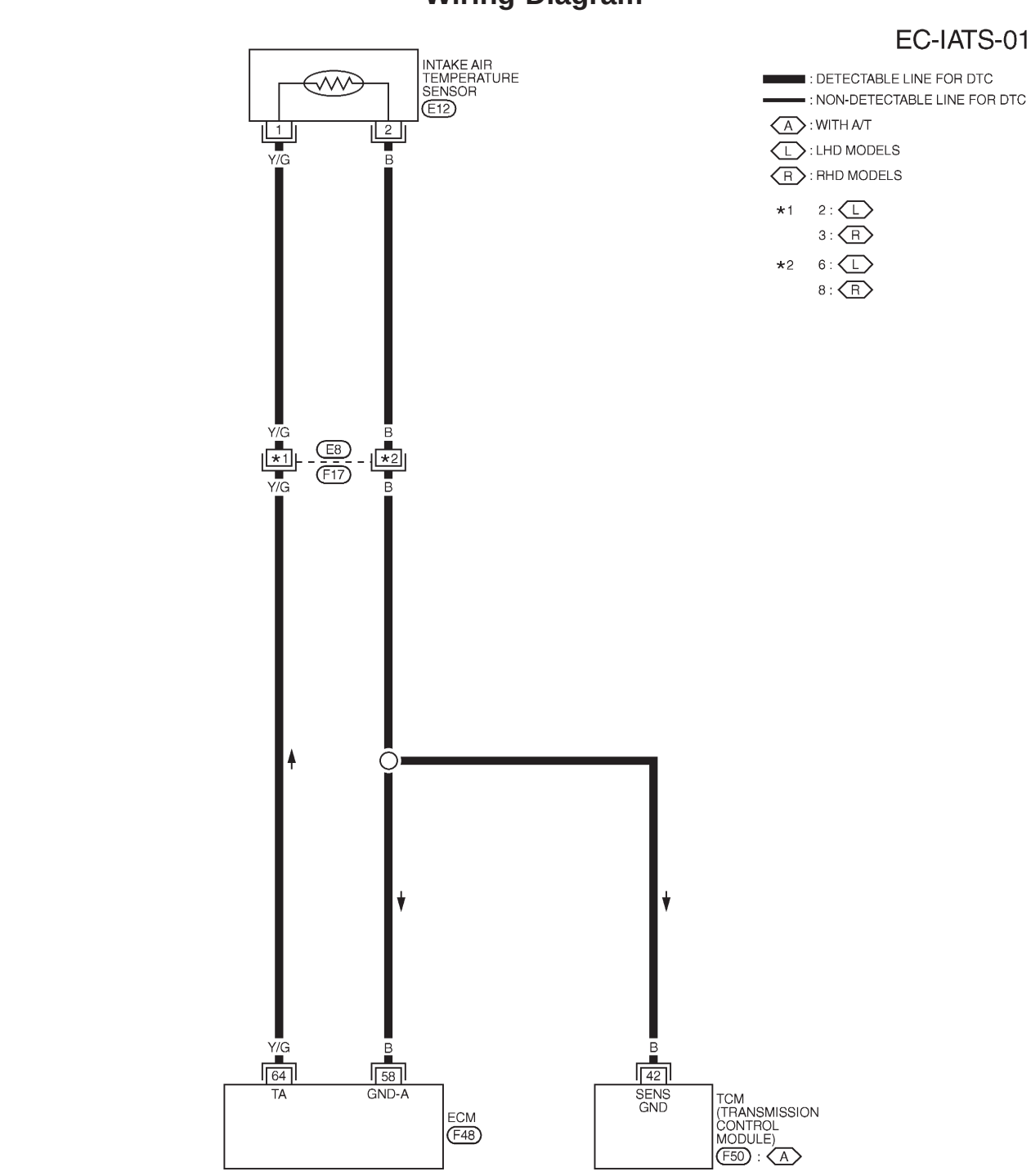
With GST

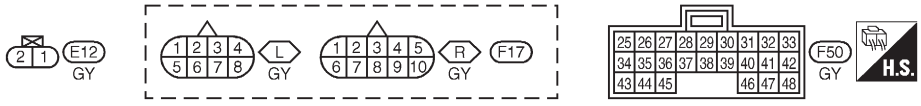
NFEC0659S0202

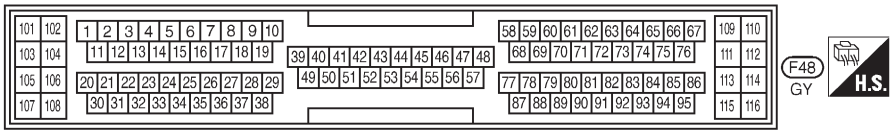
Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NFEC0660







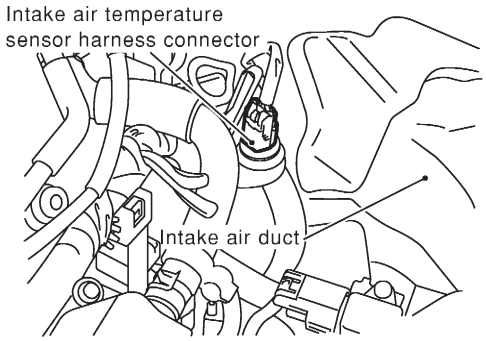
MEC991C

Diagnostic Procedure

NFEC0661

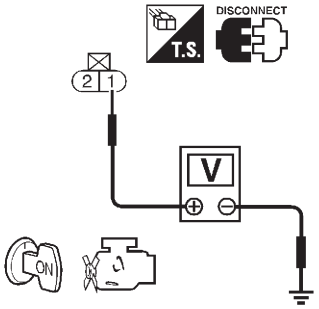
1	CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect intake air temperature sensor harness connector.



SEF258X

3. Turn ignition switch “ON”.
4. Check voltage between terminal 1 and ground.



Voltage: Approximately 5V

SEF301X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E8, F17
- Harness for open or short between ECM and intake air temperature sensor

	▶	Repair harness or connectors.

3	CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between sensor terminal 2 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

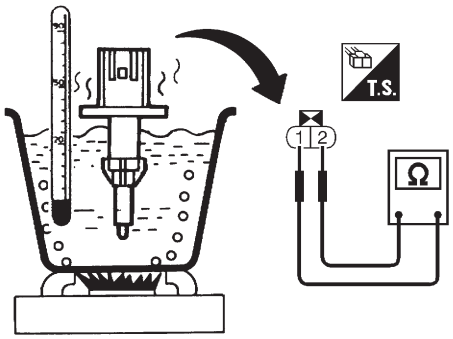
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E8, F17 ● Harness for open or short between ECM and intake air temperature sensor ● Harness for open or short between TCM (Transmission Control Module) and intake air temperature sensor	
▶	Repair open circuit or short to power in harness or connectors.

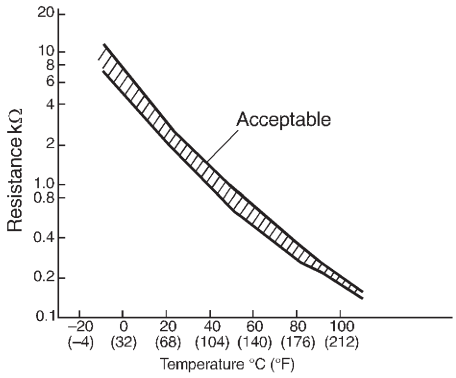
5	CHECK INTAKE AIR TEMPERATURE SENSOR

Check resistance between intake air temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

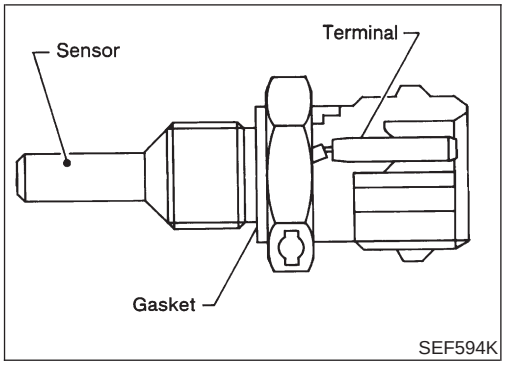


SEF302X

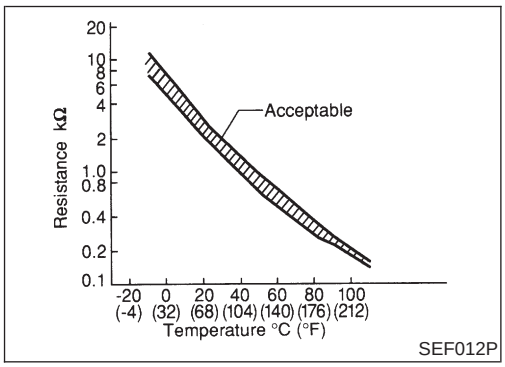
OK or NG

OK	▶	GO TO 6.
NG	▶	Replace intake air temperature sensor.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



SEF594K



SEF012P

Component Description

NFEC0069

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 70 (Engine coolant temperature sensor) 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

NFEC0070

Malfunction is detected when an excessively high or low voltage from the sensor is sent to ECM.

FAIL-SAFE MODE

NFEC0070S02

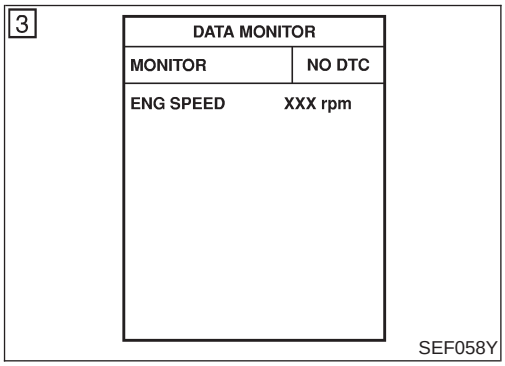
When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

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)

Possible Cause

NFEC0429

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Engine coolant temperature sensor



DTC Confirmation Procedure

NFEC0071

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

NFEC0071S01

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 “Diagnostic Procedure”, EC-149.

WITH GST

NFEC0071S03

Follow the procedure “WITH CONSULT-II” above.

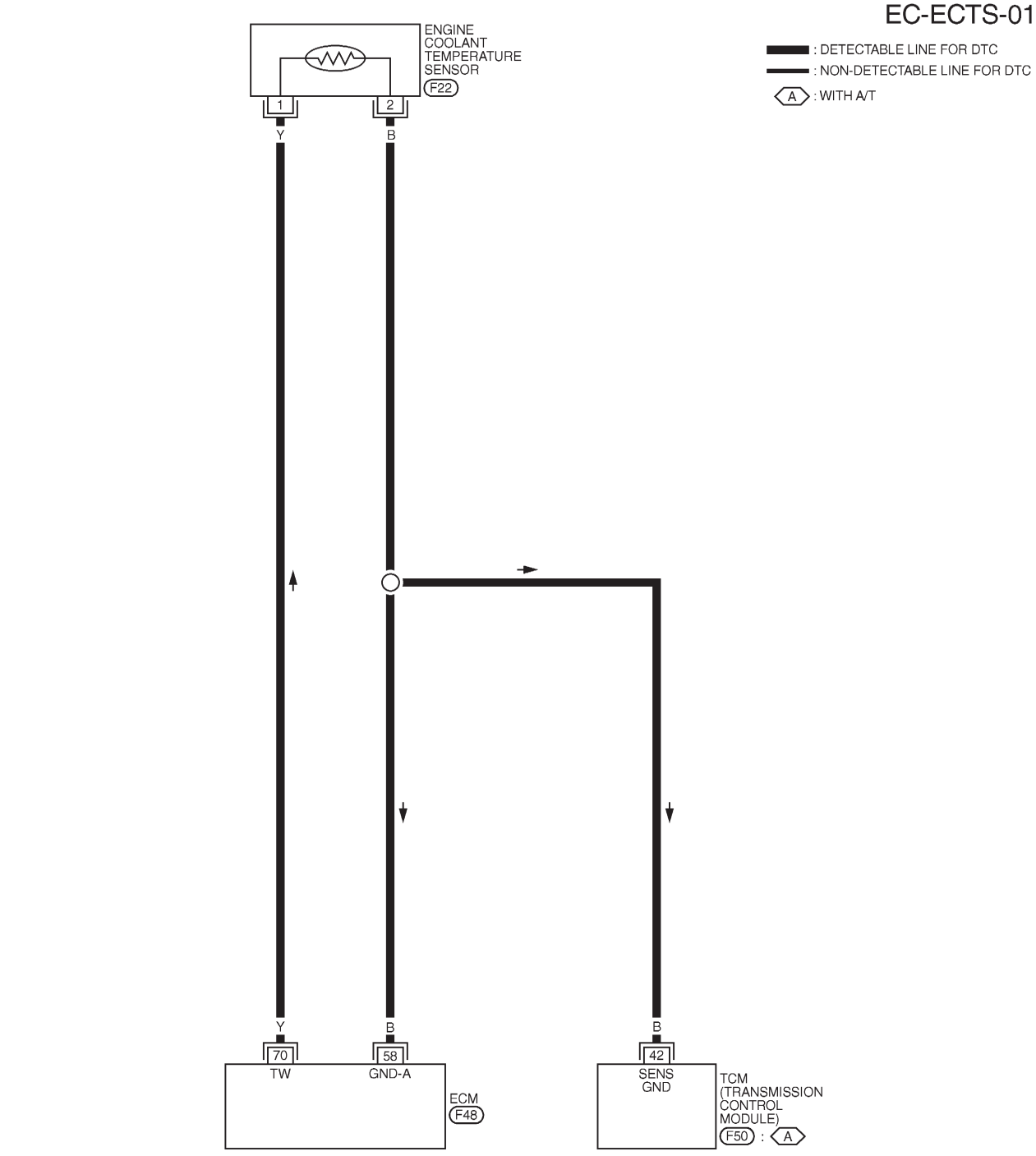
NO TOOLS

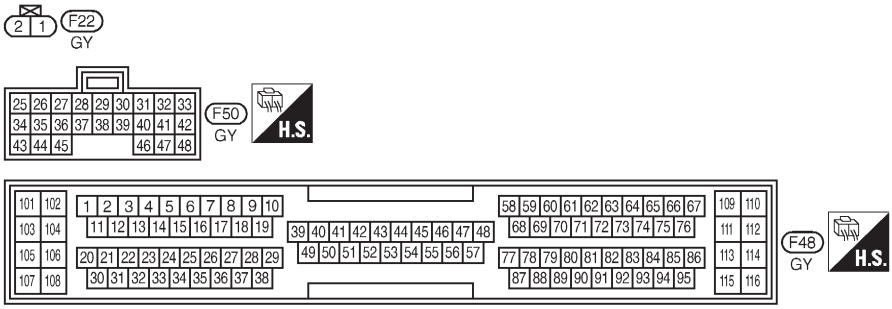
NFEC0071S02

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 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-149.

Wiring Diagram

NFEC0072





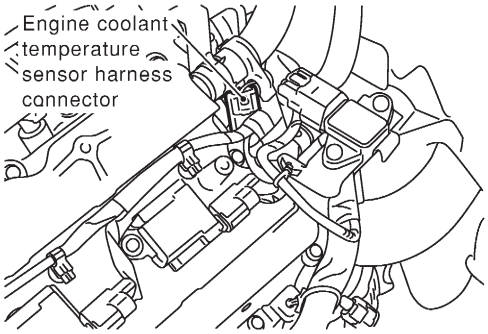
MEC721C

Diagnostic Procedure

NFEC0073

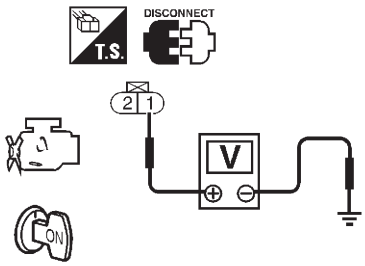
1	CHECK ECTS POWER SUPPLY CIRCUIT

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



SEF259X

3. Turn ignition switch “ON”.
4. Check voltage between ECTS terminal 1 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF585X

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 ECTS GROUND CIRCUIT FOR OPEN AND CIRCUIT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECTS 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 4.
NG	▶	GO TO 3.

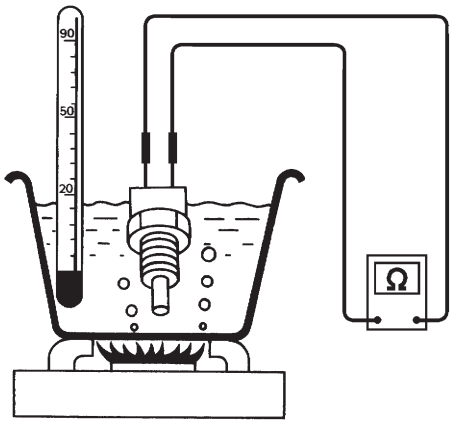
3	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness for open or short between TCM (Transmission Control Module) and engine coolant temperature sensor

	▶	Repair open circuit or short to power in harness or connectors.

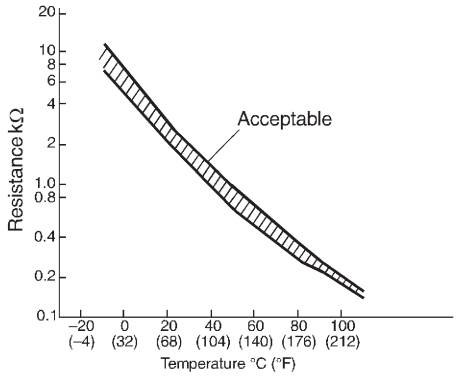
4	CHECK ENGINE COOLANT TEMPERATURE SENSOR

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



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



SEF304X

OK or NG

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

5	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Description

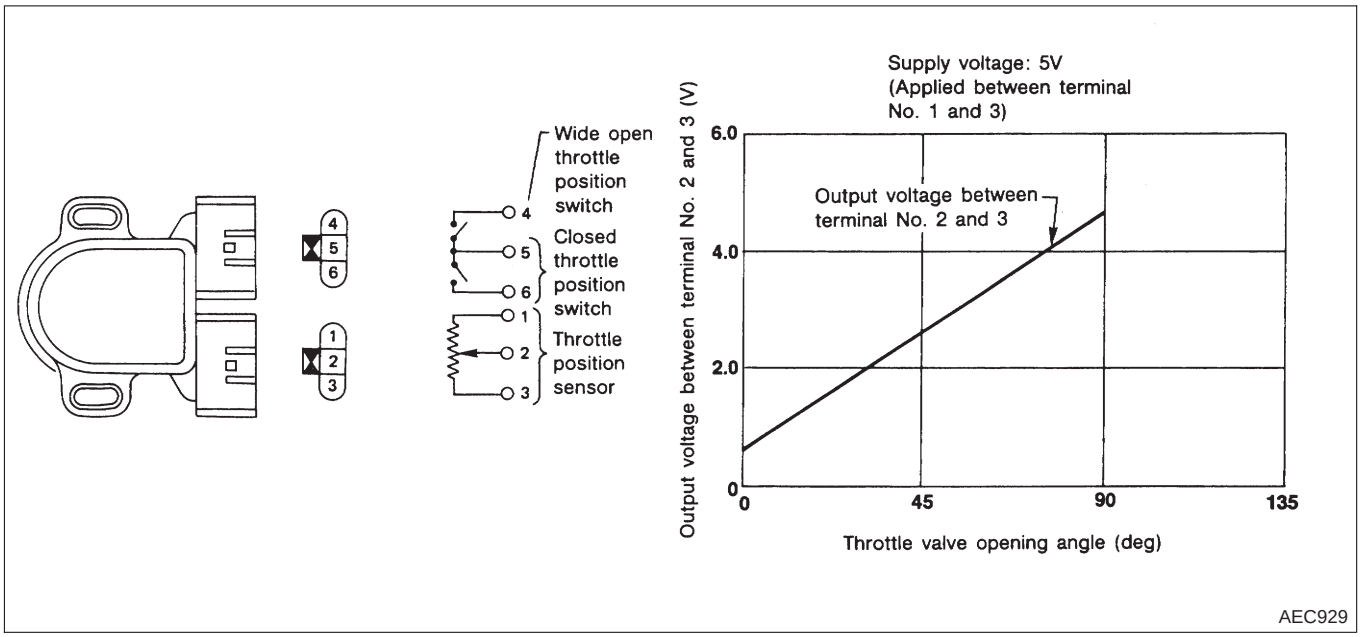
NFEC0074

COMPONENT DESCRIPTION

NFEC0074S01

The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.

Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This sensor controls engine operation such as fuel cut. On the other hand, the “Wide open and closed throttle position switch”, which is built into the throttle position sensor unit, is not used for engine control.



CONSULT-II Reference Value in Data Monitor Mode

NFEC0075

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Engine: After warming up, idle the engine	Throttle valve: fully closed	0.15 - 0.85V
	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	3.5 - 4.7V
ABSOL TH·P/S	● Engine: After warming up, idle the engine	Throttle valve: fully closed	0.0%
	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	Approx. 80%

On Board Diagnosis Logic

NFEC0077

Malfunction is detected when an excessively low or high voltage from the sensor is sent to ECM.

FAIL-SAFE MODE

NFEC0077S02

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

<table>
<tr><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td rowspan="4">Throttle position sensor circuit</td><td colspan="2">Throttle position will be determined based on the injected fuel amount and the engine speed.
Therefore, acceleration will be poor.</td></tr>
<tr><td>Condition</td><td>Driving condition</td></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table>

Possible Cause

NFEC0430

- Harness or connectors
  (The throttle position sensor circuit is open or shorted.)
- Throttle position sensor

DTC Confirmation Procedure

NFEC0078

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.

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**
- **This test 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.**

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
VHCL SPEED SE	XXX km/h
P/N POSI SW	OFF

SEF065Y

WITH CONSULT-II

NFEC0078S01

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine and maintain the following conditions for at least 5 consecutive seconds.

Vehicle speed	More than 5 km/h (3 MPH)
Selector lever	Suitable position except "P" or "N" position

3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-155.

WITH GST

NFEC0078S05

Follow the procedure "WITH CONSULT-II" above.

NO TOOLS

NFEC0078S04

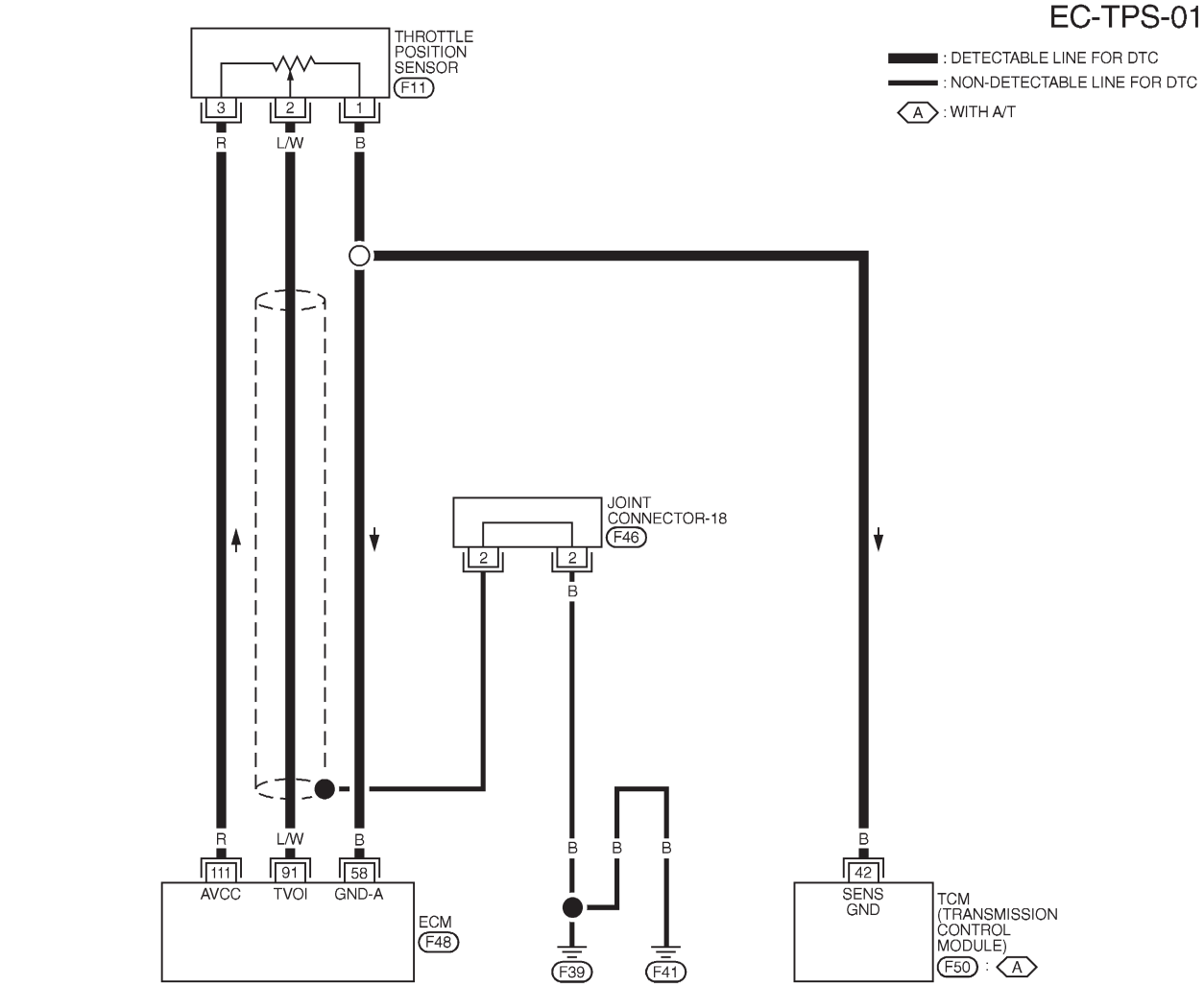
1) Start engine and maintain the following conditions for at least 5 consecutive seconds.

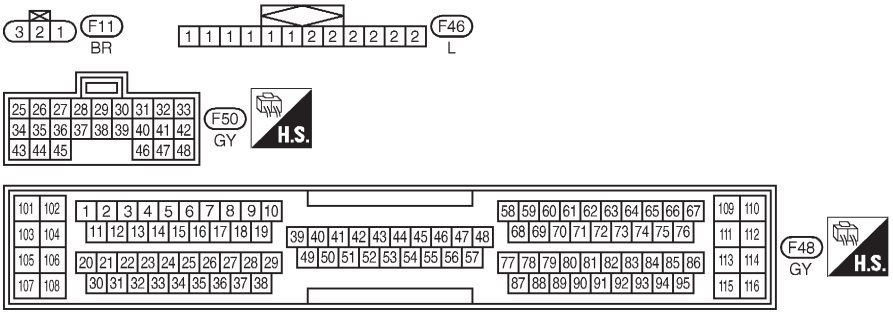
Vehicle speed	More than 5 km/h (3 MPH)
Selector lever	Suitable position except "P" or "N" position

2) Turn ignition switch "OFF" and wait at least 10 seconds.
3) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-155.

Wiring Diagram

NFEC0079





MEC837C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
91	L/W	THROTTLE POSITION SENSOR	ENGINE RUNNING UNDER WARM-UP CONDITION WITH ACCELERATOR PEDAL FULLY RELEASED	0.15 - 0.85V
			IGN ON WITH ACCELERATOR PEDAL FULLY DEPRESSED	3.5 - 4.7V
111	R	SENSORS' POWER SUPPLY	IGN ON	APPROX. 5V
58	B	SENSORS' GROUND	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 0V

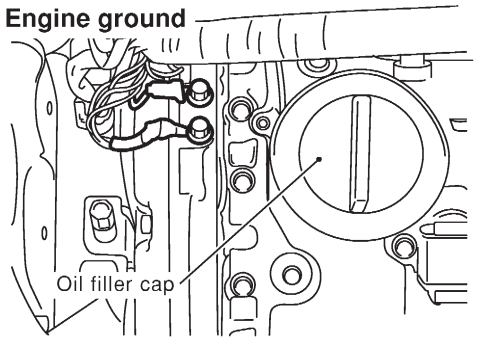
SEF652XB

Diagnostic Procedure

NFEC0080

1	RETIGHTEN GROUND SCREWS

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

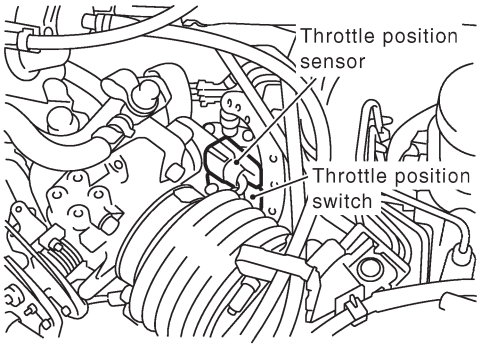


SEF255X

	▶	GO TO 2.

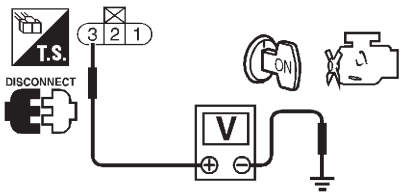
2	CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect throttle position sensor harness connector.



SEC001C

2. Turn ignition switch “ON”.
3. Check voltage between throttle position sensor terminal 3 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF306X

OK or NG

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

Diagnostic Procedure (Cont'd)

3	CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check harness continuity between sensor terminal 1 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and throttle position sensor
- Harness for open or short between TCM (Transmission Control Module) and throttle position sensor

	▶	Repair open circuit or short to power in harness or connectors.

5	CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 91 and throttle position sensor 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 (With CONSULT-II)	▶	GO TO 6.
OK (Without CONSULT-II)	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK THROTTLE POSITION SENSOR

With CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Stop engine (ignition switch OFF).
3. Turn ignition switch ON.
4. Select "DATA MONITOR" mode with CONSULT-II.
5. Check voltage of "THRTL POS SEN" under the following conditions.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
THRTL POS SEN	XXX V

Throttle valve conditions	THRTL POS SEN
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

SEF062Y

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

7	CHECK THROTTLE POSITION SENSOR

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine (ignition switch OFF).
3. Turn ignition switch ON.
4. Check voltage between ECM terminal 91 (Throttle position sensor signal) and ground.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

Throttle valve conditions	Voltage
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

MTBL0231

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	ADJUST CLOSED THROTTLE POSITION SWITCH

Adjust closed throttle position switch. Refer to "Basic Inspection", EC-90.

Items	Specifications
Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)

MTBL0623

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-90.

9	CHECK THROTTLE POSTION SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-18
3. Check the following

- Continuity between joint connector terminal 2 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)
  Continuity should exist.
- Also check harness for short to power.
- Then reconnect joint connector-18.

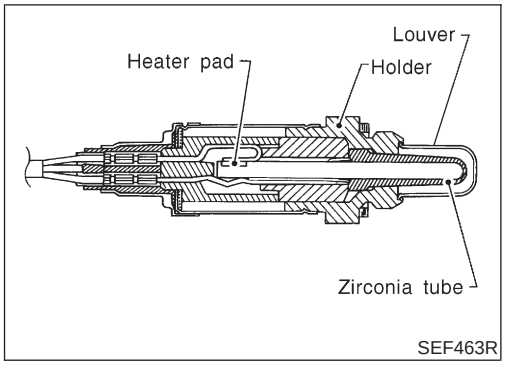
OK or NG

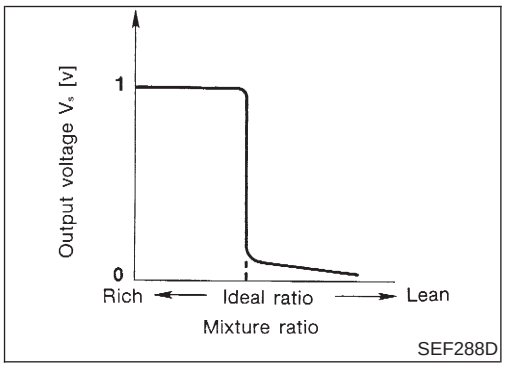
OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**





Component Description

NFEC0086

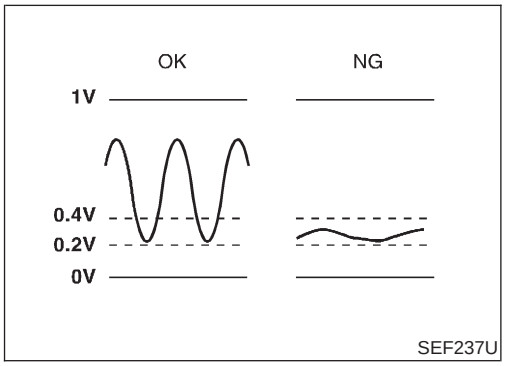
The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) 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

NFEC0087

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.



On Board Diagnosis Logic

NFEC0089

Under the condition in which the heated oxygen sensor 1 (front) 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.
Malfunction is detected when the voltage from the sensor is constantly approx. 0.3V.

Possible Cause

NFEC0432

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)

5

HO2S1 (B1) P0130	
OUT OF CONDTION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V
VHCL SPEED SE	XXX km/h

SEF825Y

5

HO2S1 (B1) P0130	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V
VHCL SPEED SE	XXX km/h

SEF826Y

5

HO2S1 (B1) P0130
COMPLETED

SEF645Y

DTC Confirmation Procedure

NFEC0662

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

NFEC0662S01

1) Start engine and warm it up to normal operating temperature.
2) Select “HO2S1 (B1) P0130/HO2S1 (B2) P0150” of “HO2S1 (B1)/(B2)” in “DTC WORK SUPPORT” mode with CONSULT-II.
3) Touch “START”.
4) Let it idle for at least 3 minutes.

NOTE:

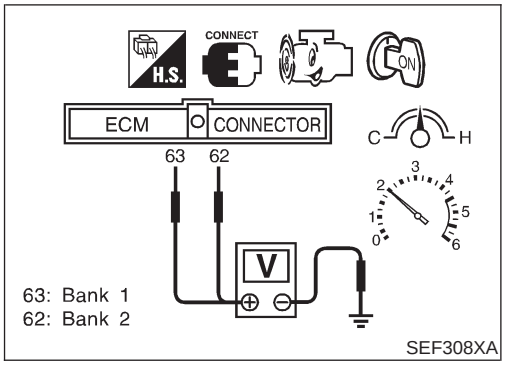
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 4.

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	1,400 - 2,400 rpm (A/T) 1,600 - 2,600 rpm (M/T)
Vehicle speed	More than 64 km/h (40 MPH)
B/FUEL SCHDL	2.0 - 10 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 “Diagnostic Procedure”, EC-163.



Overall Function Check

NFEC0663

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

WITHOUT CONSULT-II

NFEC0663S01

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 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.

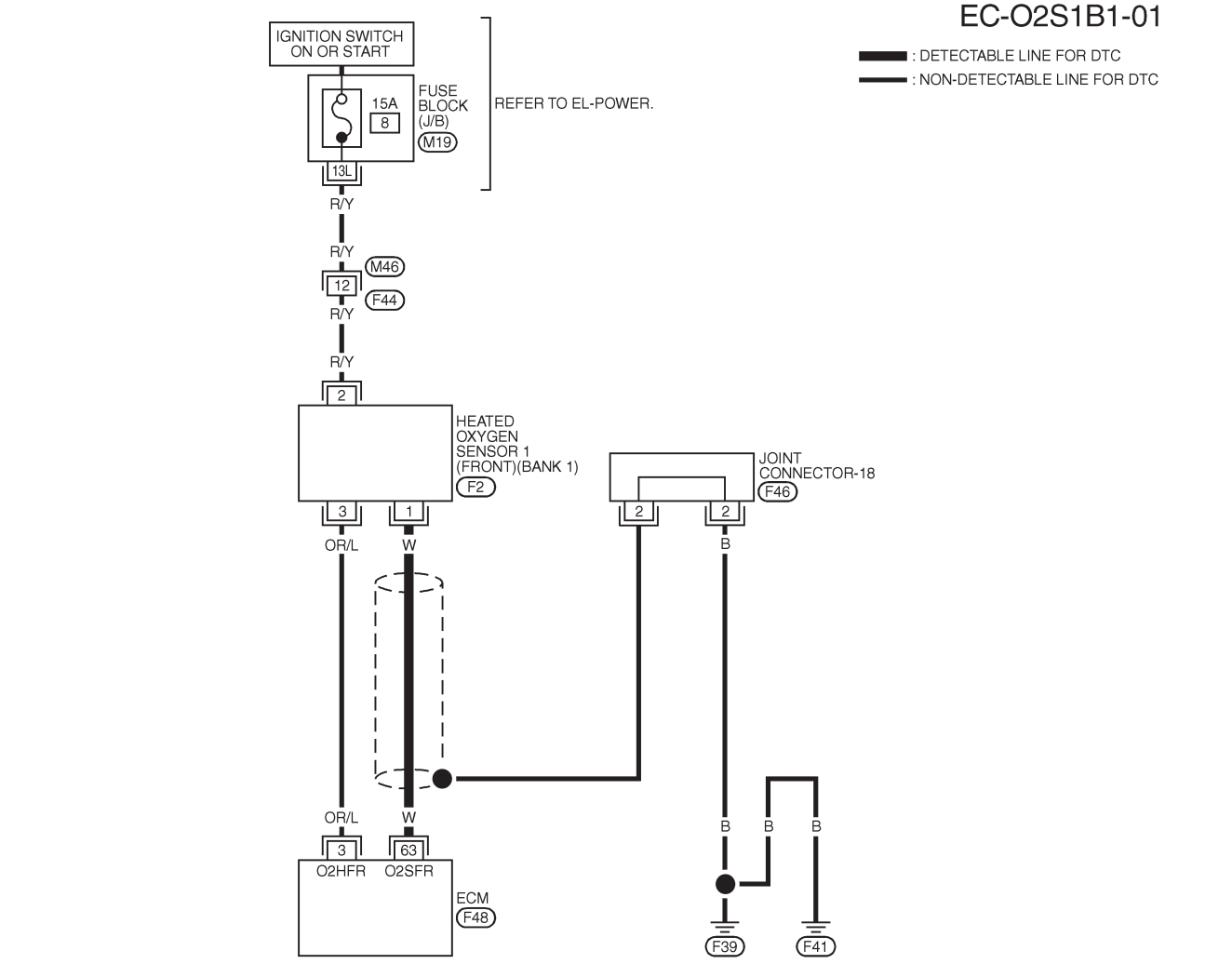
4) If NG, go to “Diagnostic Procedure”, EC-163.

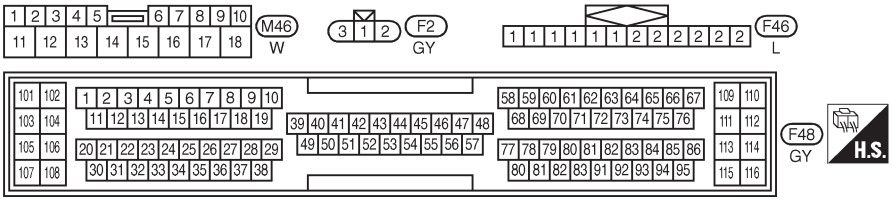
Wiring Diagram

=NFEC0092

BANK 1

NFEC0092S01

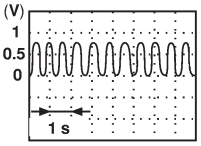




REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC296D

ECM TERMINALS AND REFERENCE VALUE 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.

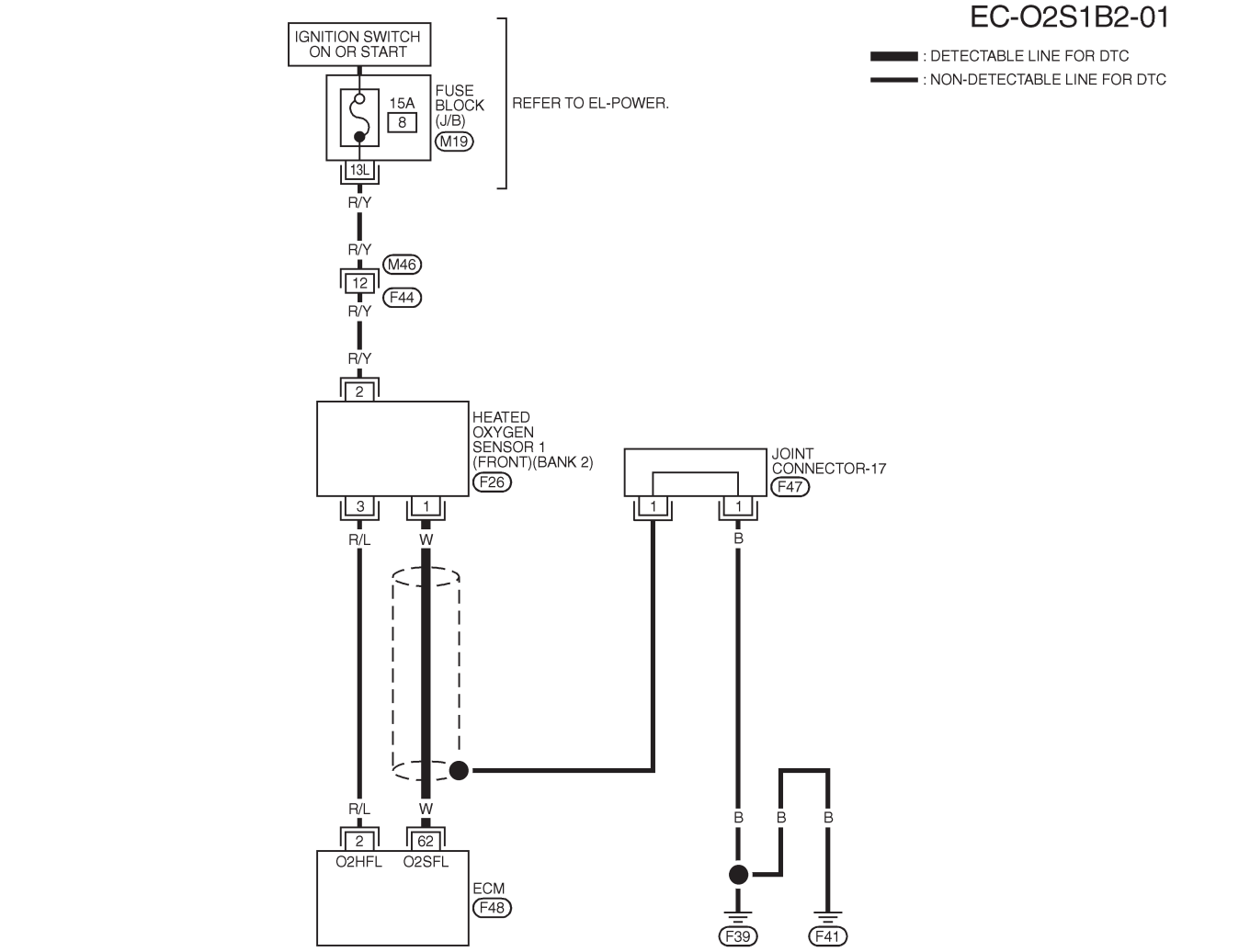
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
63	W	HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1)	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V 

SEF854YC

Wiring Diagram (Cont'd)

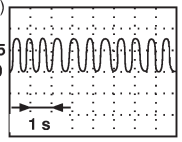
BANK 2

NFEC0092S02



MEC297D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
62	W	HEATED OXYGEN SENSOR 1 (FRONT) (BANK 2)	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V 

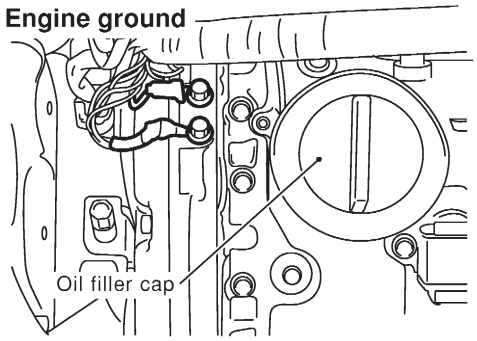
SEF855YC

Diagnostic Procedure

NFEC0093

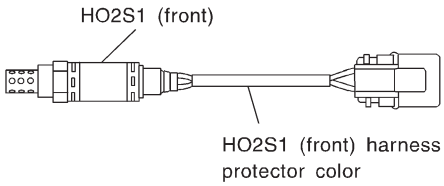
1	INSPECTION START

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



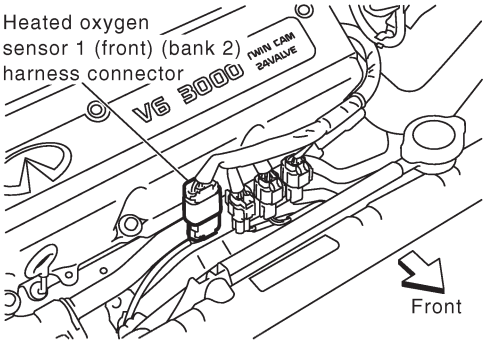
SEF255X

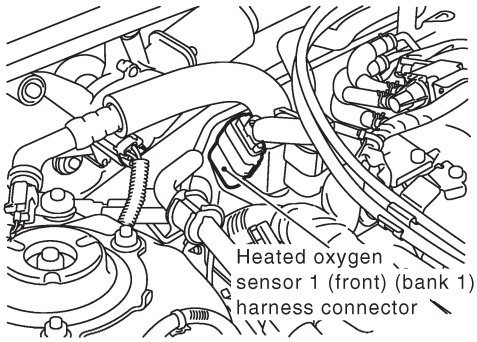
3. Make sure HO2S1 (front) harness protector color, and disconnect corresponding heated oxygen sensor 1 (front) harness connector.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA





SEF902XA

▶	GO TO 2.

Diagnostic Procedure (Cont'd)

2 **CHECK HEATED OXYGEN SENSOR 1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT**

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0130	63	1	1
P0150	62	1	2

MTBL0484

Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0130	63 or 1	Ground	1
P0150	62 or 1	Ground	2

MTBL0485

Continuity should not exist.

4. Also check harness for short to power.

OK or NG

OK (With CONSULT-II) ▶	GO TO 3.
OK (Without CONSULT-II) ▶	GO TO 4.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

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)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
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)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below.

Bank 1

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

Bank 2

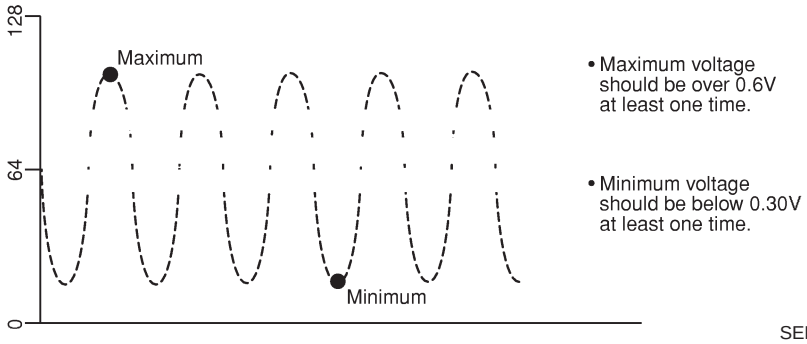
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" 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
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.

OK or NG

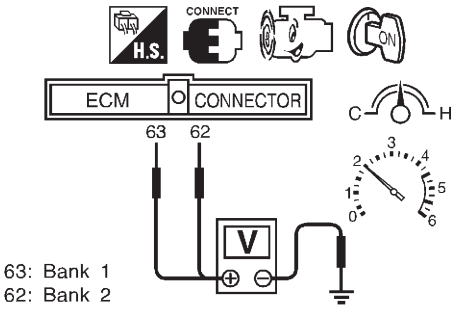
OK	▶	GO TO 6.
NG	▶	GO TO 5.

Diagnostic Procedure (Cont'd)

4	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
4. 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 → 0 - 0.3V

SEF967XA

CAUTION:

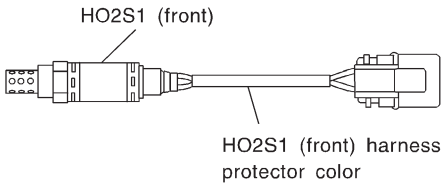
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

CAUTION:

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

6	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17 or joint connector-18.
3. Check the following.

- Continuity between joint connector terminal 1 or 2 and ground
- Joint connector

(Refer to EL-377, "HARNESS LAYOUT".)

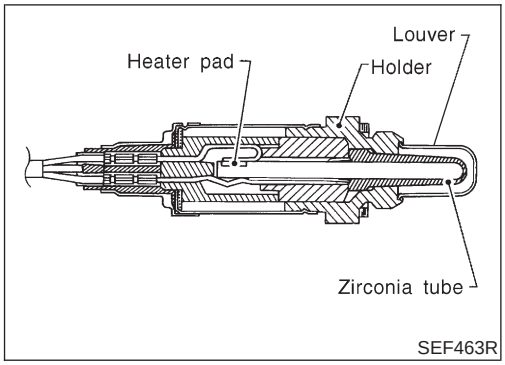
Continuity should exist.

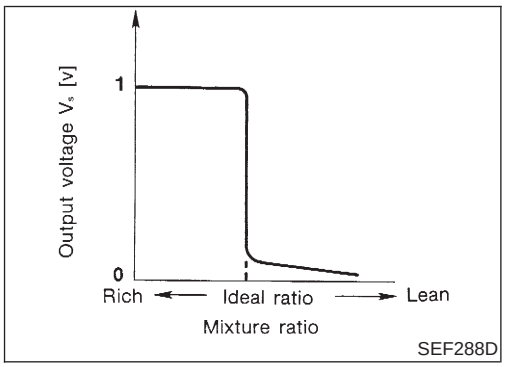
4. Also check harness for short to power.
5. Then reconnect joint connector-17 or joint connector-18.

OK or NG

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

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**





Component Description

NFEC0664

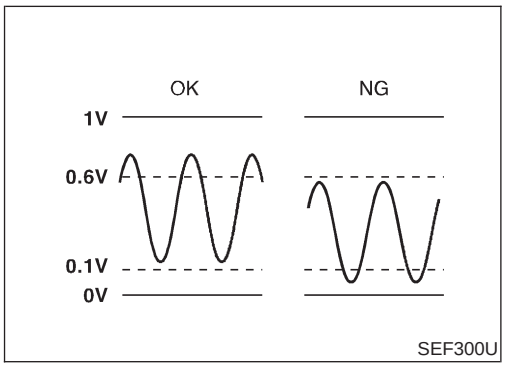
The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) 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

NFEC0665

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.



On Board Diagnosis Logic

NFEC0666

To judge the malfunction, the output from the heated oxygen sensor 1 (front) 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.
Malfunction is detected when the maximum and minimum voltage from the sensor are not reached to the specified voltages.

Possible Cause

NFEC0667

- Heated oxygen sensor 1 (front)
- Heated oxygen sensor 1 heater (front)
- Fuel pressure
- Injectors
- Intake air leaks

DTC Confirmation Procedure

NFEC0668

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

NFEC0668S01

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) P0131/ HO2S1 (B2) P0151” of “HO2S1 (B1)/(B2)” 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 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) 1,800 - 2,600 rpm (M/T)
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	3 - 9 msec (A/T) 2.5 - 9 msec (M/T)
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 “Diagnostic Procedure”, EC-170.

6

HO2S1 (B1) P0131	
OUT OF CONDTION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V
VHCL SPEED SE	XXX km/h

SEF827Y

6

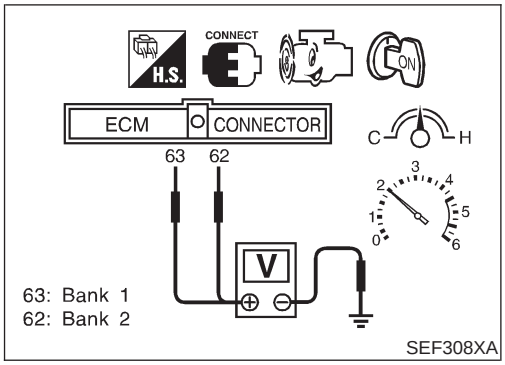
HO2S1 (B1) P0131	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V
VHCL SPEED SE	XXX km/h

SEF828Y

6

HO2S1 (B1) P0131
COMPLETED

SEF651Y



Overall Function Check

NFEC0669

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

WITH GST

NFEC0669S01

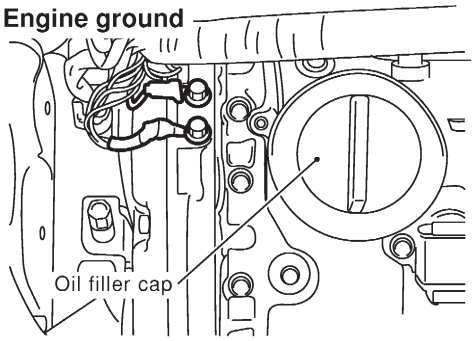
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
3) Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is over 0.1V at least one time.
4) If NG, go to “Diagnostic Procedure”, EC-170.

Diagnostic Procedure

NFEC0670

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 (FRONT)

Loosen and retighten corresponding heated oxygen sensor 1 (front).

Tightening torque:

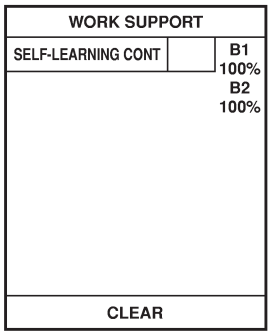
40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

▶	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".



SEF652Y

4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 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 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-56.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 detected?
   Is it difficult to start engine?

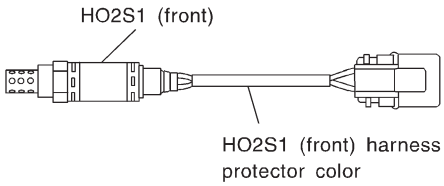
Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171, P0174. Refer to EC-261.
No	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

4	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

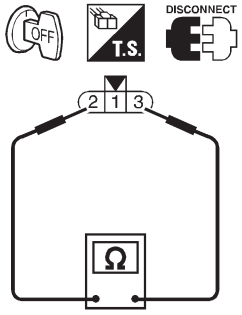
1. Stop engine.
2. Check heated oxygen sensor 1 (front) harness protector color.

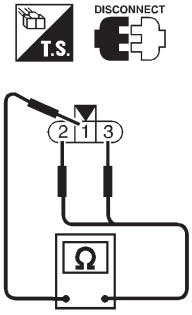


HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

3. Disconnect HO2S1 (front) harness connector.
4. Check resistance between HO2S1 (front) terminals as follows.





Terminals	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 1 and 3	∞Ω (Continuity should not exist.)

SEF310X

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.

OK or NG

OK (With CONSULT-II) ▶	GO TO 5.
OK (Without CONSULT-II) ▶	GO TO 6.
NG ▶	GO TO 7.

5	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

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)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
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)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below.

Bank 1

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

Bank 2

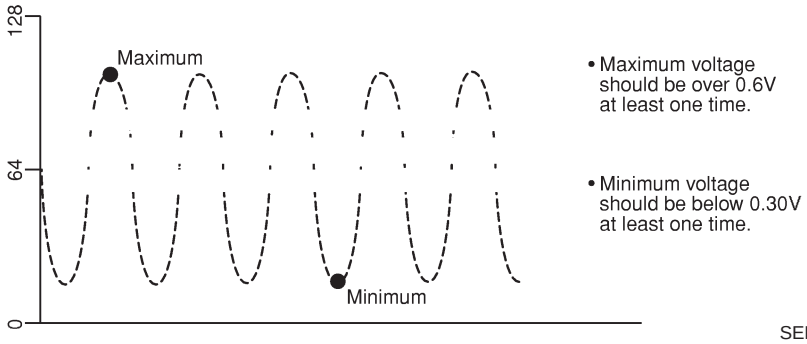
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" 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
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.

OK or NG

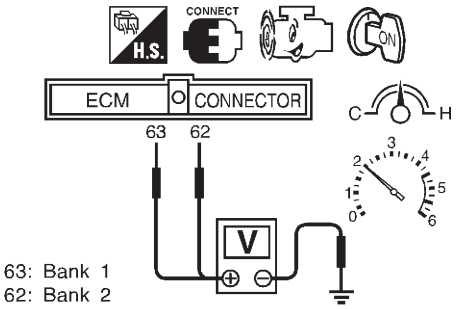
OK	▶	GO TO 8.
NG	▶	GO TO 7.

Diagnostic Procedure (Cont'd)

6	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
4. Check the following with engine speed held at 2,000 rpm constant under no load.



63: Bank 1
62: Bank 2

- 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 → 0 - 0.3V

SEF967XA

CAUTION:

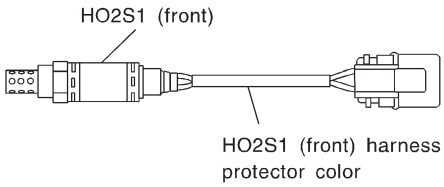
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

CAUTION:

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.

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

8	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17 or joint connector-18.
3. For circuit, refer to "DTC P0130/P0150 HO2S1 (FRONT) (BANK 1)/(BANK 2) (CIRCUIT)", EC-158.
4. Check the following.

- Continuity between joint connector terminal 1 or 2 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)

Continuity should exist.

5. Also check harness for short to power.
6. Then reconnect joint connector-17 or joint connector-18.

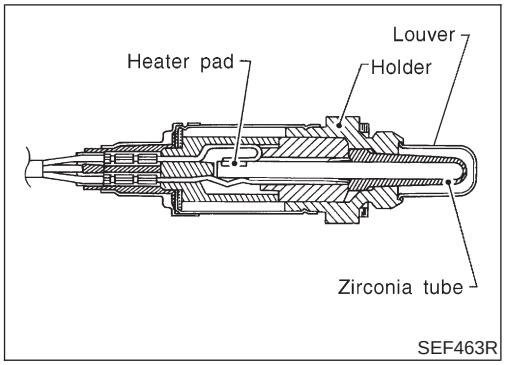
OK or NG

OK	▶	GO TO 9.
NG	▶	Repair open circuit or short to power in harness or connectors.

9	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.
For circuit, refer to "DTC P0130/P0150 HO2S1 (FRONT) (BANK 1)/(BANK 2) (CIRCUIT)", EC-158.

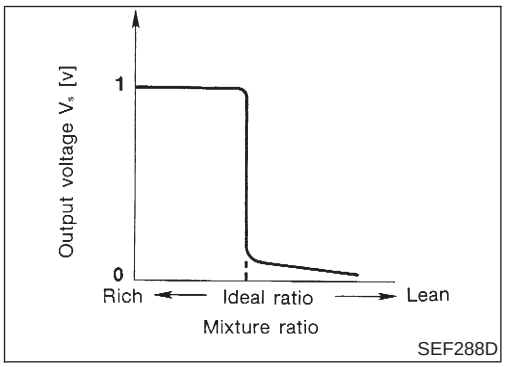
	▶	**INSPECTION END**



Component Description

NFEC0671

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) 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 (front) 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.

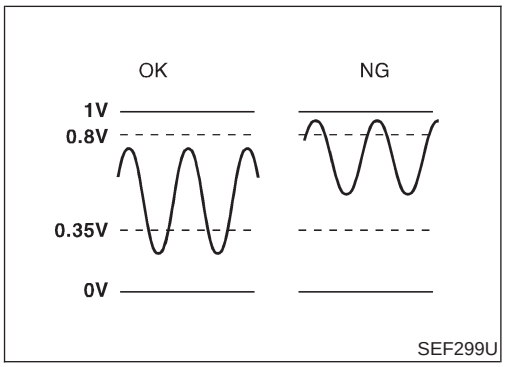


CONSULT-II Reference Value in Data Monitor Mode

NFEC0672

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.



On Board Diagnosis Logic

NFEC0673

To judge the malfunction, the output from the heated oxygen sensor 1 (front) 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.

Malfunction is detected when the maximum and minimum voltages from the sensor are beyond the specified voltages.

Possible Cause

NFEC0674

- Heated oxygen sensor 1 (front)
- Fuel pressure
- Injectors
- Heated oxygen sensor 1 heater (front)

DTC Confirmation Procedure

NFEC0675

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

NFEC0675S01

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) P0132/ HO2S1 (B2) P0152” of “HO2S1 (B1)/(B2)” 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 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) 1,800 - 2,600 rpm (M/T)
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	3 - 9 msec (A/T) 2.5 - 9 msec (M/T)
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 “Diagnostic Procedure”, EC-178.

6

HO2S1 (B1) P0132	
OUT OF CONDTION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V
VHCL SPEED SE	XXX km/h

SEF829Y

6

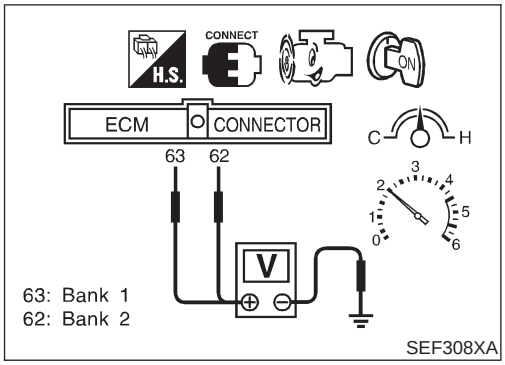
HO2S1 (B1) P0132	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V
VHCL SPEED SE	XXX km/h

SEF830Y

6

HO2S1 (B1) P0132
COMPLETED

SEF655Y



Overall Function Check

NFEC0676

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

WITH GST

NFEC0676S01

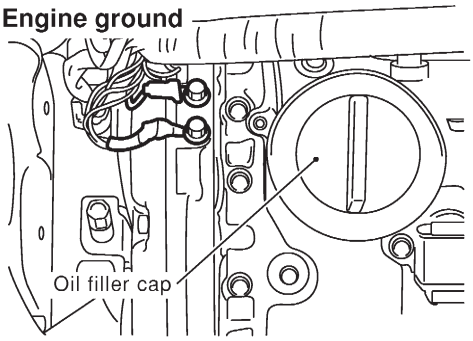
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
3) Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is below 0.8V at least one time.
   - The minimum voltage is below 0.35V at least one time.
4) If NG, go to “Diagnostic Procedure”, EC-178.

Diagnostic Procedure

NFEC0677

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 (FRONT)

Loosen and retighten corresponding heated oxygen sensor 1 (front).

Tightening torque:

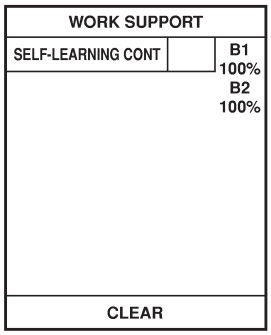
40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

▶	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".



SEF652Y

4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?

Without CONSULT-II

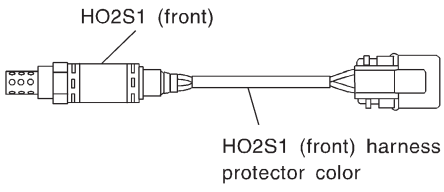
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-56.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-269.
No	▶	GO TO 4.

4	CHECK HEATED OXYGEN SENSOR (FRONT) CONNECTOR FOR WATER

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

3. Disconnect heated oxygen sensor 1 (front) harness connector.
4. Check connectors for water.
   Water should not exist.

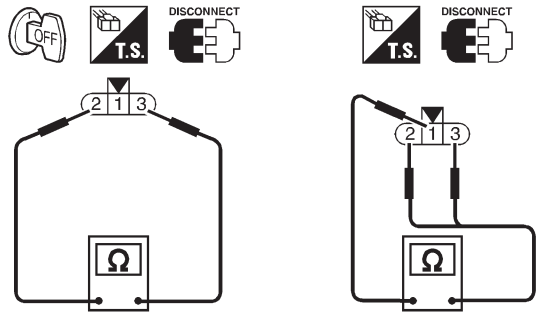
OK or NG

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

Diagnostic Procedure (Cont'd)

5	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Check resistance between HO2S1 (front) terminals as follows.



Terminals	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 1 and 3	∞Ω (Continuity should not exist.)

SEF310X

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.

OK or NG

OK (With CONSULT-II)	▶	GO TO 6.
OK (Without CONSULT-II)	▶	GO TO 7.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

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)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
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)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below.

Bank 1

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

Bank 2

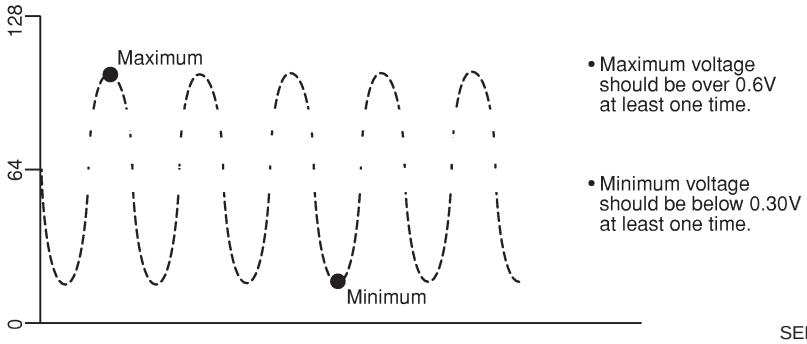
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" 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
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.

OK or NG

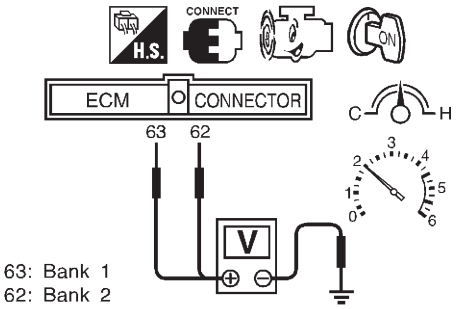
OK	▶	GO TO 9.
NG	▶	GO TO 8.

Diagnostic Procedure (Cont'd)

7	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
4. 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 → 0 - 0.3V

SEF967XA

CAUTION:

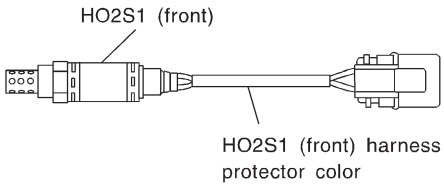
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

CAUTION:

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.

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

9	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17 or joint connector-18.
   For circuit, refer to "DTC P0130/P0150 HO2S1 (FRONT) (BANK 1)/(BANK 2) (CIRCUIT)", EC-158.
3. Check the following.

- Continuity between joint connector terminal 1 or 2 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)

Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-17 or joint connector-18.

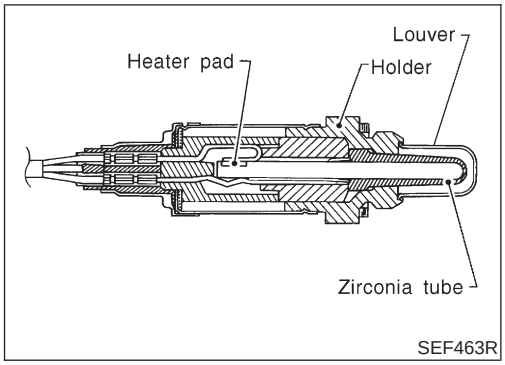
OK or NG

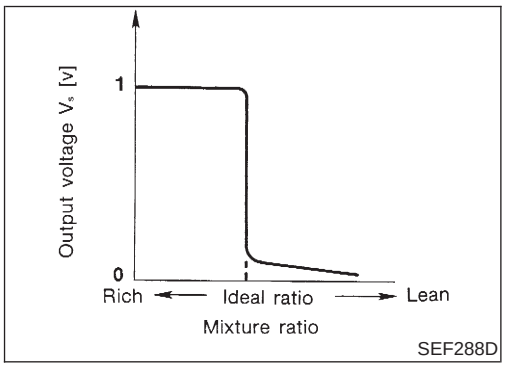
OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.
For circuit, refer to P0130/P0150 HO2S1 (FRONT) (BANK 1)/(BANK 2) (CIRCUIT)", EC-158.

	▶	**INSPECTION END**





Component Description

NFEC0678

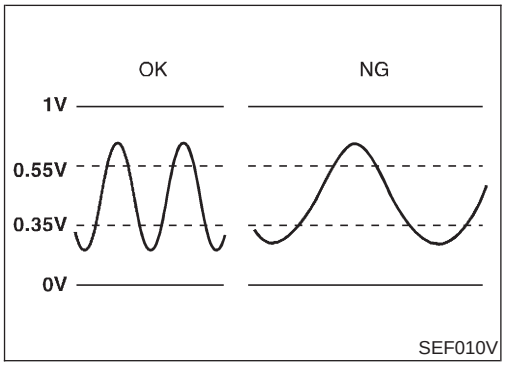
The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) 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

NFEC0679

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.



On Board Diagnosis Logic

NFEC0680

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

Malfunction is detected when the response of the voltage signal from the sensor takes more than the specified time.

Possible Cause

NFEC0681

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)
- Heated oxygen sensor 1 heater (front)
- Fuel pressure
- Injectors
- Intake air leaks
- Exhaust gas leaks
- PCV valve
- Mass air flow sensor

DTC Confirmation Procedure

NFEC0682

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.**

DTC Confirmation Procedure (Cont'd)

6

HO2S1 (B1) P0133	
OUT OF CONDTION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V
VHCL SPEED SE	XXX km/h

SEF831Y

6

HO2S1 (B1) P0133	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V
VHCL SPEED SE	XXX km/h

SEF832Y

6

HO2S1 (B1) P0133
COMPLETED

SEF658Y

WITH CONSULT-II

NFEC0682S01

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) P0133/ HO2S1 (B2) P0153" of "HO2S1 (B1)/(B2)" 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 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 40 to 50 seconds.)

ENG SPEED	1,200 - 2,800 rpm (A/T) 1,800 - 3,100 rpm (M/T)
Vehicle speed	More than 80 km/h (50 MPH)
B/FUEL SCHDL	3 - 9 msec (A/T) 2.5 - 9 msec (M/T)
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 "Diagnostic Procedure", EC-189.

Overall Function Check

NFEC0683

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

WITH GST

NFEC0683S01

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor monitor (front)]
3) Start engine and check the following with engine speed head of a constant 2,000 rpm under no load.

- MI comes on more than five times within 10 seconds.

4) If NG, go to "Diagnostic Procedure", EC-189.

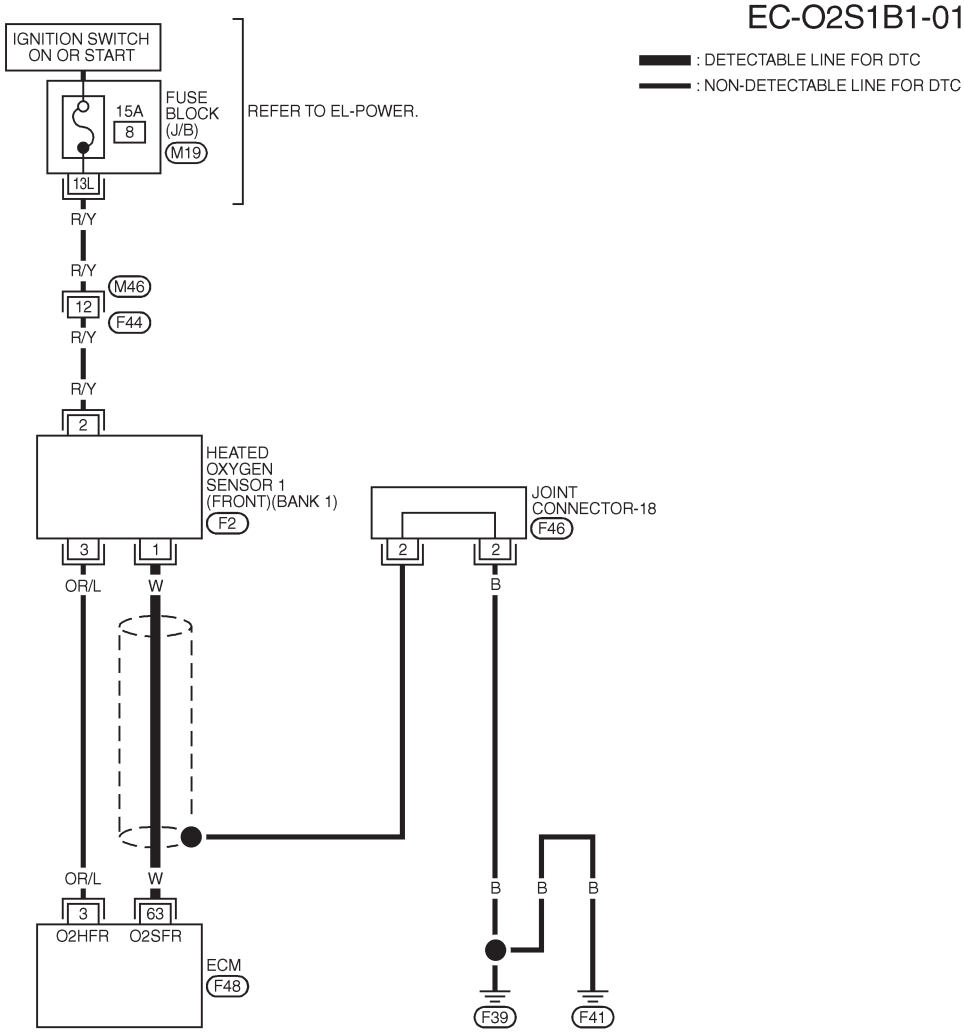
Wiring Diagram

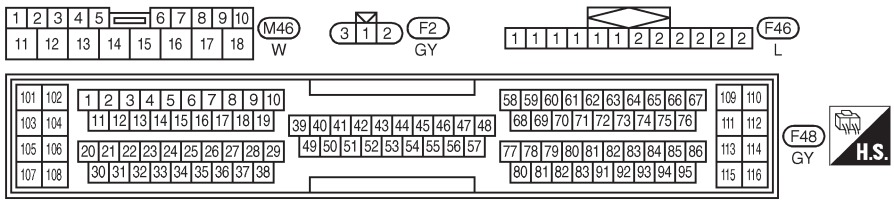
NFEC0684

BANK 1

NFEC0684S01

EC-O2S1B1-01

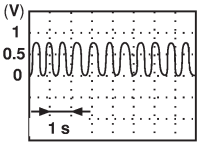




REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC296D

ECM TERMINALS AND REFERENCE VALUE 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.

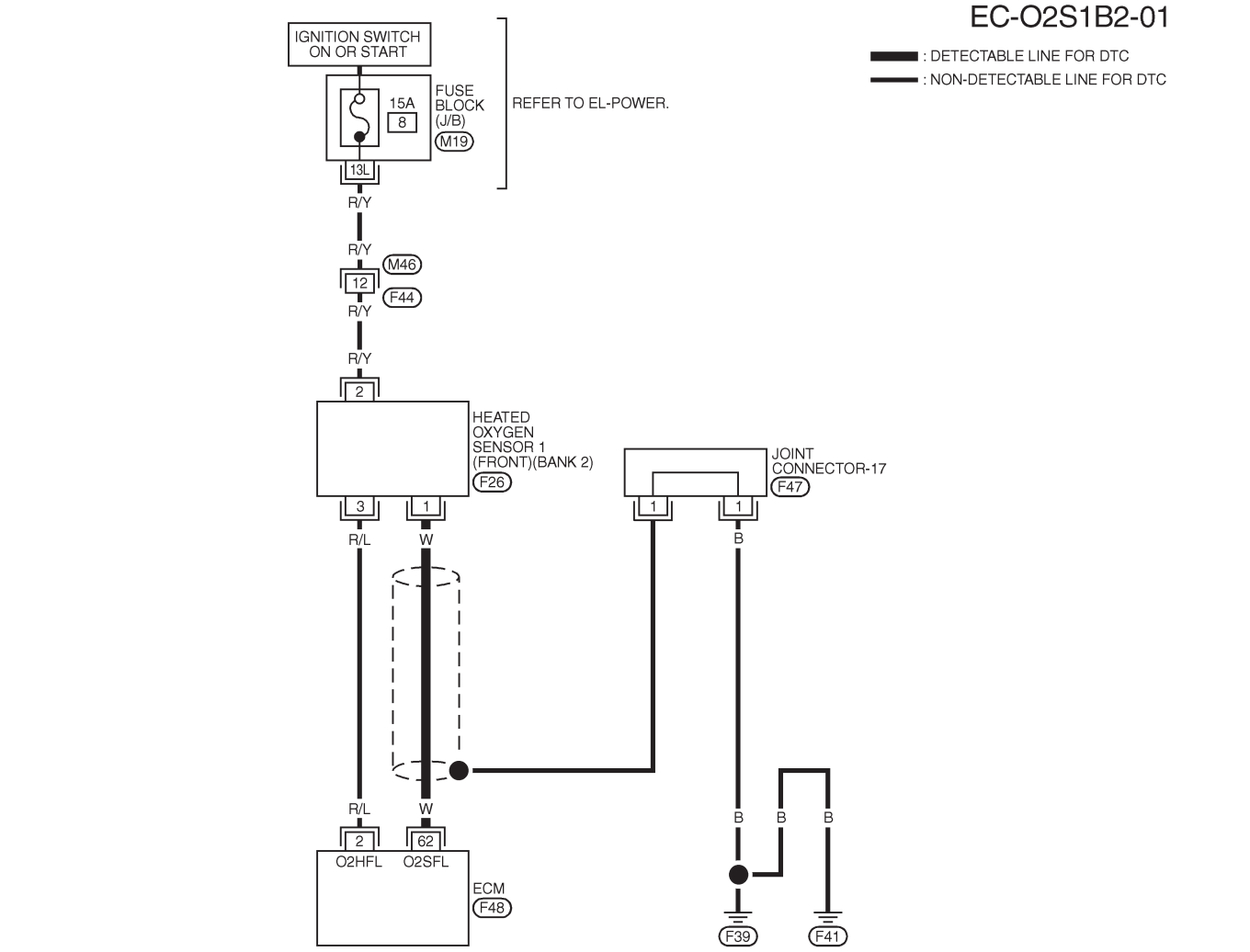
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
63	W	HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1)	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V 

SEF854YC

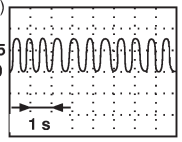
Wiring Diagram (Cont'd)

BANK 2

NFEC0684S02



ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
62	W	HEATED OXYGEN SENSOR 1 (FRONT) (BANK 2)	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V 

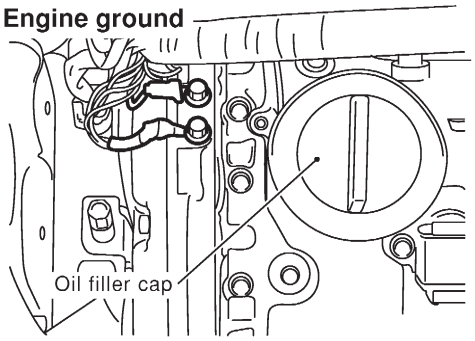
SEF855YC

Diagnostic Procedure

NFEC0685

1	RETIGHTEN GROUND SCREWS

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



SEF255X

	▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)

Loosen and retighten corresponding heated oxygen sensor 1 (front).

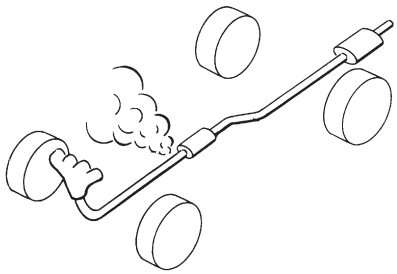
Tightening torque:

40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

	▶	GO TO 3.

3	CHECK FOR EXHAUST AIR LEAK

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



SEF099P

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.

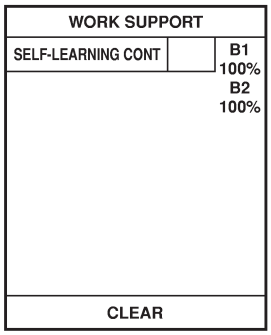
OK or NG

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".



SEF652Y

4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?

Without CONSULT-II

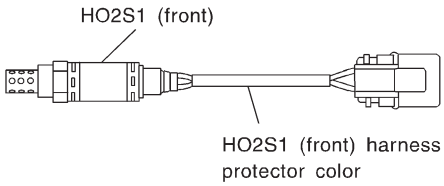
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-56.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?

Yes or No

Yes ▶	Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-261, EC-269.
No ▶	GO TO 6.

6	CHECK HEATED OXYGEN SENSOR 1 (FRONT) HARNESS PROTECTOR COLOR

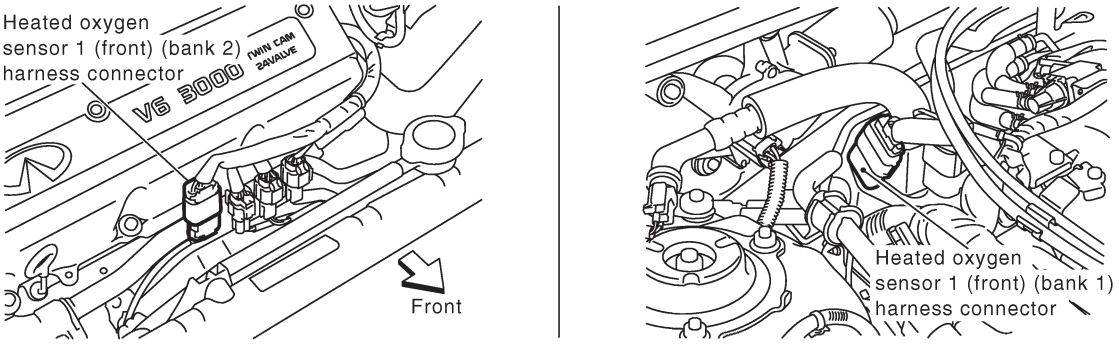
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.



SEF902XA

▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0133	63	1	1
P0153	62	1	2

MTBL0486

Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0133	63 or 1	Ground	1
P0153	62 or 1	Ground	2

MTBL0487

Continuity should not exist.

4. Also check harness for short to power.

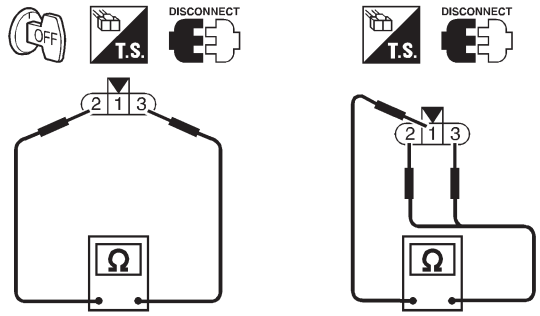
OK or NG

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

Diagnostic Procedure (Cont'd)

8	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Check resistance between HO2S1 (front) terminals as follows.



Terminals	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 1 and 3	∞Ω (Continuity should not exist.)

SEF310X

CAUTION:

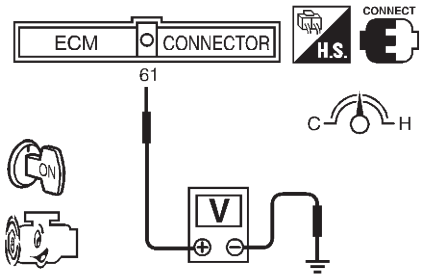
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 13.

9	CHECK 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 61 (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.)	1.2 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.2
Idle to about 4,000 rpm*	1.2 - 1.8 to Approx. 4.0

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

SEF298X

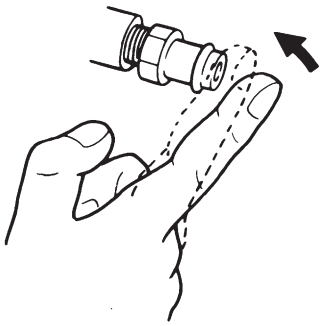
4. If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Then repeat above check.

OK or NG

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

10	CHECK PCV VALVE

1. Install all removed parts.
2. Start engine and let it idle.
3. Remove PCV valve ventilation hose from PCV valve.
4. Make sure that a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



SEC137A

OK or NG

OK (With CONSULT-II)	▶	GO TO 11.
OK (Without CONSULT-II)	▶	GO TO 12.
NG	▶	Replace PCV valve.

11	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

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)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
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)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below.

Bank 1

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

Bank 2

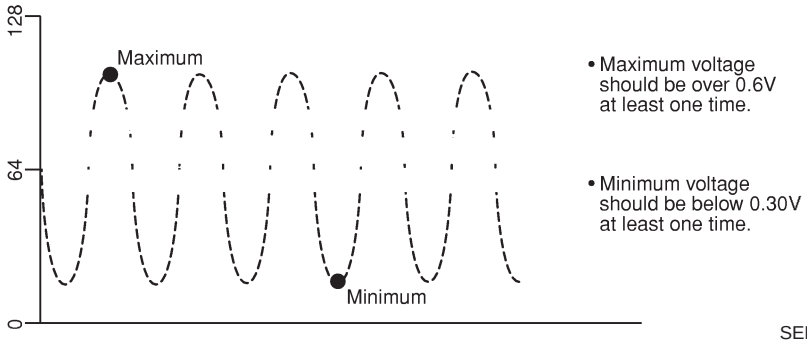
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" 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
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.

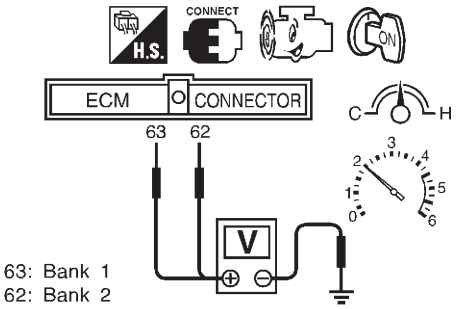
OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

12	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 gank 2 signal) and engine ground.
4. 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 → 0 - 0.3V

SEF967XA

CAUTION:

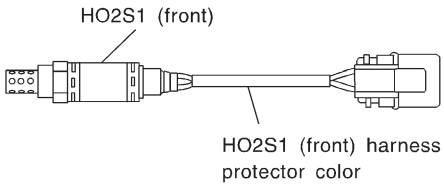
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

14	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17 or joint connector-18.
3. Check the following.

- Continuity between joint connector terminal 1 or 2 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)

Continuity should exist.

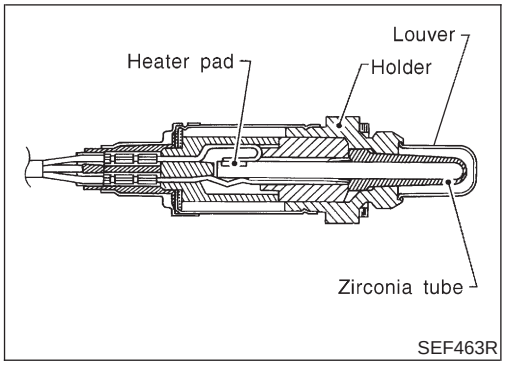
4. Also check harness for short to power.
5. Then reconnect joint connector-17 or joint connector-18.

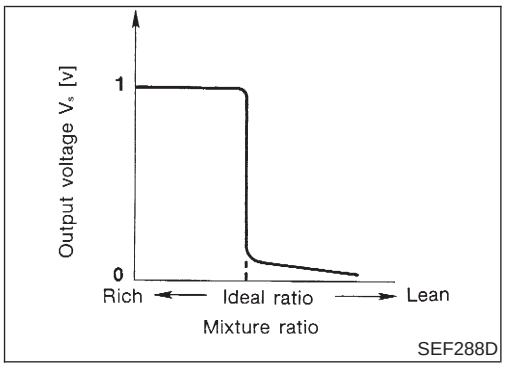
OK or NG

OK	▶	GO TO 15.
NG	▶	Repair open circuit or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

15	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**





Component Description

NFEC0686

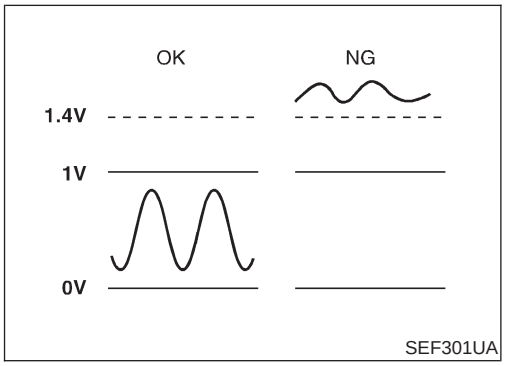
The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) 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

NFEC0687

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.



On Board Diagnosis Logic

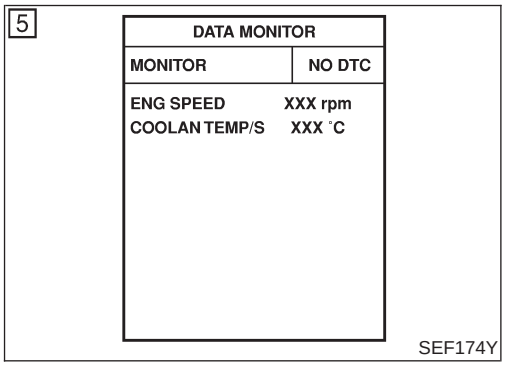
NFEC0688

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 (front) output is not inordinately high.
Malfunction is detected when an excessively high voltage from the sensor is sent to ECM.

Possible Cause

NFEC0689

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)



DTC Confirmation Procedure

NFEC0690

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

NFEC0690S01

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 25 seconds.
6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-201.

WITH GST

NFEC0690S02

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 25 seconds.
4) Turn ignition switch “OFF” and wait at least 10 seconds.
5) Restart engine and let it idle for 25 seconds.
6) Select “MODE 3” with GST.
7) If DTC is detected, go to “Diagnostic Procedure”, EC-201.

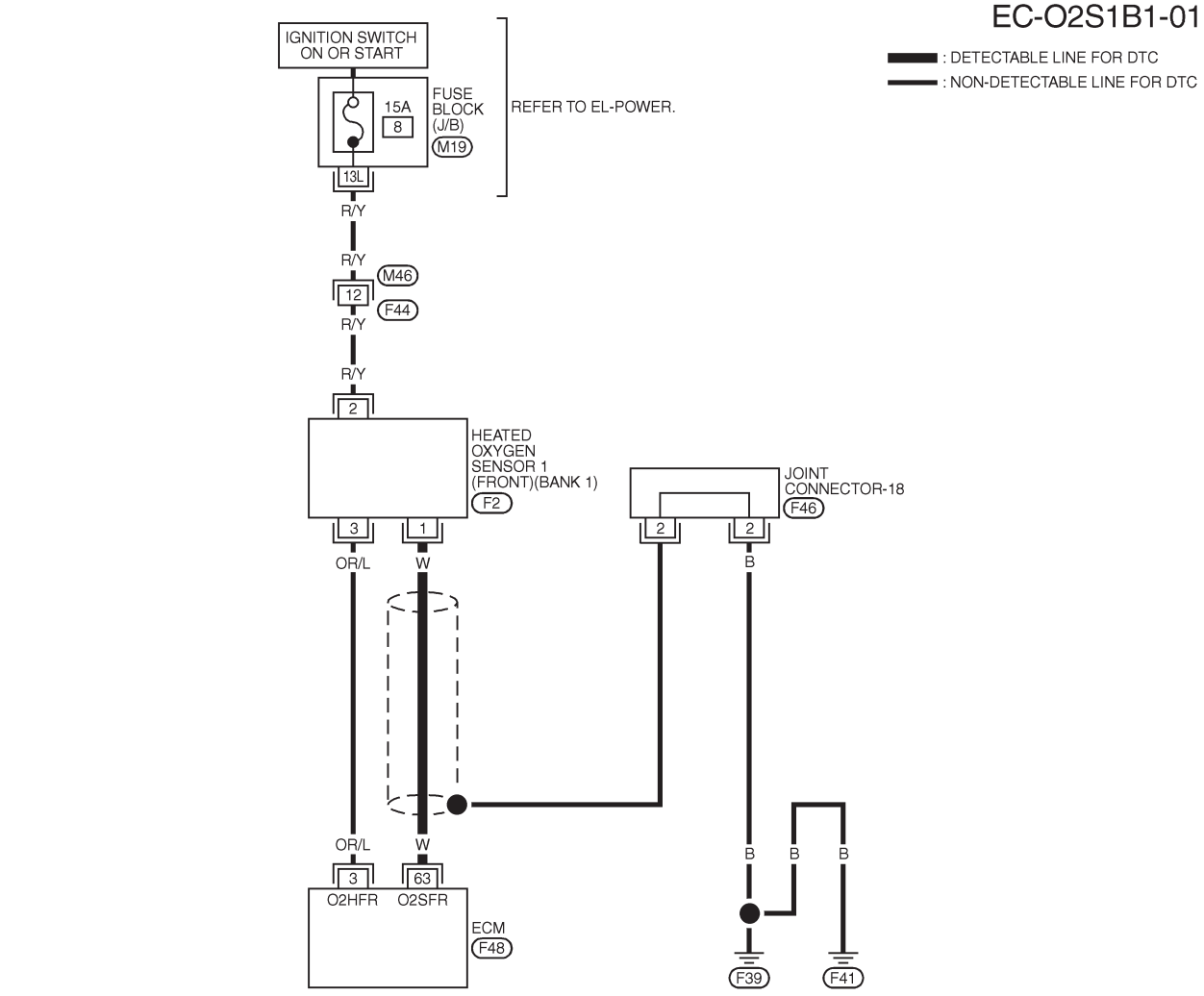
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

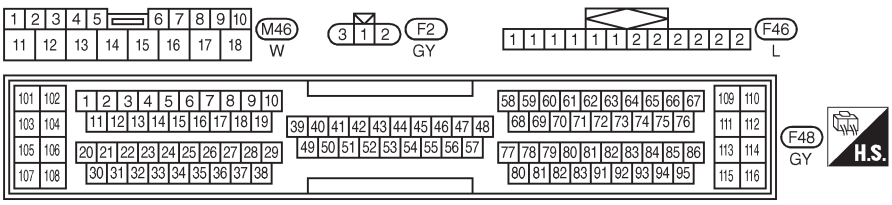
Wiring Diagram

NFEC0691

BANK 1

NFEC0691S01

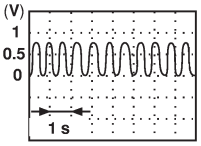




REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC296D

ECM TERMINALS AND REFERENCE VALUE 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.

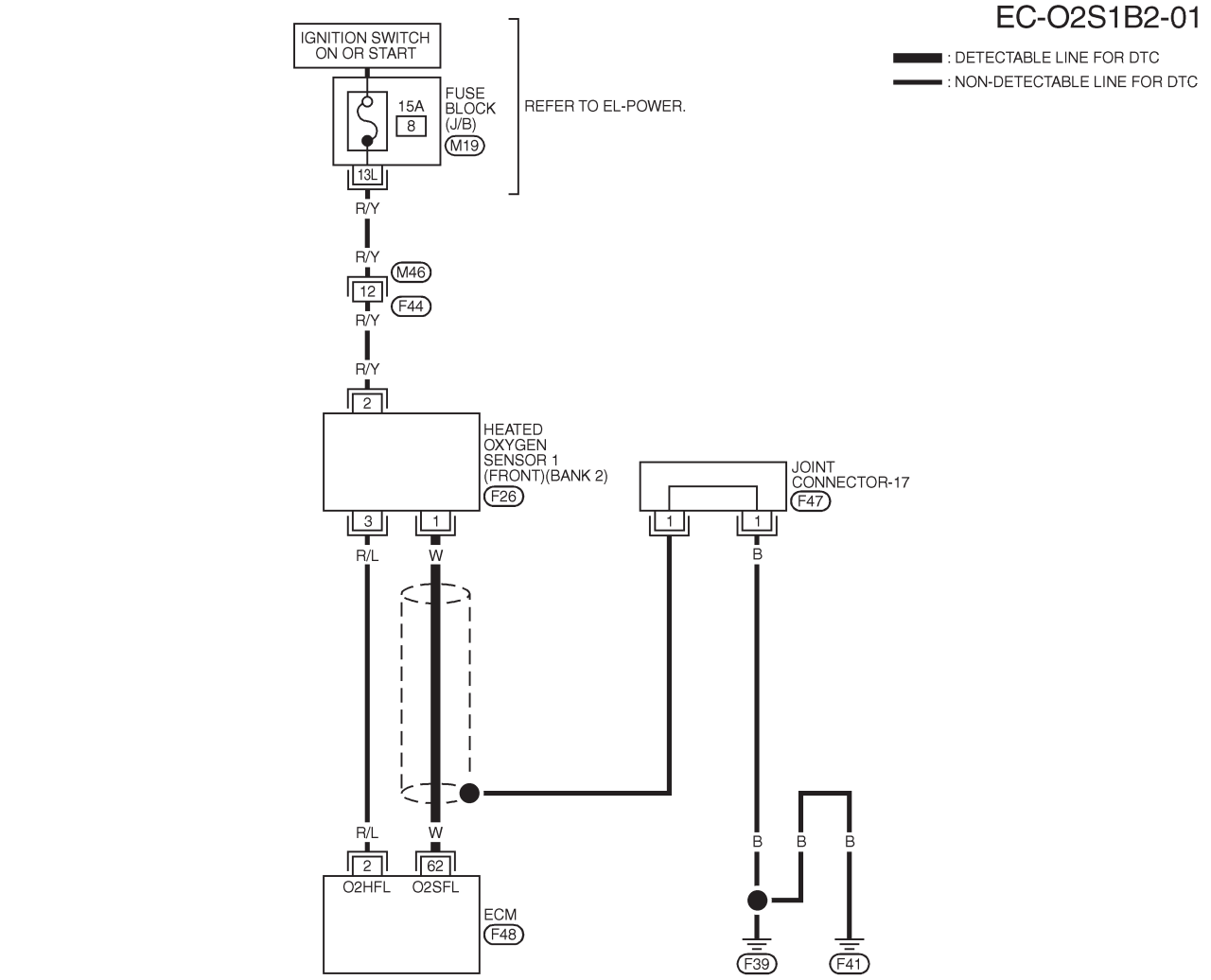
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
63	W	HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1)	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V 

SEF854YC

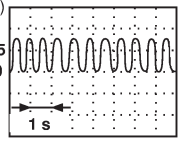
Wiring Diagram (Cont'd)

BANK 2

NFEC0691S02



ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
62	W	HEATED OXYGEN SENSOR 1 (FRONT) (BANK 2)	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V 

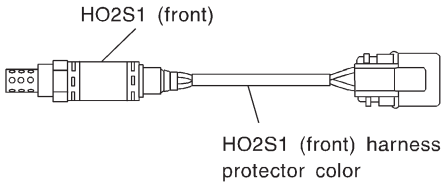
SEF855YC

Diagnostic Procedure

NFEC0692

1	INSPECTION START

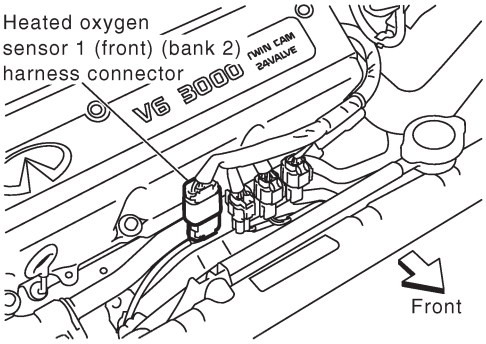
1. Turn ignition switch “OFF”.
2. Check heated oxygen sensor 1 (front) harness protector color.

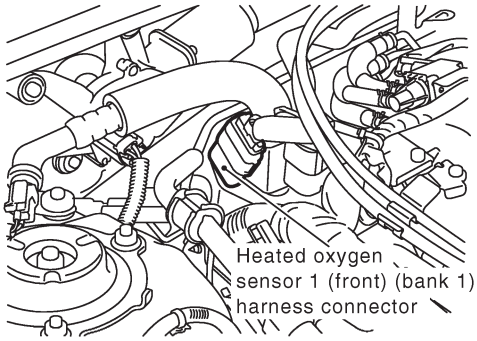


HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.





SEF902XA

▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)

Loosen and retighten corresponding heated oxygen sensor 1 (front).

Tightening torque:

40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	CHECK HEATED OXYGEN SENSOR 1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0134	63	1	1
P0154	62	1	2

MTBL0488

Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0134	63 or 1	Ground	1
P0154	62 or 1	Ground	2

MTBL0489

Continuity should not exist.

4. 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 (FRONT) CONNECTOR FOR WATER

1. Disconnect heated oxygen sensor 1 (front) harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair or replace harness or connectors.

5 **CHECK HEATED OXYGEN SENSOR 1 (FRONT)**

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)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
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)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown left:

Bank 1

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

Bank 2

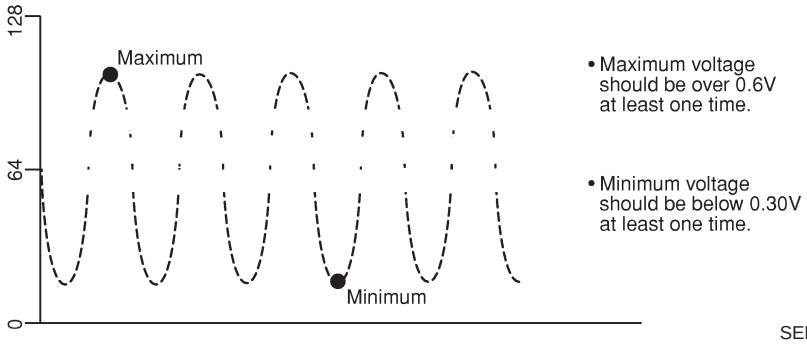
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" 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
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.

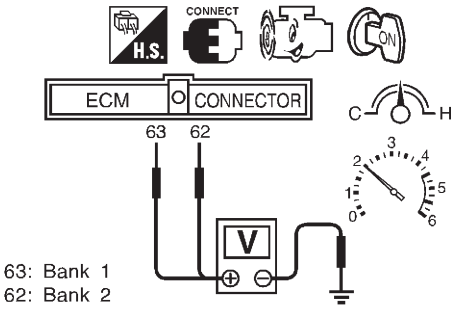
OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

6	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
4. Check the following with engine speed held at 2,000 rpm constant under no load.



63: Bank 1
62: Bank 2

- 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 → 0 - 0.3V

SEF967XA

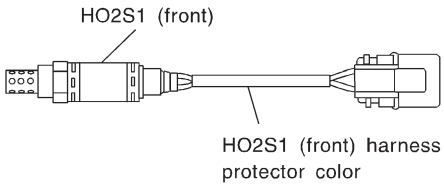
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

CAUTION:
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.

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
	▶ **INSPECTION END**

Description

NFEC0693

SYSTEM DESCRIPTION

NFEC0693S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater (front) control	Heated oxygen sensors 1 heater (front)
Crankshaft position sensor (REF)			

The ECM performs ON/OFF control of the heated oxygen sensor 1 heater (front) corresponding to the engine speed.

OPERATION

NFEC0693S02

Engine speed rpm	Heated oxygen sensors 1 heater (front)
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

NFEC0694

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1) HO2S1 HTR (B2)	● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF

On Board Diagnosis Logic

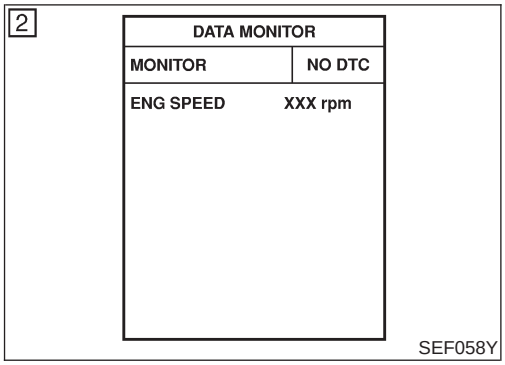
NFEC0695

Malfunction is detected when the current amperage in the heated oxygen sensor 1 heater (front) circuit is out of the normal range. [An improper voltage drop signal is sent to ECM through the heated oxygen sensor 1 heater (front).]

Possible Cause

NFEC0696

- Harness or connectors
  [The heated oxygen sensor 1 heater (front) circuit is open or shorted.]
- Heated oxygen sensor 1 heater (front)



DTC Confirmation Procedure

NFEC0697

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

NFEC0697S01

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT.
2) Start engine and run it for at least 6 seconds at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-209.

WITH GST

NFEC0697S02

1) Start engine and run it for at least 6 seconds at idle speed.
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) Select “MODE 3” with GST.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-209.

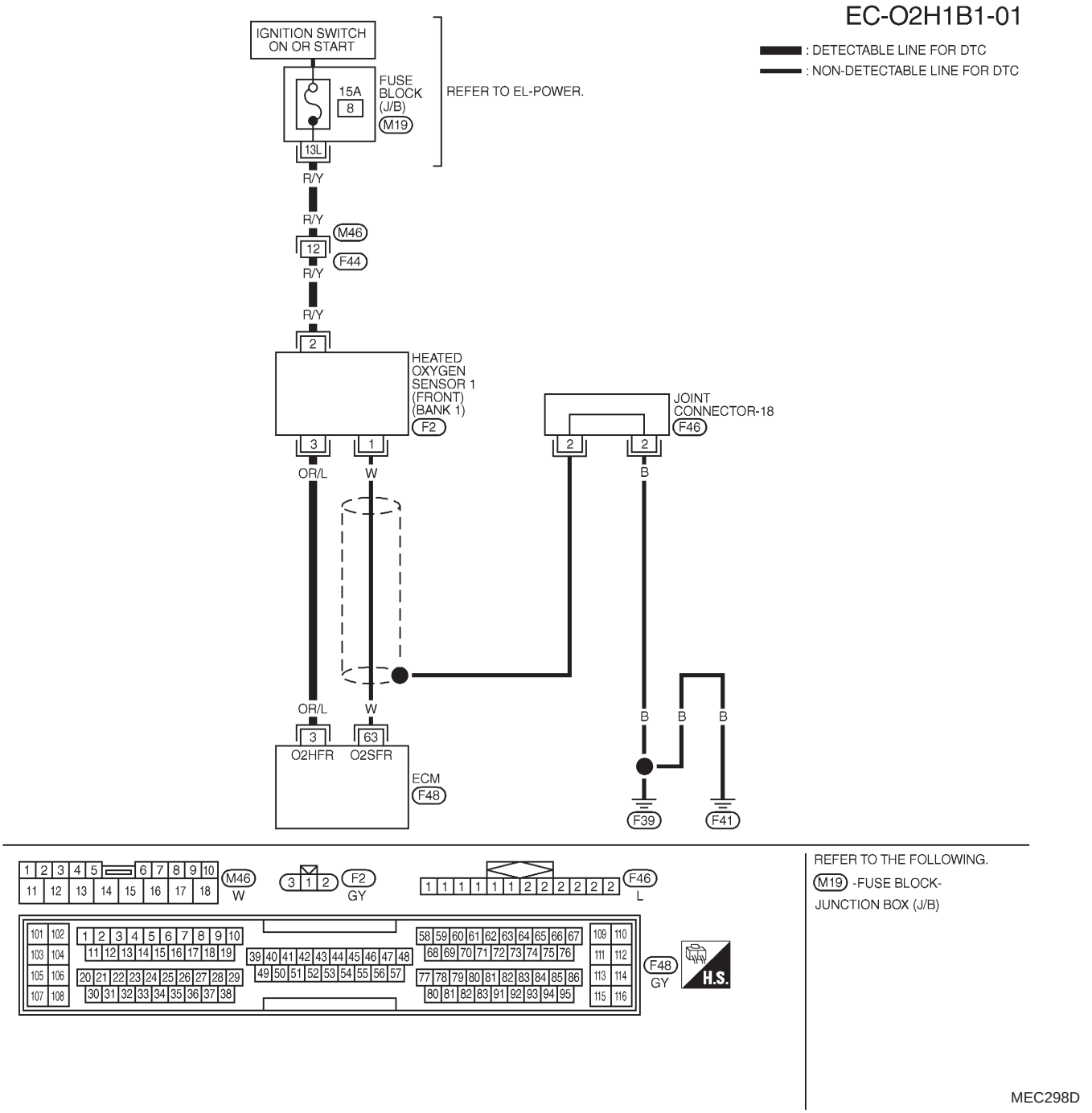
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

NFEC0698

BANK 1

NFEC0698S01



MEC298D

ECM TERMINALS AND REFERENCE VALUE 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.

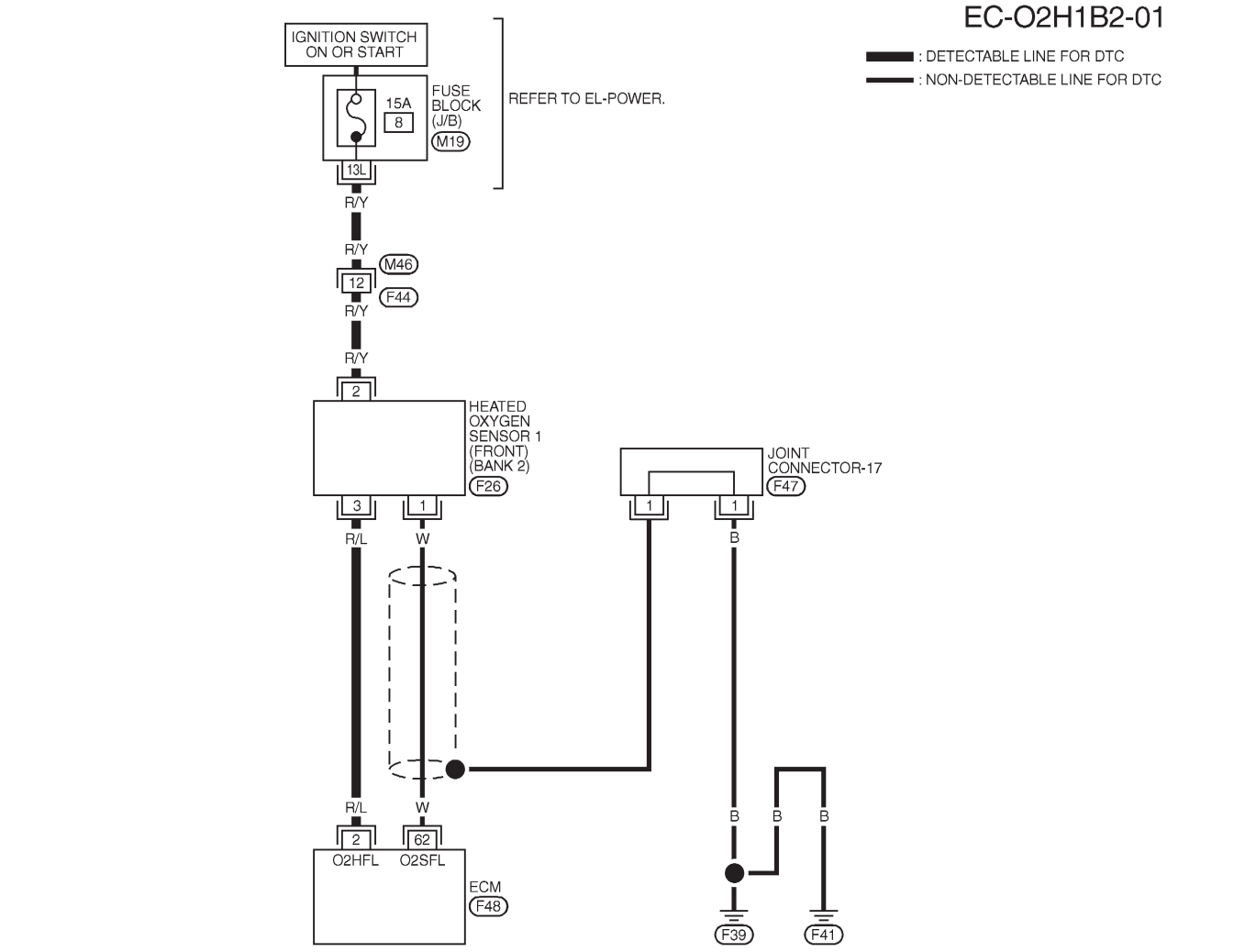
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
3	OR/L	HEATED OXYGEN SENSOR 1 HEATER (FRONT) (BANK 1)	ENGINE RUNNING BELOW 3,600 RPM	0 - 1.0V
			ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE

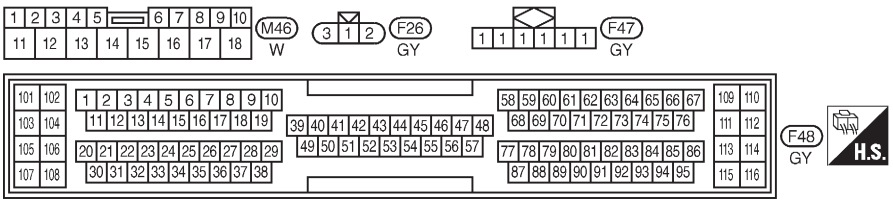
SEF655XE

Wiring Diagram (Cont'd)

BANK 2

NFEC0698S02





REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC299D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
2	R/L	HEATED OXYGEN SENSOR 1 HEATER (FRONT) (BANK 2)	ENGINE RUNNING BELOW 3,600 RPM	0 - 1.0V
			ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE

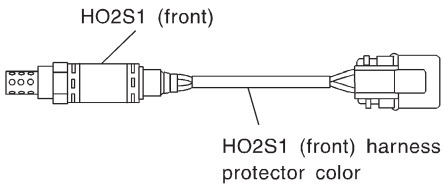
SEF656XE

Diagnostic Procedure

NFEC0699

1	CHECK HEATED OXYGEN SENSOR 1 (FRONT) POWER SUPPLY CIRCUIT

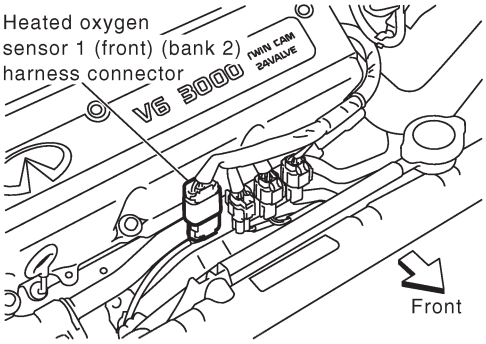
1. Turn ignition switch “OFF”.
2. Check heated oxygen sensor 1 (front) harness protector color.

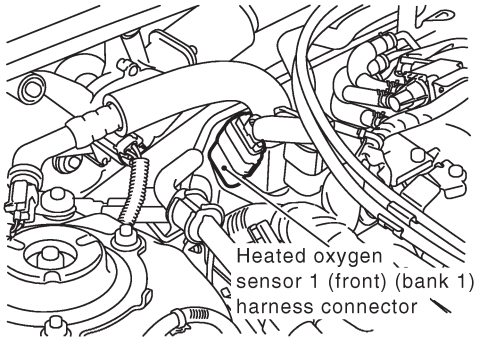


HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

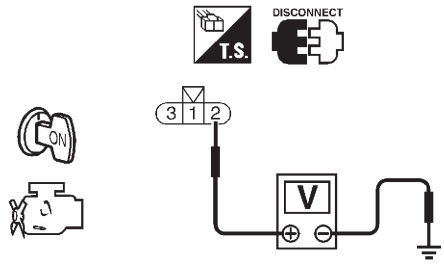
3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.





SEF902XA

4. Turn ignition switch “ON”.
5. Check voltage between HO2S1 (front) terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF311X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between heated oxygen sensor 1 (front) and fuse

	▶	Repair harness or connectors.

Diagnostic Procedure (Cont'd)

3	CHECK HEATED OXYGEN SENSOR 1 (FRONT) OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0135	3	3	1
P0155	2	3	2

MTBL0490

Continuity should exist.

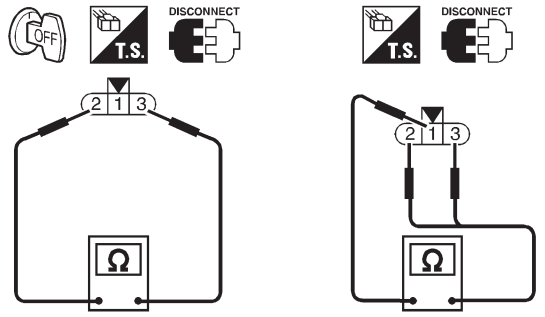
4. Also check harness for short to ground and short to power.

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 (FRONT)

Check resistance between HO2S1 (front) terminals as follows.



Terminals	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 1 and 3	∞Ω (Continuity should not exist.)

SEF310X

CAUTION:

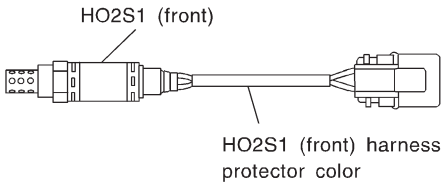
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



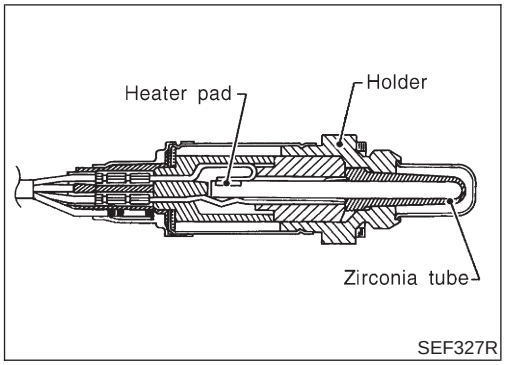
HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

CAUTION:
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.

▶	Replace malfunctioning heated oxygen sensor 1 (front).

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0700

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

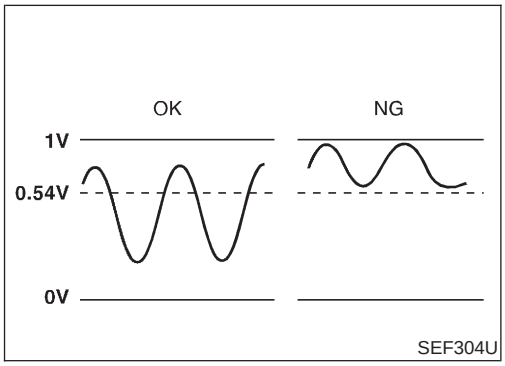
Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0701

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH



On Board Diagnosis Logic

NFEC0702

The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst (Manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.

Malfunction is detected when the minimum voltage from the sensor is not reached to the specified voltage.

Possible Cause

NFEC0703

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors

8

HO2S2 (B1) P0137	
COND1:	OUT OF CONDITION
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF833Y

8

HO2S2 (B1) P0137	
COND1:	TESTING
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF834Y

8

HO2S2 (B1) P0137	
COND1:	COMPLETED
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF835Y

DTC Confirmation Procedure

NFEC0759

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

NFEC0759S01

Procedure for COND1

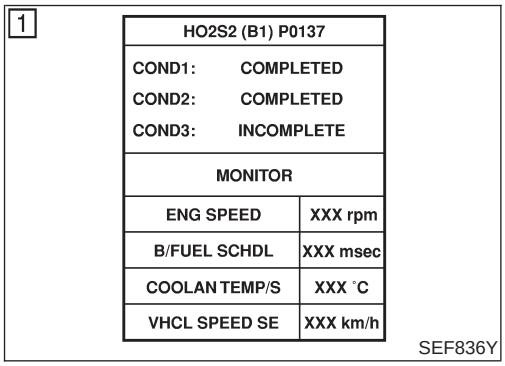
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 seconds.
3) Turn ignition switch "ON" and select "HO2S2 (B1) P0137/ HO2S2 (B2) P0157" of "HO2S2 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
4) Touch "START".
5) Start engine and let it idle for at least 30 seconds.
6) 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.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) 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	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
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**

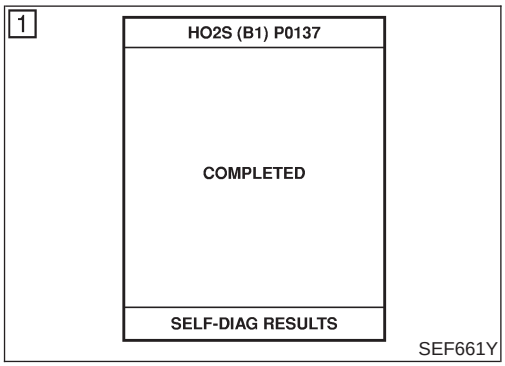
conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".



Procedure for COND2

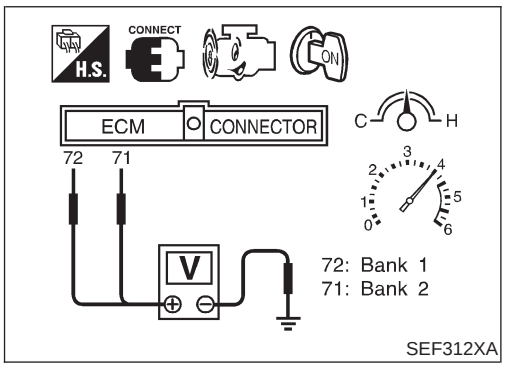
1) While driving, release accelerator pedal completely with "OD" OFF (A/T models only) from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

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 "Diagnostic Procedure", EC-218.



Overall Function Check

NFEC0705

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NFEC0705S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
4) Check the voltage when racing 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 0.54V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
   The voltage should be below 0.54V at least once during this procedure.

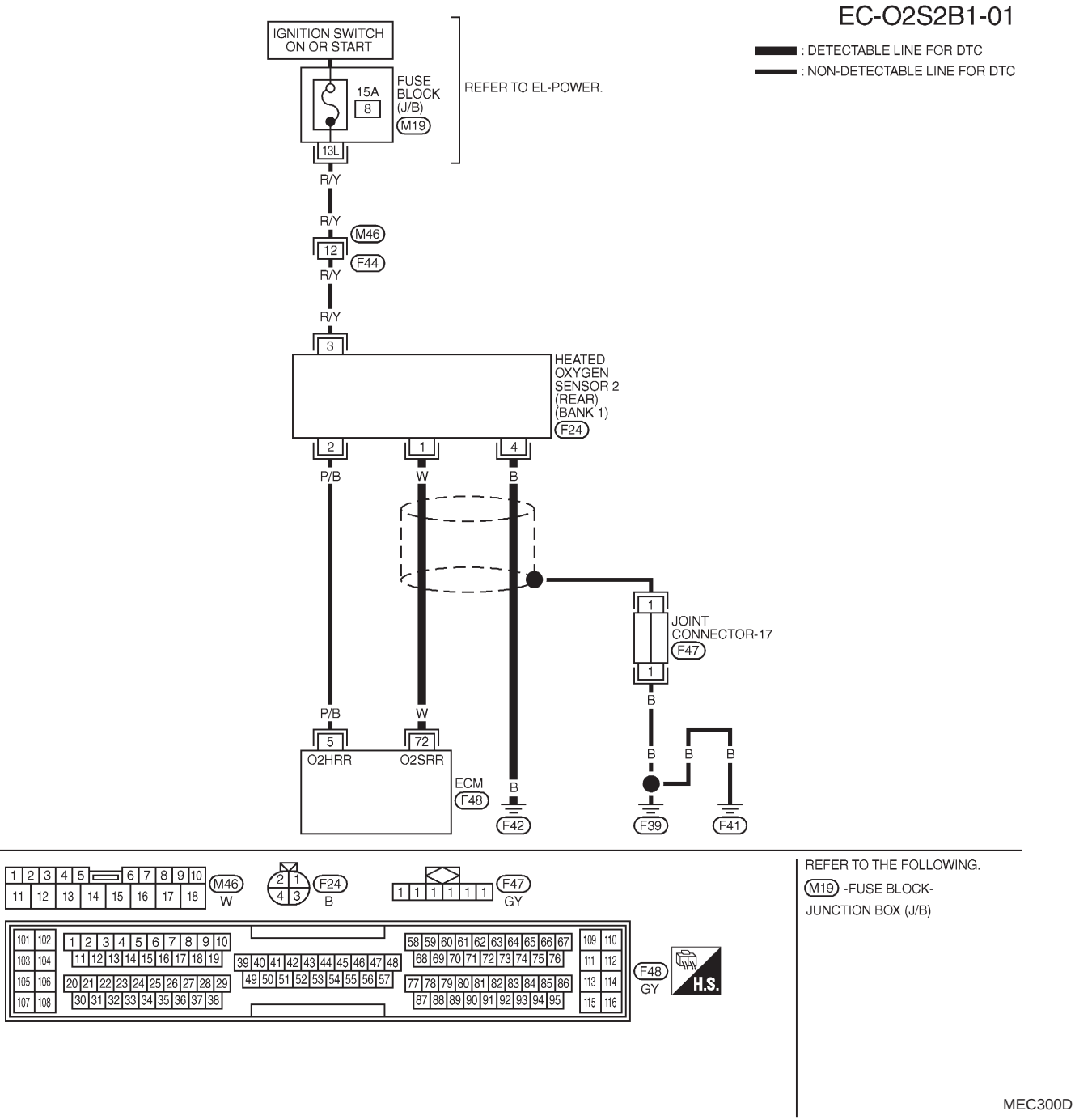
6) If NG, go to "Diagnostic Procedure", EC-218.

Wiring Diagram

=NFEC0706

BANK 1

NFEC0706S01



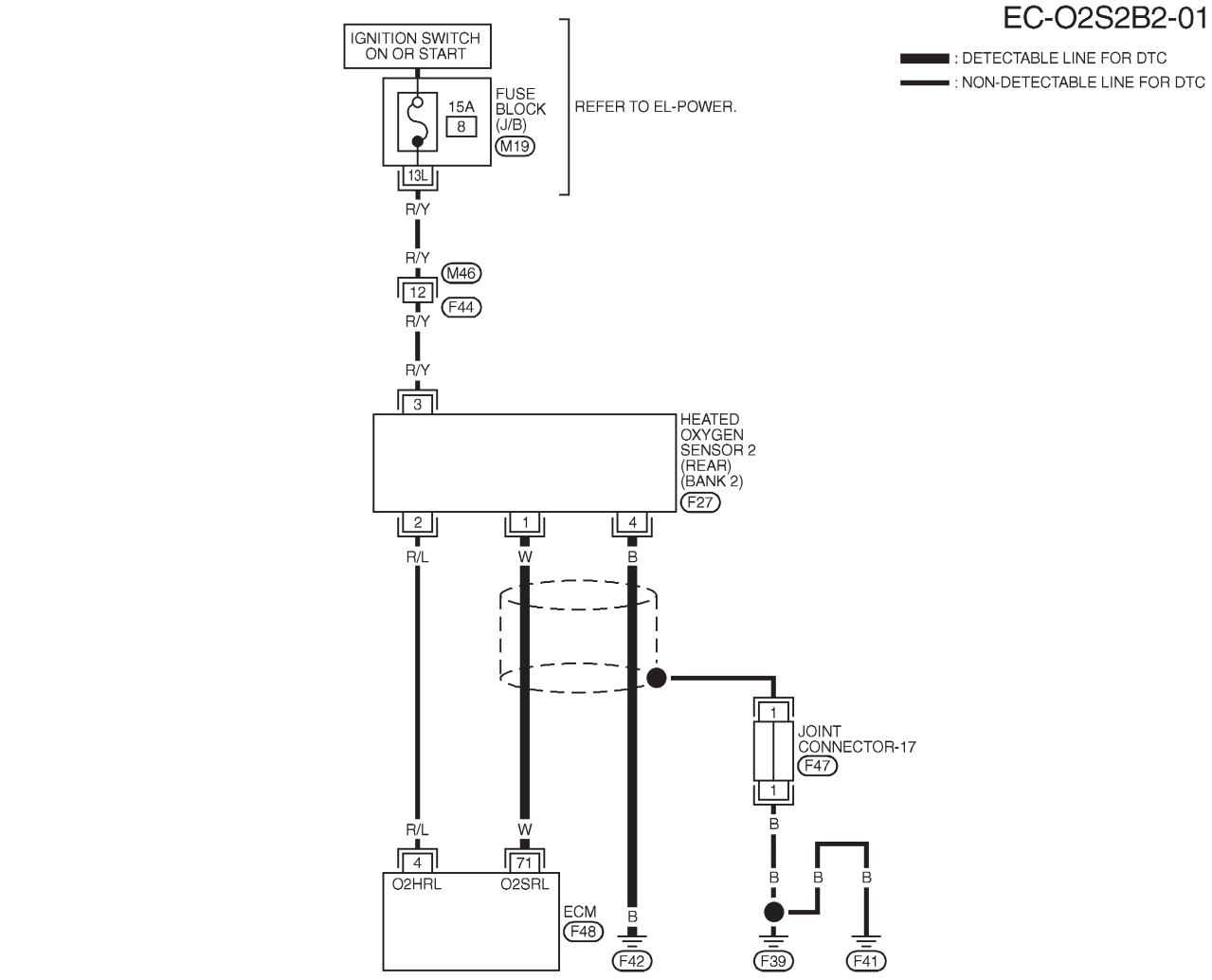
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 1)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

SEF657XE

BANK 2

NFEC0706S02



MEC301D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
71	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 2)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

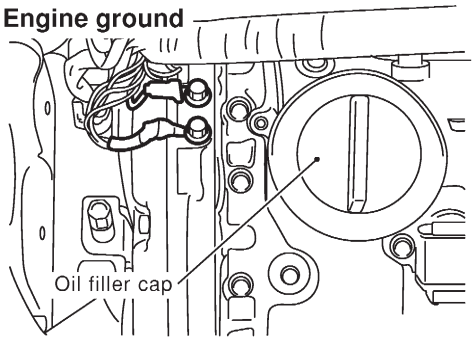
SEF658XE

Diagnostic Procedure

NFEC0707

1	RETIGHTEN GROUND SCREWS

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



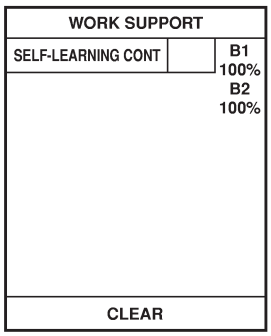
SEF255X

▶	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”.



SEF652Y

4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?

Without CONSULT-II

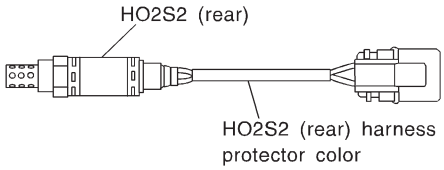
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to “How to Erase Emission-related Diagnostic Information”, EC-56.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-269.
No	▶	GO TO 3.

3 **CHECK HEATED OXYGEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT**

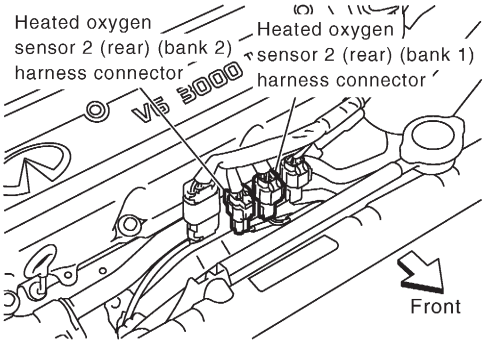
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WB

4. Disconnect ECM harness connector.
5. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0137	72	1	1
P0157	71	1	2

MTBL0491

Continuity should exist.

6. Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0137	72 or 1	Ground	1
P0157	71 or 1	Ground	2

MTBL0492

Continuity should not exist.

7. 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.

Diagnostic Procedure (Cont'd)

4	CHECK HEATED OXYGEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 (rear) terminal 4 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

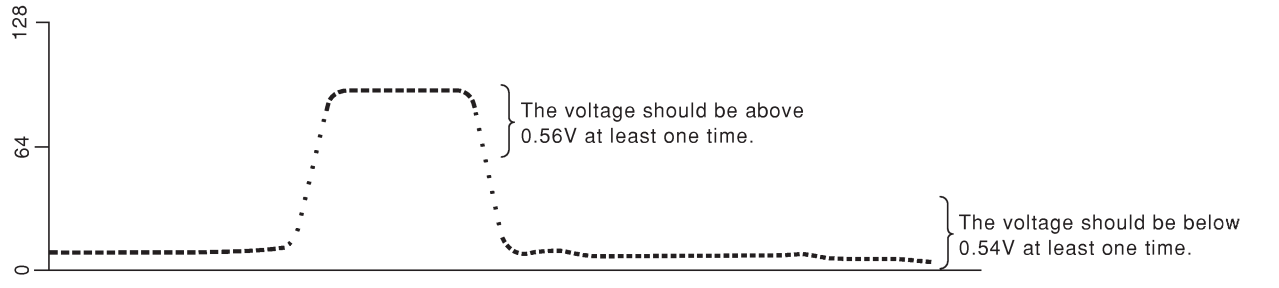
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair open circuit or short to power in harness or connectors.

5	CHECK HEATED OXYGEN SENSOR 2 (REAR)

With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

"HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.54V 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.

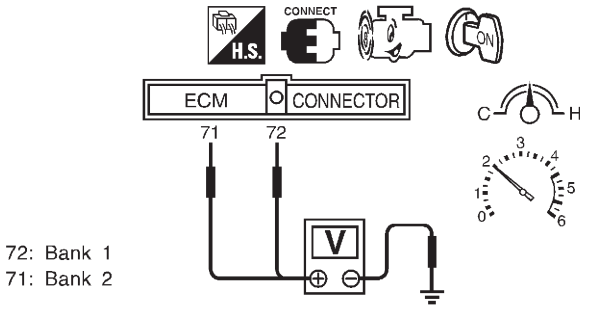
OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
4. Check the voltage when rewing 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 0.56V at least once during this procedure.

SEF313XB

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

CAUTION:

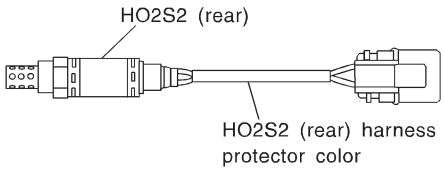
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

1. Stop vehicle and turn ignition switch OFF.
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

CAUTION:

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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

Diagnostic Procedure (Cont'd)

9	CHECK HEATED OXYGEN SENSOR 2 (REAR) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17.
3. Check the following.

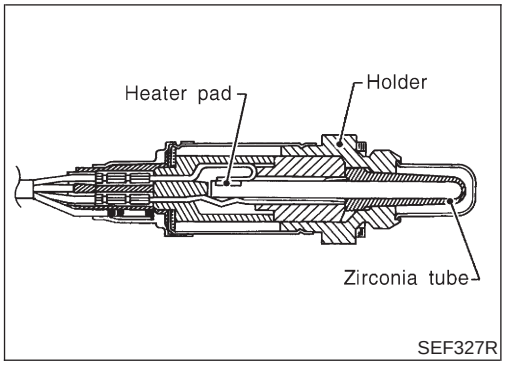
- Continuity between joint connector terminal 1 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)
  Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-17.

OK or NG

OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0708

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

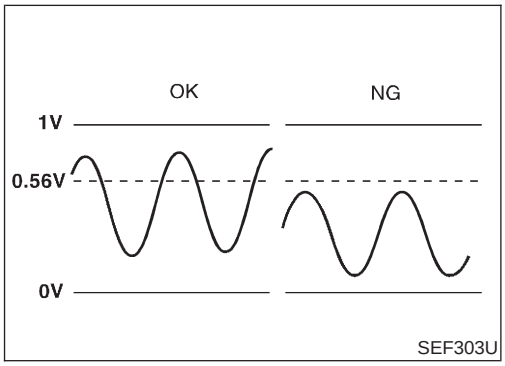
Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0709

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH



On Board Diagnosis Logic

NFEC0710

The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst (Manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.

Malfunction is detected when the maximum voltage from the sensor is not reached to the specified voltage.

Possible Cause

NFEC0711

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors
- Intake air leaks

8

HO2S2 (B1) P0138	
COND1:	OUT OF CONDITION
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF837Y

8

HO2S2 (B1) P0138	
COND1:	TESTING
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF838Y

8

HO2S2 (B1) P0138	
COND1:	COMPLETED
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF839Y

DTC Confirmation Procedure

NFEC0760

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

NFEC0760S01

Procedure for COND1

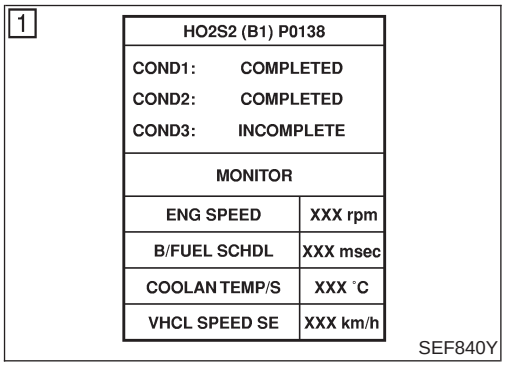
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 seconds.
3) Turn ignition switch "ON" and select "HO2S2 (B1) P0138/ HO2S2 (B2) P0158" of "HO2S2 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
4) Touch "START".
5) Start engine and let it idle for at least 30 seconds.
6) 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.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) 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	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
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**

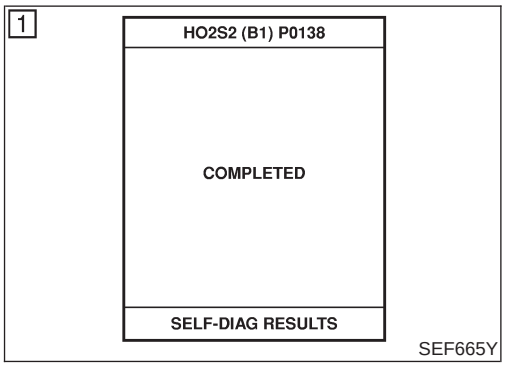
conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".



Procedure for COND2

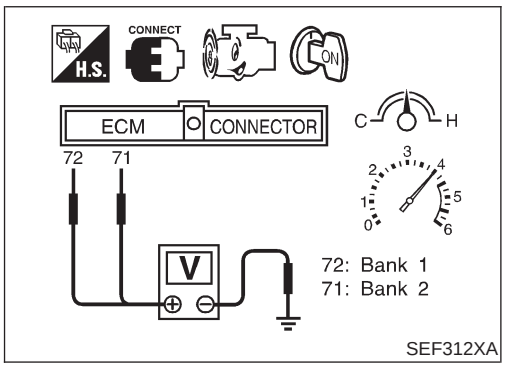
1) While driving, release accelerator pedal completely with "OD" OFF (A/T models only) from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT-II screen is turned to "COMPLETED". (It will take approximately 4 seconds.)

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 "Diagnostic Procedure", EC-229.



Overall Function Check

NFEC0713

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NFEC0713S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
4) Check the voltage when racing 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 0.56V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
   The voltage should be above 0.56V at least once during this procedure.

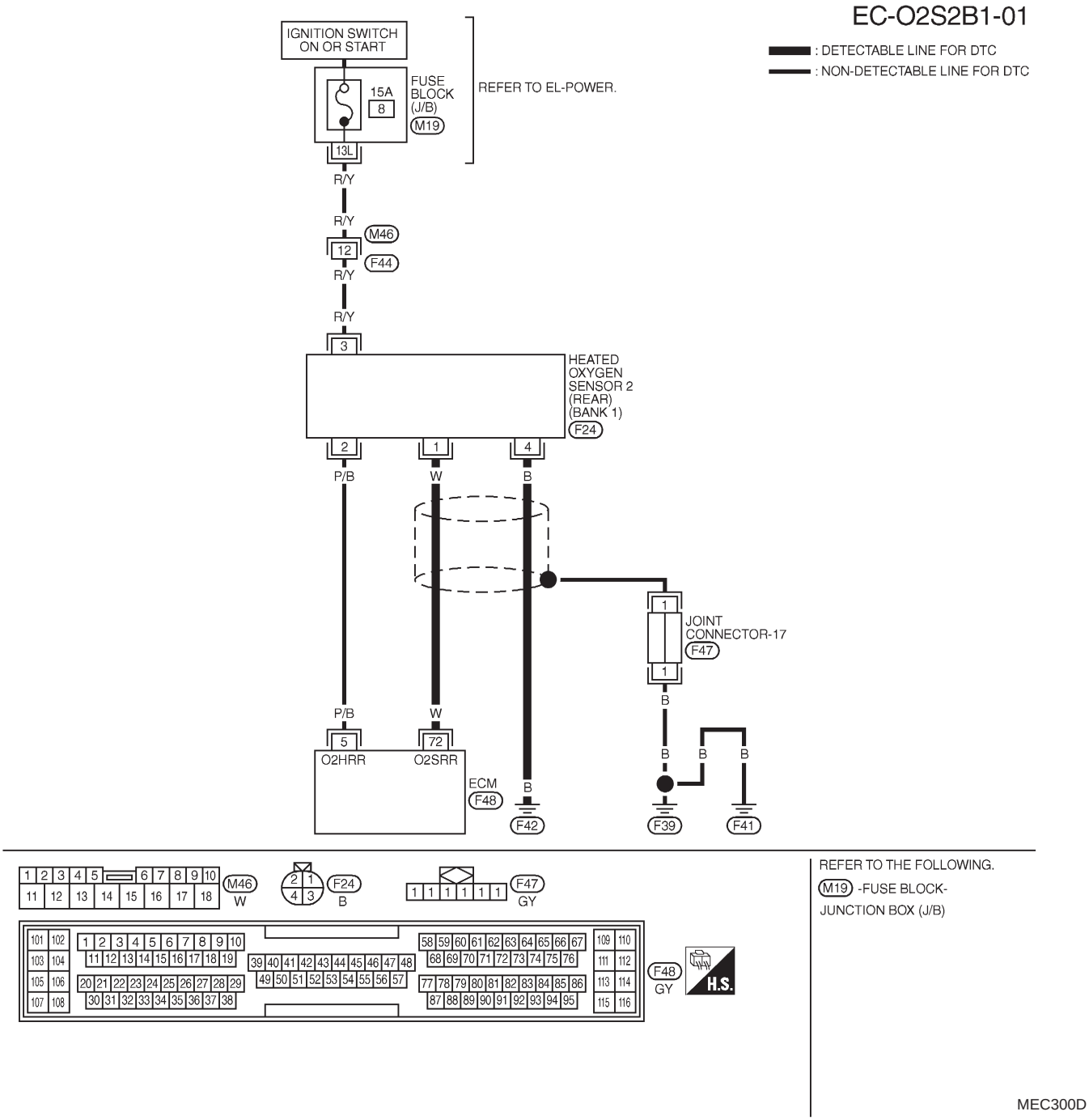
6) If NG, go to “Diagnostic Procedure”, EC-229.

Wiring Diagram

=NFEC0714

BANK 1

NFEC0714S01



ECM TERMINALS AND REFERENCE VALUE 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.

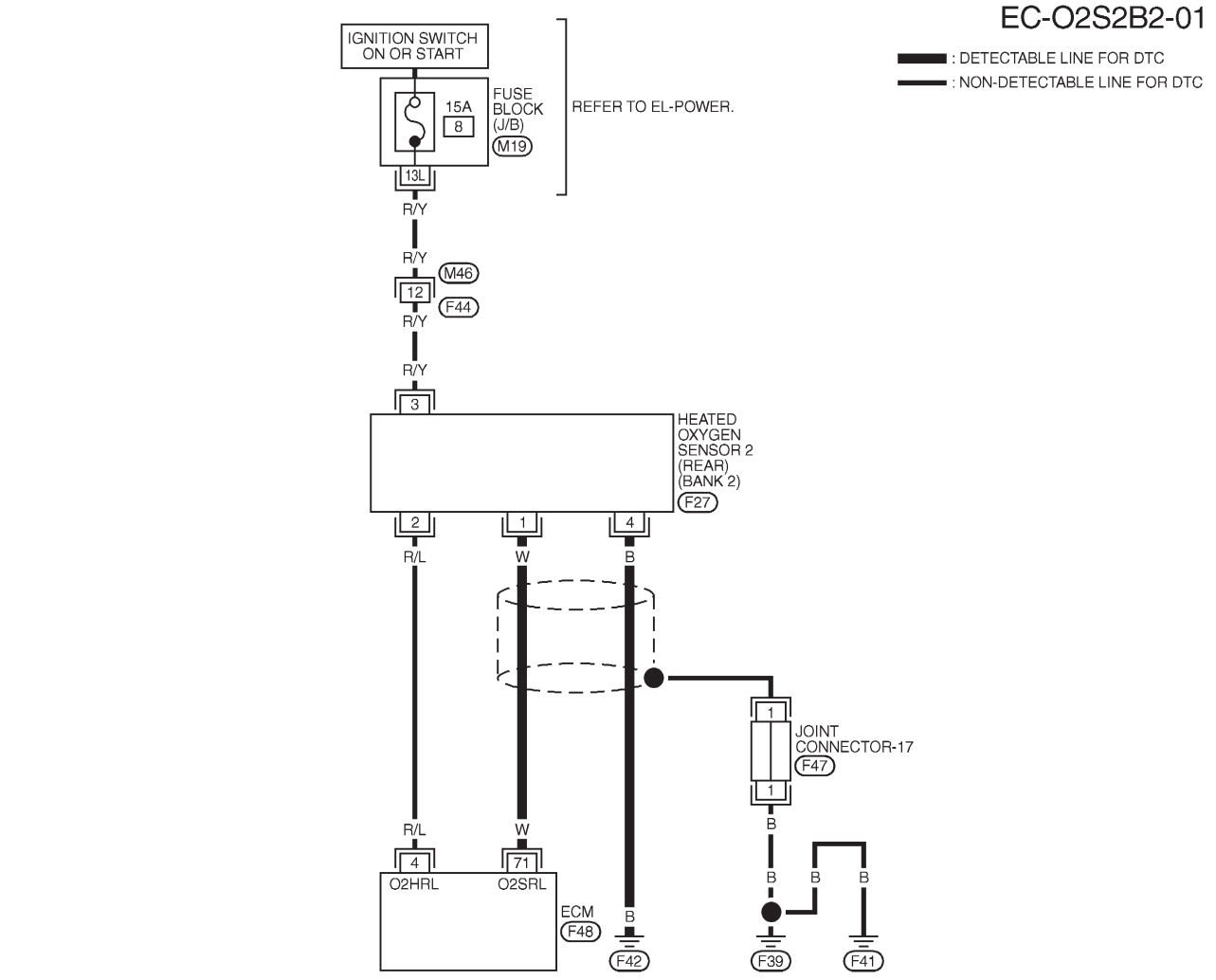
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 1)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

SEF657XE

Wiring Diagram (Cont'd)

BANK 2

NFEC0714S02



MEC301D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
71	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 2)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

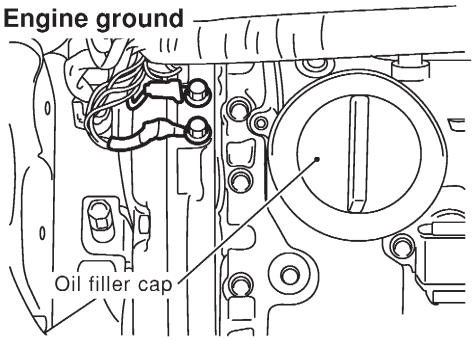
SEF658XE

Diagnostic Procedure

NFEC0715

1	RETIGHTEN GROUND SCREWS

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



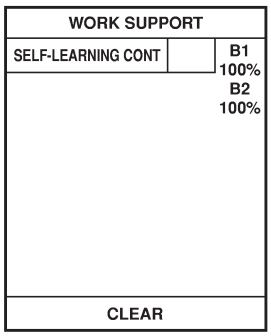
SEF255X

▶	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”.



SEF652Y

4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 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 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to “How to Erase Emission-related Diagnostic Information”, EC-56.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 detected?
   Is it difficult to start engine?

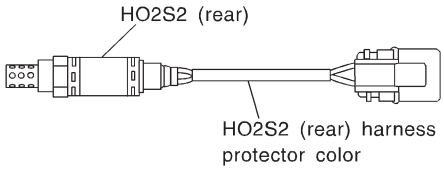
Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171, P0174. Refer to EC-261.
No	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	CHECK HEATED OXYGEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

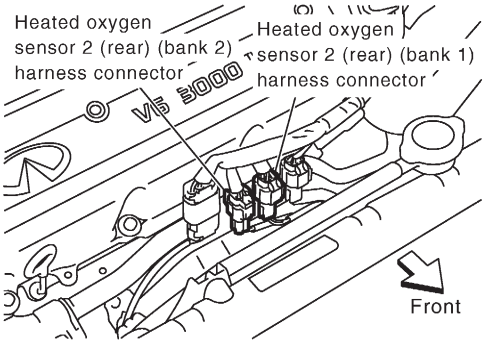
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WB

4. Disconnect ECM harness connector.
5. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	72	1	1
P0158	71	1	2

MTBL0493

Continuity should exist.

6. Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0138	72 or 1	Ground	1
P0158	71 or 1	Ground	2

MTBL0494

Continuity should not exist.

7. 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 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 (rear) terminal 4 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

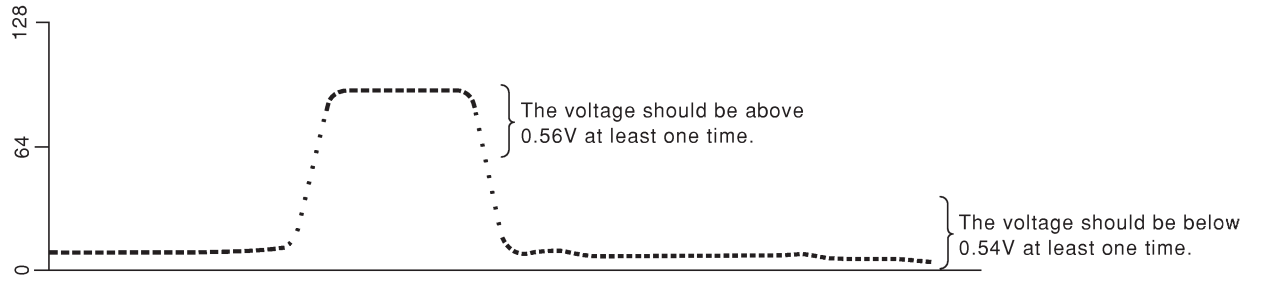
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair open circuit or short to power in harness or connectors.

5	CHECK HEATED OXYGEN SENSOR 2 (REAR)

With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

"HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.54V 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.

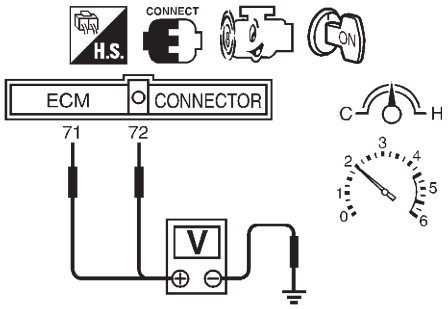
OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
4. 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.)



72: Bank 1
71: Bank 2

The voltage should be above 0.56V at least once during this procedure.

SEF313XB

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

CAUTION:

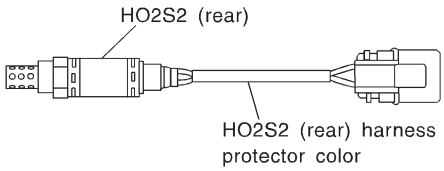
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

1. Stop vehicle and turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

CAUTION:

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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

9	CHECK HEATED OXYGEN SENSOR 2 (REAR) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17.
3. Check the following.

- Continuity between joint connector terminal 1 and ground
- Joint connector

(Refer to EL-377, "HARNESS LAYOUT".)

Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-17.

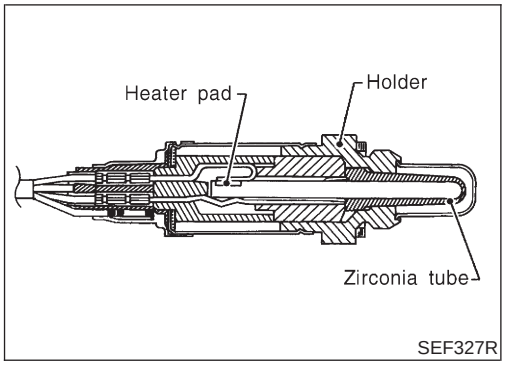
OK or NG

OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

	▶	**INSPECTION END**



Component Description

NFEC0716

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

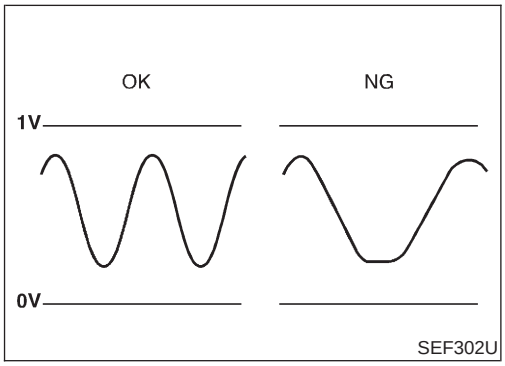
Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0717

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH



On Board Diagnosis Logic

NFEC0718

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

Malfunction is detected when it takes more time for the sensor to respond between rich and lean than the specified time.

Possible Cause

NFEC0719

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors
- Intake air leaks

8

HO2S2 (B1) P0139	
COND1:	OUT OF CONDITION
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF841Y

8

HO2S2 (B1) P0139	
COND1:	TESTING
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF842Y

8

HO2S2 (B1) P0139	
COND1:	COMPLETED
COND2:	INCOMPLETE
COND3:	INCOMPLETE
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF843Y

DTC Confirmation Procedure

NFEC0761

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

NFEC0761S01

Procedure for COND1

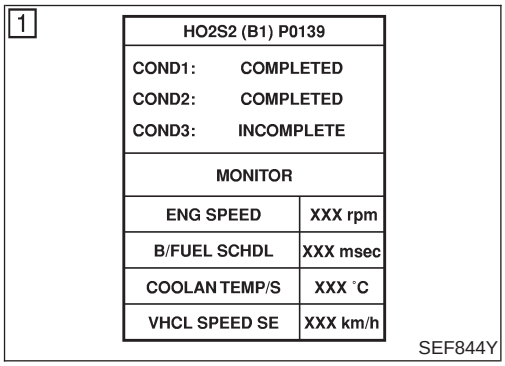
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 conds.
3) Turn ignition switch "ON" and select "HO2S2 (B1) P0139/ HO2S2 (B2) P0159" of "HO2S2 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
4) Touch "START".
5) Start engine and let it idle for at least 30 seconds.
6) 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.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) 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	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
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**

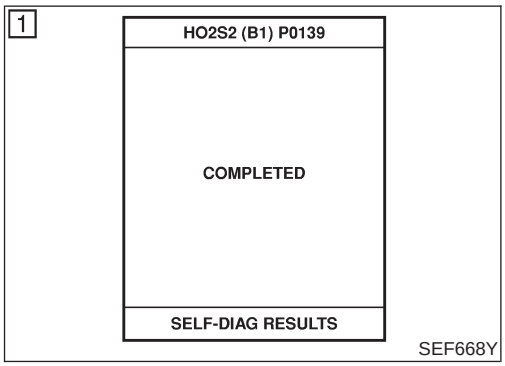
conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".



Procedure for COND2

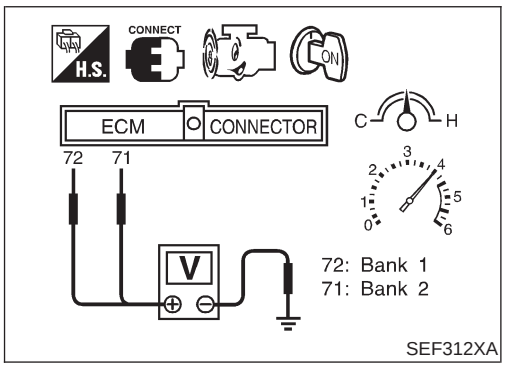
1) While driving, release accelerator pedal completely with "OD" OFF (A/T models only) from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

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 "Diagnostic Procedure", EC-240.



Overall Function Check

NFEC0721

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NFEC0721S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should change at more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
   The voltage should change at more than 0.06V for 1 second during this procedure.

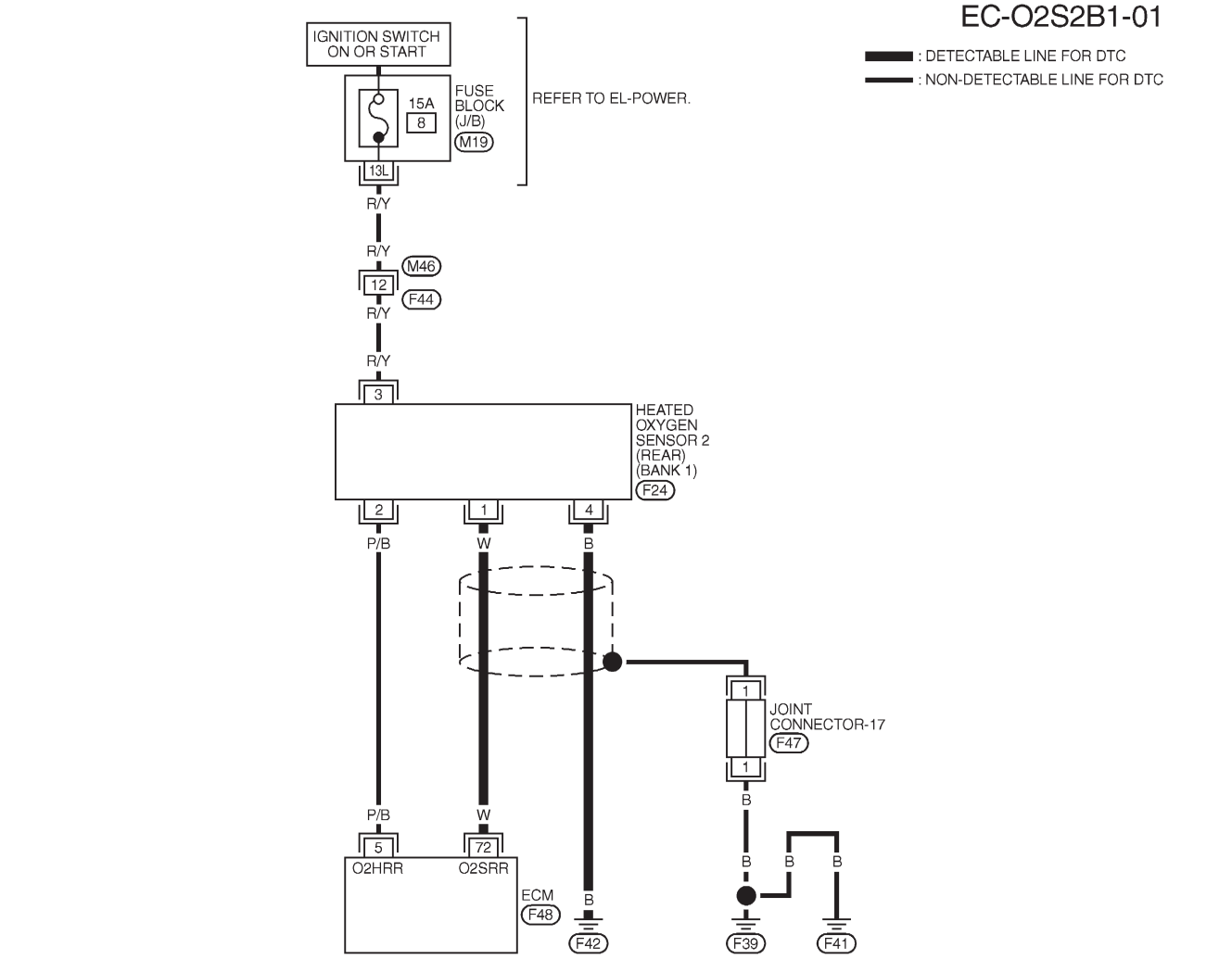
6) If NG, go to "Diagnostic Procedure", EC-240.

Wiring Diagram

=NFEC0722

BANK 1

NFEC0722S01



MEC300D

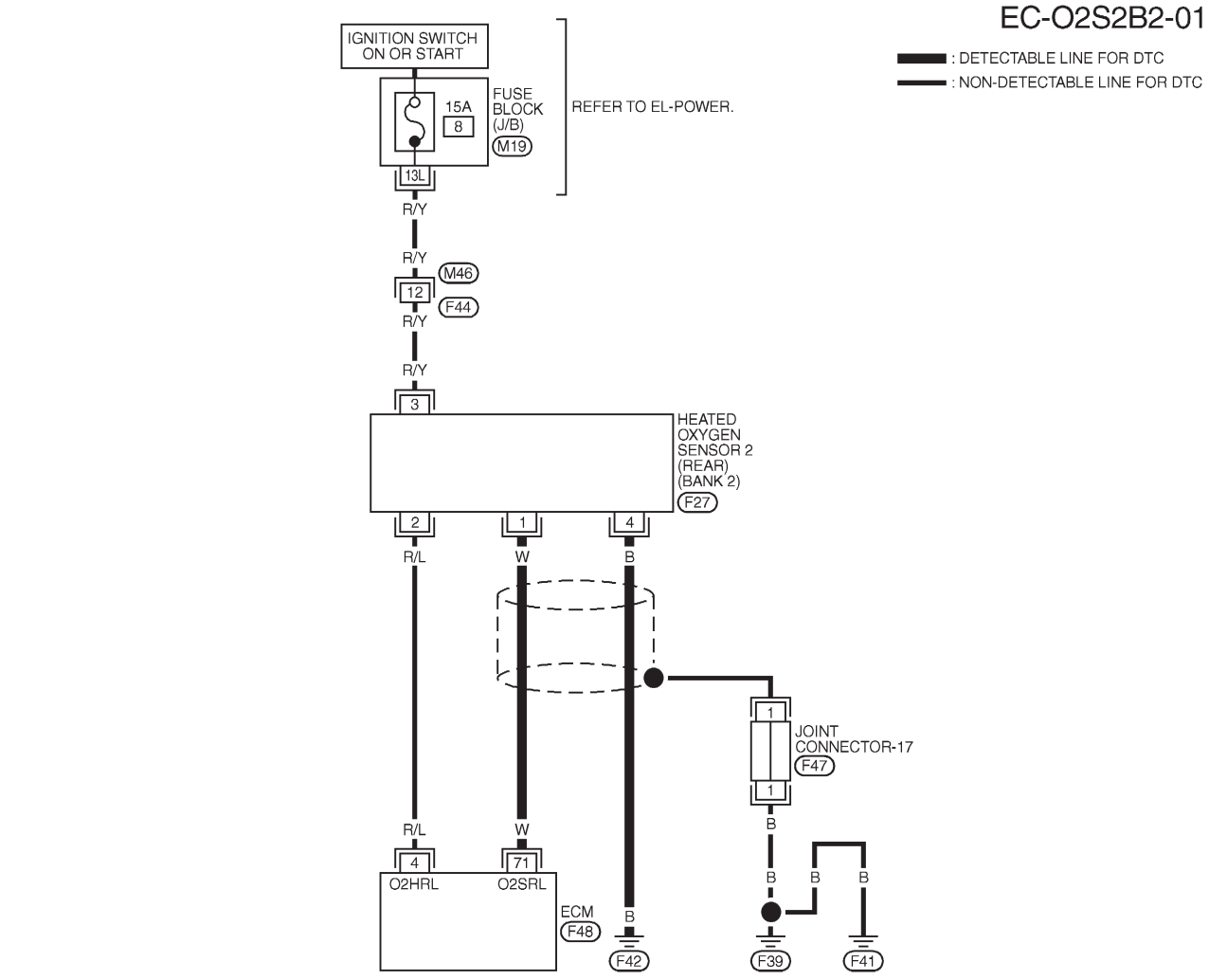
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 1)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

SEF657XE

BANK 2

NFEC0722S02



MEC301D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
71	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 2)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

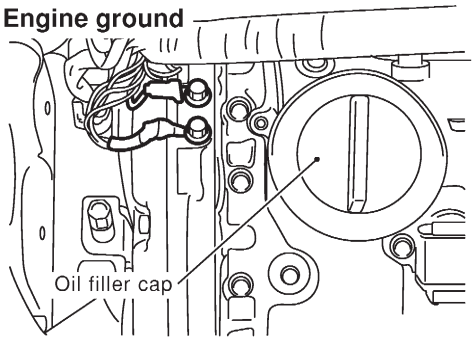
SEF658XE

Diagnostic Procedure

NFEC0723

1	RETIGHTEN GROUND SCREWS

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



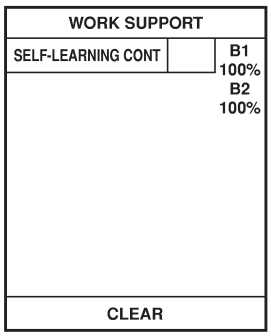
SEF255X

	▶	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”.



SEF652Y

4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?

Without CONSULT-II

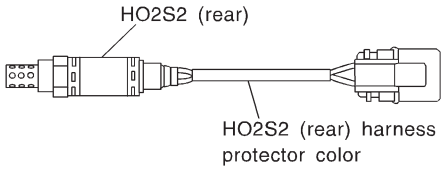
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC No. 0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to “How to Erase Emission-related Diagnostic Information”, EC-56.
7. Make sure DTC No. 0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-261, EC-269.
No	▶	GO TO 3.

3	CHECK HEATED OXYGEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

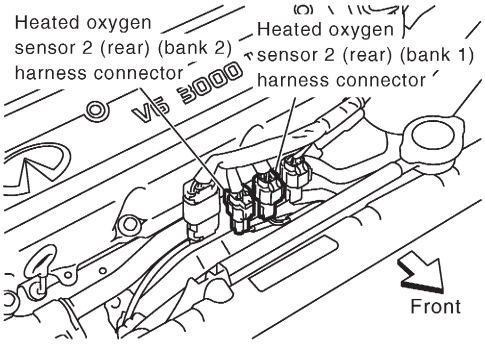
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WB

4. Disconnect ECM harness connector.
5. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0139	72	1	1
P0159	71	1	2

MTBL0495

Continuity should exist.

6. Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0139	72 or 1	Ground	1
P0159	71 or 1	Ground	2

MTBL0496

Continuity should not exist.

7. 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.

Diagnostic Procedure (Cont'd)

4	CHECK HEATED OXYGEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 (rear) terminal 4 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

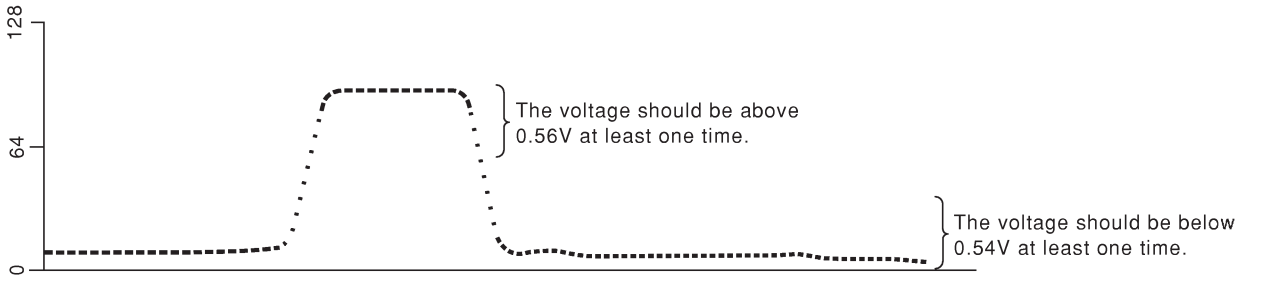
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair open circuit or short to power in harness or connectors

5	CHECK HEATED OXYGEN SENSOR 2 (REAR)

With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

"HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.54V 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.

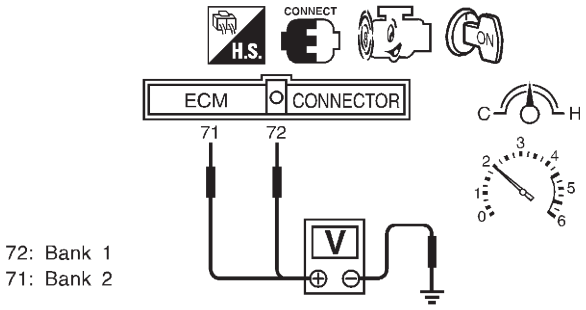
OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
4. 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.)



72: Bank 1
71: Bank 2

The voltage should be above 0.56V at least once during this procedure.

SEF313XB

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

CAUTION:

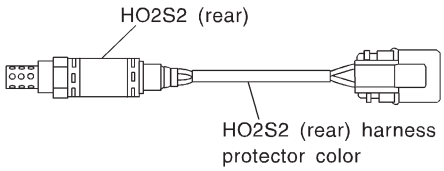
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

1. Stop vehicle and turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

CAUTION:

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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

Diagnostic Procedure (Cont'd)

9	CHECK HEATED OXYGEN SENSOR 2 (REAR) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17.
3. Check the following.

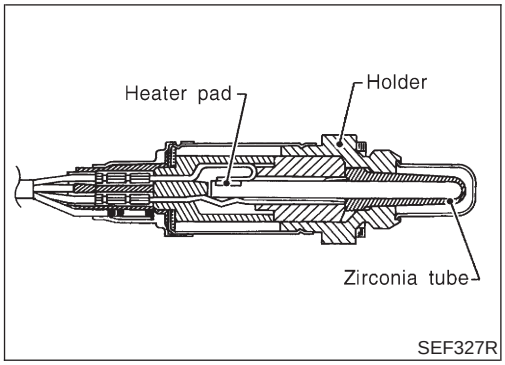
- Continuity between joint connector terminal 1 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)
  Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-17.

OK or NG

OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0724

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

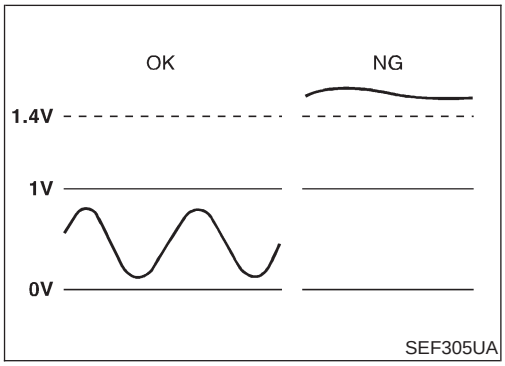
Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0725

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH



On Board Diagnosis Logic

NFEC0726

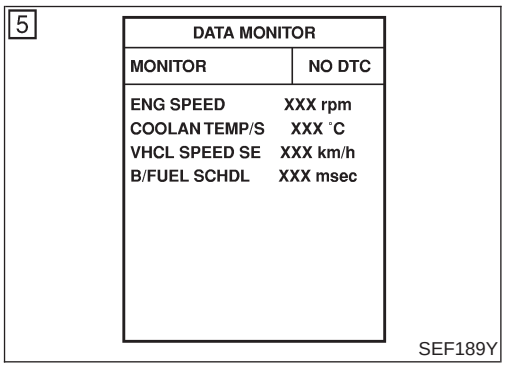
The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst (Manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors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

Malfunction is detected when an excessively high voltage from the sensor is sent to ECM.

Possible Cause

NFEC0727

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)



DTC Confirmation Procedure

NFEC0728

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.

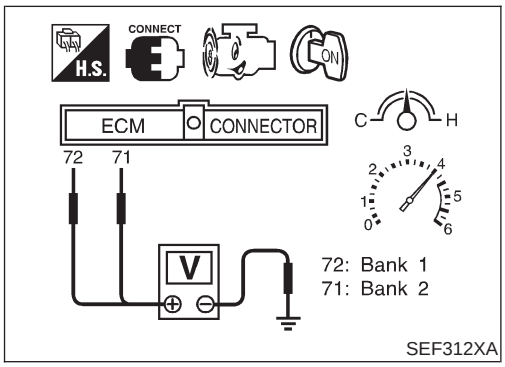
WITH CONSULT-II

NFEC0728S01

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) Stop vehicle with engine running.
4) Let engine idle for 1 minute.
5) Maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	1,300 - 3,100 rpm
VHCL SPEED SE	64 - 130 km/h (40 - 80 MPH)
B/FUEL SCHDL	0.5 - 6.4 msec
COOLAN TEMP/S	70 - 100°C (158 - 212°F)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-250.



Overall Function Check

NFEC0729

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NFEC0729S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.

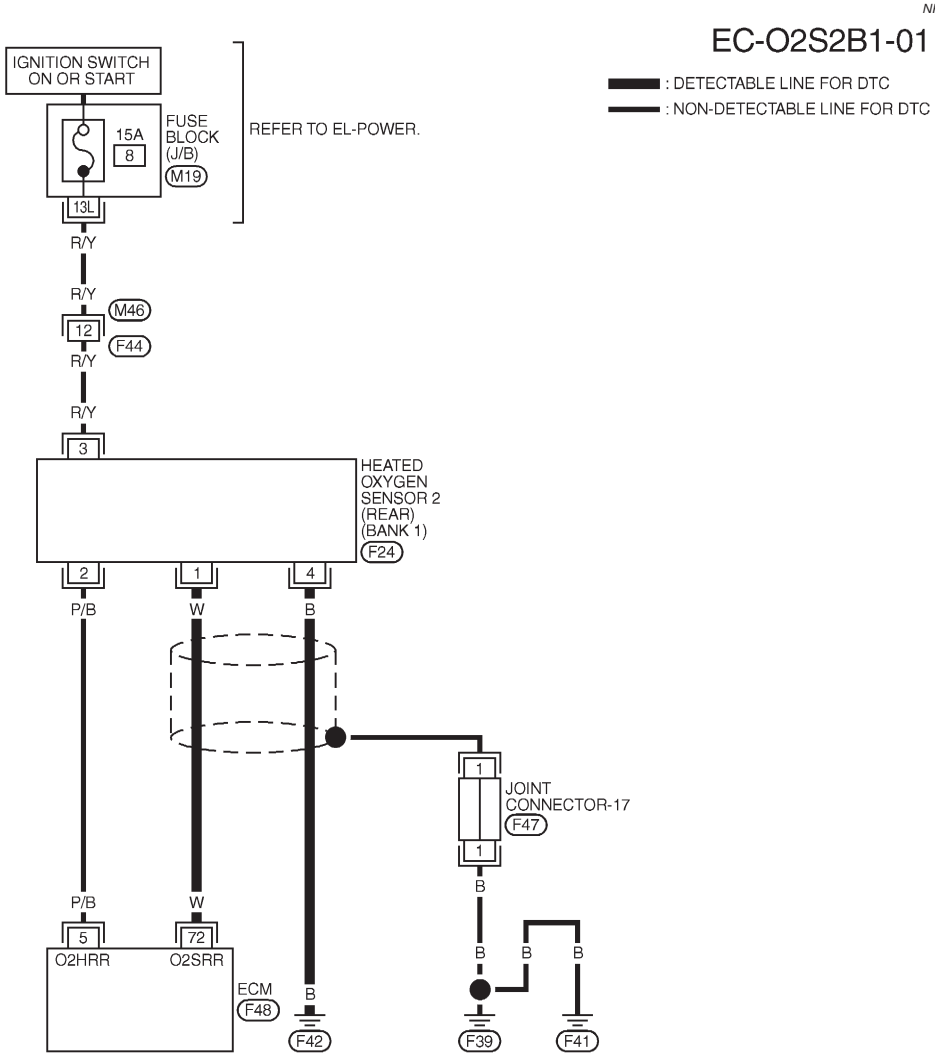
4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be below 1.4V during this procedure.
5) If NG, go to "Diagnostic Procedure", EC-250.

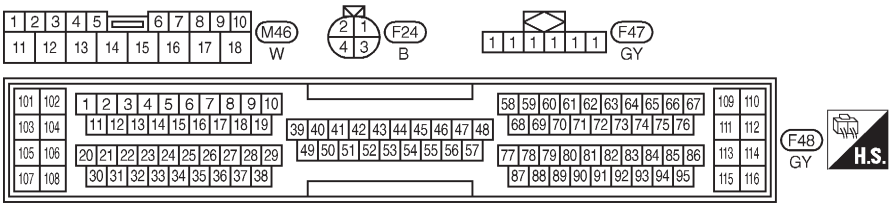
Wiring Diagram

=NFEC0730

BANK 1

NFEC0730S01





REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC300D

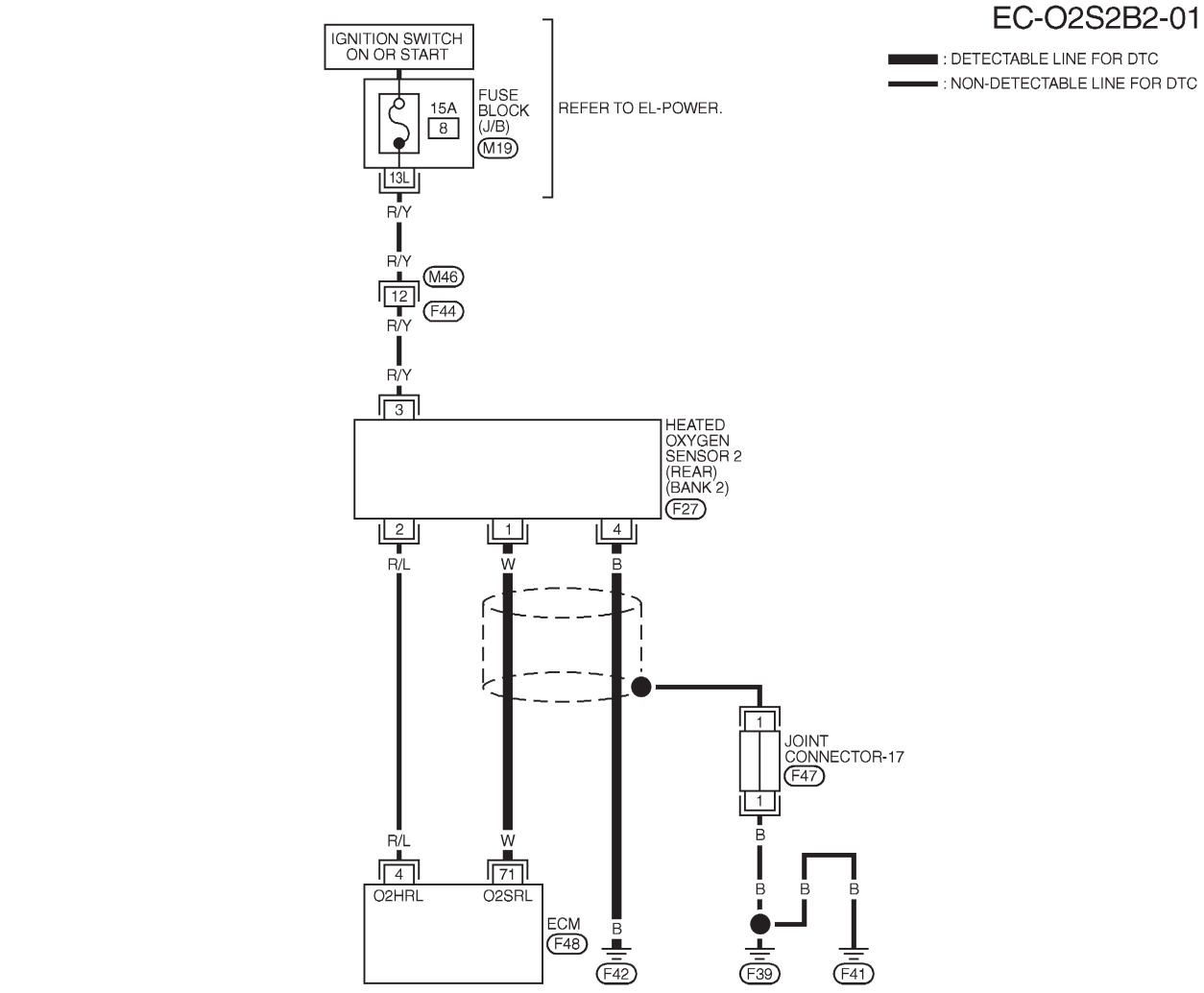
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 1)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

SEF657XE

BANK 2

NFEC0730S02



MEC301D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
71	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 2)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

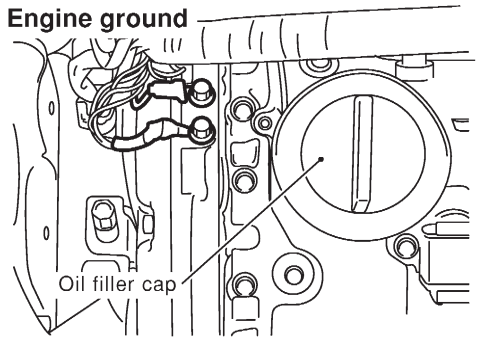
SEF658XE

Diagnostic Procedure

NFEC0731

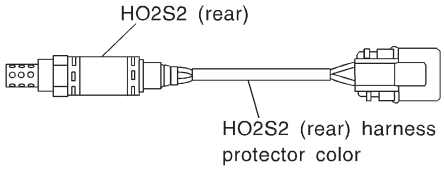
1	INSPECTION START

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



SEF255X

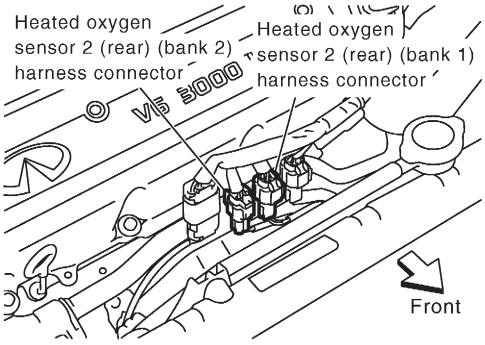
3. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

4. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WB

5. Disconnect ECM harness connector.

▶	GO TO 2.

2	CHECK HEATED OXYGEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	Terminals		Bank
	ECM	Sensor	
P0140	72	1	1
P0160	71	1	2

MTBL0497

Continuity should exist.

2. Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0140	72 or 1	Ground	1
P0160	71 or 1	Ground	2

MTBL0498

Continuity should not exist.

3. Also check harness for 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 HEATED OXYGEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 (rear) terminal 4 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

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

4	CHECK HEATED OXYGEN SENSOR 2 (REAR) CONNECTORS FOR WATER

Check heated oxygen sensor 2 (rear) connector and harness connector for water.
Water should not exist.

OK or NG

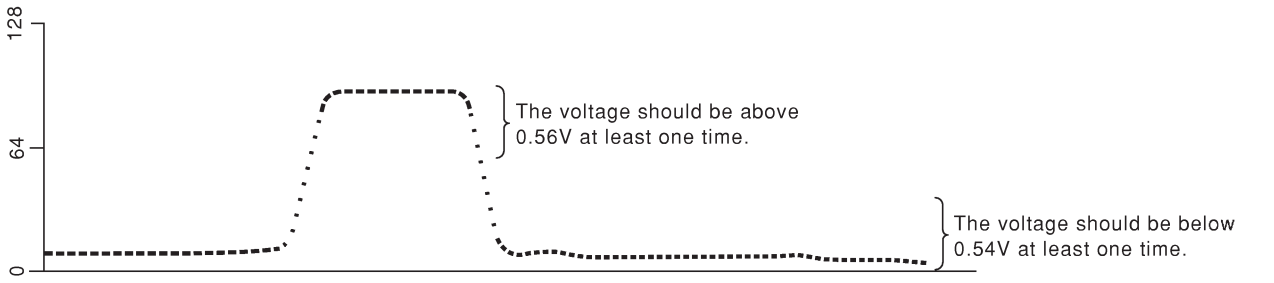
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair or replace harness or connectors.

5	CHECK HEATED OXYGEN SENSOR 2 (REAR)

With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

"HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.54V 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.

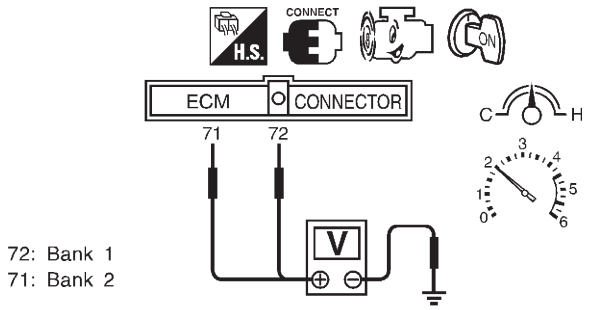
OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
4. 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 0.56V at least once during this procedure.

SEF313XB

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

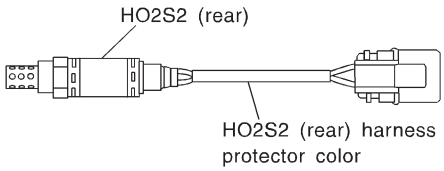
Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
The voltage should go below 0.54V at least once during this procedure.
CAUTION:
Discard any heated 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.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

1. Stop vehicle and turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

CAUTION:
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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

9	CHECK HEATED OXYGEN SENSOR 2 (REAR) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17.
3. Check the following.
- Continuity between joint connector terminal 1 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)
  Continuity should exist.
4. Also check harness for short to power.
5. Then reconnect joint connector-17.

OK or NG

OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

	▶	**INSPECTION END**

Description

NFEC0732

SYSTEM DESCRIPTION

NFEC0732S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 2 heater (rear) control	Heated oxygen sensor 2 heater (rear)
Crankshaft position sensor (REF)			

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater (rear) corresponding to the engine speed.

OPERATION

NFEC0732S02

Engine speed rpm	Heated oxygen sensor 2 heater (rear)
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

NFEC0733

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1) HO2S2 HTR (B2)	● Ignition switch: ON (Engine stopped) ● Engine is running above 3,600 rpm.	OFF
	● Engine is running below 3,600 rpm after driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	ON

On Board Diagnosis Logic

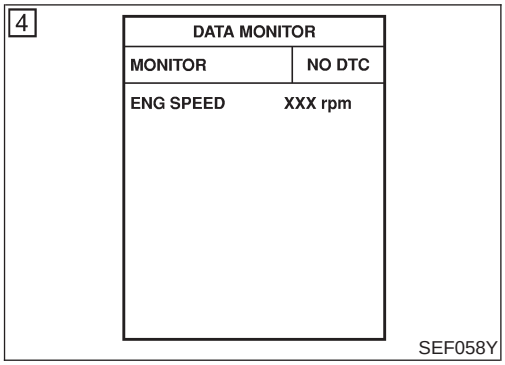
NFEC0734

Malfunction is detected when the current amperage in the heated oxygen sensor 2 heater (rear) circuit is out of the normal range. [An improper voltage drop signal is sent to ECM through the heated oxygen sensor 2 heater (rear).]

Possible Cause

NFEC0735

- Harness or connectors
  [The heated oxygen sensor 2 heater (rear) circuit is open or shorted.]
- Heated oxygen sensor 2 heater (rear)



DTC Confirmation Procedure

NFEC0736

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

NFEC0736S01

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine.
3) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
4) Stop vehicle and let engine idle for at least 6 seconds.
5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-258.

WITH GST

NFEC0736S02

1) Start engine.
2) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) Stop vehicle and let engine idle for at least 6 seconds.
4) Turn ignition switch “OFF” and wait at least 10 seconds.
5) Start engine.
6) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
7) Stop vehicle and let engine idle for at least 6 seconds.
8) Select “MODE 3” with GST.
9) If DTC is detected, go to “Diagnostic Procedure”, EC-258.

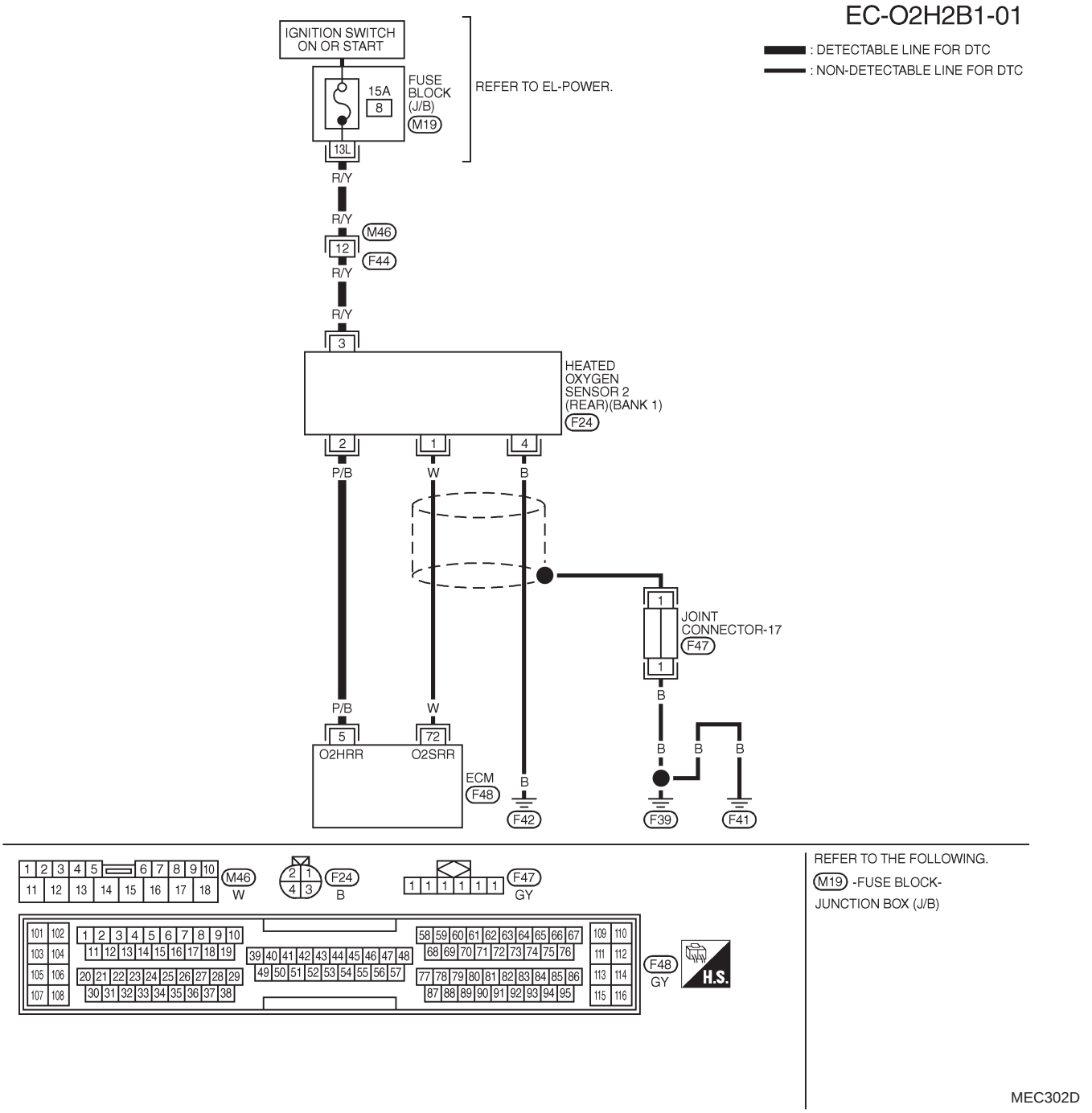
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

NFEC0737

BANK 1

NFEC0737S01



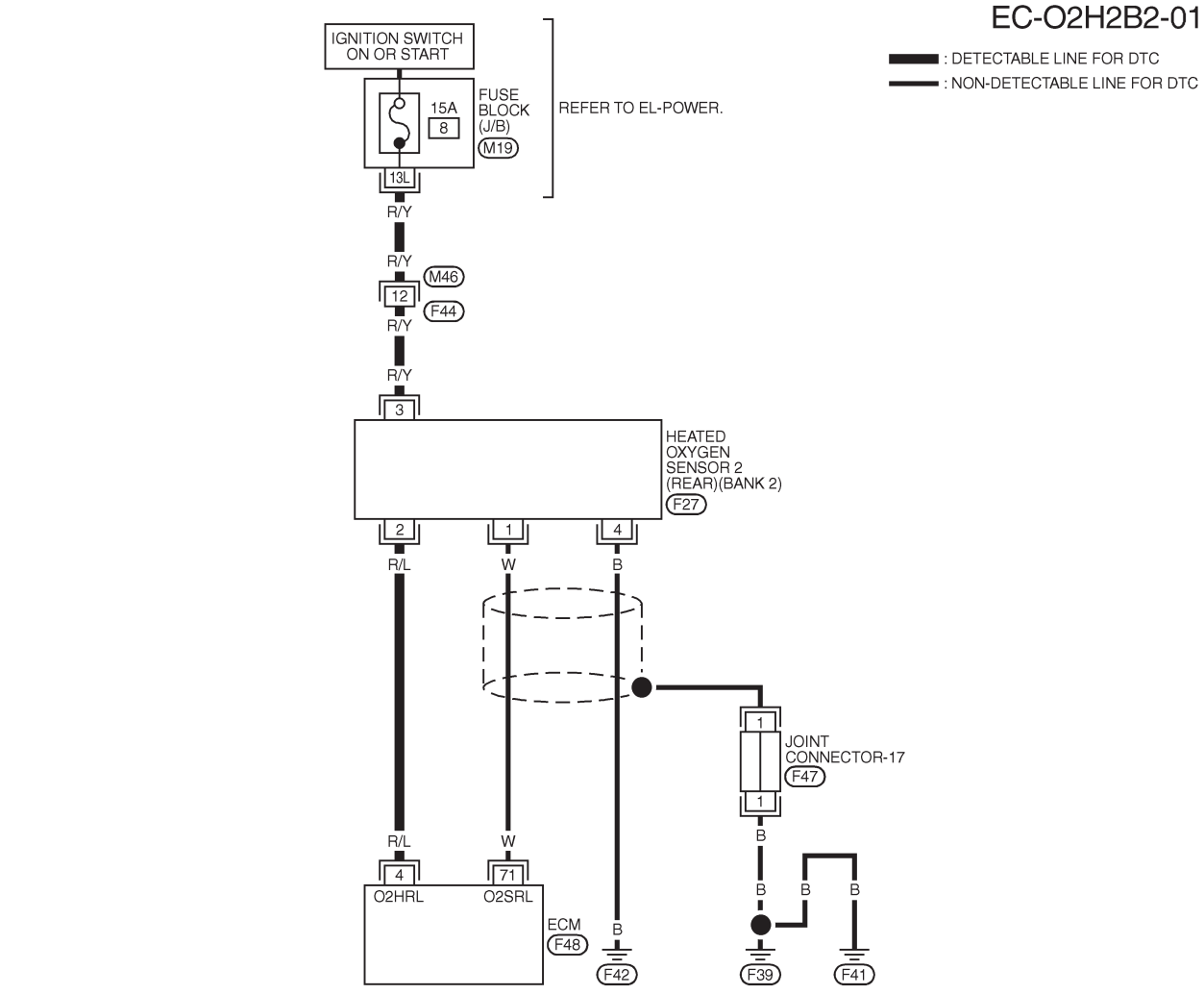
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

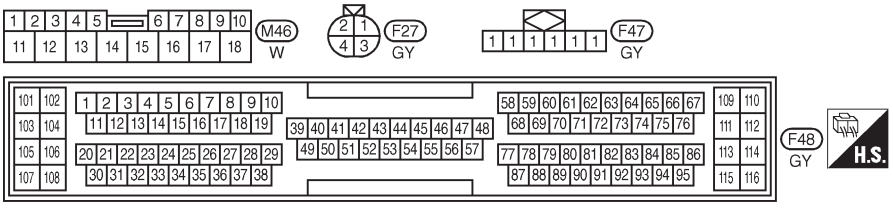
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
5	P/B	HEATED OXYGEN SENSOR 2 HEATER (REAR) (BANK 1)	IGN ON ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE
			ENGINE RUNNING BELOW 3,600 RPM AFTER DRIVING FOR 2 MINITES AT A SPEED OF 70 KM/H (43 MPH) OR MORE	0 - 1.0V

SEF659XE

BANK 2

NFEC0737S02





REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC303D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
4	R/L	HEATED OXYGEN SENSOR 2 HEATER (REAR) (BANK 2)	IGN ON ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE
			ENGINE RUNNING BELOW 3,600 RPM AFTER DRIVING FOR 2 MINITES AT A SPEED OF 70 KM/H (43 MPH) OR MORE	0 - 1.0V

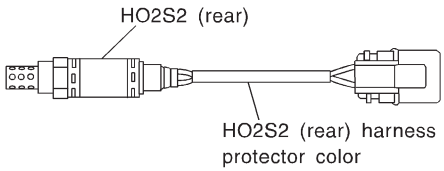
SEF660XE

Diagnostic Procedure

NFEC0738

1	CHECK HEATED OXYGEN SENSOR 2 (REAR) POWER SUPPLY CIRCUIT

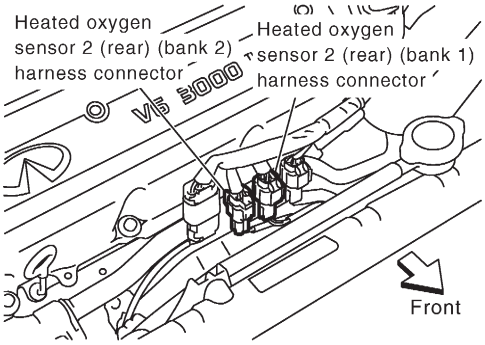
1. Turn ignition switch “OFF”.
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

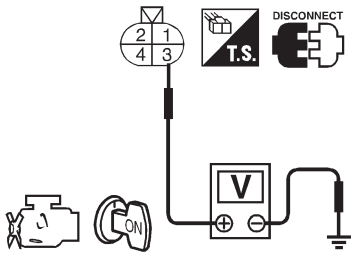
SEF154Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WB

4. Turn ignition switch “ON”.
5. Check voltage between HO2S2 (rear) terminal 3 and ground.



Voltage: Battery voltage

SEF314X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between heated oxygen sensor 2 (rear) and fuse

	▶	Repair harness or connectors.

3 CHECK HEATED OXYGEN SENSOR 2 (REAR) OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0141	5	2	1
P0161	4	2	2

MTBL0499

Continuity should exist.

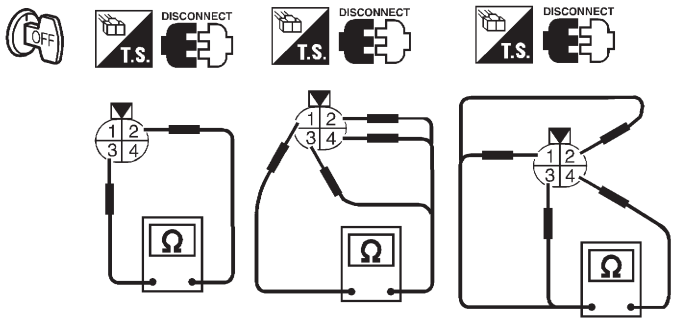
4. Also check harness for short to ground and short to power.

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 (REAR)

Check the resistance between HO2S2 (rear) terminals as follows.



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

SEF315X

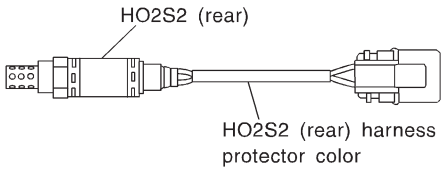
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5 REPLACE HEATED OXYGEN SENSOR 2 (REAR)

Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

CAUTION:
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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

Diagnostic Procedure (Cont'd)

6	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NFEC0739

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 (front). 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).

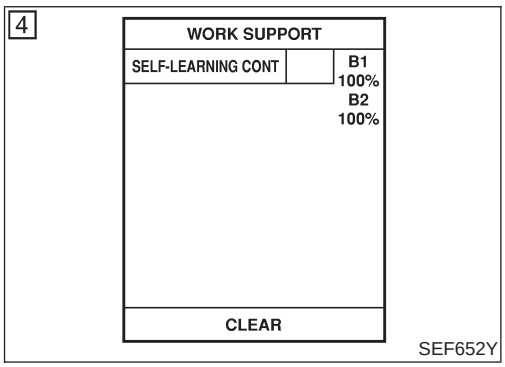
Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Injectors

Malfunction is detected when fuel injection system does not operate properly, the amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)

Possible Cause

NFEC0740

- Intake air leaks
- Heated oxygen sensor 1 (front)
- Injectors
- Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Mass air flow sensor



DTC Confirmation Procedure

NFEC0741

NOTE:

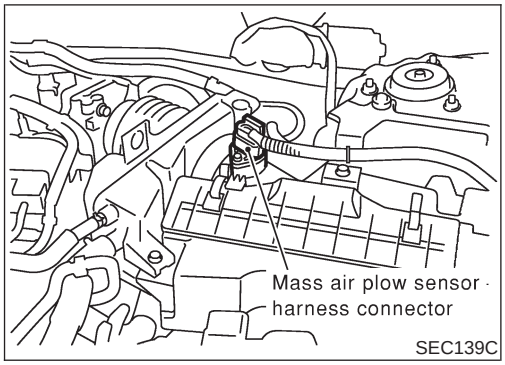
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

NFEC0741S01

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 or P0174 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-265.
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 “Diagnostic Procedure”, EC-265. If engine does not start, check exhaust and intake air leak visually.

DTC Confirmation Procedure (Cont'd)



WITH GST

NFEC0741S02

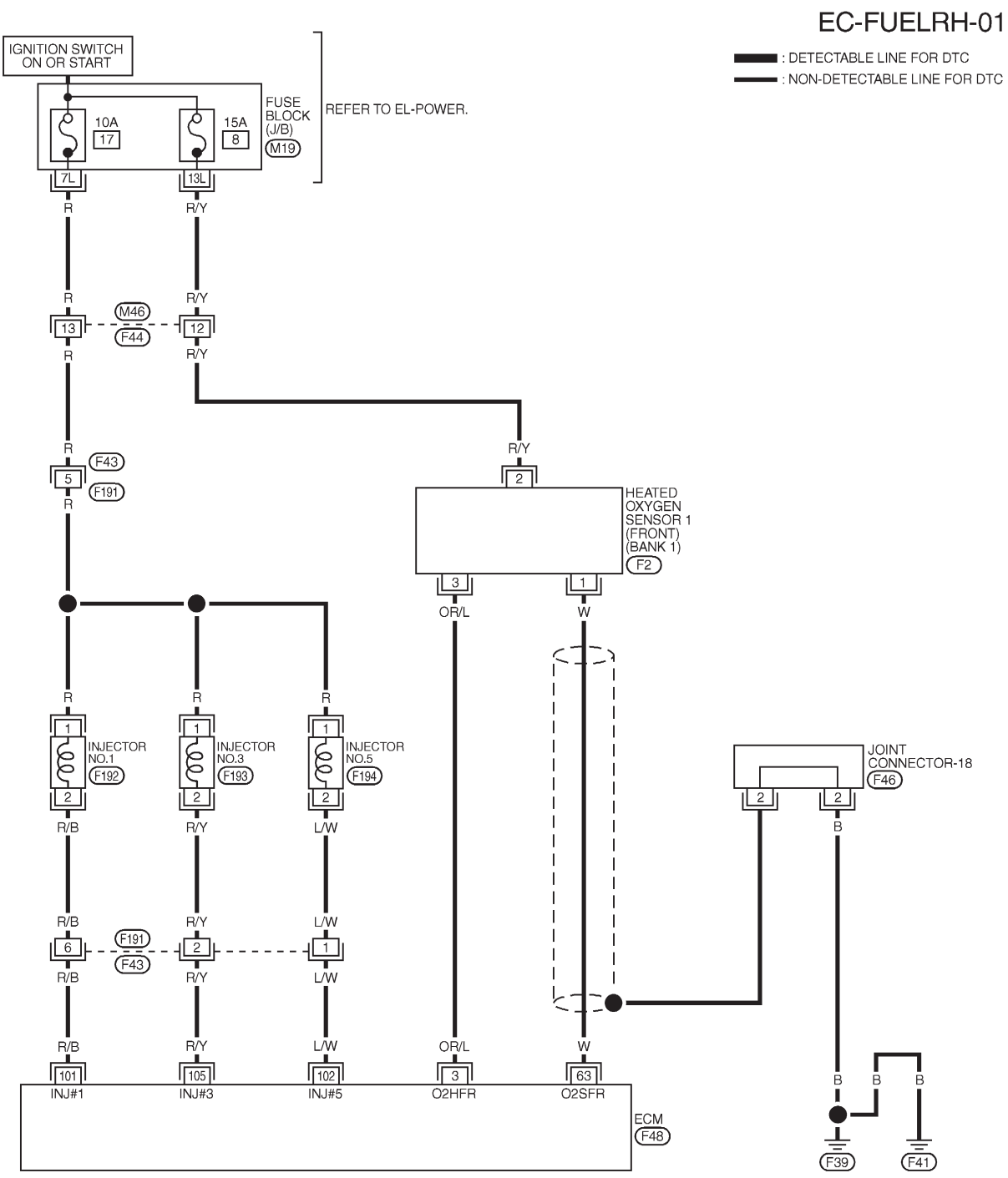
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
7) Start engine again and let it idle for at least 10 minutes.
8) Select "MODE 7" with GST. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-265.
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 "Diagnostic Procedure", EC-265. If engine does not start, check exhaust and intake air leak visually.

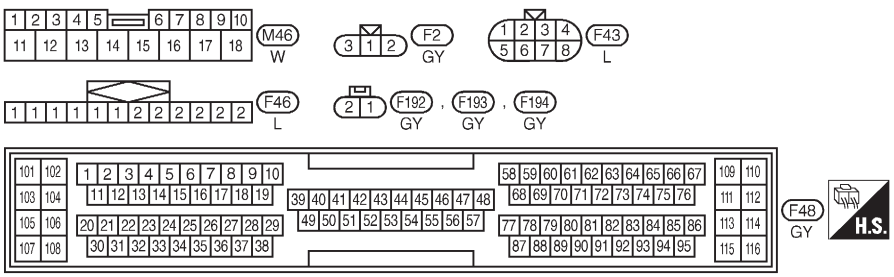
Wiring Diagram

NFEC0742

BANK 1

NFEC0742S01





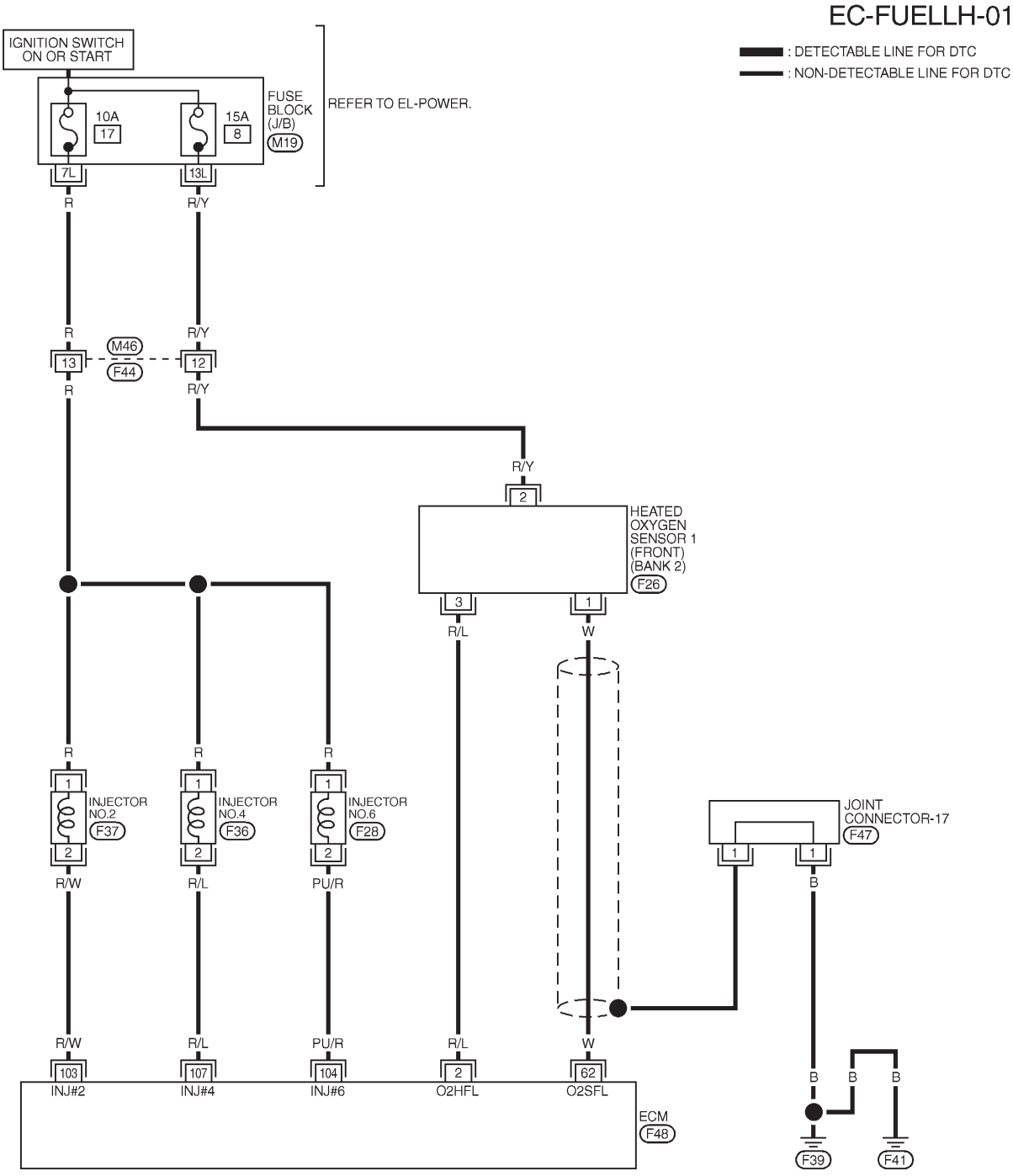
REFER TO THE FOLLOWING.
M19 -FUSE BLOCK- JUNCTION BOX (J/B)

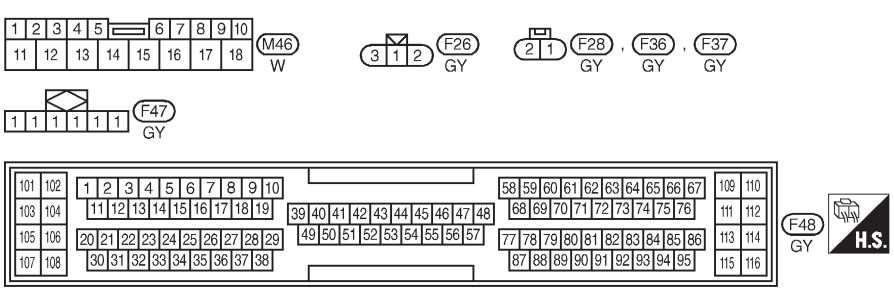
MEC304D

Wiring Diagram (Cont'd)

BANK 2

NFEC0742S02





REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

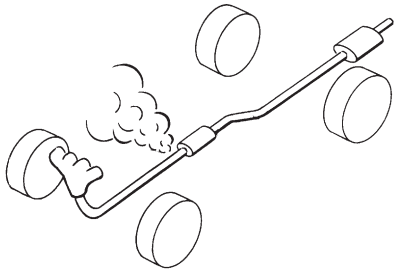
MEC305D

Diagnostic Procedure

NFEC0743

1	CHECK EXHAUST AIR LEAK

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



SEF099P

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 (FRONT) CIRCUIT FOR OPEN AND SHORT

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

DTC	Terminals		Bank
	ECM	Sensor	
P0171	63	1	1
P0174	62	1	2

MTBL0500

Continuity should exist.

5. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0172	63 or 1	Ground	1
P0175	62 or 1	Ground	2

MTBL0501

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.

Diagnostic Procedure (Cont'd)

4	CHECK FUEL PRESSURE
1. Release fuel pressure to zero. Refer to EC-36. 2. Install fuel pressure gauge and check fuel pressure. Refer to EC-37. **At idling:** **When fuel pressure regulator valve vacuum hose is connected.** **235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)** **When fuel pressure regulator valve vacuum hose is disconnected.** **294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)** **OK or NG**	
OK ▶	GO TO 6.
NG ▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Fuel pump and circuit (Refer to EC-533.) ● Fuel pressure regulator (Refer to EC-37.) ● Fuel lines (Refer to MA-20, "Checking Fuel Lines".) ● Fuel filter for clogging	
▶	Repair or replace.

6	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. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 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. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 g·m/sec: at 2,500 rpm** **OK or NG**	
OK ▶	GO TO 7.
NG ▶	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-134.

7	CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

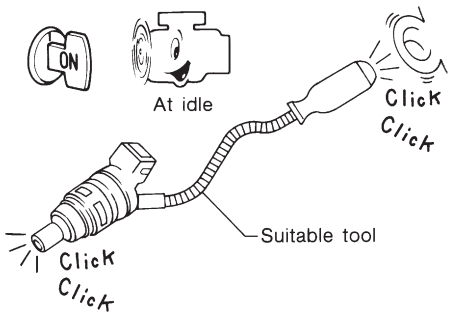
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS AIF SE-B1	XXX V
IACV-AAC/V	XXX step

SEF070Y

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.



MEC703B

Clicking noise should be heard.

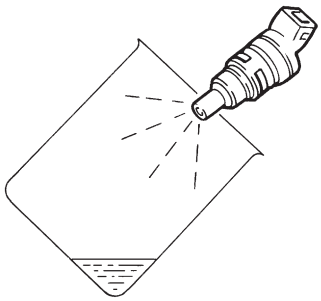
OK or NG

OK	▶	GO TO 8.
NG	▶	Perform trouble diagnosis for "INJECTORS", EC-523.

Diagnostic Procedure (Cont'd)

8	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 on bank 2 (for DTC P0171), bank 1 (for DTC P0174).
4. Remove injector gallery assembly. Refer to EC-38.
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors on bank 1 (for DTC P0171), bank 2 (for DTC P0174) 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.



SEF595Q

Fuel should be sprayed evenly for each injector.

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

9	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NFEC0744

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 (front). 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).

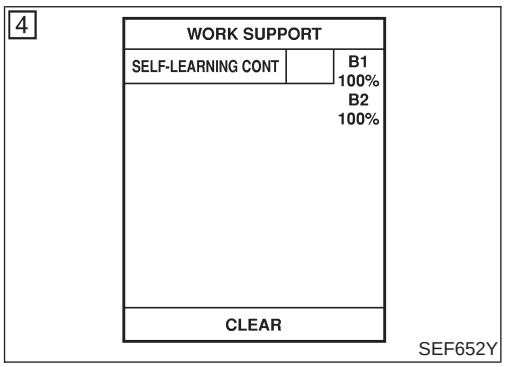
Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Injectors

Malfunction is detected when fuel injection system does not operate properly, the amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)

Possible Cause

NFEC0745

- Heated oxygen sensor 1 (front)
- Injectors
- Exhaust gas leaks
- Incorrect fuel pressure
- Mass air flow sensor



DTC Confirmation Procedure

NFEC0746

NOTE:

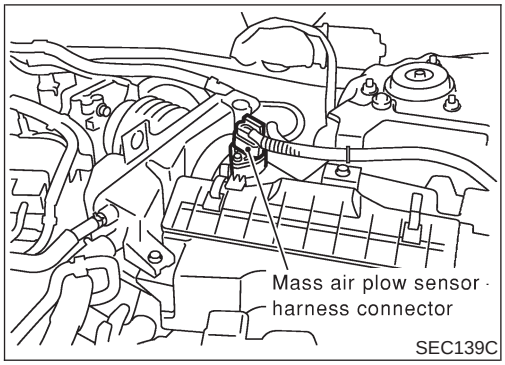
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

NFEC0746S01

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, P0175 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-273.
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 “Diagnostic Procedure”, EC-273. If engine does not start, remove ignition plugs and check for fouling, etc.

DTC Confirmation Procedure (Cont'd)



WITH GST

NFEC0746S02

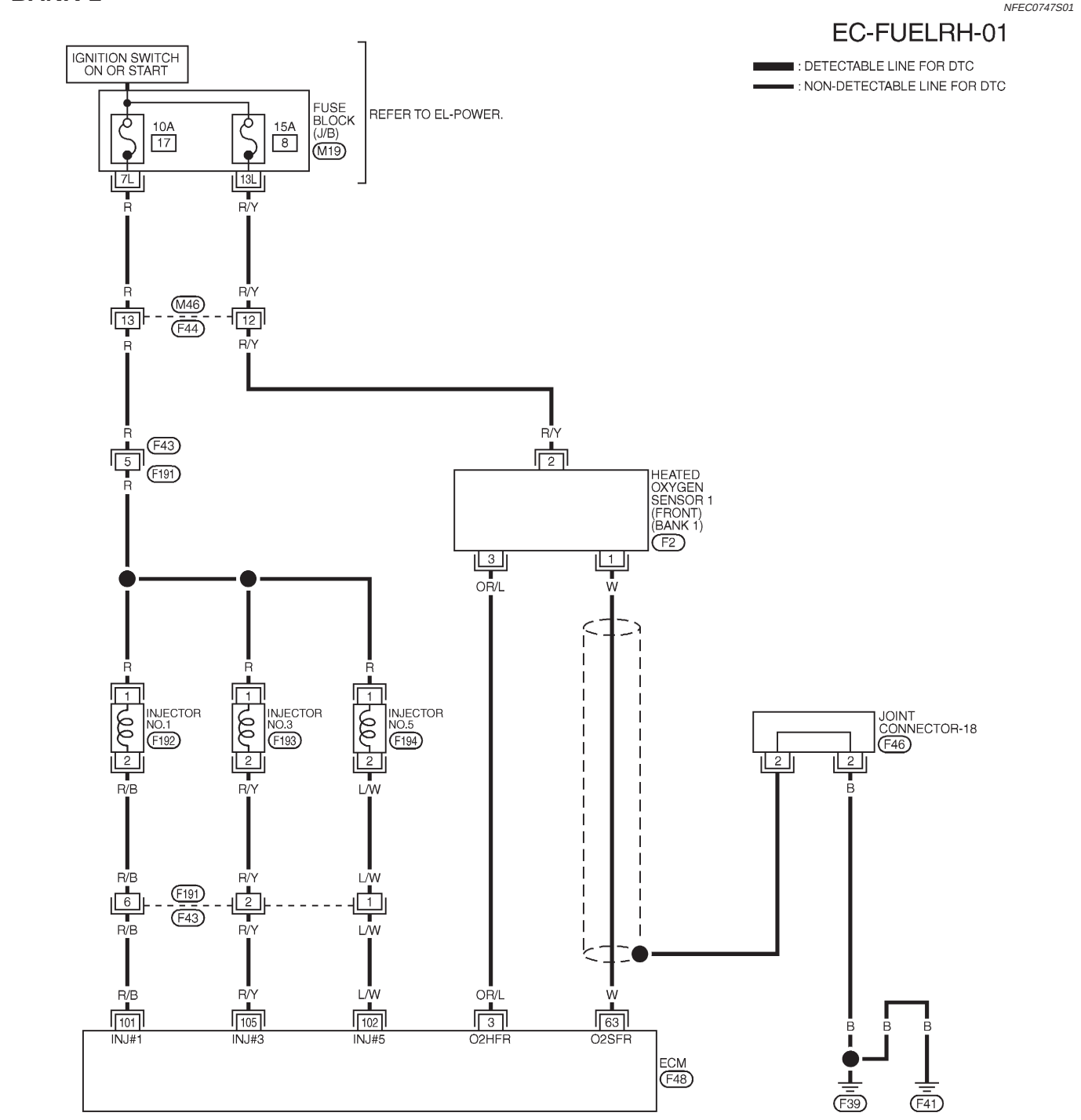
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
7) Start engine again and let it idle for at least 10 minutes.
8) Select "MODE 7" with GST. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-273.
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 "Diagnostic Procedure", EC-273. If engine does not start, check exhaust and intake air leak visually.

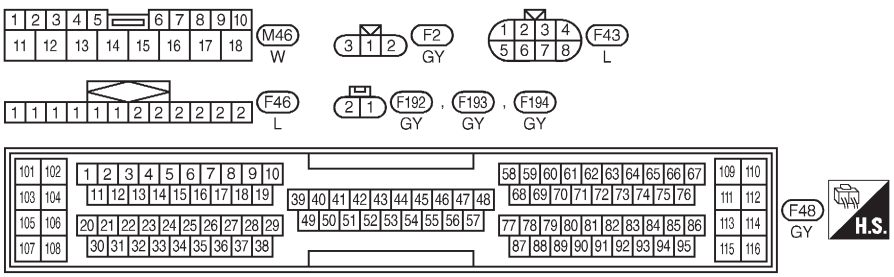
Wiring Diagram

NFEC0747

BANK 1

NFEC0747S01





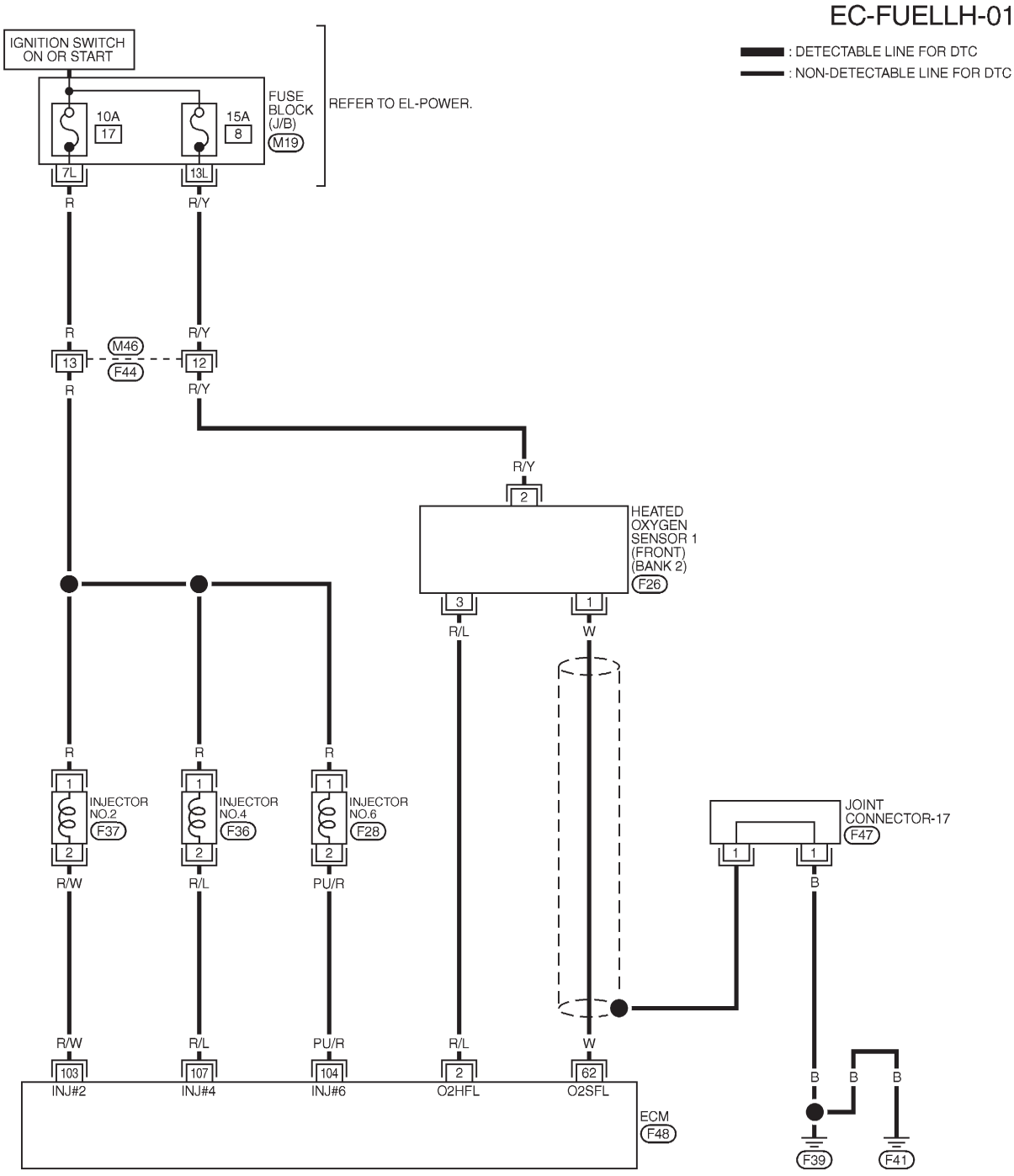
REFER TO THE FOLLOWING.
M19 -FUSE BLOCK- JUNCTION BOX (J/B)

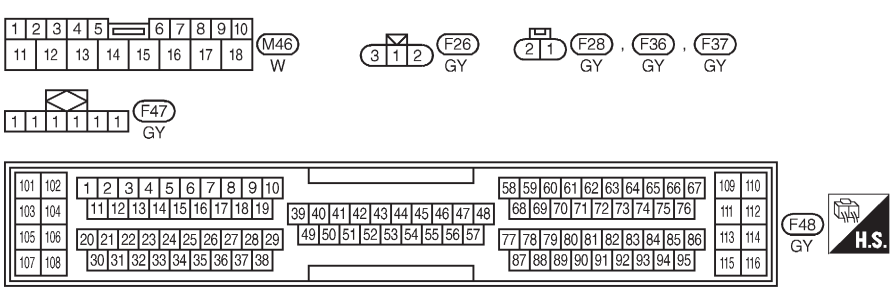
MEC304D

Wiring Diagram (Cont'd)

BANK 2

NFEC0747S02





REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

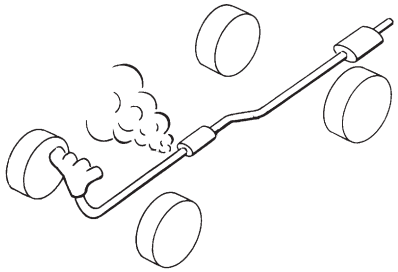
MEC305D

Diagnostic Procedure

NFEC0748

1	CHECK EXHAUST AIR LEAK

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



SEF099P

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 (FRONT) CIRCUIT FOR OPEN AND SHORT

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

DTC	Terminals		Bank
	ECM	Sensor	
P0172	63	1	1
P0175	62	1	2

MTBL0502

Continuity should exist.

5. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0172	63 or 1	Ground	1
P0175	62 or 1	Ground	2

MTBL0503

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.

Diagnostic Procedure (Cont'd)

4	CHECK FUEL PRESSURE
1. Release fuel pressure to zero. Refer to EC-36. 2. Install fuel pressure gauge and check fuel pressure. Refer to EC-37. **At idling:** **When fuel pressure regulator valve vacuum hose is connected.** **235 kPa (2.34 bar, 2.4 kg/cm^2, 34 psi)** **When fuel pressure regulator valve vacuum hose is disconnected.** **294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)** **OK or NG**	
OK ▶	GO TO 6.
NG ▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Fuel pump and circuit (Refer to EC-533.) ● Fuel pressure regulator (Refer to EC-37.)	
▶	Repair or replace.

6	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. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 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. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 g·m/sec: at 2,500 rpm** **OK or NG**	
OK ▶	GO TO 7.
NG ▶	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-134.

7	CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

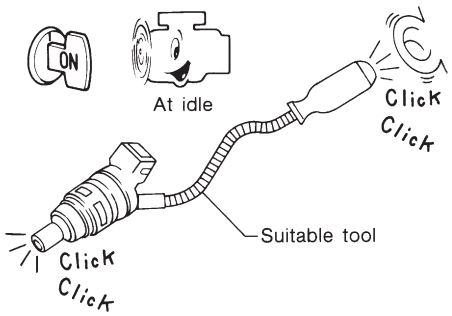
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS AIF SE-B1	XXX V
IACV-AAC/V	XXX step

SEF070Y

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.



MEC703B

Clicking noise should be heard.

OK or NG

OK	▶	GO TO 8.
NG	▶	Perform trouble diagnosis for "INJECTORS", EC-523.

8	CHECK INJECTOR

1. Remove injector assembly. Refer to EC-38.
   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 bank 2 (for DTC P0172), bank 1 (for P0175).
   The injector harness connectors on bank 1 (for P0172), bank 2 (for P0175) 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.

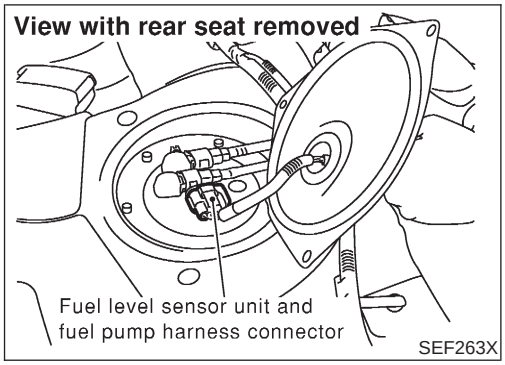
OK or NG

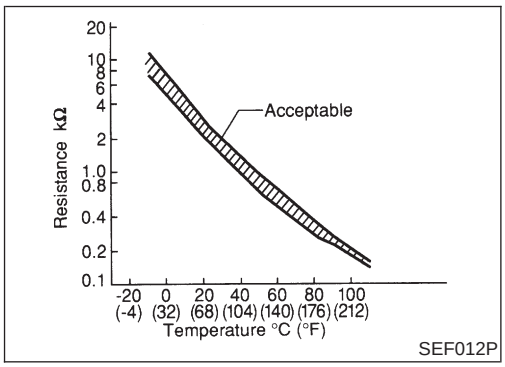
OK (Does not drip.)	▶	GO TO 9.
NG (Drips.)	▶	Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

9	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**





Component Description

NFEC0749

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel 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>

Fuel temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 92 (Fuel tank 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

NFEC0750

Malfunction is detected when an excessively high or low voltage is sent to ECM, rationally incorrect voltage is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.

Possible Cause

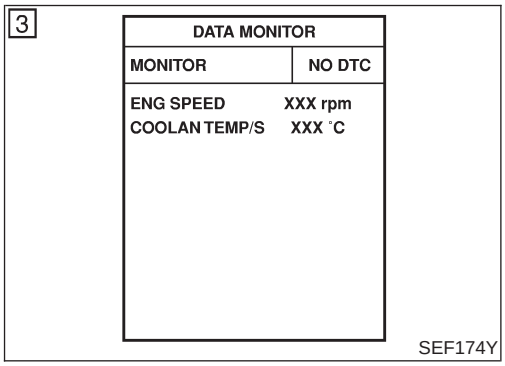
NFEC0751

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Fuel tank temperature sensor

DTC Confirmation Procedure

NFEC0752

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

NFEC0752S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 10 seconds.
   If the result is NG, go to “Diagnostic Procedure”, EC-279.
   If the result is OK, go to following step.
4) Check “COOLAN TEMP/S” value.
   If “COOLAN TEMP/S” is less than 60°C (140°F), the result will be OK.
   If “COOLAN TEMP/S” is above 60°C (140°F), go to the following step.
5) Cool engine down until “COOLAN TEMP/S” is less than 60°C (140°F).
6) Wait at least 10 seconds.
7) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-279.

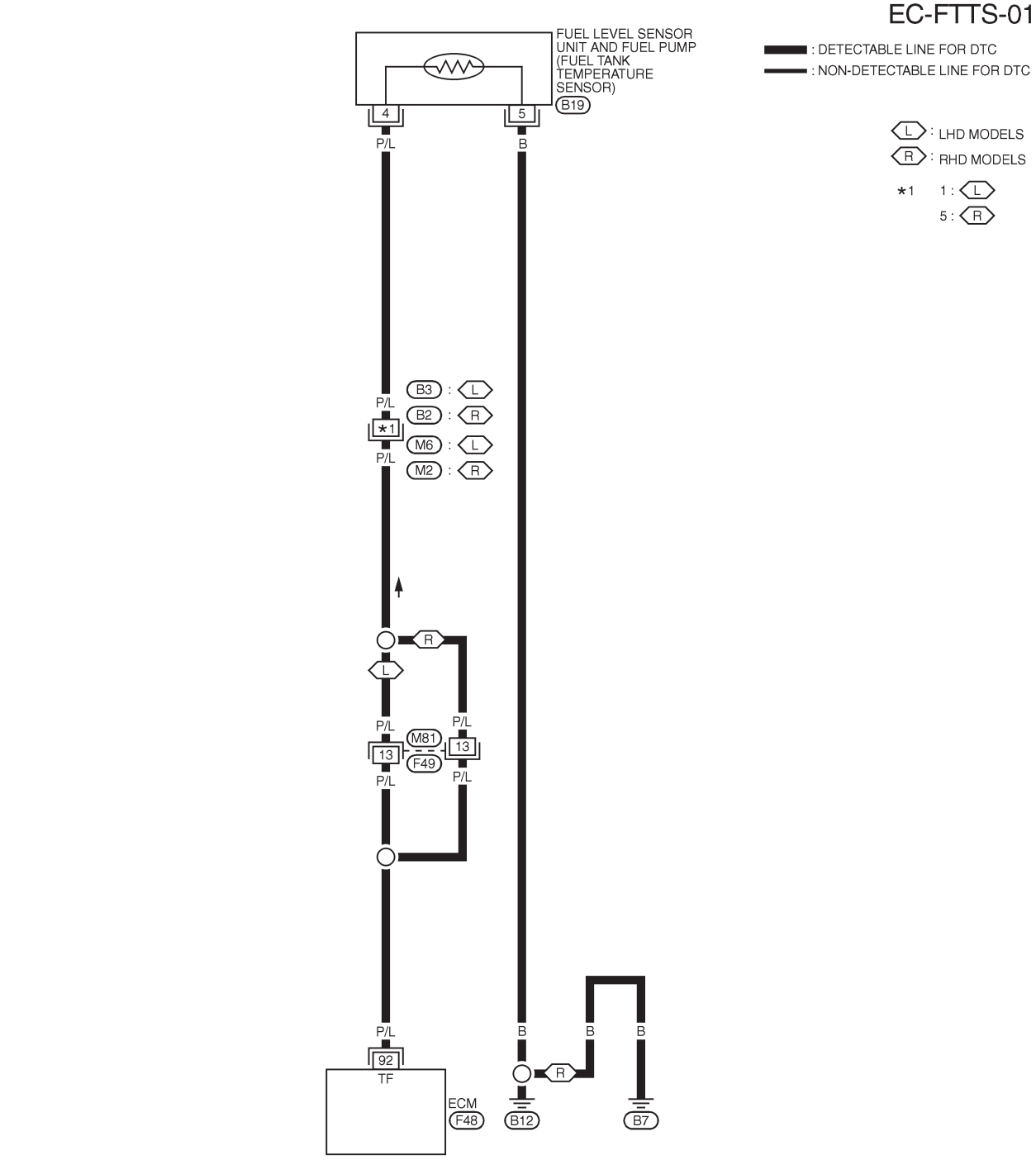
WITH GST

NFEC0752S02

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

NFEC0753



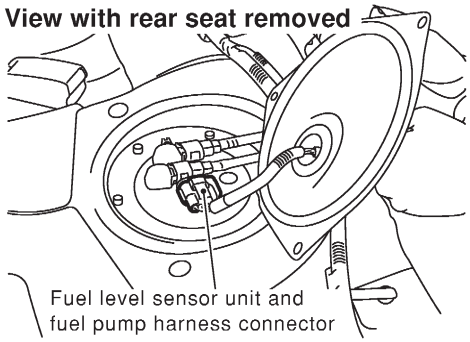
MEC045D

Diagnostic Procedure

NFEC0754

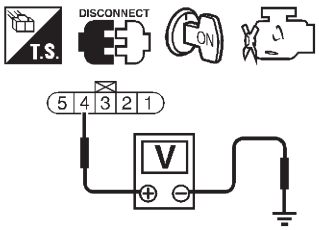
1	CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF263X

3. Turn ignition switch “ON”.
4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF586X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B3, M6 or B2, M2
- Harness connectors M81, F49
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

	▶	Repair harness or connector.

3	CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

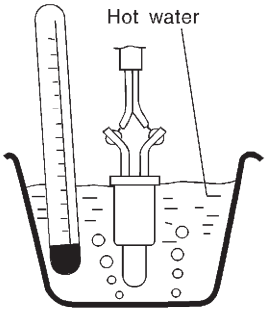
OK or NG

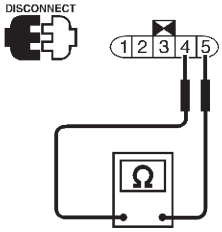
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.





Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

SEF587X

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace fuel level sensor unit.

5	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NFEC0755

When a misfire occurs, engine speed will fluctuate (vary). If the engine speed fluctuates enough to cause the 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 cause damage to 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 (POS) signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on-multiple cylinders.

Malfunction is detected when multiple cylinders misfire, No. 1 cylinder misfires, No. 2 cylinder misfires, No. 3 cylinder misfires, No. 4 cylinder misfires, No. 5 cylinder misfires and No. 6 cylinder misfires.

Possible Cause

NFEC0756

- Improper spark plug
- Insufficient compression
- Incorrect fuel pressure
- The injector circuit is open or shorted
- Injectors
- Intake air leak
- The ignition secondary circuit is open or shorted
- Lack of fuel
- Drive plate or flywheel
- Heated oxygen sensor 1 (front)

4

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h
P/N POSI SW	OFF
B/FUEL SCHDL	XXX msec

SEF213Y

DTC Confirmation Procedure

NFEC0757

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

NFEC0757S01

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 “Diagnostic Procedure”, EC-282.

WITH GST

NFEC0757S02

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

NFEC0758

1	CHECK FOR INTAKE AIR LEAK	
1. Start engine and run it at idle speed. 2. Listen for the sound of the intake air leak.		
OK or NG		
OK	▶	GO TO 2.
NG	▶	Discover air leak location and repair.

2	CHECK FOR EXHAUST SYSTEM CLOGGING	
1. Stop engine and visually check exhaust tube, three way catalyst (Manifold) and muffler for dents.		
OK or NG		
OK	▶	GO TO 3.
NG	▶	Repair or replace it.

3	PERFORM POWER BALANCE TEST

With CONSULT-II

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.

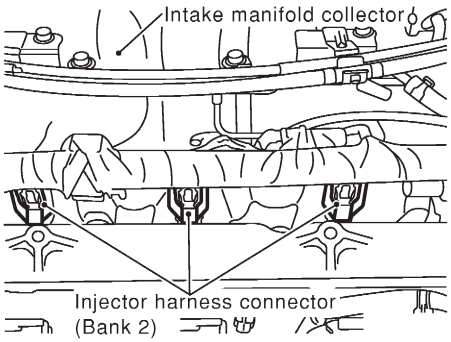
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

2. Is there any cylinder which does not produce a momentary engine speed drop?

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?



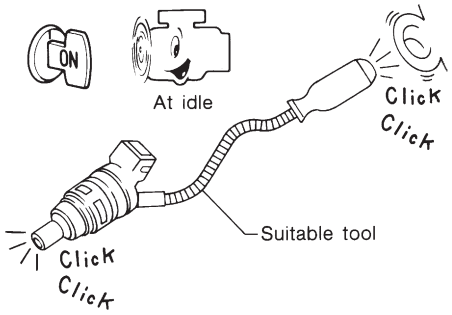
SEF281XA

Yes or No

Yes	▶	GO TO 4.
No	▶	GO TO 7.

4	CHECK INJECTOR

Does each injector make an operating sound at idle?



MEC703B

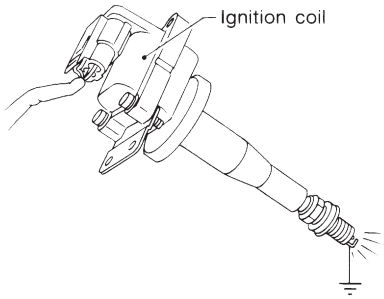
Yes or No

Yes	▶	GO TO 5.
No	▶	Check injector(s) and circuit(s). Refer to EC-523.

Diagnostic Procedure (Cont'd)

5	CHECK IGNITION SPARK

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.



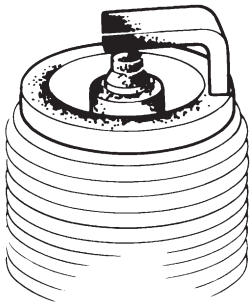
SEF575Q

OK or NG

OK	▶	GO TO 6.
NG	▶	Check ignition coil, power transistor and their circuits. Refer to "IGNITION SIGNAL", EC-495.

6	CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.



SEF156I

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-15, "ENGINE MAINTENANCE".

7	CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-11, "Measurement of Compression Pressure".

Standard:
1,275 kPa (12.75 bar, 13.0 kg/cm^2, 185 psi)/300 rpm
Minimum:
981 kPa (9.81 bar, 10.0 kg/cm^2, 142 psi)/300 rpm
Difference between each cylinder:
98 kPa (0.98 bar, 1.0 kg/cm^2, 14 psi)/300 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-36.
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-37.

At idle:

Approx. 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to EC-533.)
- Fuel pressure regulator (Refer to EC-37.)
- Fuel lines (Refer to MA-20, "Checking Fuel Lines".)
- Fuel filter for clogging

	▶	Repair or replace.

10	CHECK IGNITION TIMING

Check the following items. Refer to "Basic Inspection", EC-90.

Items	Specifications
Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)

MTBL0623

OK or NG

OK (With CONSULT-II)	▶	GO TO 11.
OK (Without CONSULT-II)	▶	GO TO 12.
NG	▶	Follow the "Basic Inspection".

11	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (B1)/(B2)

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)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
3. Hold engine speed at 2,000 rpm under no load during the following steps.
4. 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

5. Check the following.

- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown left:

Bank 1

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

Bank 2

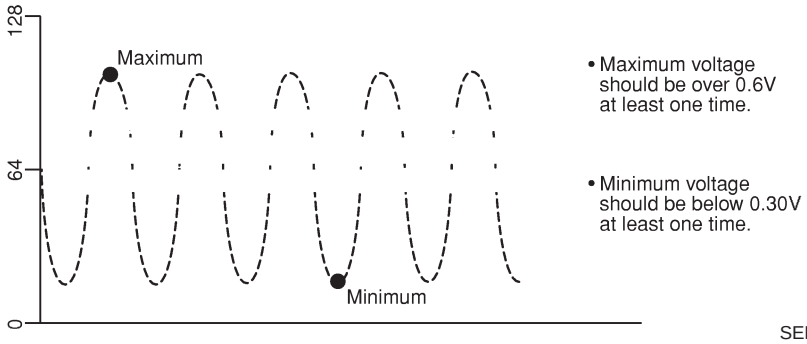
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" 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
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.

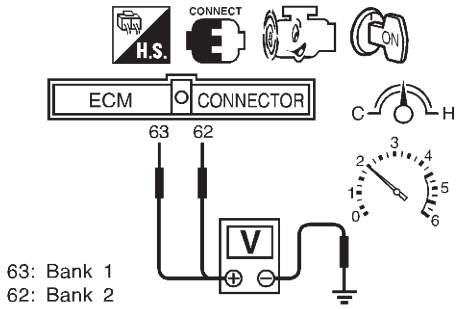
OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

12	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (B1)/(B2)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
4. Check the following with engine speed held at 2,000 rpm constant under no load.



63: Bank 1
62: Bank 2

- 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 → 0 - 0.3V

SEF967XA

CAUTION:

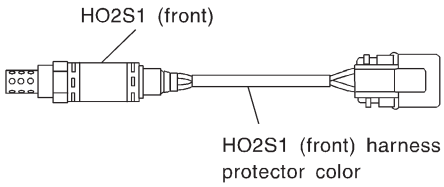
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

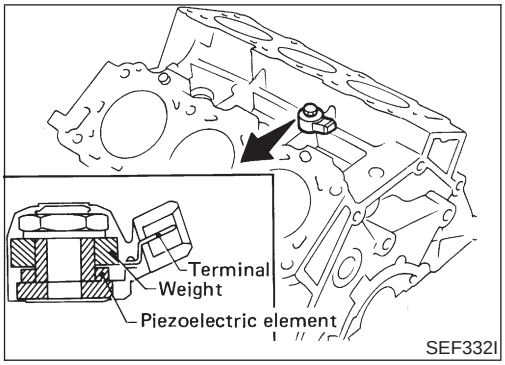
Diagnostic Procedure (Cont'd)

14	CHECK MASS AIR FLOW SENSOR	
With CONSULT-II Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT-II. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 g·m/sec: at 2,500 rpm**		
With GST Check mass air flow sensor signal in MODE 1 with GST. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 g·m/sec: at 2,500 rpm**		
OK or NG		
OK	▶	GO TO 15.
NG	▶	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-134.

15	CHECK SYMPTOM MATRIX CHART	
Check items on the rough idle symptom in "Symptom Matrix Chart", EC-105.		
OK or NG		
OK	▶	GO TO 16.
NG	▶	Repair or replace.

16	ERASE THE 1ST TRIP DTC	
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-56. Some tests may cause a 1st trip DTC to be set.		
	▶	GO TO 17.

17	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.		
	▶	**INSPECTION END**



Component Description

NFEC0185

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.

Freeze frame data will not be stored in the ECM for the knock sensor. The MI will not light for knock sensor malfunction. The knock sensor has one trip detection logic.

On Board Diagnosis Logic

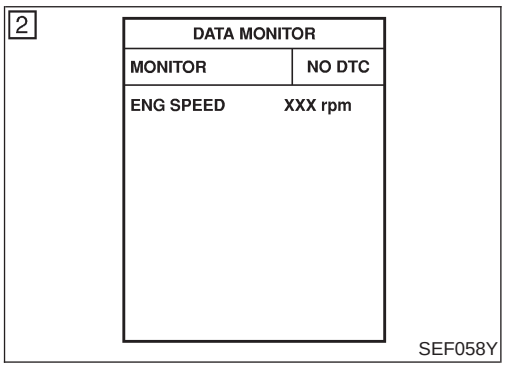
NFEC0187

Malfunction is detected when an excessively low or high voltage from the knock sensor is sent to ECM.

Possible Cause

NFEC0491

- Harness or connectors
  (The knock sensor circuit is open or shorted.)
- Knock sensor



DTC Confirmation Procedure

NFEC0188

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

NFEC0188S01

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 DTC is detected, go to “Diagnostic Procedure”, EC-292.

WITH GST

NFEC0188S04

Follow the procedure “WITH CONSULT-II” above.

NO TOOLS

NFEC0188S03

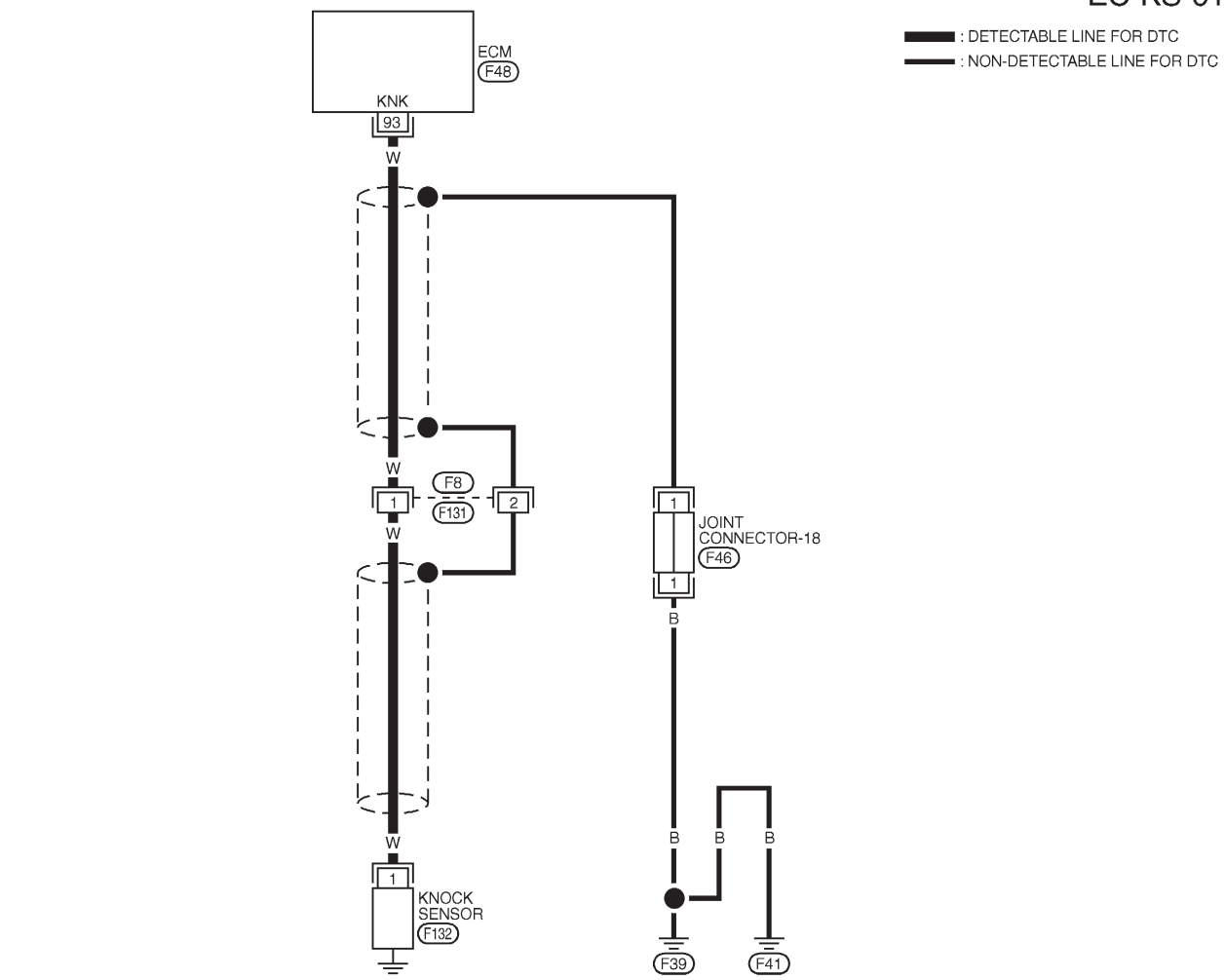
1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

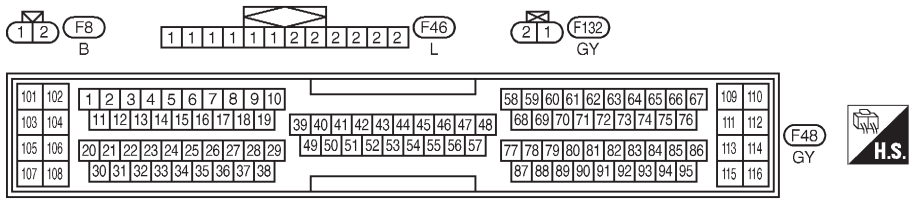
4) If DTC is detected, go to "Diagnostic Procedure", EC-292.

Wiring Diagram

=NFEC0189

EC-KS-01





MEC736C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
93	W	KNOCK SENSOR	ENGINE RUNNING AT IDLE SPEED	APPROX. 2.5V

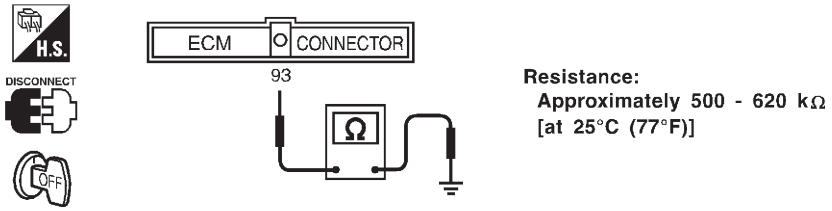
SEF663XB

Diagnostic Procedure

NFEC0190

1	CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 93 and engine ground.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.



Resistance:
Approximately 500 - 620 kΩ
[at 25°C (77°F)]

SEF321X

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

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 2.

2	CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 93 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 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connector F8, F131
- Harness for open or short between ECM and knock sensor

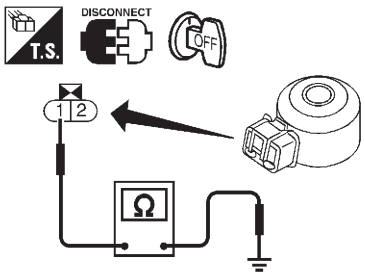
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK 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: 500 - 620 kΩ [at 25°C (77°F)]

SEF322X

CAUTION:

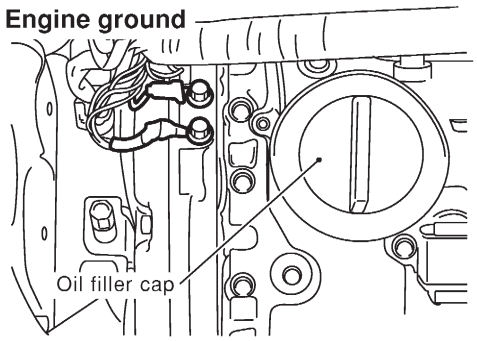
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace knock sensor.

5	RETIGHTEN GROUND SCREWS

Loose and retighten engine ground screws.



SEF255X

	▶	GO TO 6.

6	CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect harness connectors F8, F131.
2. Check harness continuity between harness connector F8 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 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

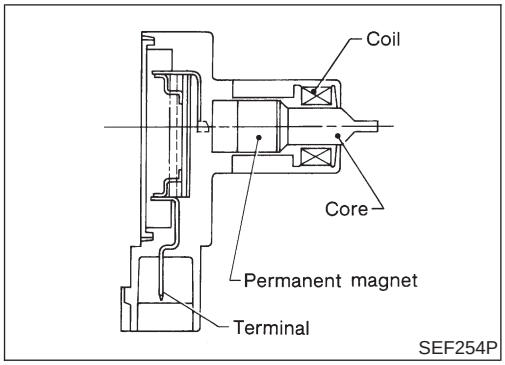
Check the following.

- Harness connectors F8, F131
- Joint connectors-18
- Harness for open or short between harness connector F8 and engine ground

	▶	Repair open circuit or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

8	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0762

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

CONSULT-II Reference Value in Data Monitor Mode

NFEC0763

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (POS)	● 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

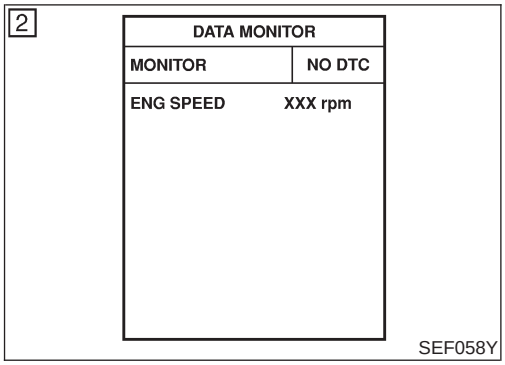
NFEC0764

Malfunction is detected when 1° signal is not entered to ECM for the first few seconds during engine cranking, or 1° signal is not entered to ECM during engine running.

Possible Cause

NFEC0765

- Harness or connectors
  [The crankshaft position sensor (POS) circuit is open or shorted.]
- Crankshaft position sensor (POS)
- Starter motor (Refer to EL section.)
- Starting system circuit (Refer to EL section.)
- Dead (Weak) battery



DTC Confirmation Procedure

NFEC0766

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 CONSULT-II

NFEC0766S01

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Crank engine for at least two seconds.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-298.

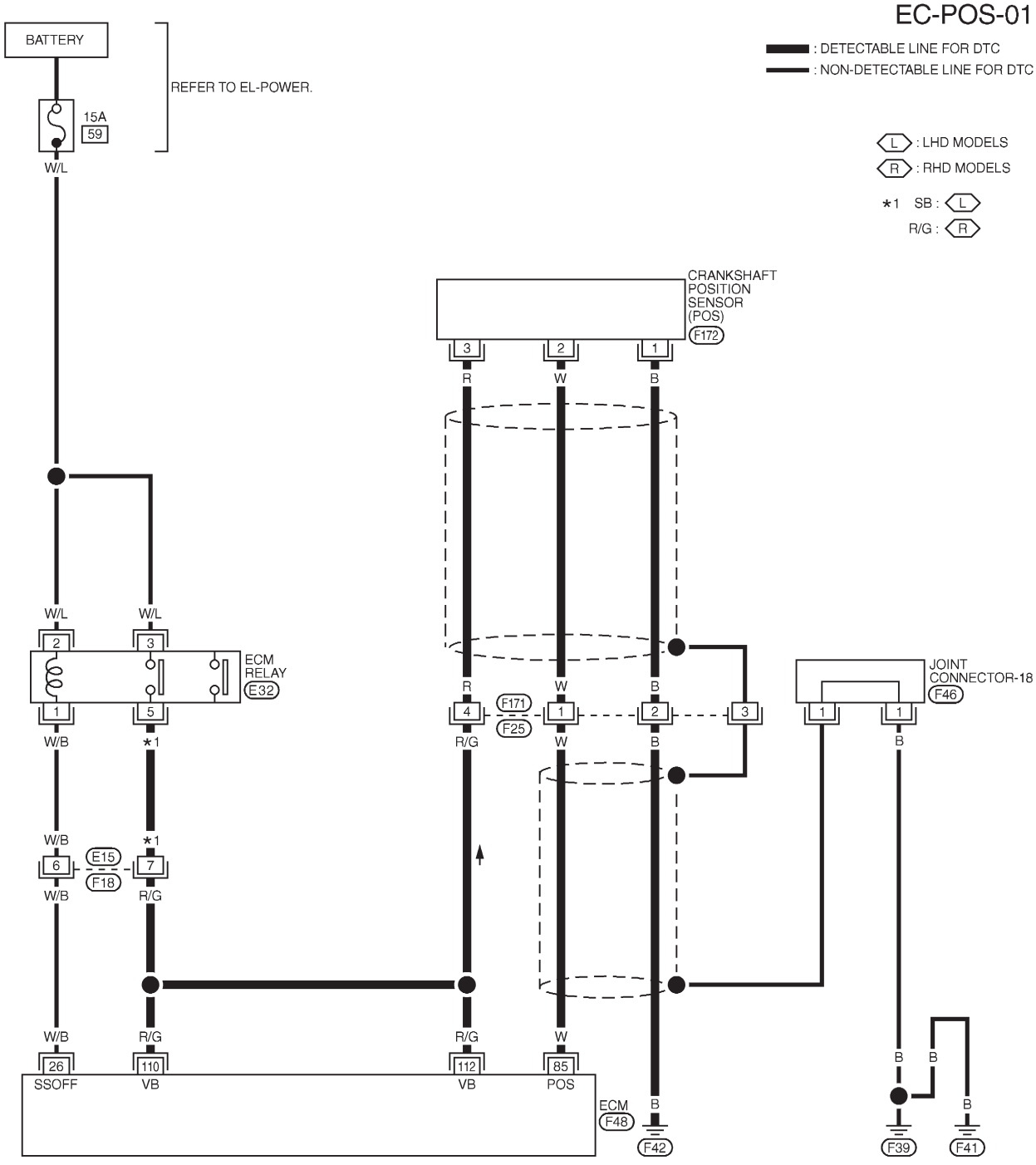
WITH GST

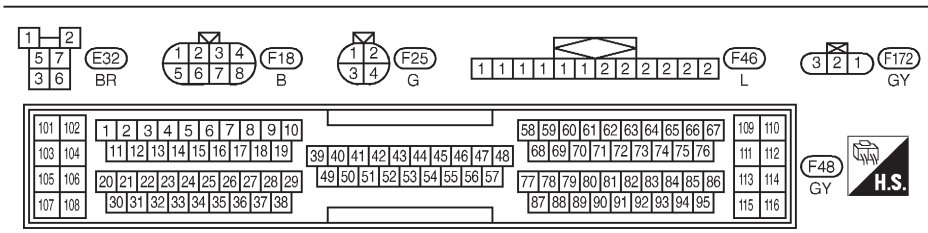
NFEC0766S02

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

NFEC0767

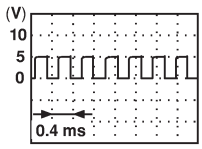
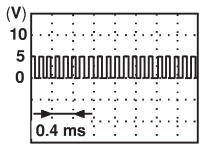




MEC850C

Wiring Diagram (Cont'd)

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
85	W	CRANKSHAFT POSITION SENSOR (POS)	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 2.4V 
			ENGINE RUNNING AT 2,000 RPM	APPROX. 2.3V 

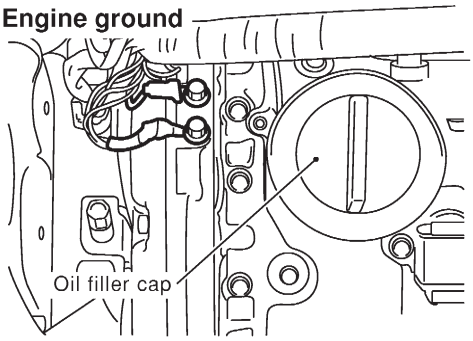
SEF856Y

Diagnostic Procedure

NFEC0768

1	RETIGHTEN GROUND SCREWS

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

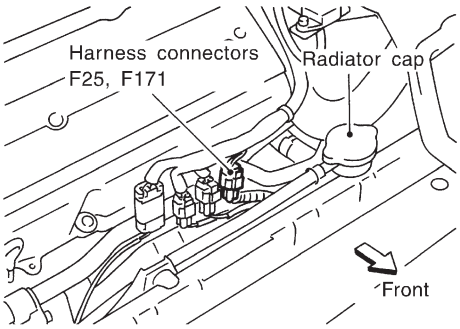


SEF255X

▶	GO TO 2.

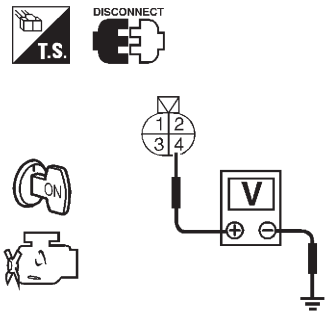
2	CHECK CKPS (POS) POWER SUPPLY CIRCUIT

1. Disconnect harness connectors F25, F171.



SEF511WB

2. Check voltage between harness connector F25 terminal 4 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF323X

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 connectors F25, F171
- Harness connectors E15, F18
- Harness for open or short between ECM and crankshaft position sensor (POS)
- Harness for open or short between ECM relay and crankshaft position sensor (POS)

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

4	CHECK CKPS (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between harness connector F25 terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
2. 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.

Diagnostic Procedure (Cont'd)

5	CHECK CKPS (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

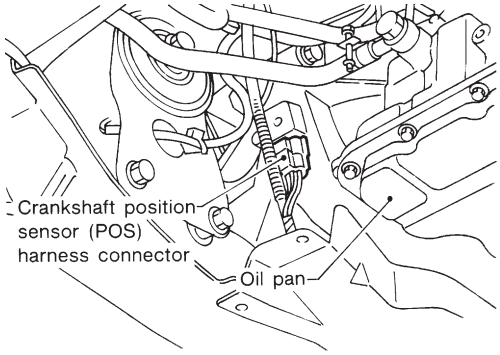
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 85 and harness connector F25 terminal 1.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK CKPS (POS) SUB-HARNESS CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (POS) harness connector.



SEF367Q

2. Check harness continuity between CKPS (POS) terminals and harness connector F171 terminals as follows.

CKPS (POS) terminal	Harness connector F171 terminal
1	2
2	1
3	4

MTBL0352

Continuity should exist.

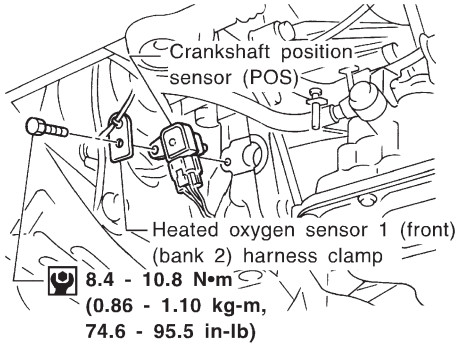
3. Also check harness for short to ground and short to power.

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 CKPS (POS) INSTALLATION

Check that CKPS (POS) and HO2S1 bank 2 harness clamp are installed correctly as shown below.



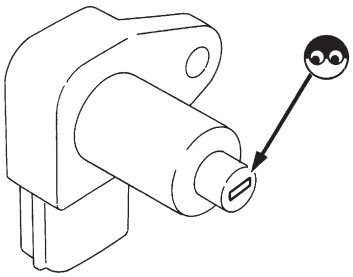
SEM222FE

OK or NG

OK	▶	GO TO 8.
NG	▶	Install CKPS (POS) correctly.

8	CHECK CRANKSHAFT POSITION SENSOR (POS)-I

1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



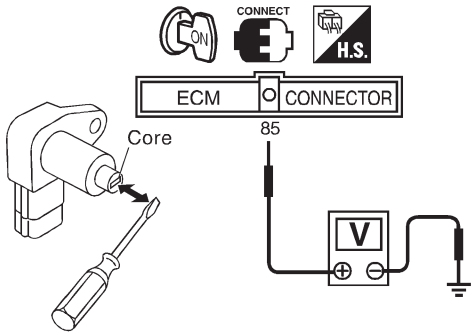
SEF587P

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace crankshaft position sensor (POS).

9	CHECK CRANKSHAFT POSITION SENSOR (POS)-II

1. Reconnect disconnected harness connectors.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal 85 and ground by briefly touching the sensor core with a flat-bladed screwdrivers.



ECM terminal	Condition	Voltage
85	Contacted	Approximately 5V
	Pulled away	Approximately 0V

There should be a steady 5V as the flat-bladed screwdriver is drawn away slowly.

SEF324X

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace crankshaft position sensor (POS).

10	CHECK CKPS (POS) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect harness connectors F25, F171.
2. Check harness continuity between harness connector F25 terminal 3 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

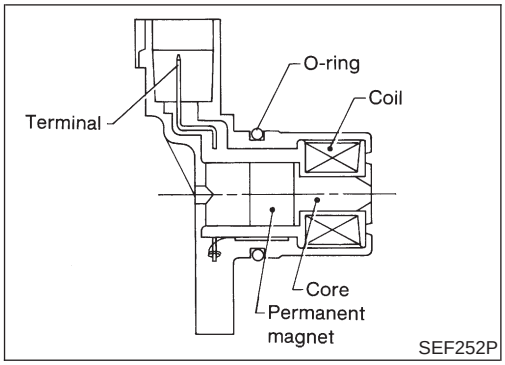
OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

Diagnostic Procedure (Cont'd)

11	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F25, F171 ● Joint connector-18 ● Harness for open or short between harness connector F25 and engine ground	
▶	Repair open circuit or short to power in harness or connectors.

12	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0197

The camshaft position sensor (PHASE) is located on the engine front cover facing the camshaft sprocket. It detects the cylinder No. signal.
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the camshaft sprocket will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the cylinder No. signal.

On Board Diagnosis Logic

NFEC0199

Malfunction is detected when
(Malfunction A) the cylinder No. signal is not sent to ECM for the first few seconds during engine cranking,
(Malfunction B) the cylinder No. signal is not sent to ECM during engine running,
(Malfunction C) the cylinder No. signal is not in the normal pattern during engine running.

Possible Cause

NFEC0494

- Harness or connectors
  [The camshaft position sensor (PHASE) circuit is open or shorted.]
- Camshaft position sensor (PHASE)
- Starter motor (Refer to SC section.)
- Starting system circuit (Refer to SC section.)
- Dead (Weak) battery

DTC Confirmation Procedure

NFEC0200

NOTE:

- **Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B AND 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.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
VHCL SPEED SE	XXX km/h
P/N POSI SW	OFF

SEF065Y

PROCEDURE FOR MALFUNCTION A

NFEC0200S01

With CONSULT-II

NFEC0200S0101

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Crank engine for at least 2 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-306.

With GST

NFEC0200S0103

Follow the procedure "With CONSULT-II" above.

No Tools

NFEC0200S0102

1) Crank engine for at least 2 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 1st trip DTC is detected, go to "Diagnostic Procedure", EC-306.

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION B AND C

NFEC0200S02

With CONSULT-II

NFEC0200S0201

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-306.

With GST

NFEC0200S0203

Follow the procedure "With CONSULT-II" above.

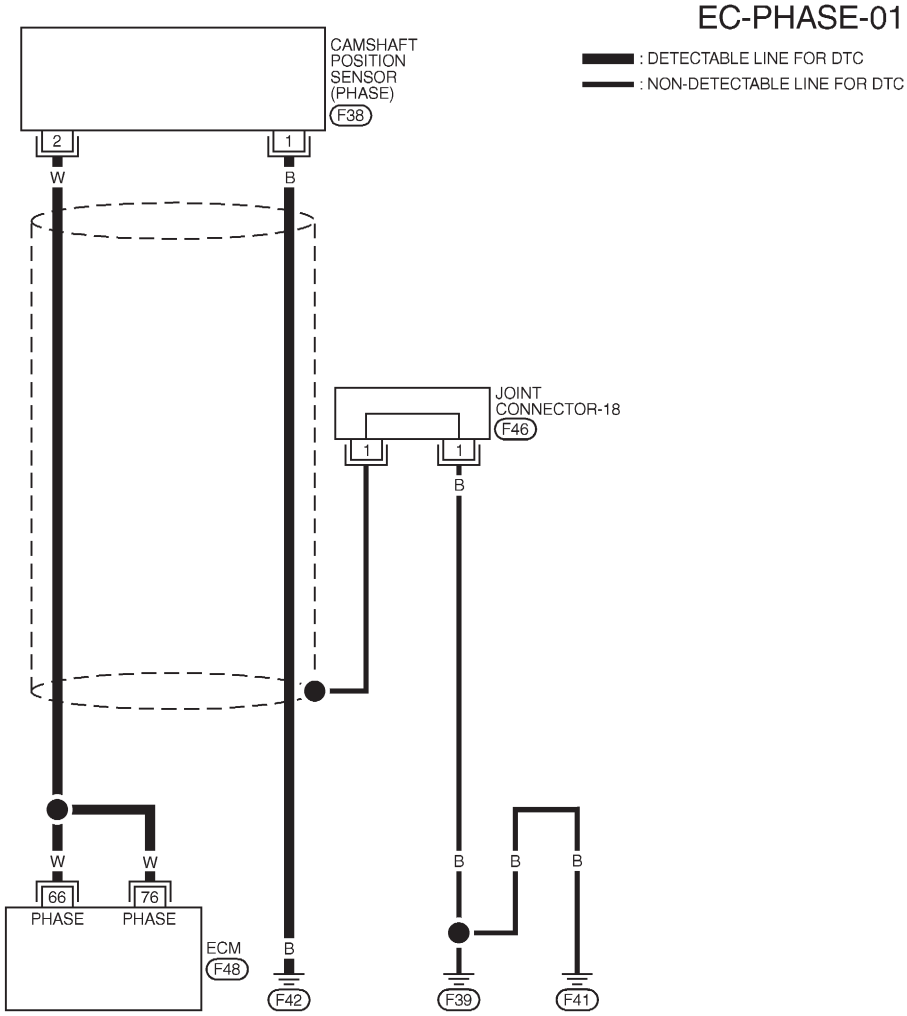
No Tools

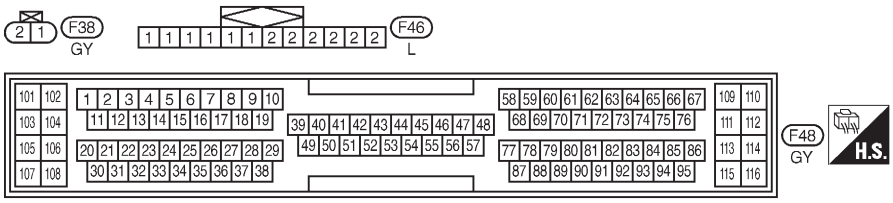
NFEC0200S0202

1) Start engine and run it for at least 2 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 "Diagnostic Procedure", EC-306.

Wiring Diagram

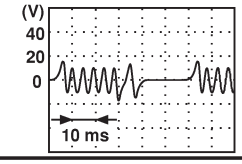
NFEC0201





MEC046D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
66 76	W W	CAMSHAFT POSITION SENSOR (PHASE)	ENGINE RUNNING AT IDLE SPEED	APPROX. 4.2V (AC RANGE) 

SEF857Y

Diagnostic Procedure

NFEC0202

1	CHECK STARTING SYSTEM

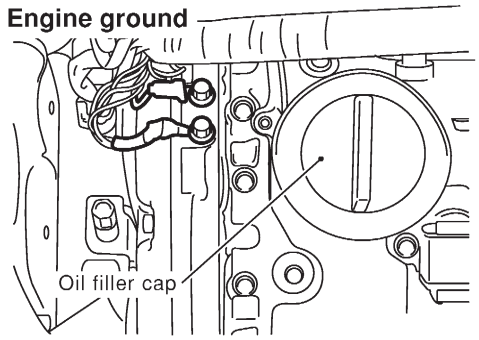
Turn ignition switch to “START” position.
Does the engine turn over?
Does the starter motor operate?

Yes or No

Yes	▶	GO TO 2.
No	▶	Check starting system. (Refer to SC-12, “STARTING SYSTEM”.)

2	RETIGHTEN GROUND SCREWS

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

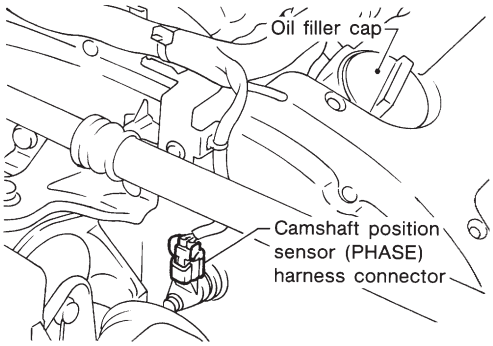


SEF255X

	▶	GO TO 3.

3	CHECK CMPS (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and CMPS (PHASE) harness connector.



SEF274P

3. Check harness continuity between CMPS (PHASE) terminal 2 and ECM terminals 66, 76. 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 CMPS (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

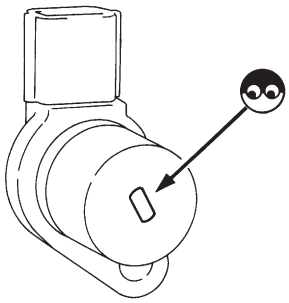
1. Check harness continuity between CMPS (PHASE) terminal 1 and engine ground.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair open circuit or short to power in harness or connector.

5	CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

1. Loosen the fixing bolt of the camshaft position sensor (PHASE).
2. Remove the CMPS (PHASE).
3. Visually check the CMPS (PHASE) for chipping.



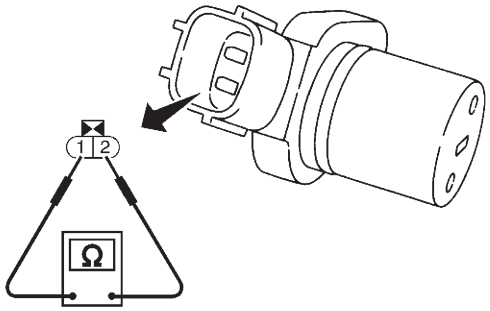
SEF583P

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace camshaft position sensor (PHASE).

6	CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance between CMPS (PHASE) terminals 1 and 2 as shown below.



Resistance:
Approximately 1,440 - 1,760 Ω at 20°C (68°F)
(HITACHI make)
Approximately 2,090 - 2,550 Ω at 20°C (68°F)
(MITSUBISHI make)

SEF325X

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace camshaft position sensor (PHASE).

Diagnostic Procedure (Cont'd)

7	CHECK CMPS (PHASE) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-18.
3. Check the following.

- Continuity between joint connector terminal 1 and ground
- Joint connector

(Refer to EL-377, "HARNESS LAYOUT".)

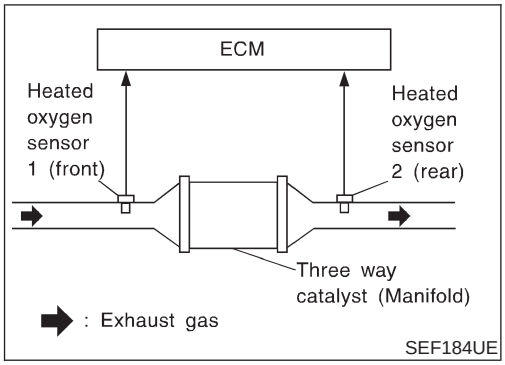
Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-18.

OK or NG

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

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



On Board Diagnosis Logic

NFEC0783

The ECM monitors the switching frequency ratio of heated oxygen sensor 1 (front) and heated oxygen sensors 2 (rear).
A three way catalyst (Manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2 (rear). As oxygen storage capacity decreases, the heated oxygen sensor 2 (rear) switching frequency will increase.
When the frequency ratio of heated oxygen sensor 1 (front) and heated oxygen sensor 2 (rear) approaches a specified limit value, the three way catalyst (Manifold) malfunction is diagnosed.
Malfunction is detected when three way catalyst (Manifold) does not operate properly, three way catalyst (Manifold) does not have enough oxygen storage capacity.

Possible Cause

NFEC0784

- Three way catalyst (Manifold)
- Exhaust tube
- Intake air leaks
- Injectors
- Injector leaks
- Spark plug
- Improper ignition timing

Possible Cause (Cont'd)

4

SRT WORK SUPPORT	
CATALYST	INCMP
HO2S HTR	CMPLT
HO2S	INCMP
EGR SYSTEM	INCMP
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE B1	XXX V
B/FUEL SCHDL	XXX msec
A/F ALPHA-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V

SEF847Y

6

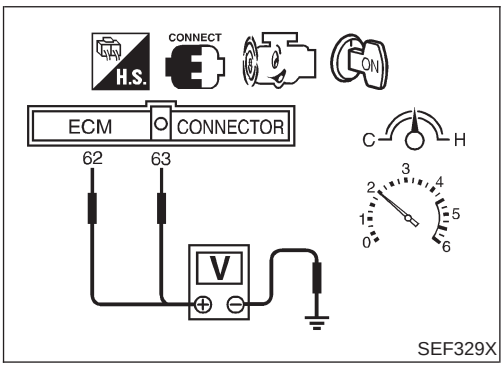
SRT WORK SUPPORT	
CATALYST	CMPLT
HO2S HTR	CMPLT
HO2S	INCMP
EGR SYSTEM	INCMP
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE B1	XXX V
B/FUEL SCHDL	XXX msec
A/F ALPHA-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V

SEF848Y

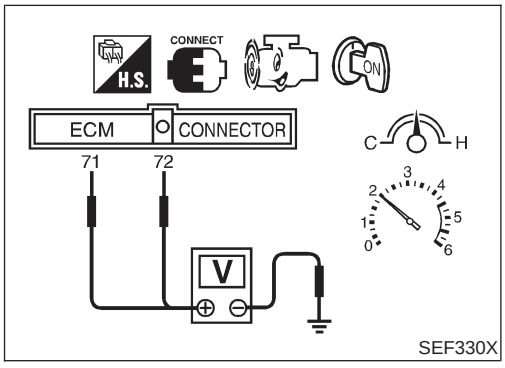
7

SELF DIAG RESULTS	
DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

SEF560X



SEF329X



SEF330X

DTC Confirmation Procedure

NFEC0785

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

NFEC0785S01

TESTING CONDITION:

- **Open engine hood before conducting the following procedure.**
- **Do not hold engine speed for more than the specified minutes below.**

1) Turn ignition switch "ON".
2) Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT-II.
3) Start engine.
4) Rev engine up to 3,000±500 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
5) Wait 5 seconds at idle.
6) Rev engine up to 2,500±500 rpm and maintain it until "INCMP" of CATALYST changes to "CMPLT" (It will take approximately 5 minutes).
   If not "CMPLT", stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.
7) Select "SELF-DIAG RESULTS" mode with CONSULT-II.
8) Confirm that the 1st trip DTC is not detected.
   If the 1st trip DTC is detected, go to "Diagnostic Procedure", EC-311.

Overall Function Check

NFEC0786

Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a 1st trip DTC might not be confirmed.

CAUTION:

Always drive vehicle at a safe speed.

WITH GST

NFEC0786S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeters probes between ECM terminals 63 (HO2S1 bank 1 signal), 62 (HO2S1 bank 2 signal) and engine ground, and ECM terminals 72 (HO2S2 bank 1 signal), 71 (HO2S2 bank 2 signal) and engine ground.
4) Keep engine speed at 2,000 rpm constant under no load.
5) Make sure that the voltage switching frequency (high & low) between ECM terminals 72 and engine ground, or 71 and engine ground is very less than that of ECM terminals 63 and engine ground, or 62 and engine ground.
   Switching frequency ratio = A/B
   A: Heated oxygen sensor 2 (rear) voltage switching frequency

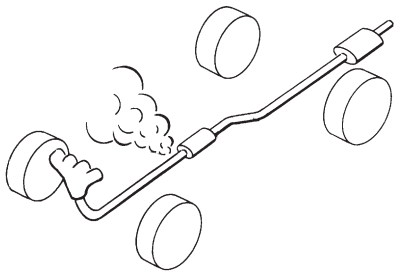
B: Heated oxygen sensor 1 (front) voltage switching frequency
This ratio should be less than 0.75.
If the ratio is greater than above, it means three way catalyst (Manifold) does not operate properly. Go to "Diagnostic Procedure", EC-311.

NOTE:
If the voltage at ECM terminal 62 or 63 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for "DTC P0133, P0153" first. (See EC-184.)

Diagnostic Procedure

NFEC0787

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 AIR LEAK	
1. Start engine and run it at idle. 2. Listen for an exhaust air leak before the three way catalyst (Manifold).		
 SEF099P		
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 "Basic Inspection", EC-90.

Items	Specifications
Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)

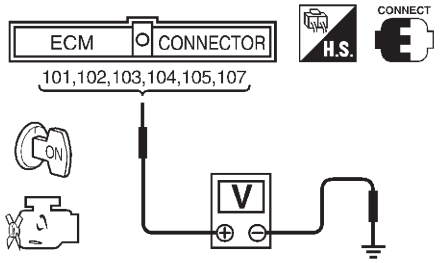
MTBL0623

OK or NG

OK	▶	GO TO 5.
NG	▶	Follow the "Basic Inspection".

5	CHECK INJECTORS

1. Refer to WIRING DIAGRAM for Injectors, EC-524.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals 101, 102, 103, 104, 105, 107 and ground with CONSULT-II or tester.



Battery voltage should exist.

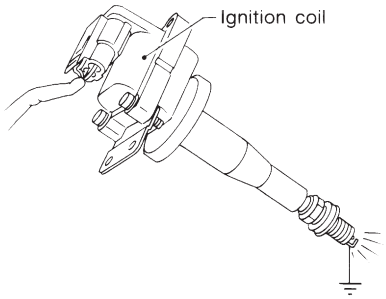
SEF331X

OK or NG

OK	▶	GO TO 6.
NG	▶	Perform "Diagnostic Procedure" under "INJECTOR", EC-525.

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.



SEF575Q

OK or NG

OK	▶	GO TO 7.
NG	▶	Check ignition coil with power transistor and their circuit. Refer to "IGNITION SIGNAL", EC-495.

7	CHECK INJECTOR

1. Turn ignition switch "OFF".
2. Remove injector assembly.
   Refer to EC-38.
   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 "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

Trouble is fixed.	▶	**INSPECTION END**
Trouble is not fixed.	▶	Replace three way catalyst (Manifold).

Description

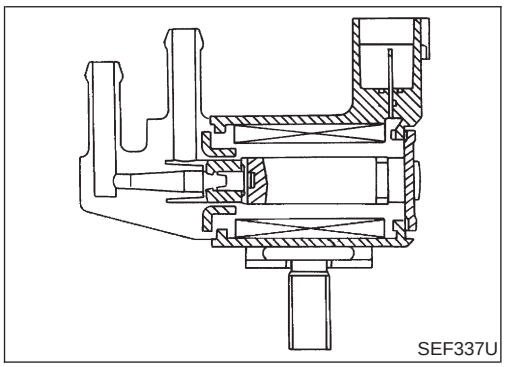
SYSTEM DESCRIPTION

NFEC0788

NFEC0788S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Throttle position switch	Closed throttle position		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor	Vehicle speed		

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.


SEF337U

COMPONENT DESCRIPTION

NFEC0788S02

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

NFEC0789

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch “OFF” ● Shift lever: “N” ● No-load	Idle (Vehicle stopped)	0%
		2,000 rpm	—

On Board Diagnosis Logic

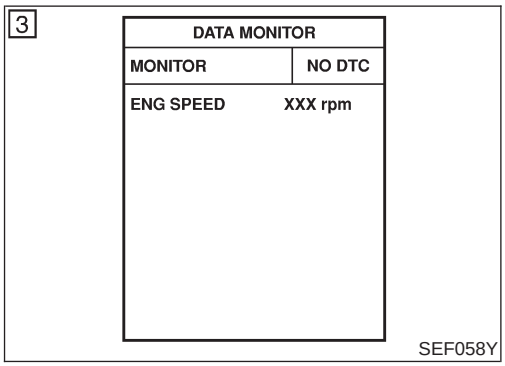
NFEC0790

Malfunction is detected when an improper voltage signal is sent to ECM through the valve.

Possible Cause

NFEC0791

- Harness or connectors
  (The valve circuit is open or shorted.)
- EVAP canister purge volume control solenoid valve



DTC Confirmation Procedure

NFEC0792

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

NFEC0792S01

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 “Diagnostic Procedure”, EC-317.

WITH GST

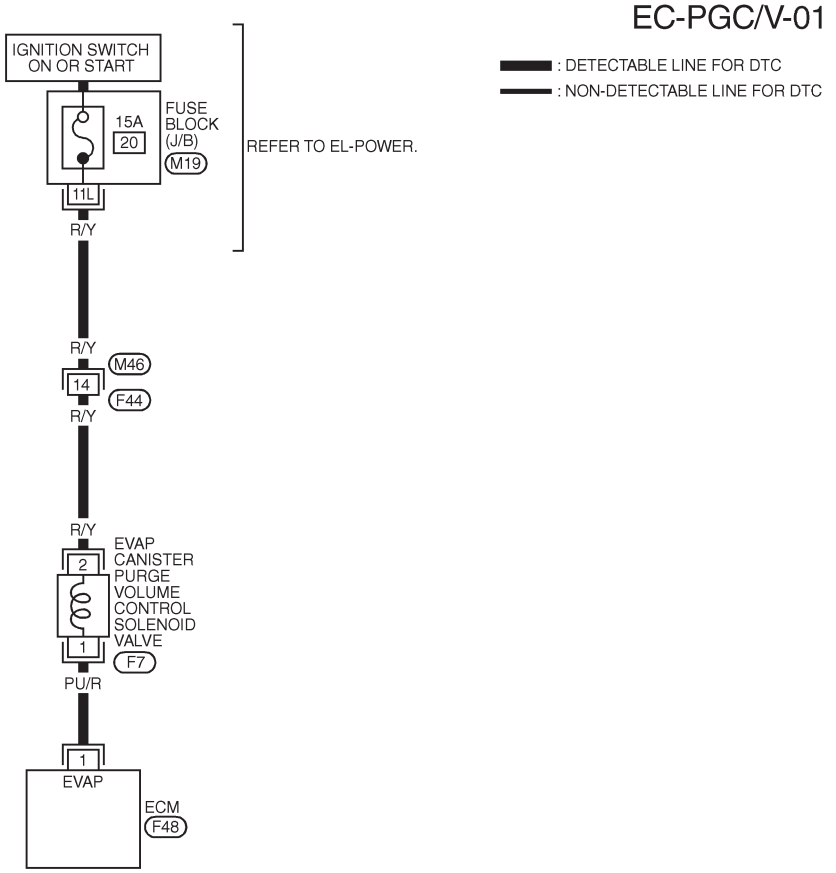
NFEC0792S02

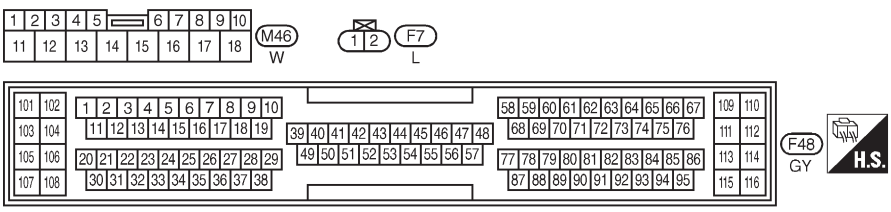
Follow the proocedure “WITH CONSULT-II” above.

Wiring Diagram

NFEC0793

EC-PGC/V-01

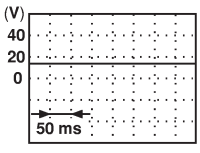
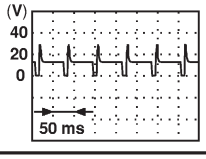




REFER TO THE FOLLOWING.
M19 -FUSE BLOCK- JUNCTION BOX (J/B)

MEC002D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	PU/R	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	ENGINE RUNNING AT IDLE SPEED	BATTERY VOLTAGE 
			ENGINE RUNNING AT 2,000 RPM (MORE THAN 100 SECONDS AFTER STARTING ENGINE)	BATTERY VOLTAGE 

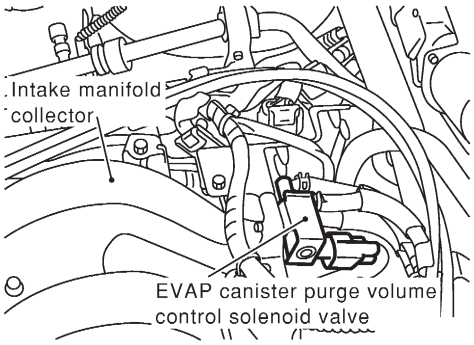
SEF858Y

Diagnostic Procedure

NFEC0794

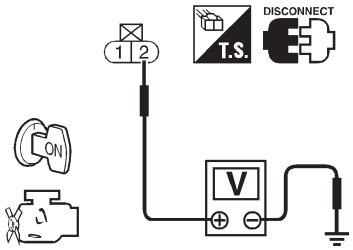
1	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF266X

3. Turn ignition switch “ON”.
4. Check voltage between EVAP canister purge volume control solenoid valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF333X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

	▶	Repair harness or connectors.

Diagnostic Procedure (Cont'd)

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 1 and EVAP canister purge volume control solenoid valve 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 (With CONSULT-II)	▶	GO TO 4.
OK (Without CONSULT-II)	▶	GO TO 5.
NG	▶	Repair open circuit or short to ground and short to power in harness or connetors.

4	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that engine speed varies according to the valve opening.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
A/F ALPHA-B2	XX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	X. XX V

SEF677Y

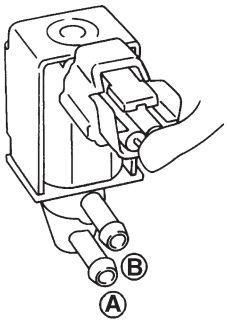
OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	CHECK 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.

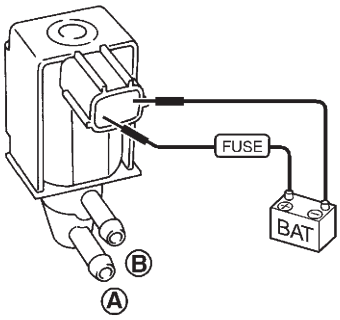


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



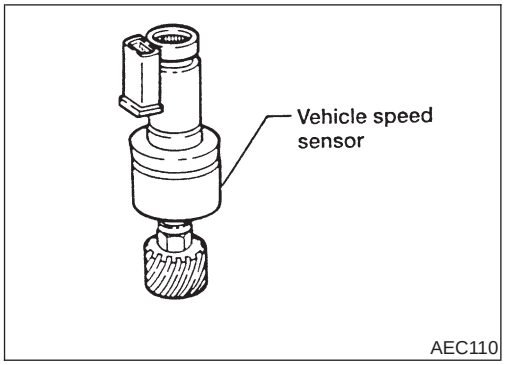
Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

SEF335X

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

=NFEC0795

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

On Board Diagnosis Logic

NFEC0796

Malfunction is detected when the almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.

Possible Cause

NFEC0797

- Harness or connector
  (The vehicle speed sensor circuit is open or shorted.)
- Vehicle speed sensor

DTC Confirmation Procedure

NFEC0798

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.

5

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
B/FUEL SCHDL	XXX msec
PW/ST SIGNAL	OFF
VHCL SPEED SE	XXX km/h

SEF196Y

WITH CONSULT-II

NFEC0798S01

1) Start engine (TCS switch “OFF”).
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 “Diagnostic Procedure”, EC-323.
   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 10 consecutive seconds.

ENG SPEED	1,400 - 6,000 rpm (A/T) 1,900 - 6,000 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	4 - 8 msec (A/T) 4.8 - 9 msec (M/T)
Selector lever	Suitable position
PW/ST SIGNAL	OFF

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-323.

Overall Function Check

NFEC0799

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a 1st trip DTC might not be confirmed.

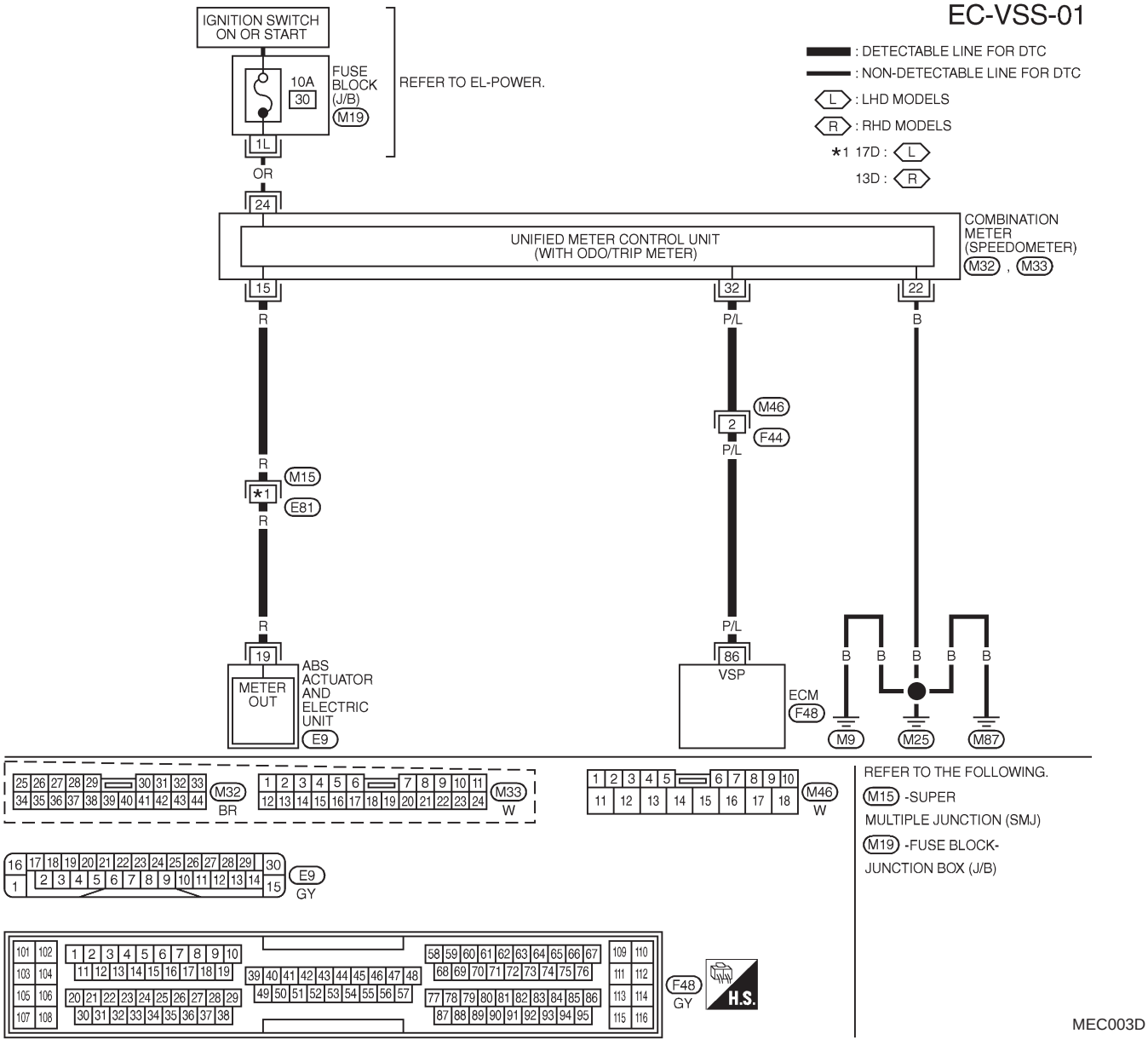
WITH GST

NFEC0799S01

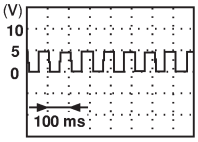
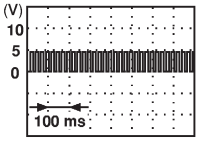
1) Lift up drive wheels.
2) Start engine.
3) Read vehicle speed sensor signal in "MODE 1" with GST.
   The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4) If NG, go to "Diagnostic Procedure", EC-323.

Wiring Diagram

NFEC0800



ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
86	P/L	VEHICLE SPEED SENSOR	VEHICLE DRIVING AT 10 KM/H (6 MPH) IN 1ST GEAR POSITION UNDER LIFTED UP CONDITION	APPROX. 2.0V 
			VEHICLE DRIVING AT 30 KM/H (19 MPH) IN 2ND GEAR POSITION UNDER LIFTED UP CONDITION	APPROX. 2.5V 

SEF859Y

Diagnostic Procedure

NFEC0801

1	CHECK VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch “OFF”. 2. Disconnect ECM harness connector and combination meter harness connector. 3. Check harness continuity between ECM terminal 86 and combination meter terminal 32. 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 ▶	GO TO 2.

2	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M46, F44 ● Harness for open or short between ECM and combination meter	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK SPEEDOMETER FUNCTION
Make sure that speedometer functions properly. **OK or NG**	
OK ▶	GO TO 5.
NG ▶	GO TO 4.

4	CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT
Check the following. ● Harness connectors M15, E81 ● Harness for open or short between combination meter and ABS actuator and electric unit **OK or NG**	
OK ▶	Check combination meter and ABS actuator and electric unitr. Refer to EL or BR section.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-126.	
▶	**INSPECTION END**

Description

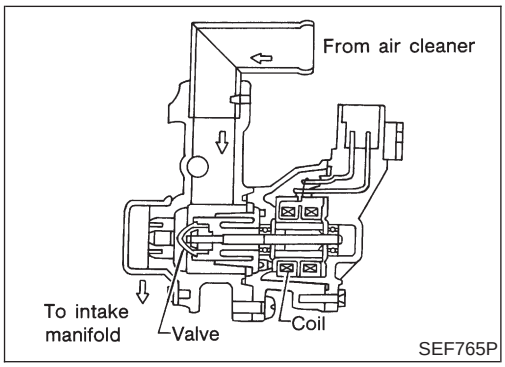
NFEC0802

SYSTEM DESCRIPTION

NFEC0802S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Idle air control	IACV-AAC valve
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Park/neutral position (PNP) switch	Park/neutral position		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed		
Ambient air temperature switch	Ambient air temperature		
Intake air temperature sensor	Intake air temperature		
Absolute pressure sensor	Ambient barometic pressure		

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by takig into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).



COMPONENT DESCRIPTION

NFEC0802S02

IACV-AAC Valve

NFEC0802S0201

The IACV-AAC valve is operated by a step motor for centralized control of auxiliary air supply. This motor has four winding phases and is actuated by the output signals of ECM which turns ON and OFF two windings each in seqeunce. Each time the IACV-AAC valve opens or closes to change tha auxiliary air quantity, the ECM sends a pulse signal to the step motor. When no change in the auxiliary air quantity is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0803

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	2 - 10 step
		2,000 rpm	—

On Board Diagnosis Logic

NFEC0804

Malfunction is detected when
(Malfunction A) the IACV-AAC valve does not operate properly,
(Malfunction B) the IACV-AAC valve does not operate properly.

Possible Cause

NFEC0805

MALFUNCTION A

NFEC0805S01

- Harness or connectors
  (The IACV-AAC valve circuit is open.)
- IACV-AAC valve

MALFUNCTION B

NFEC0805S02

- Harness or connectors
  (The IACV-AAC valve circuit is shorted.)
- Air control valve (Power steering)
- IACV-AAC valve

DTC Confirmation Procedure

NFEC0806

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.
- **If the engine idle speed is out of the specified value, perform “Idle air Volume Learning”, EC-41, before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the “Service Data and Specifications (SDS)”, EC-559.**
- **Perform “PROCEDURE FOR MALFUNCTION A” first. If 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”.**

DTC Confirmation Procedure (Cont'd)

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION A

NFEC0806S01

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch "ON".

With CONSULT-II

NFEC0806S0101

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and let it idle.
4) Keep engine speed at 2,500 rpm for three seconds, then let it idle for three seconds.
   Do not rev engine to more than 3,000 rpm.
5) Perform step 4 once more.
6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-328.

With GST

NFEC0806S0102

Follow the procedure "With CONSULT-II" above.

4

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C

SEF174Y

PROCEDURE FOR MALFUNCTION B

NFEC0806S02

TESTING CONDITION:

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

With CONSULT-II

NFEC0806S0201

1) Open engine hood.
2) Start engine and warm it up to normal operating temperature.
3) Turn ignition switch "OFF" and wait at least 10 seconds.
4) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT-II
5) Start engine and run it for at least 1 minute at idle speed.
6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-328.

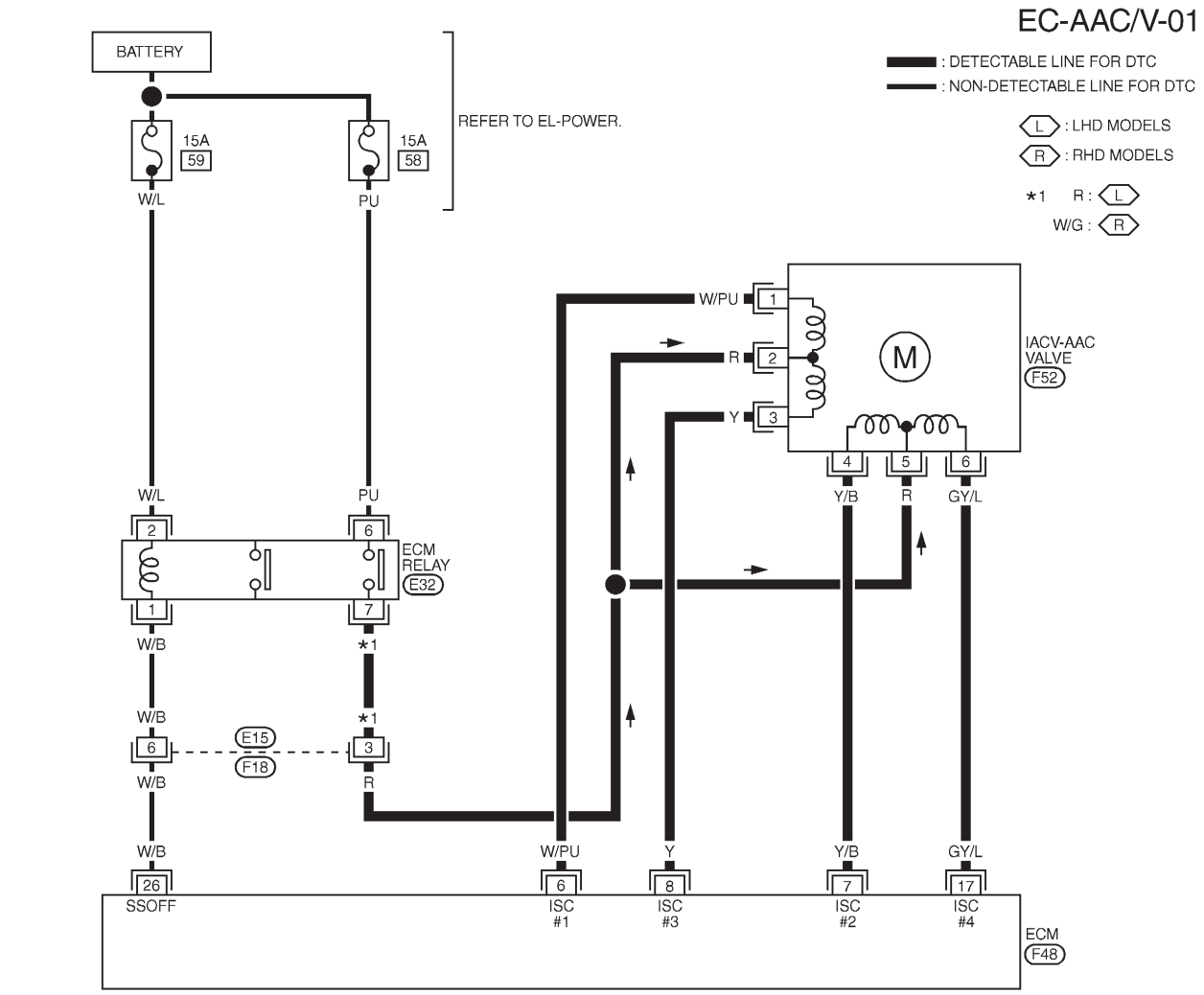
With GST

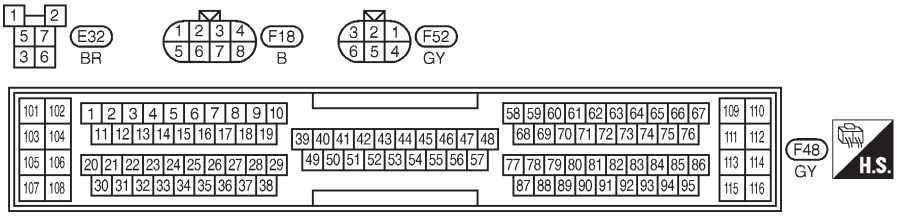
NFEC0806S0202

Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NFEC0807





MEC004D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
6	W/PU	IACV-AAC VALVE	ENGINE RUNNING AT IDLE SPEED	0.1 - 14V
7	Y/B			
8	Y			
17	GY/L			

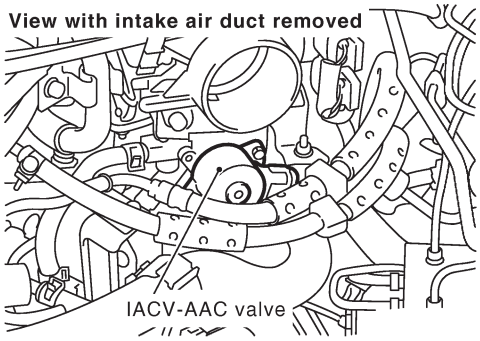
SEF625XB

Diagnostic Procedure

NFEC0808

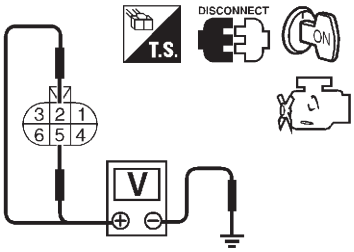
1	CHECK IACV-AAC VALVE POWER SUPPLY CIRCUIT

1. Stop engine.
2. Disconnect IACV-AAC valve harness connector.



SEC008C

3. Turn ignition switch “ON”.
4. Check voltage between IACV-AAC valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF343X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E15, F18
- Harness for open or short between IACV-AAC valve and ECM relay

	▶	Repair harness or connectors.

3	CHECK IACV-AAC VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and IACV-AAC valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	IACV-AAC valve terminal
6	1
7	4
8	3
17	6

MTBL0354

Continuity should exist.

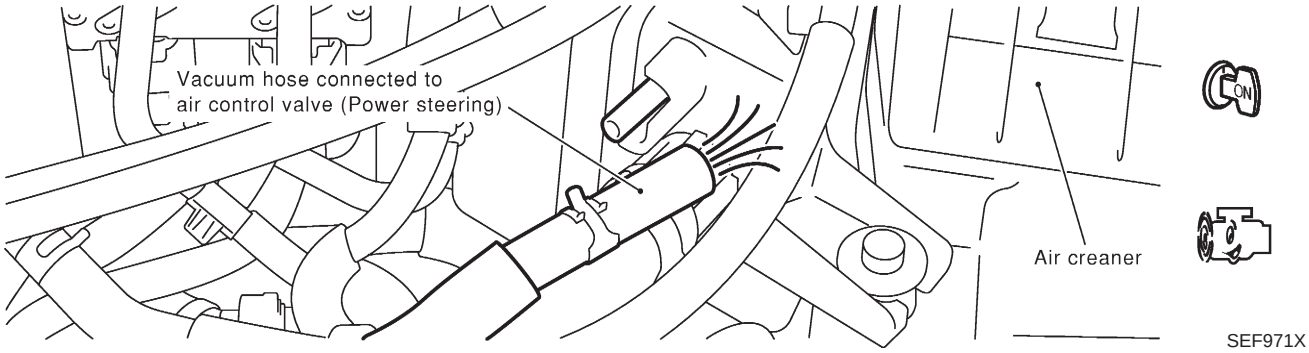
4. Also check harness for short to ground and short to power.

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 AIR CONTROL VALVE (POWER STEERING) OPERATION-I

1. Reconnect ECM harness connector and IACV-AAC valve harness connector.
2. Disconnect vacuum hose connected to air control valve (Power steering) at intake air duct.
3. Start engine and let it idle.
4. Check vacuum hose for vacuum existence.



SEF971X

Vacuum slightly exists or does not exist.

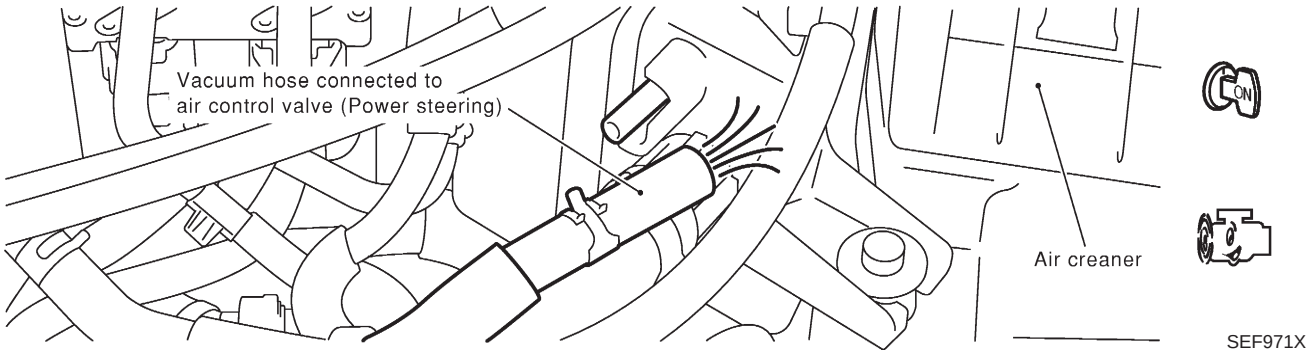
OK or NG

OK	▶	GO TO 5.
NG	▶	Replace air control valve (Power steering).

Diagnostic Procedure (Cont'd)

5	CHECK AIR CONTROL VALVE (POWER STEERING) OPERATION-II

Check vacuum hose for vacuum existence when steering wheel is turned.



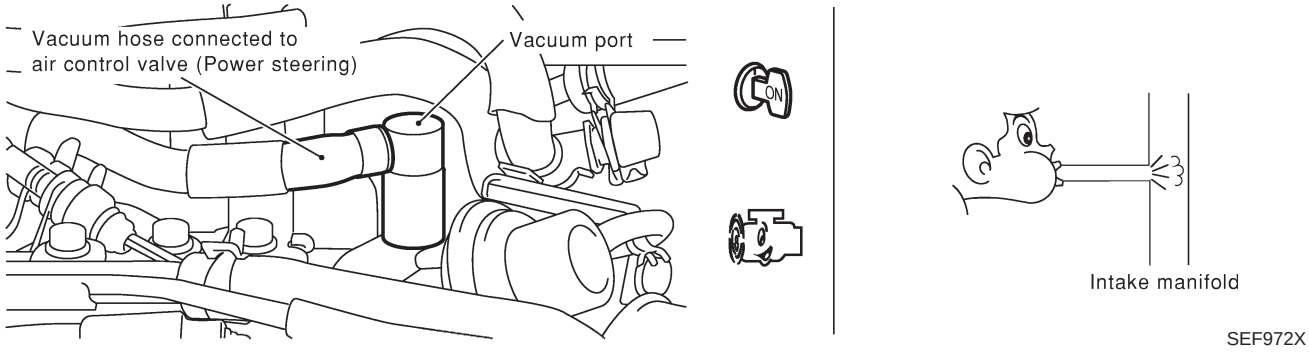
Vacuum should exist.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 6.

6	CHECK VACUUM PORT

1. Stop engine.
2. Disconnect vacuum hose connected to air control valve (Power steering) at vacuum port.
3. Blow air into vacuum port.
4. Check that air flows freely.

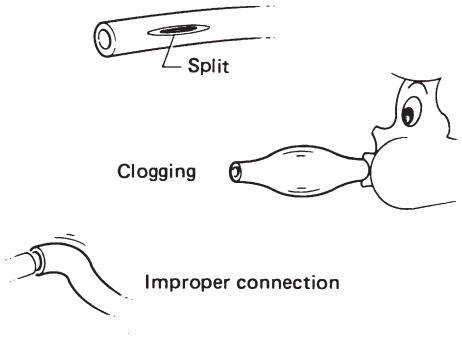


OK or NG

OK	▶	GO TO 7.
NG	▶	Repair or clean vacuum port.

7	CHECK VACUUM HOSES AND TUBES

1. Disconnect vacuum hoses between air control valve (Power steering) and vacuum port, air control valve (Power steering) and intake air duct.
2. Check the hoses and tubes for crack, clogging, improper connection or disconnection.



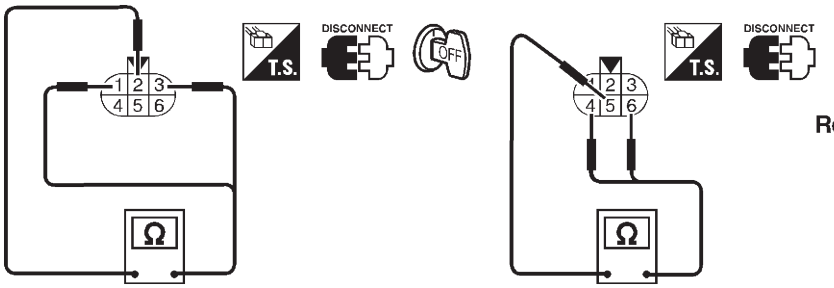
SEF109L

OK or NG

OK	▶	GO TO 8.
NG	▶	Repair hoses or tubes.

8	CHECK IACV-AAC VALVE-I

1. Disconnect IACV-AAC valve harness connector.
2. Check resistance between IACV-AAC valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.



Resistance:
Approximately 22Ω [at 20°C (68°F)]

SEF344X

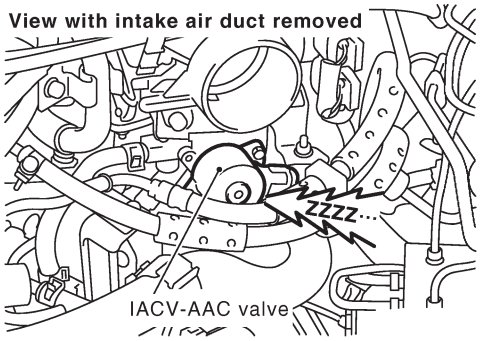
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace IACV-AAC valve assembly.

Diagnostic Procedure (Cont'd)

9	CHECK IACV-AAC VALVE-II

1. Reconnect IACV-AAC valve harness connector and ECM harness connector.
2. Turn ignition switch "ON" and "OFF", and ensure the IACV-AAC valve makes operating sound according to the ignition switch position.



SEC009C

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

10	REPLACE IACV-AAC VALVE

1. Replace IACV-AAC valve assembly.
2. Perform "Idle Air Volume Learning", EC-41.

Is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT	▶	**INSPECTION END**
INCMP	▶	Follow the construction of "Idle Air Volume Learning".

11	CHECK TARGET IDLE SPEED

1. Turn ignition switch "OFF".
2. Reconnect all harness connectors and vacuum hoses.
3. Start engine and warm it up to normal operating temperature.
4. Also warm up transmission to normal operating temperature.

- 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.

5. Stop vehicle with engine running.
6. Check target idle speed.

M/T: 625±50 rpm (VQ30DE engine models)
M/T: 675±50 rpm (VQ20DE engine models)
A/T: 700±50 rpm (in "P" or "N" position)

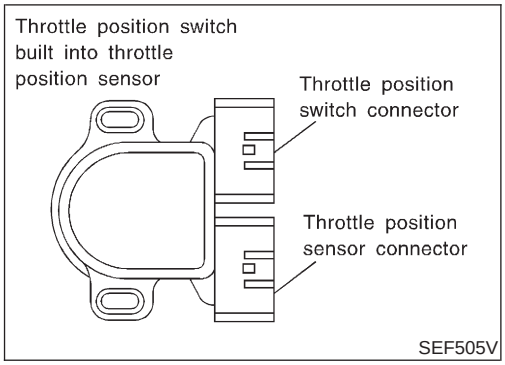
OK or NG

OK	▶	GO TO 12.
NG	▶	Perform "Idle Air Volume Learning", EC-41.

12	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**



Component Description

NFEC0809

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is used only for A/T control.
When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge volume control solenoid valve when the throttle position sensor is malfunctioning.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0810

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
CLSD THL/P SW	● Engine: After warming up, idle the engine	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

On Board Diagnosis Logic

NFEC0811

Malfunction is detected when battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened.

Possible Cause

NFEC0812

- Harness or connectors
  (The closed throttle position switch circuit is shorted.)
- Closed throttle position switch
- Throttle position sensor

4

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
CLSD THL/P SW	ON

SEF197Y

6

DATA MONITOR	
MONITOR	NO DTC
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h
THRTL POS SEN	XXX V

SEF198Y

DTC Confirmation Procedure

NFEC0813

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

NFEC0813S01

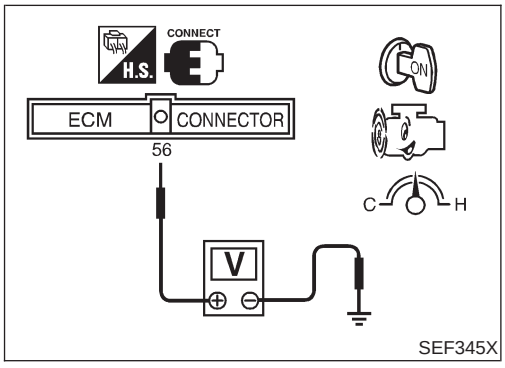
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF”, wait at least 10 seconds and then start engine.
3) Select “CLSD THL/P SW” in “DATA MONITOR” mode.
   If “CLSD THL/P SW” is not available, go to step 5.
4) Check the signal under the following conditions.

Condition	Signal indication
Throttle valve: Idle position	ON
Throttle valve: Slightly open	OFF

   If the result is NG, go to “Diagnostic Procedure”, EC-337.
   If OK, go to following step.
5) Select “DATA MONITOR” mode with CONSULT-II.
6) Drive the vehicle for at least 5 consecutive seconds under the following condition.

THRTL POS SEN	More than 2.5V
VHCL SPEED SE	More than 5 km/h (3 MPH)
Selector lever	Suitable position
Driving location	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 “Diagnostic Procedure”, EC-337.



SEF345X

Overall Function Check

NFEC0814

Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NFEC0814S01

1) Start engine and warm it up to normal operating temperature.
2) Check the voltage between ECM terminal 56 (Closed throttle position switch signal) and ground under the following conditions.

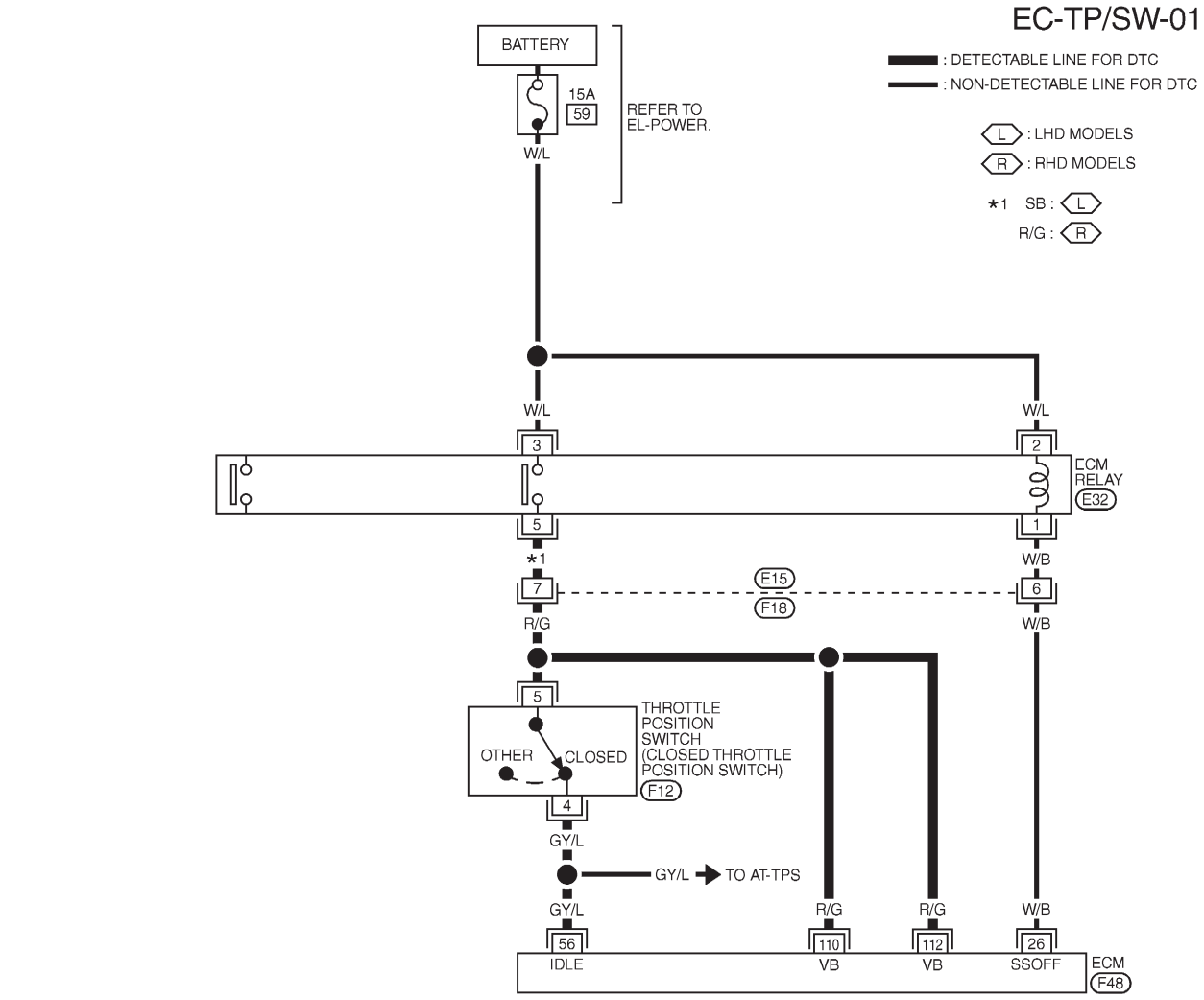
   At idle: Battery voltage

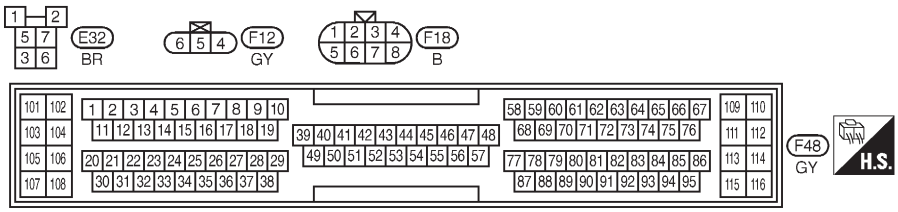
At 2,000 rpm: Approximately 0V

3) If NG, go to "Diagnostic Procedure", EC-337.

Wiring Diagram

=NFEC0815





MEC005D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
5	R/G	THROTTLE POSITION SWITCH (CLOSED POSITION)	ENGINE RUNNING WITH ACCELERATOR PEDAL FULLY RELEASED UNDER WARM-UP CONDITION	BATTERY VOLTAGE
			IGN ON WITH ACCELERATOR PEDAL DEPRESSED	APPROX. 0V

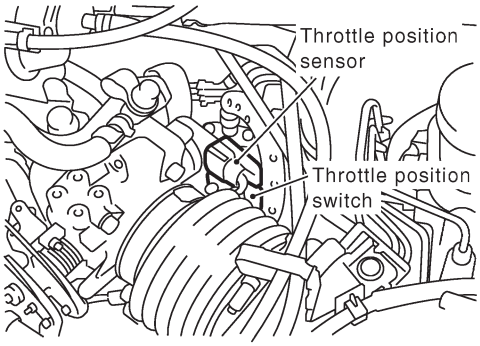
SEF626XC

Diagnostic Procedure

NFEC0816

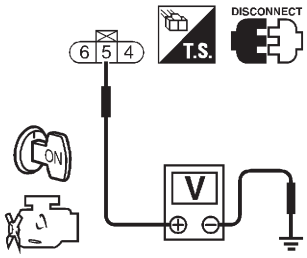
1	CHECK CLOSED THROTTLE POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle position switch harness connector.



SEC001C

3. Turn ignition switch “ON”.
4. Check voltage between throttle position switch terminal 5 and engine ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF346X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E15, F18
- Harness for open or short between throttle position switch and ECM relay
- Harness for open or short between throttle position switch and ECM

	▶	Repair harness or connectors.

3	CHECK CLOSED THROTTLE POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and throttle position switch 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 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK IGNITION TIMING AND ENGINE IDLE SPEED

Check the following items. Refer to "Basic Inspection", EC-90.

Items	Specifications
Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)
Idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)

MTBL0625

Models with CONSULT-II ▶	GO TO 6.
Models without CONSULT-II ▶	GO TO 6.

5	CHECK THROTTLE POSITION SWITCH

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Turn ignition switch "ON".
4. Select "DATA MONITOR" mode with CONSULT-II.
5. Check indication of "CLSD THL/P SW" under the following conditions.
   Measurement must be made with throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

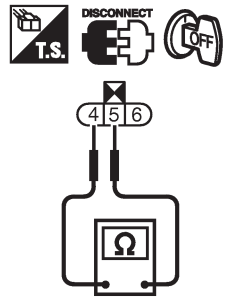
MTBL0355

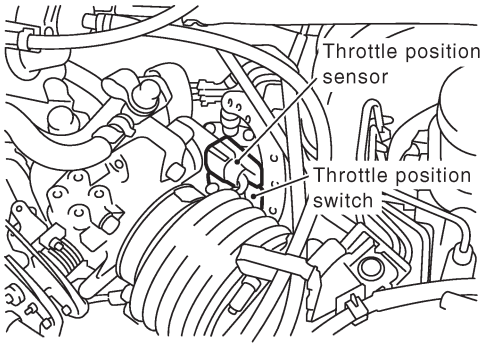
OK or NG

OK (With CONSULT-II) ▶	GO TO 8.
OK (Without CONSULT-II) ▶	GO TO 9.
NG ▶	GO TO 7.

6	CHECK THROTTLE POSITION SWITCH

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect closed throttle position switch harness connector.
4. Check continuity between closed throttle position switch terminals 4 and 5 under the following conditions.
   Resistance measurement must be made with throttle position switch installed in vehicle.





Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

SEC010C

OK or NG

OK (With CONSULT-II)	▶	GO TO 8.
OK (Without CONSULT-II)	▶	GO TO 9.
NG	▶	GO TO 7.

7	ADJUST THROTTLE POSITION SWITCH

Check the following items. Refer to "Basic Inspection", EC-90.

Items	Specifications
Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)

MTBL0623

Is it possible to adjust closed throttle position switch?

Yes or No

Yes (With CONSULT-II)	▶	GO TO 9.
Yes (Without CONSULT-II)	▶	GO TO 9.
No	▶	Replace throttle position switch.

Diagnostic Procedure (Cont'd)

8	CHECK THROTTLE POSITION SENSOR

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine (ignition switch OFF).
3. Turn ignition switch ON.
4. Select "DATA MONITOR" mode with CONSULT-II.
5. Check voltage of "THRTL POS SEN" under the following conditins.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

Throttle valve conditions	THRTL POS SEN
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

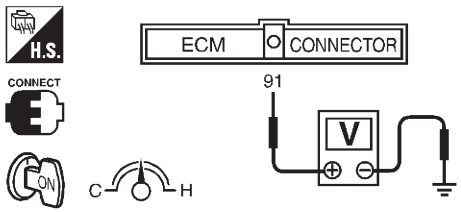
MTBL0230

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace throttle position sensor.

9	CHECK THROTTLE POSITION SENSOR

1. Start engine and warm it up to normal operating temperature.
2. Stop engine (ignition switch OFF).
3. Turn ignition switch ON.
4. Check voltage between ECM terminal 91 (Throttle position sensor signal) and ground.
   Voltage measurement must be made with throttle position sensor installed in vehicle.



Throttle valve conditions	Voltage
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

SEF348X

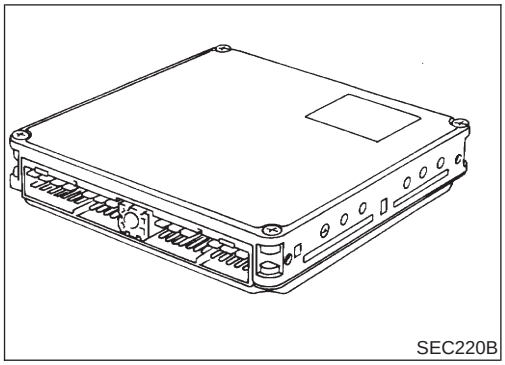
OK or NG

OK	▶	GO TO 10.
NG	▶	Replace throttle position sensor.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**



SEC220B

Component Description

NFEC0271

The ECM consists of a microcomputer and connector for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

NFEC0272

Malfunction is detected when ECM calculation function is malfunctioning.

Possible Cause

NFEC0518

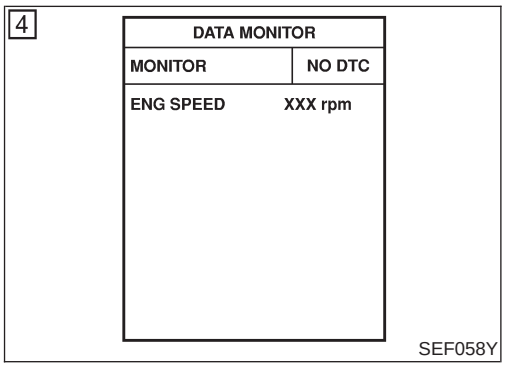
- ECM

DTC Confirmation Procedure

NFEC0273

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.



SEF058Y

WITH CONSULT-II

NFEC0273S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine.
4) Run engine for at least 30 seconds at idle speed.
5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-342.

WITH GST

NFEC0273S03

Follow the procedure “WITH CONSULT-II” above.

DTC Confirmation Procedure (Cont'd)

NO TOOLS

NFEC0273S02

1) Turn ignition switch "ON".
2) Start engine and wait at least 30 seconds.
3) Turn ignition switch "OFF" and wait at least 10 seconds.
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-342.

Diagnostic Procedure

NFEC0274

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-341.
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-341.
5. Is the 1st trip DTC P0605 displayed again?

No Tools

1. Turn ignition switch "ON".
2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-56, EC-59.
3. **Perform "DTC Confirmation Procedure".**
   See EC-341.
4. Is the 1st trip DTC 0605 displayed again?

Yes or No

Yes [With NVIS (NATS) system]	▶	GO TO 2.
Yes [Without NVIS (NATS) system]	▶	GO TO 3.
No	▶	**INSPECTION END**

2	REPLACE ECM

1. Turn ignition switch "OFF".
2. Replace ECM.
3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to "NVIS (Nissan Vehicle Immobilizer System — NATS)", EC-60.
4. Perform "Idle Air Volume Learning", EC-41.

Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT	▶	**INSPECTION END**
INCMP	▶	Follow the construction of "Idle Air Volume Learning".

3	REPLACE ECM	
1. Turn ignition switch "OFF". 2. Replace ECM. 3. Perform "Idle Air Volume Learning", EC-41. **Which is the result CMPLT or INCMP?**		
CMPLT or INCMP		
CMPLT	▶	**INSPECTION END**
INCMP	▶	Follow the construction of "Idle Air Volume Learning".

Description

NFEC0823

SYSTEM DESCRIPTION

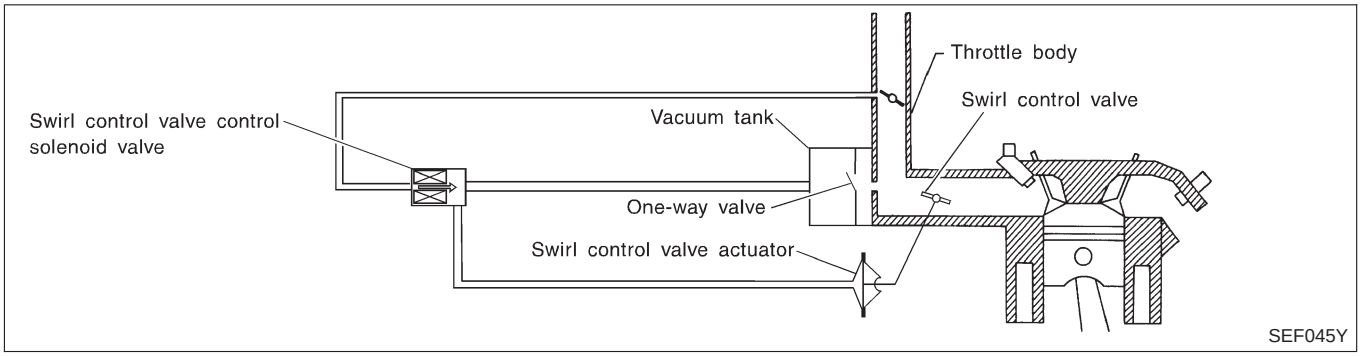
NFEC0823S01

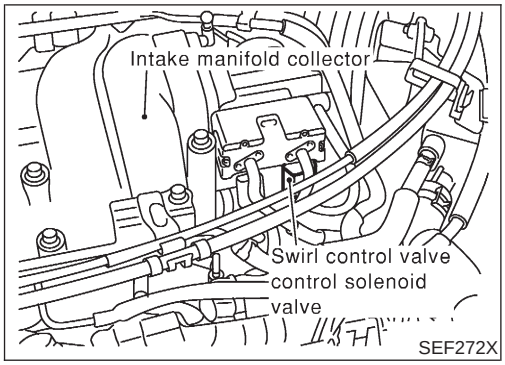
Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position	Swirl control valve control	Swirl control valve control solenoid valve ↓ Vacuum signal Swirl control valve actuator ↓ Swirl control valve
Ignition switch	Start signal		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		

This system has a swirl control valve in the intake passage of each cylinder.
While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.
Also, except when idling and during low engine speed operation, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

Throttle position sensor (Idle position)	Engine speed	Swirl control valve control solenoid valve	Swirl control valve
ON	Below 3,200 rpm	ON	Closed
OFF	Less than 3,200 rpm	ON	Closed
	More than 3,600 rpm	OFF	Open

When engine coolant temperature is below 10°C (50°F) and above 55°C (131°F), swirl control valve is kept open regardless of above condition.





COMPONENT DESCRIPTION

NFEC0823S02

Swirl Control Valve Control Solenoid Valve

NFEC0823S0201

The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply intake manifold vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0824

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWRL CONT S/V	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON
		Engine coolant temperature is above 55°C (131°F).	OFF

On Board Diagnosis Logic

NFEC0825

Malfunction is detected when an improper voltage signal is sent to ECM through swirl control valve control solenoid valve.

Possible Cause

NFEC0826

- Harness or connectors
  (The swirl control valve control solenoid valve circuit is open or shorted.)
- Swirl control valve control solenoid valve

DTC Confirmation Procedure

NFEC0827

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.

DTC Confirmation Procedure (Cont'd)

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

WITH CONSULT-II

NFEC0827S04

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
   If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-348.

WITH GST

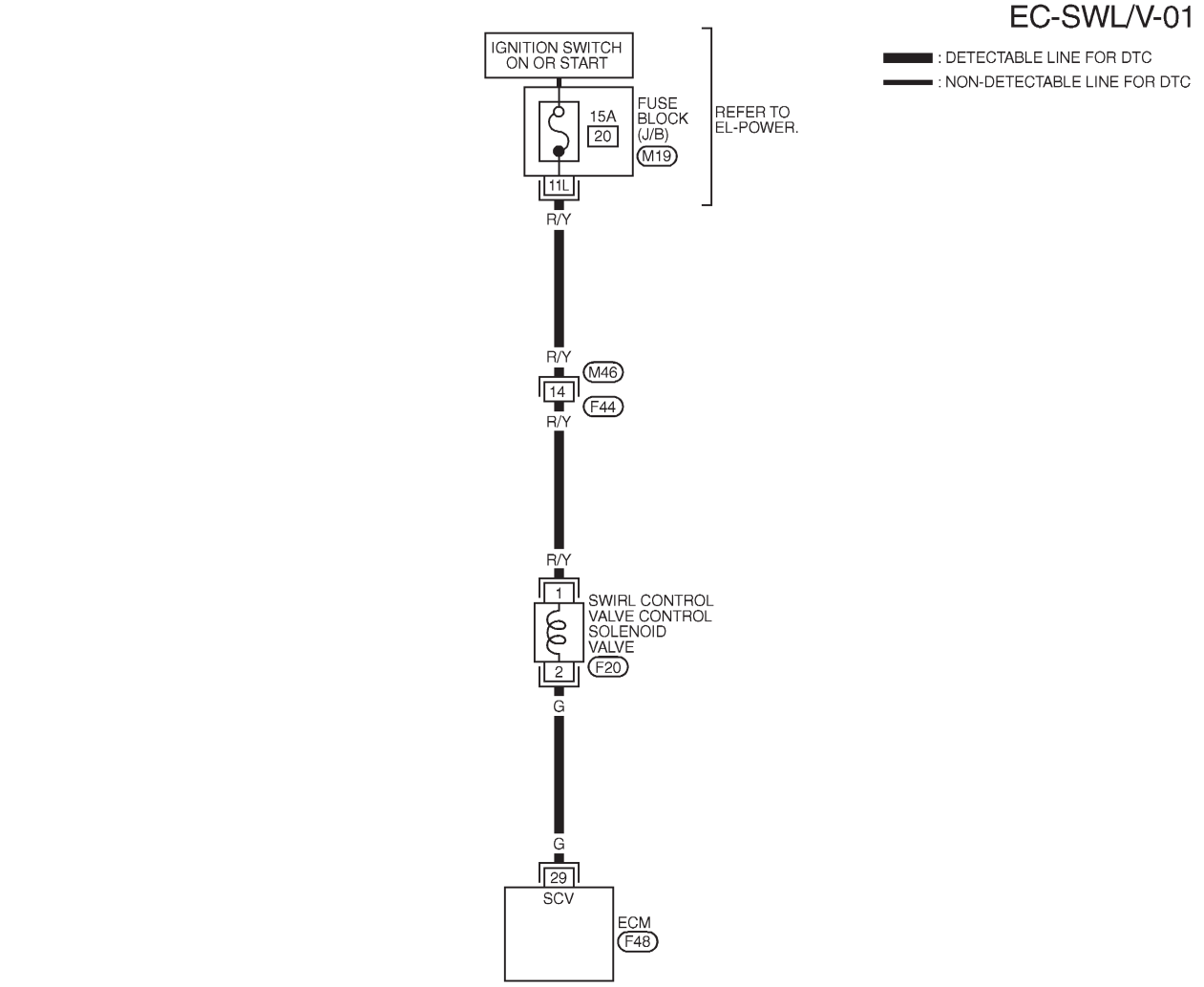
NFEC0827S05

Follow the procedure "With CONSULT-II" above.

Wiring Diagram

=NFEC0828

EC-SWL/V-01



MEC007D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
29	G	SWIRL CONTROL VALVE CONTROL SOLENOID VALVE	ENGINE RUNNING AT IDLE SPEED WITH ENGINE COOLANT TEMPERATURE BETWEEN 15°C (59°F) AND 50°C (122°F).	0 - 1V
			ENGINE RUNNING AT IDLE SPEED WITH ENGINE COOLANT TEMPERATURE ABOVE 55°C (131°F).	BATTERY VOLTAGE

SEF627XB

Diagnostic Procedure

NFEC0829

1	INSPECTION START
Do you have CONSULT-II?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SWIRL CONT SOL/V” in “ACTIVE TEST” mode with CONSULT-II.
3. Touch “ON” and “OFF” on CONSULT-II screen.

ACTIVE TEST	
SWIRL CONT SOL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
IACV-AAC/V	XXX step

SEF069Y

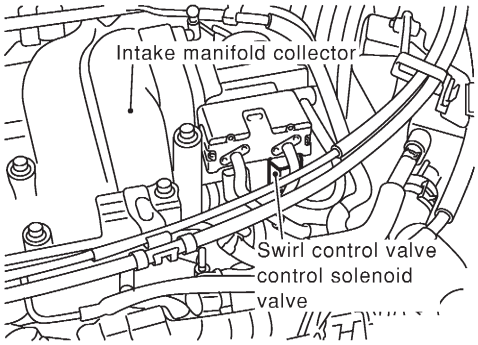
4. Make sure that clicking sound is heard from the swirl control valve control solenoid valve.

OK or NG

OK ▶	GO TO 6.
NG ▶	GO TO 3.

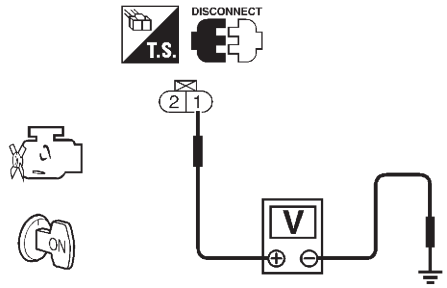
3	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect swirl control valve control solenoid valve harness connector.



SEF272X

3. Turn ignition switch "ON".
4. Check voltage between swirl control valve control solenoid valve terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF619X

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M46, F44
- 15A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse

	▶	Repair harness or connectors.

5	CHECK SWIRL CONTROL VALVE 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 29 and swirl control valve 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

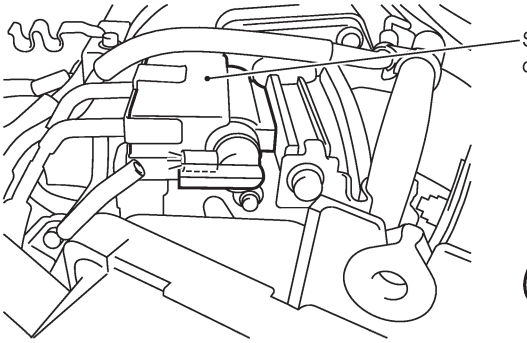
OK	▶	GO TO 6.
NG	▶	Repair open circuit, short to ground or short to power in harness connectors.

Diagnostic Procedure (Cont'd)

6	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

With CONSULT-II

1. Reconnect the disconnected harness connectors.
2. Start engine and let it idle.
3. Remove vacuum hose connected to swirl control valve actuator.
4. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Touch "ON" and "OFF" on CONSULT-II screen.
6. Check vacuum existence and operation delay time under the following conditions.



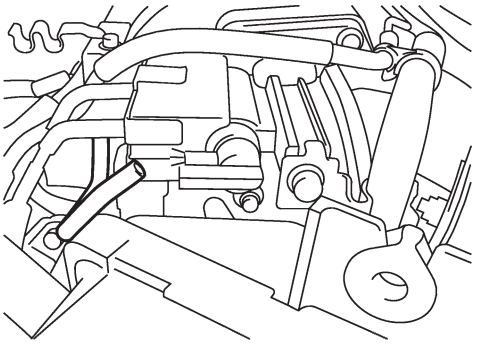
SWIRL CONT SOL/V	Vacuum
ON	should exist.
OFF	should not exist.

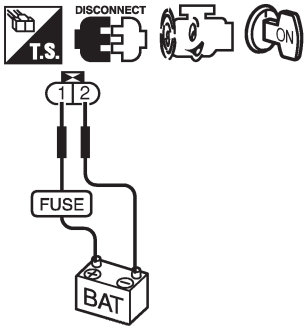
Operation takes less than 1 second.

SEF046Y

Without CONSULT-II

1. Reconnect ECM harness connector.
2. Remove vacuum hose connected to swirl control valve actuator.
3. Start engine and let it idle.
4. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
5. Check vacuum existence and operation delay time under the following conditions.





Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

Operation takes less than 1 second.

SEF047Y

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace intake manifold collector assembly.

7	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

System Description

NFEC0554

COOLING FAN CONTROL

NFEC0554S01

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		

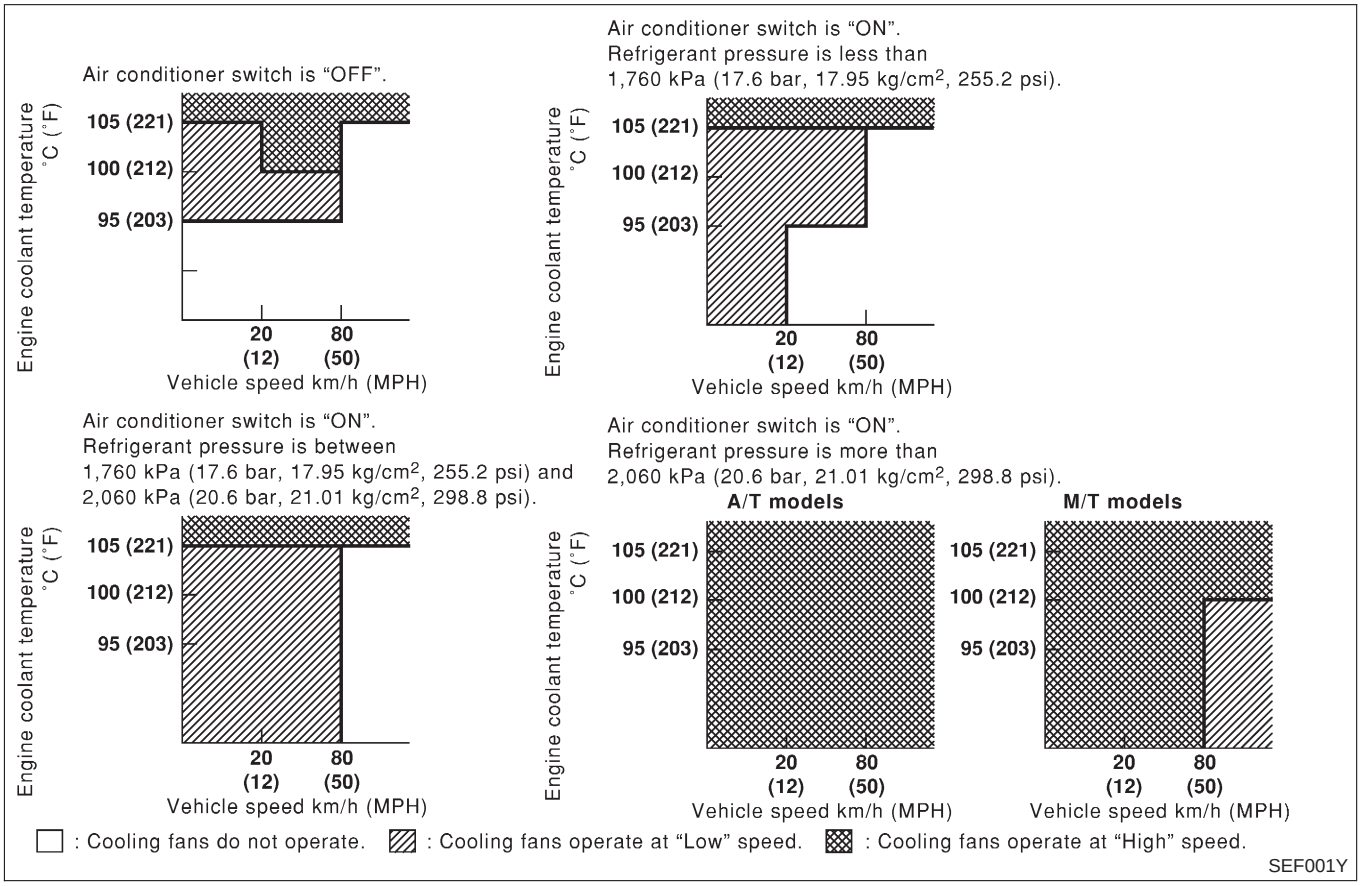
The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION

NFEC0554S02

VQ20DE Engine Models

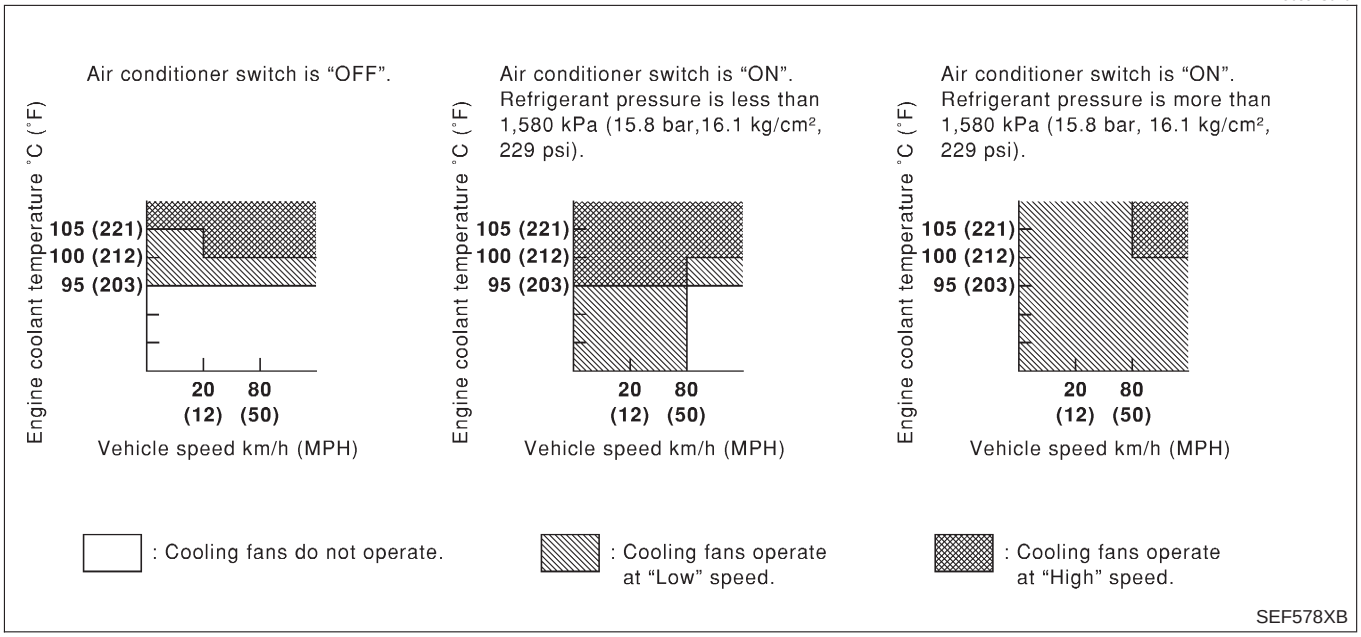
NFEC0554S0203



CONSULT-II Reference Value in Data Monitor Mode

VQ30DE Engine Models

NFEC0554S0204



SEF578XB

CONSULT-II Reference Value in Data Monitor Mode

NFEC0555

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	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

On Board Diagnosis Logic

NFEC0557

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.

Malfunction is detected when cooling fan does not operate properly (Overheat), cooling fan system does not operate properly (Overheat) and engine coolant was not added to the system using the proper filling method.

Possible Cause

NFEC0563

- Harness or connectors
  (The cooling fan circuit is open or shorted.)
- Cooling fan
- Radiator hose
- Radiator
- Radiator cap
- Water pump
- Thermostat

For more information, refer to “MAIN 12 CAUSES OF OVERHEATING”, EC-368.

CAUTION:

When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA-16, “Changing Engine Coolant”. Also, replace the engine oil.

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-14, “Engine Coolant Mixture Ratio”.**
2) **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

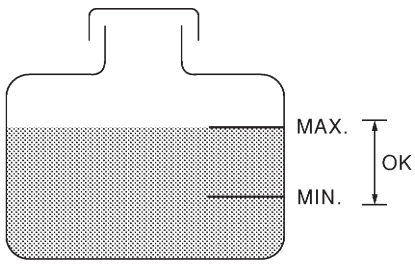
NFEC0558

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.

1



SEF621W

WITH CONSULT-II

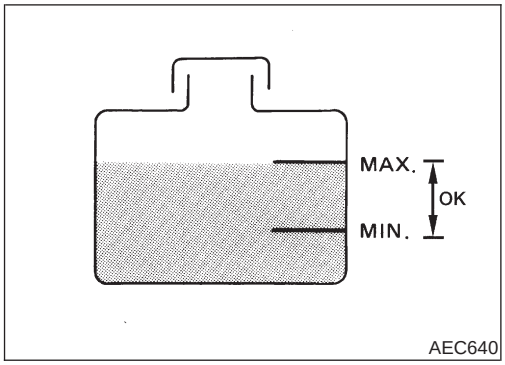
NFEC0558S01

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 “Diagnostic Procedure”, EC-357.
2) Confirm whether the customer filled the coolant or not. If the customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-357.
3) Turn ignition switch “ON”.
4) Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5) If the results are NG, go to “Diagnostic Procedure”, EC-357.

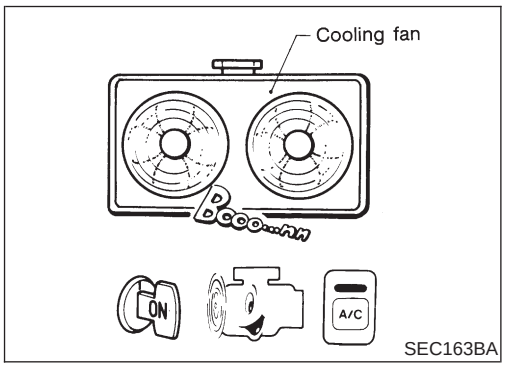
4

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

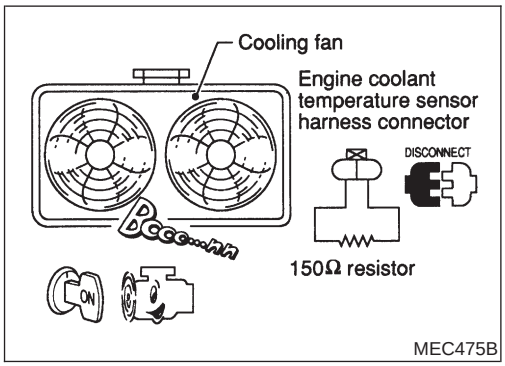
SEF111X



AEC640



SEC163BA



MEC475B

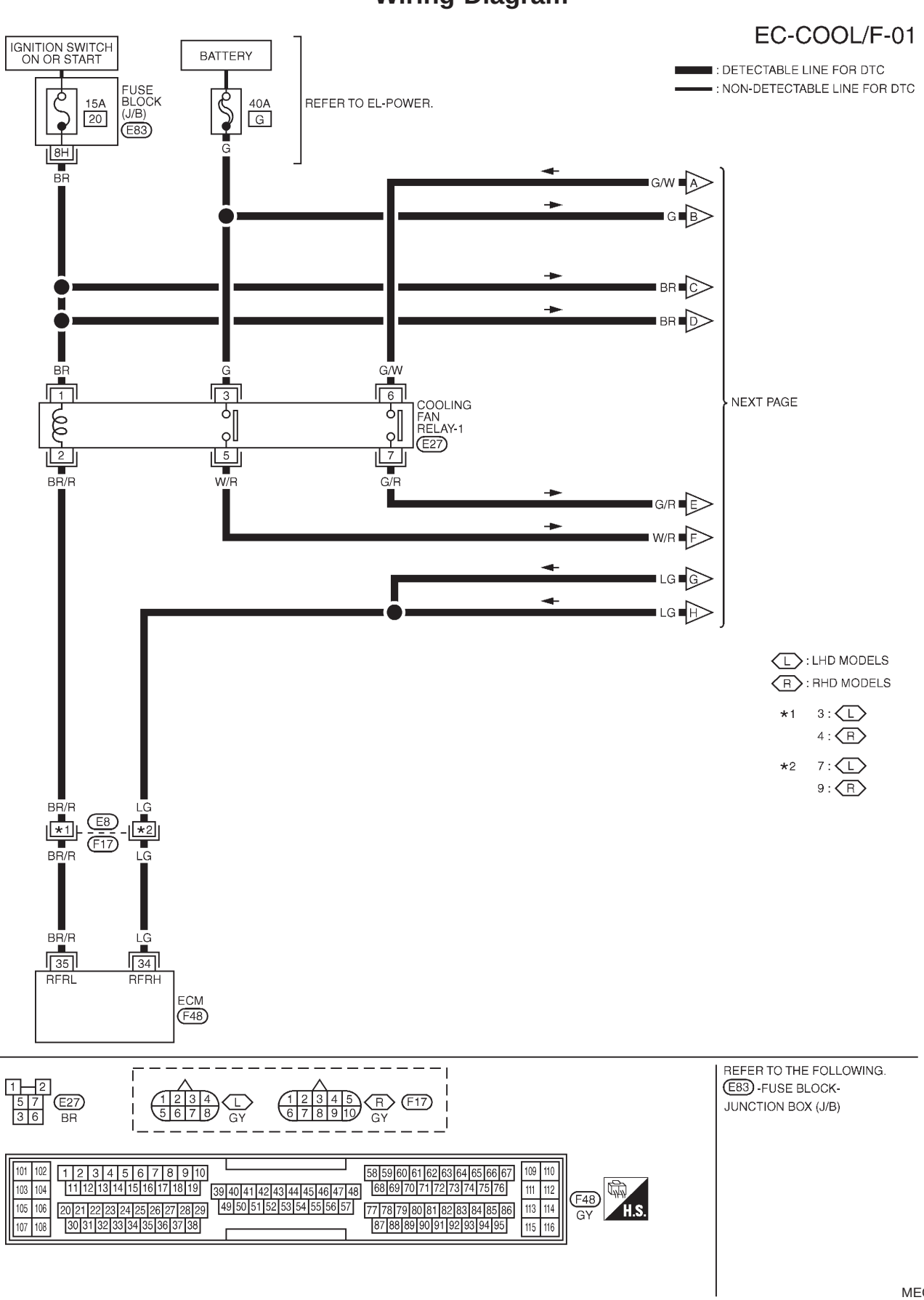
⊗ WITHOUT CONSULT-II

NFEC0558S03

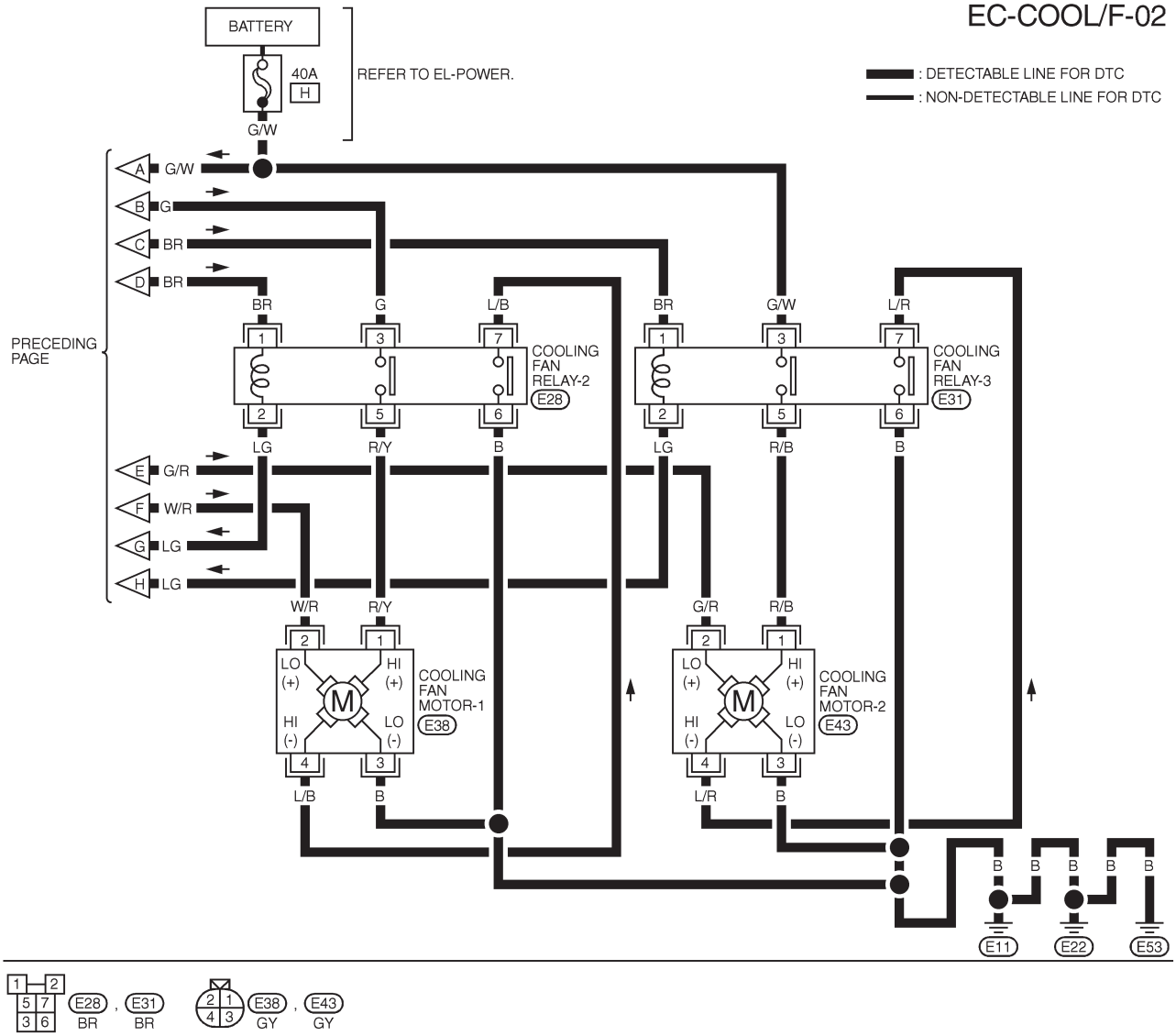
1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "Diagnostic Procedure", EC-357.
2) Confirm whether the customer filled the coolant or not. If the customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-357.
3) Start engine.
   Be careful not to overheat engine.
4) Set temperature control lever to full cold position.
5) Turn air conditioner switch "ON".
6) Turn blower fan switch "ON".
7) Run engine at idle for a few minutes with the air conditioner operating.
   Be careful not to overheat engine.
8) Make sure the cooling fans are operating at low speeds.
9) Turn ignition switch "OFF".
10) Turn air conditioner switch and blower fan switch "OFF".
11) Disconnect engine coolant temperature sensor harness connector.
12) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
13) Restart engine and make sure the cooling fans are operating at high speed.
    Be careful not to overheat engine.
14) If NG, go to "Diagnostic Procedure", EC-357.

Wiring Diagram

NFEC0559



Wiring Diagram (Cont'd)



MEC849C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
34	LG	COOLING FAN RELAY (HIGH)	ENGINE RUNNING WITH COOLING FAN NOT OPERATING	BATTERY VOLTAGE
			ENGINE RUNNING WITH COOLING FAN OPERATING AT HIGH SPEED	0 - 1.0V
35	BR/R	COOLING FAN RELAY (LOW)	ENGINE RUNNING WITH COOLING FAN NOT OPERATING	BATTERY VOLTAGE
			ENGINE RUNNING WITH COOLING FAN OPERATING AT LOW SPEED	0 - 1.0V

SEF630XB

Diagnostic Procedure

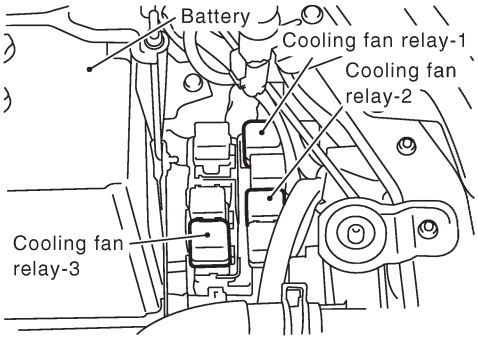
NFEC0560

1	INSPECTION START
Do you have CONSULT-II?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	GO TO 4.

2	CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

1. Disconnect cooling fan relays-2 and -3.



SEC006C

2. Turn ignition switch “ON”.
3. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF646X

4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK ▶	GO TO 3.
NG ▶	Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-363.)

Diagnostic Procedure (Cont'd)

3	CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch "OFF".
2. Reconnect cooling fan relays-2 and -3.
3. Turn ignition switch "ON".
4. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II.

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF111X

5. Make sure that cooling fans-1 and -2 operate at high speed.

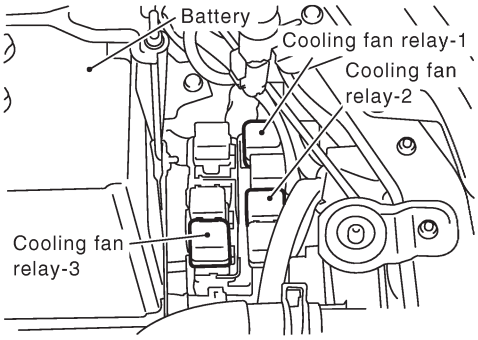
OK or NG

OK	▶	GO TO 6.
NG	▶	Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-366.)

4	CHECK COOLING FAN LOW SPEED OPERATION

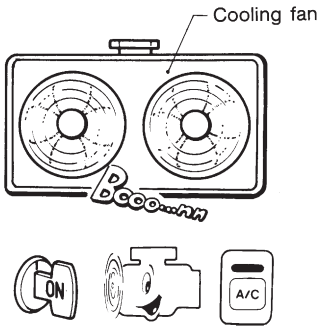
Without CONSULT-II

1. Disconnect cooling fan relays-2 and -3.



SEC006C

2. Start engine and let it idle.
3. Set temperature lever at full cold position.
4. Turn air conditioner switch "ON".
5. Turn blower fan switch "ON".
6. Make sure that cooling fans-1 and -2 operate at low speed.



SEC163BA

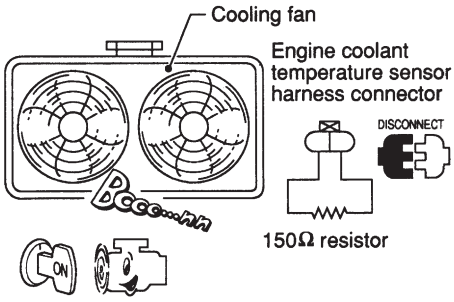
OK or NG

OK	▶	GO TO 5.
NG	▶	Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-363.)

5	CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch "OFF".
2. Reconnect cooling fan relays-2 and -3.
3. Turn air conditioner switch and blower fan switch "OFF".
4. Disconnect engine coolant temperature sensor harness connector.
5. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
6. Restart engine and make sure that cooling fans-1 and -2 operate at high speed.



MEC475B

OK or NG

OK	▶	GO TO 6.
NG	▶	Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-366.)

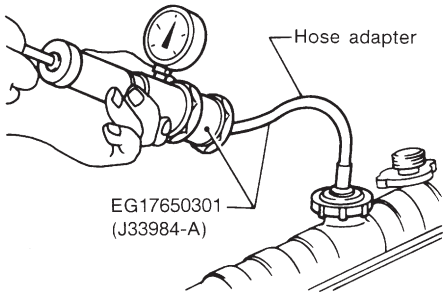
6	CHECK COOLING SYSTEM FOR LEAK

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.



SLC754A

Pressure should not drop.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

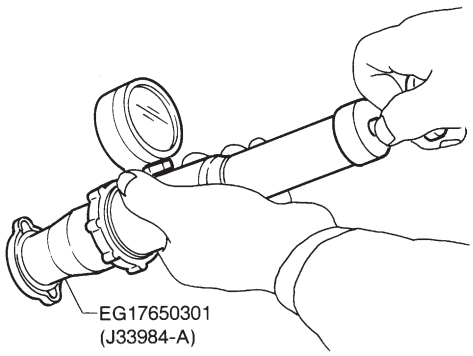
Check the following for leak.

- Hose
- Radiator
- Water pump (Refer to LC-12, "Water Pump".)

	▶	Repair or replace.

8	CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.



SLC755A

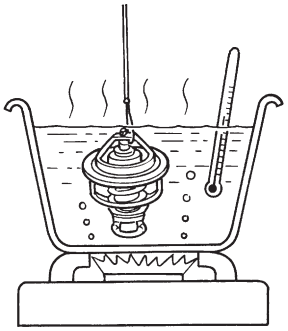
Radiator cap relief pressure:
59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace radiator cap.

9	CHECK THERMOSTAT

1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.
   It should seat tightly.
3. Check valve opening temperature and valve lift.



SLC343

Valve opening temperature:
82°C (180°F) [standard]
Valve lift:
More than 8.6 mm/95°C (0.339 in/203°F)

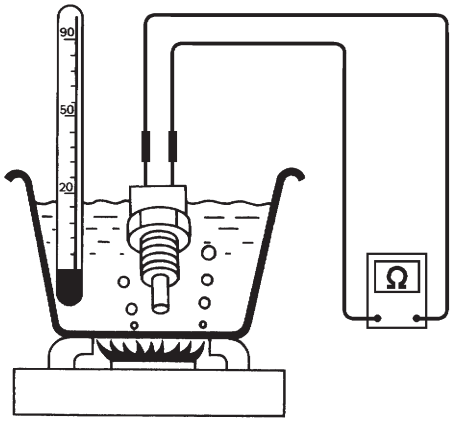
4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC-16, "Thermostat".

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace thermostat.

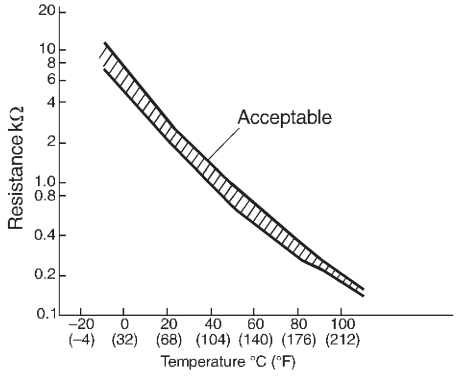
10	CHECK ENGINE COOLANT TEMPERATURE SENSOR

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



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



SEF304X

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace engine coolant temperature sensor.

11	CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-368.

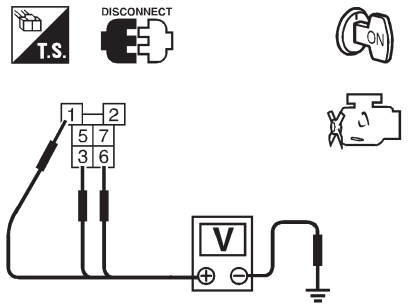
	▶	**INSPECTION END**

PROCEDURE A

=NFEC0560S01

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

SEF590X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

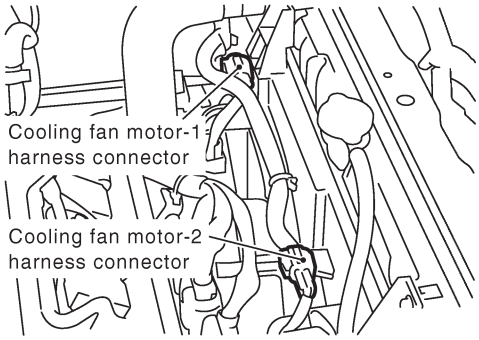
2	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuse
- 40A 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 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.



SEC007C

3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 2, cooling fan motor-1 terminal 3 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 2, cooling fan motor-2 terminal 3 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 ECM harness connector.
2. Check harness continuity between ECM terminal 35 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.

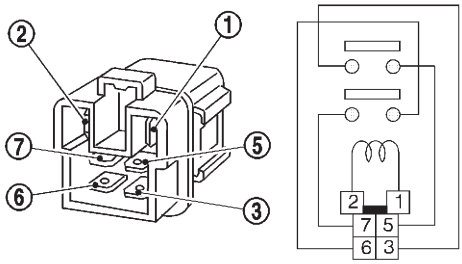
5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E8, F17
- Harness for open or short between cooling fan relay-1 and ECM

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

6	CHECK COOLING FAN RELAY-1

Check continuity between cooling fan relay-1 terminals 3 and 5, 6 and 7 under the following conditions.



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

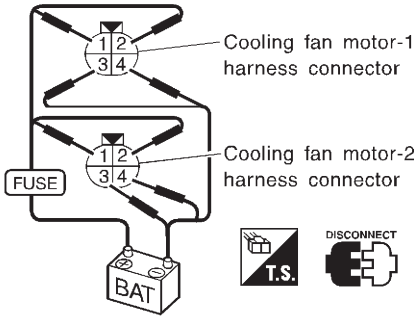
SEF591X

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace cooling fan relay.

7	CHECK COOLING FAN MOTORS-1 AND -2

Supply battery voltage between the following terminals and check operation.



	Speed	Terminals (+)	Terminals (–)
Cooling fan motor-1	Low	2	3
	High	1 , 2	3 , 4
Cooling fan motor-2	Low	2	3
	High	1 , 2	3 , 4

SEF592X

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace cooling fan motors.

8	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

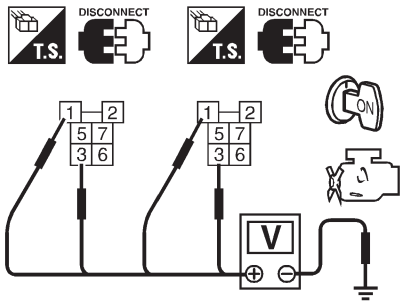
▶ **INSPECTION END**

PROCEDURE B

NFEC0560S02

1	CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch "ON".
4. Check voltage between cooling fan relays-2 and -3 terminals 1, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF593X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between cooling fan relays-2 and -3 and fuse
- Harness for open or short between cooling fan relays-2 and -3 and fusible link

	▶	Repair harness or connectors.

3	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

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-2 terminal 5 and cooling fan motor-1 terminal 1, cooling fan relay-2 terminal 7 and cooling fan motor-1 terminal 4, cooling fan relay-2 terminal 6 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-3 terminal 5 and cooling fan motor-2 terminal 1, cooling fan relay-3 terminal 7 and cooling fan motor-2 terminal 4, cooling fan relay-3 terminal 6 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 ECM harness connector.
2. Check harness continuity between ECM terminal 34 and cooling fan relay-2 terminal 2, cooling fan relay-3 terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

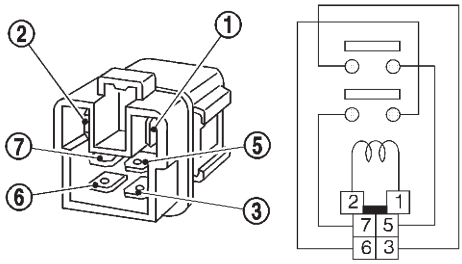
OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E8, E17 ● Harness for open or short between cooling fan relays-2 and -3 and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK COOLING FAN RELAYS-2 AND -3

Check continuity between cooling fan relay-2, -3 terminals 3 and 5, 6 and 7 under the following conditions.



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

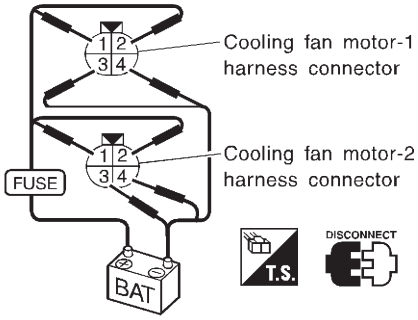
SEF591X

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace cooling fan relays.

7	CHECK COOLING FAN MOTORS

Supply battery voltage between the following terminals and check operation.



	Speed	Terminals (+)	Terminals (–)
Cooling fan motor-1	Low	2	3
	High	1 , 2	3 , 4
Cooling fan motor-2	Low	2	3
	High	1 , 2	3 , 4

SEF592X

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace cooling fan motors.

8	CHECK INTERMITTENT INCIDENT
1. Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Main 12 Causes of Overheating

NFEC0561

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-13, “RECOMMENDED FLUIDS AND LUBRICANTS”.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-16, “Changing Engine Coolant”.
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.59 - 1.0 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See LC-11, “System Check”.
ON*2	5	● Coolant leaks	● Visual	No leaks	See LC-11, “System Check”.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-16, “Thermostat” and LC-18, “Radiator”.
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-351).
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-16, “Changing Engine Coolant”.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See MA-15, “ENGINE MAINTENANCE”.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-40, “Inspection”.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-60, “Inspection”.

*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, “OVERHEATING CAUSE ANALYSIS”.

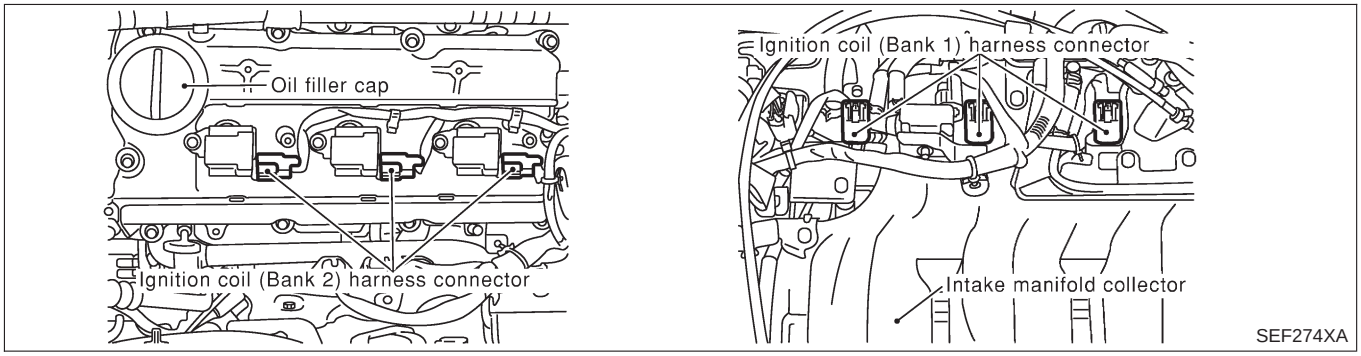
Component Description

NFEC0830

IGNITION COIL & POWER TRANSISTOR

NFEC0830S01

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.



On Board Diagnosis Logic

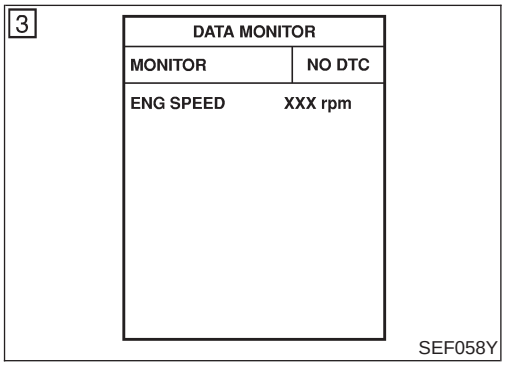
NFEC0831

Malfunction is detected when the ignition signal in the primary circuit is not sent to ECM during engine cranking or running.

Possible Cause

NFEC0832

- Harness or connectors (The ignition primary circuit is open or shorted.)
- Power transistor unit built into ignition coil
- Condenser
- Crankshaft position sensor (REF)
- Crankshaft position sensor (REF) circuit



DTC Confirmation Procedure

NFEC0833

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.
- **If DTC P1320 is displayed with DTC P0340, P1335 or P1336, perform trouble diagnosis for DTC P0340, P1335 or P1336 first. Refer to EC-303, EC-380 or EC-387.**

WITH CONSULT-II

NFEC0833S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.

3) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
4) If DTC is detected, go to "Diagnostic Procedure", EC-374.

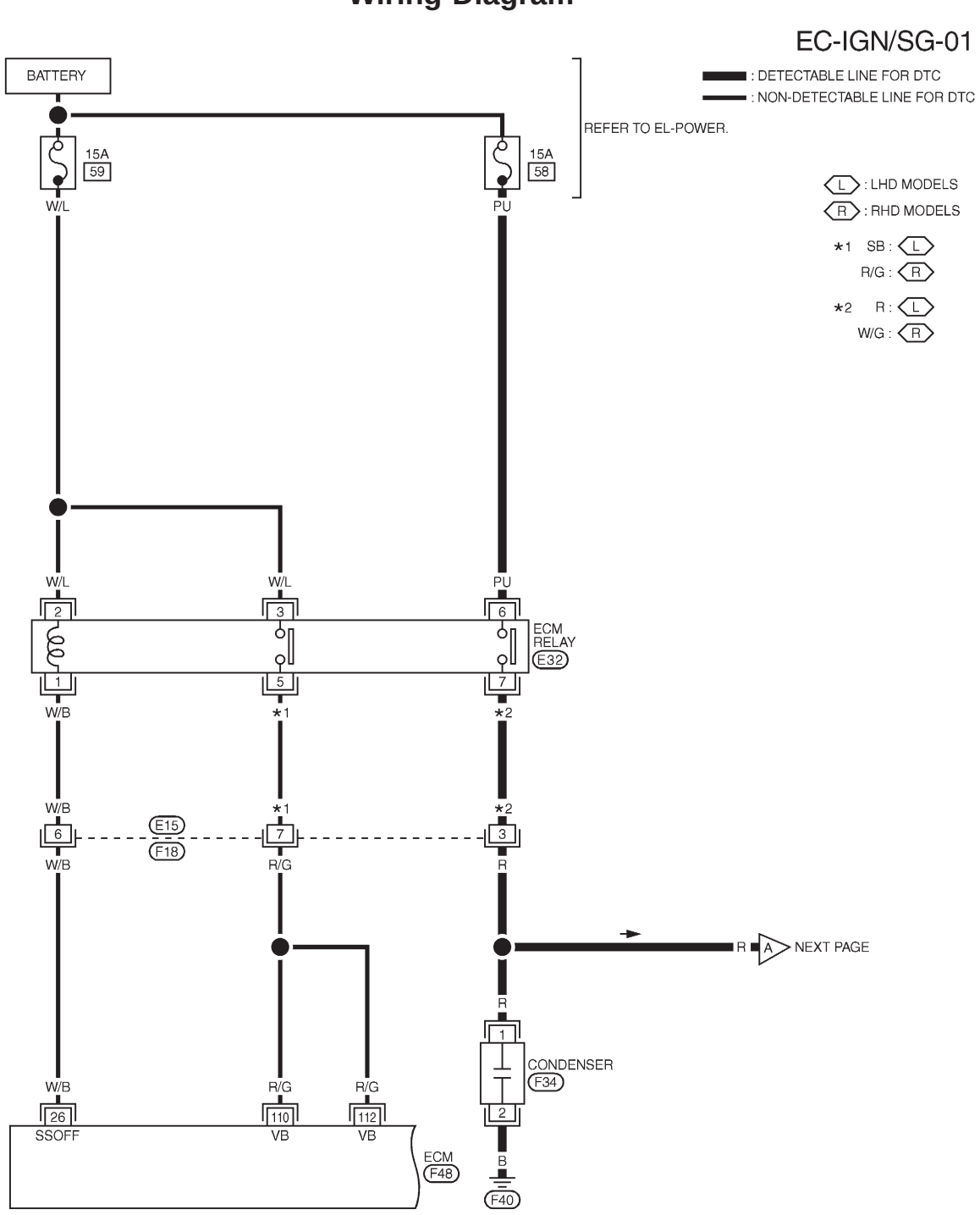
WITHOUT CONSULT-II

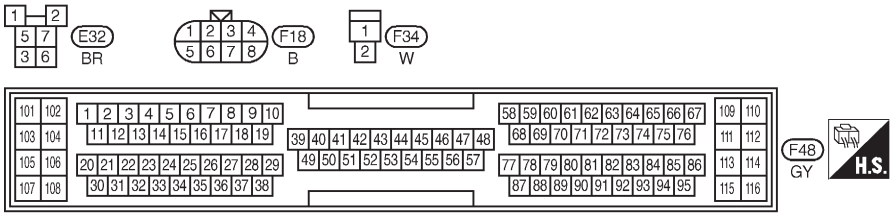
NFEC0833S03

1) Start engine. (If engine does not run, turn ignition switch to "START" for 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 "Diagnostic Procedure", EC-374.

Wiring Diagram

NFEC0834

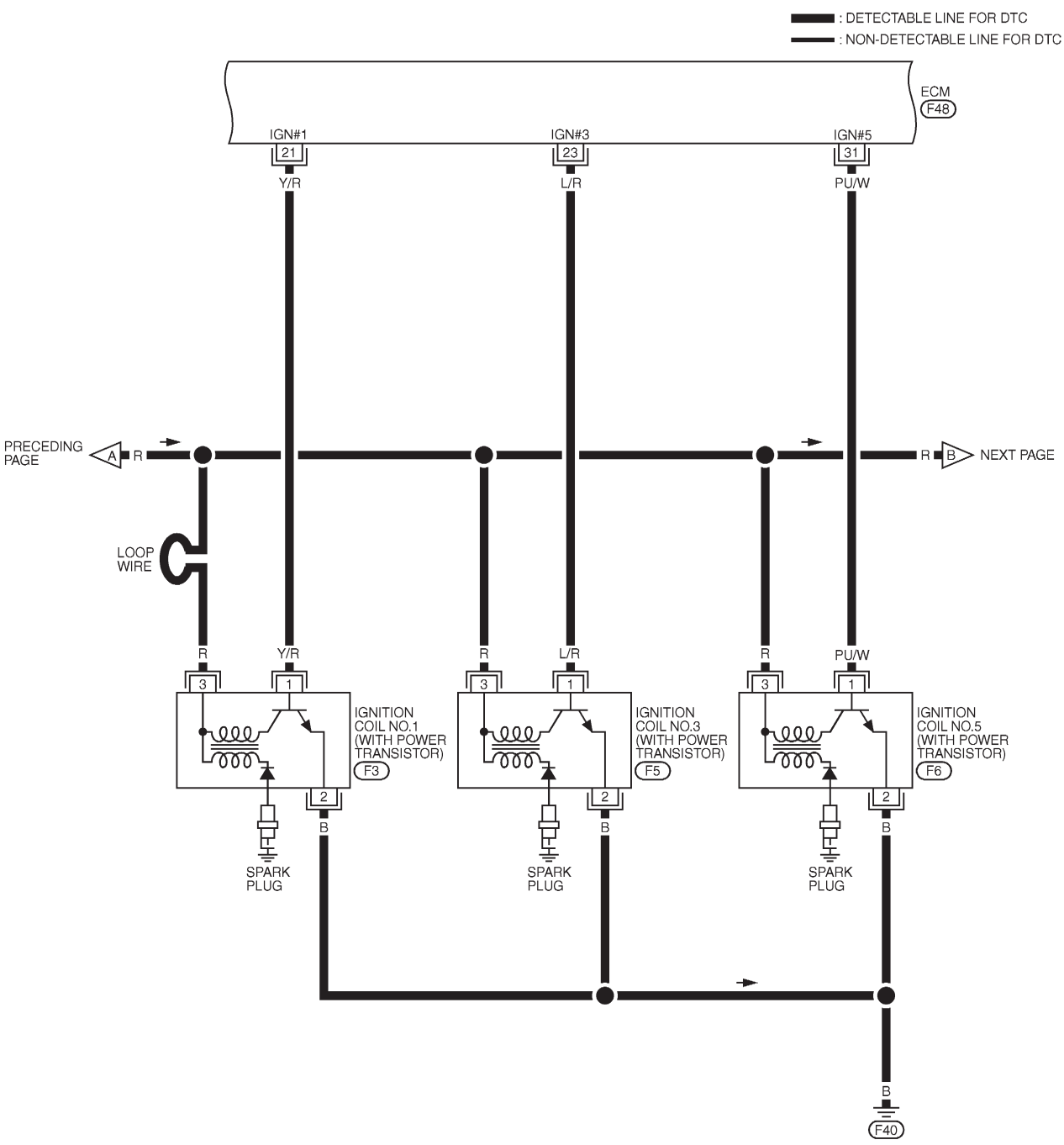


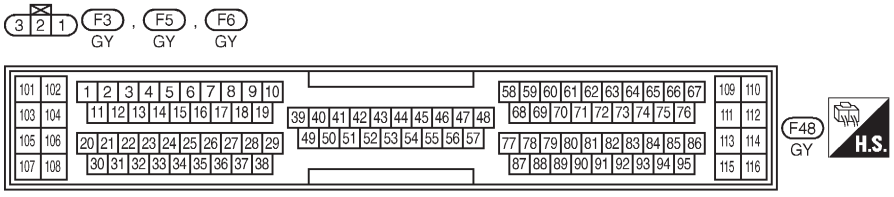


MEC050D

Wiring Diagram (Cont'd)

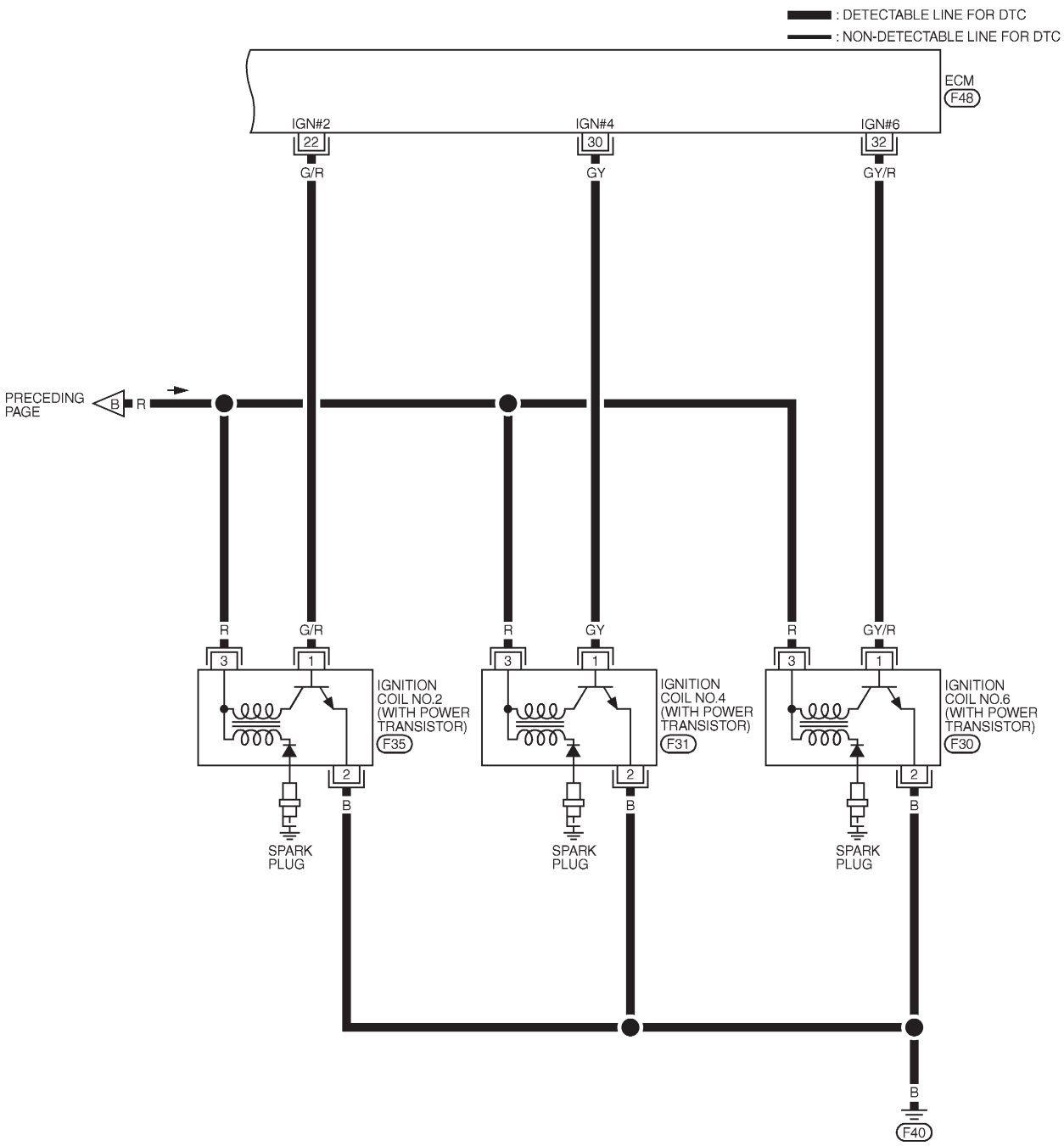
EC-IGN/SG-02

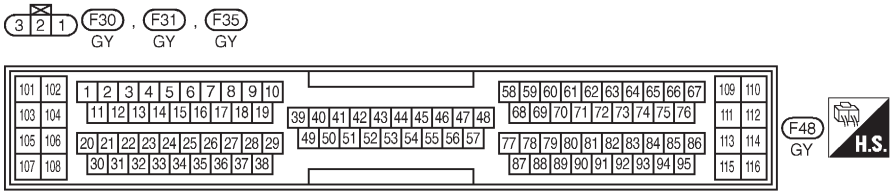




MEC752C

EC-IGN/SG-03

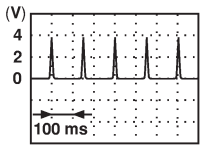
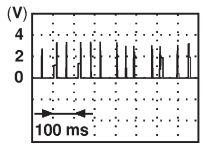




MEC753C

Wiring Diagram (Cont'd)

ECM TERMINALS AND REFERENCE VALUE 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 THE ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
21	Y/R	IGNITION SIGNAL NO. 1	ENGINE RUNNING AT IDLE SPEED UNDER THE WARM UP CONDITION	0 - 0.2V★ 
22	G/R	IGNITION SIGNAL NO. 2		
23	L/R	IGNITION SIGNAL NO. 3		
30	GY	IGNITION SIGNAL NO. 4	ENGINE RUNNING AT 2,500 RPM	0 - 0.2V★ 
31	PU/W	IGNITION SIGNAL NO. 5		
32	GY/R	IGNITION SIGNAL NO. 6		

★ : AVERAGE VOLTAGE FOR PULSE SIGNAL (ACUTUAL PULSE SIGNAL CAN BE CONFIRMED BY OSCILLOSCOPE.) SEF860Y

Diagnostic Procedure

NFEC0835

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 12.
No ▶	GO TO 3.

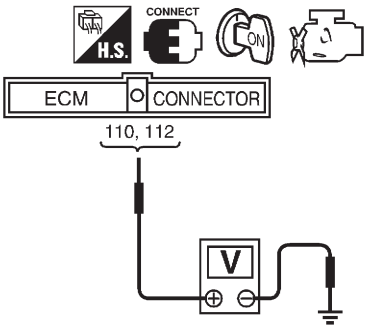
2	SEARCH FOR MALFUNCTIONING CIRCUIT
With CONSULT-II 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II. 2. Search for circuit which does not produce a momentary engine speed drop.	
▶	GO TO 12.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

3	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check voltage between ECM terminals 110, 112 and ground with CONSULT-II or tester.



Voltage: Battery voltage

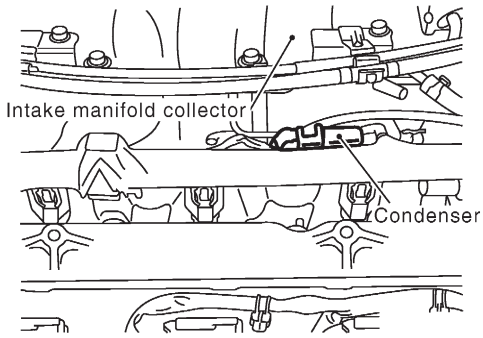
SEF366X

OK or NG

OK	▶	GO TO 4.
NG	▶	Go to TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-127.

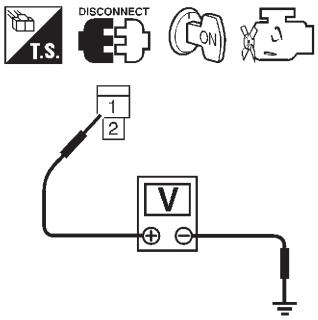
4	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.



SEF275X

3. Turn ignition switch ON.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF367X

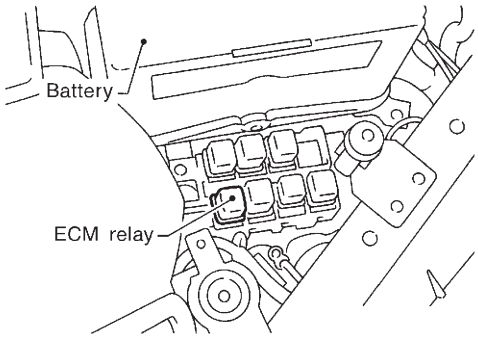
OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 5.

Diagnostic Procedure (Cont'd)

5	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect ECM relay.



SEF589PB

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	▶	GO TO 6.

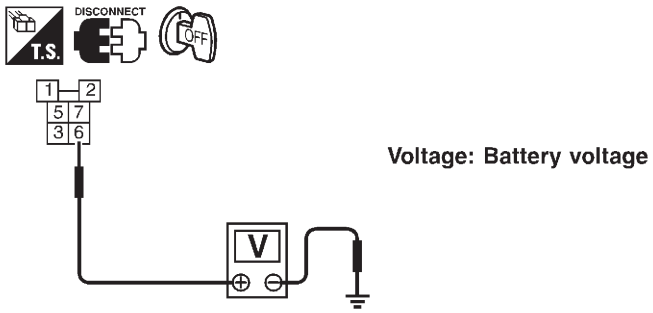
6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F18, E15
- 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.

7	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF368X

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

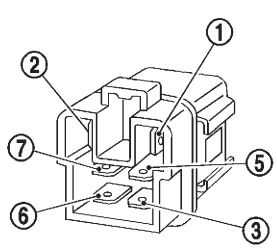
8	DETECT MALFUNCTIONING PART

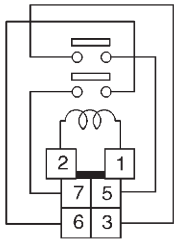
Check the following.
- 15A fuse
- Harness for open and short between ECM relay and fuse

	▶	Repair or replace harness or connectors.

9	CHECK ECM RELAY

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





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

SEF296X

OK or NG

OK	▶	GO TO 17.
NG	▶	Replace ECM relay.

10	CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

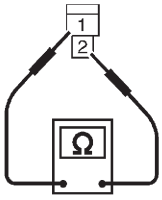
1. Turn ignition switch OFF.
2. Check harness continuity between condenser terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 11.
NG	▶	Repair open circuit or short to power in harness or connectors.

11	CHECK CONDENSER

Check resistance between condenser terminals 1 and 2.



Resistance: Above 1MΩ at 25°C (77°F)

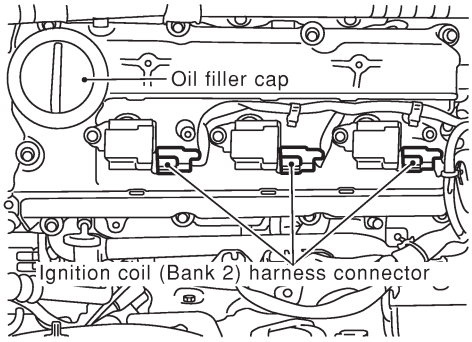
SEF369X

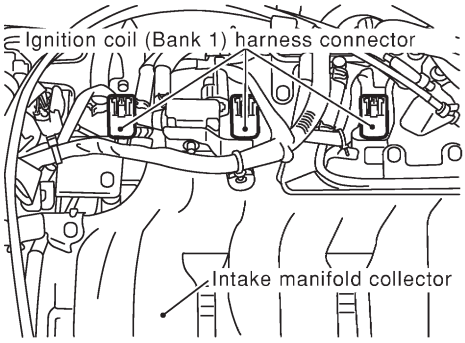
OK or NG

OK	▶	GO TO 12.
NG	▶	Replace condenser.

12	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

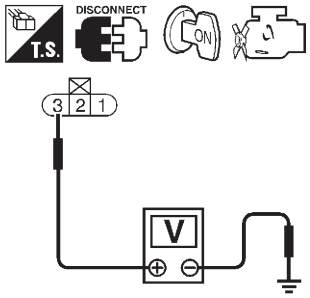
1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect ignition coil harness connector.





SEF274XA

4. Turn ignition switch ON.
5. Check voltage between ignition coil terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF370X

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	DETECT MALFUNCTIONING PART

Check the harness for open or short between ignition coil and harness connector F18.

	▶	Repair or replace harness or connectors.

14	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 15.
NG	▶	Repair open circuit or short to power in harness or connectors.

15	CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

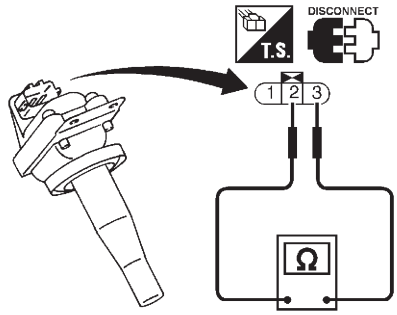
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 21, 22, 23, 30, 31, 32 and ignition coil terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

16	CHECK IGNITION COIL WITH POWER TRANSISTOR

Check resistance between ignition coil terminals 2 and 3.



Terminals	Resistance	Result
2 and 3	Not 0Ω	OK
	0Ω	NG

SEF371X

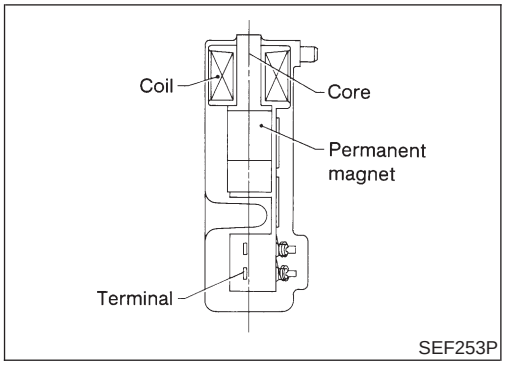
OK or NG

OK	▶	GO TO 17.
NG	▶	Replace ignition coil with power transistor.

17	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**



Component Description

NFEC0573

The crankshaft position sensor (REF) is located on the oil pan (upper) facing the crankshaft pulley. It detects the TDC (Top Dead Center) signal (120° signal).
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the crankshaft pulley will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the TDC signal (120° signal).

CONSULT-II Reference Value in Data Monitor Mode

NFEC0574

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (POS) 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

NFEC0576

Malfunction is detected when
(Malfunction A) 120° signal is not entered to ECM for the first few seconds during engine cranking,
(Malfunction B) 120° signal is not entered to ECM during engine running,
(Malfunction C) 120° signal cycle excessively changes during engine running.

FAIL-SAFE MODE

NFEC0576S01

When the ECM enters the fail-safe mode, the MI illuminates.

Detected items	Engine operating condition in fail-safe mode
Crankshaft position sensor (REF) circuit	Compression TDC signal (120° signal) is controlled by camshaft position sensor (PHASE) signal and crankshaft position sensor (POS) signal. Ignition timing will be delayed 0° to 2°.

Possible Cause

NFEC0577

- Harness or connectors
  (The crankshaft position sensor (REF) circuit is open or shorted.)
- Crankshaft position sensor (REF)
- Starter motor (Refer to SC section.)
- Starting system circuit (Refer to SC section.)
- Dead (Weak) battery

DTC Confirmation Procedure

NFEC0578

NOTE:

- **Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B AND 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.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
VHCL SPEED SE	XXX km/h
P/N POSI SW	OFF

SEF065Y

PROCEDURE FOR MALFUNCTION A

NFEC0578S01

With CONSULT-II

NFEC0578S0101

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Crank engine for at least 2 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-384.

With GST

NFEC0578S0103

Follow the procedure "With CONSULT-II" above.

No Tools

NFEC0578S0102

1) Crank engine for at least 2 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 1st trip DTC is detected, go to "Diagnostic Procedure", EC-384.

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION B AND C

NFEC0578S02

With CONSULT-II

NFEC0578S0201

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-384.

With GST

NFEC0578S0203

Follow the procedure "With CONSULT-II" above.

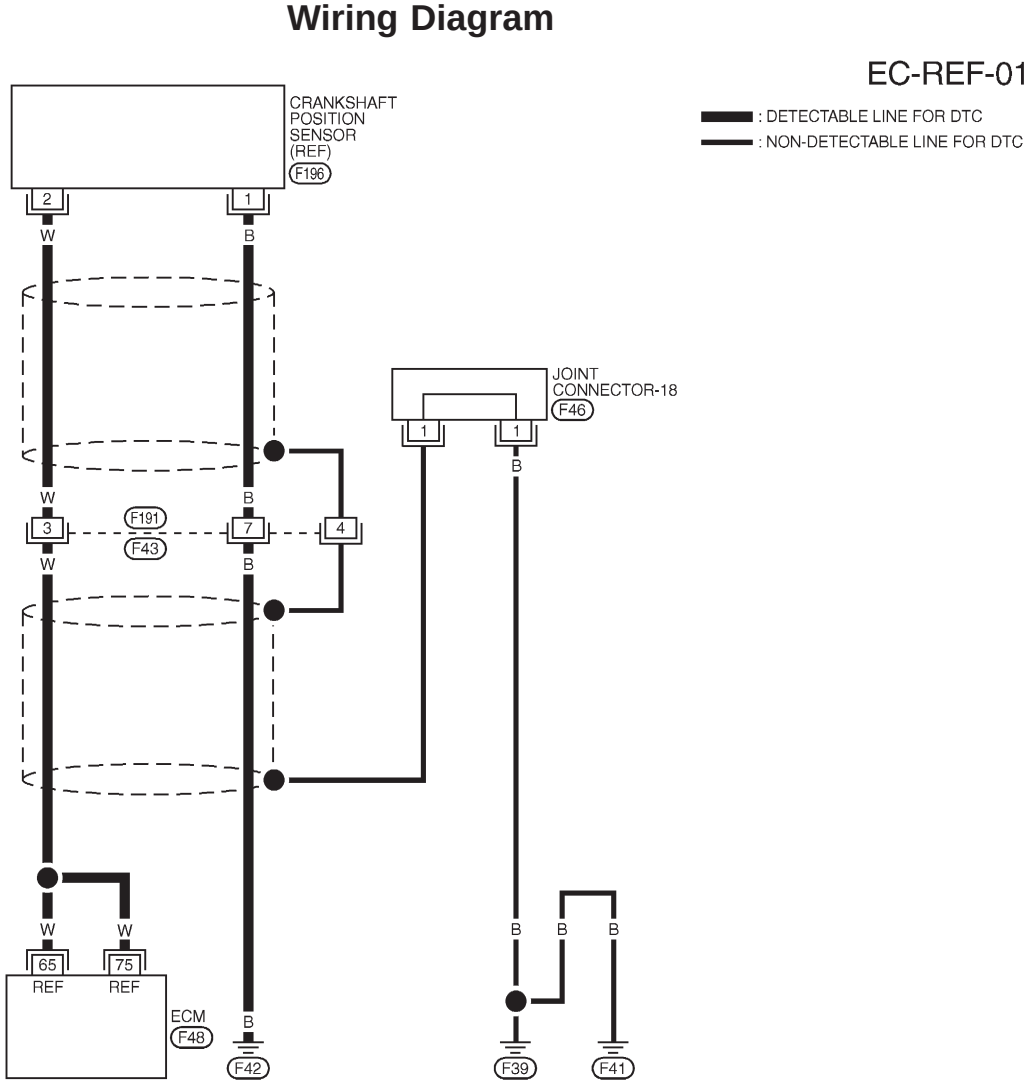
No Tools

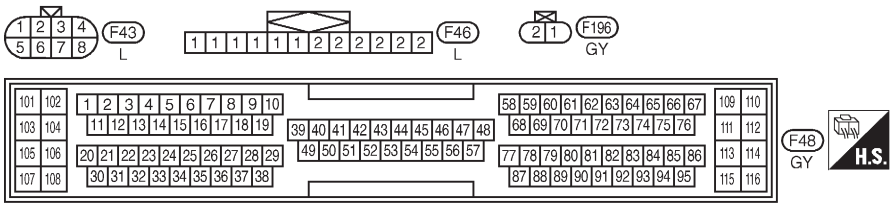
NFEC0578S0202

1) Start engine and run it for at least 2 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 "Diagnostic Procedure", EC-384.

Wiring Diagram

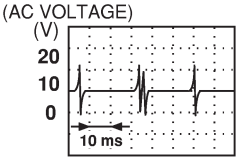
=NFEC0579





MEC047D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
65 75	W W	CRANKSHAFT POSITION SENSOR (REF)	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 2.3V★ (AC VOLTAGE) 

★ : AVERAGE VOLTAGE FOR PULSE SIGNAL (ACTUAL PULSE SIGNAL CAN BE CONFIRMED BY OSCILLOSCOPE.)

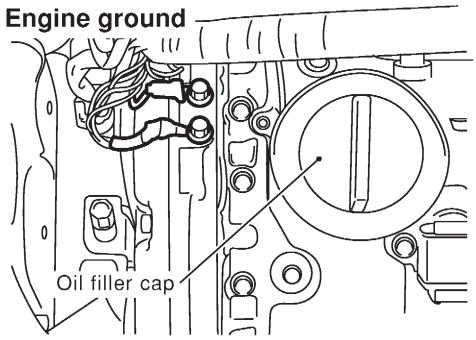
SEF861Y

Diagnostic Procedure

=NFEC0580

1	RETIGHTEN GROUND SCREWS

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

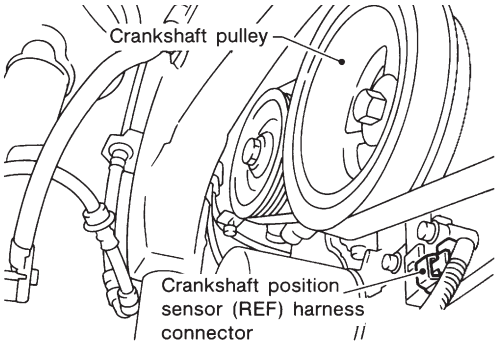


SEF255X

	▶	GO TO 2.

2	CHECK CKPS (REF) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (REF) harness connector.



SEF591PA

2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 65, 75 and CKPS (REF) 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	▶	GO TO 3.

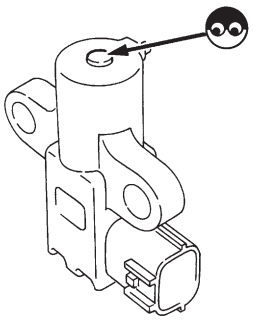
3	DETECT MALFUNCTIONING PART

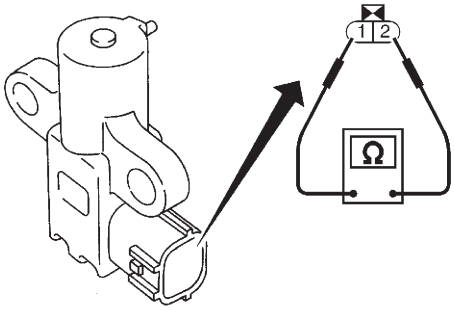
Check the following.
- Harness connectors F43, F191
- Harness for open or short between crankshaft position sensor (REF) and ECM

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

4	CHECK CKPS (REF) GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch "OFF". 2. Check harness continuity between CKPS (REF) terminal 1 and engine ground. **Continuity should exist.** 3. Also check harness for short to power. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors F43, F191 ● Harness for open or short between crankshaft position sensor (REF) and engine ground		
	▶	Repair open circuit or short to power in harness or connector.

6	CHECK CKPS (REF)-I	
1. Loosen the fixing bolts and remove the CKPS (REF). 2. Visually check the CKPS (REF) for chipping.  SEF585P **OK or NG**		
OK	▶	GO TO 7.
NG	▶	Replace crankshaft position sensor (REF).

7	CHECK CKPS (REF)-II	
Check resistance between CKPS (REF) terminals 1 and 2.  **Resistance: Approximately 470 - 570 Ω [AT 20°C (68°F)]** SEF350X **OK or NG**		
OK	▶	GO TO 8.
NG	▶	Replace crankshaft position sensor (REF).

Diagnostic Procedure (Cont'd)

8	CHECK CKPS (REF) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect harness connectors F43, F191.
3. Check harness continuity between harness connector F43 terminal 4 and engine ground.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

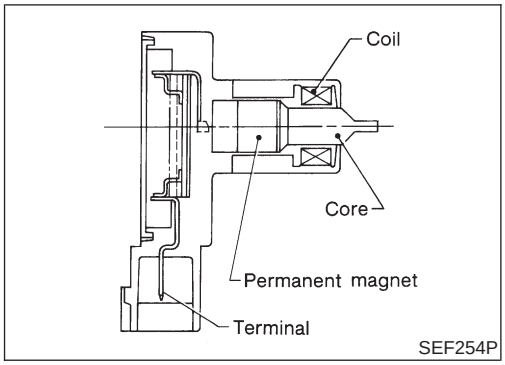
Check the following.
- Harness connectors F43, F191
- Joint connector-18
- Harness for open or short between harness connector F43 and engine ground

	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

	▶	**INSPECTION END**



Component Description

NFEC0292

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

CONSULT-II Reference Value in Data Monitor Mode

NFEC0581

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (POS) 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

NFEC0294

Malfunction is detected when chipping of the signal plate (flywheel or drive plate) gear tooth (cog) is detected by the ECM.

Possible Cause

NFEC0582

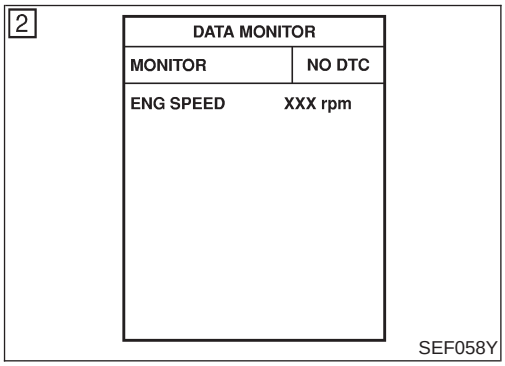
- Harness or connectors
- Crankshaft position sensor (POS)
- Signal plate (Drive plate/Flywheel)

DTC Confirmation Procedure

NFEC0295

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 CONSULT-II

NFEC0295S01

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 70 seconds at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-390.

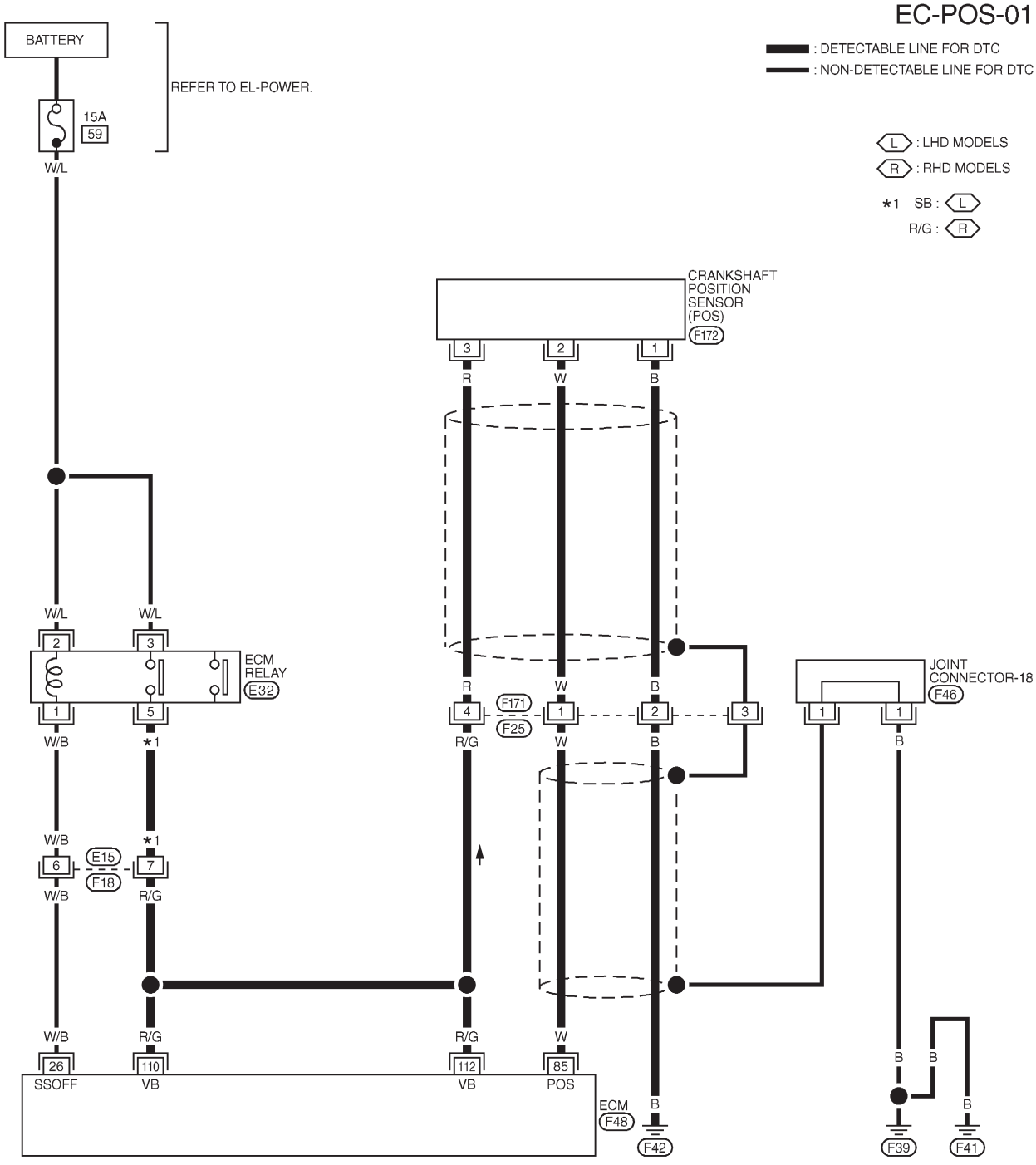
WITH GST

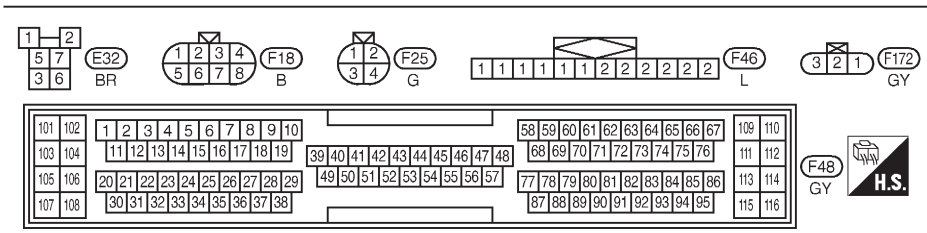
NFEC0295S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NFEC0296

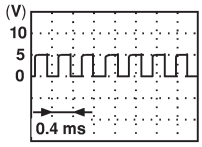
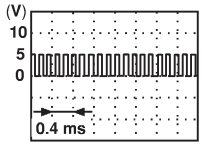




MEC850C

Wiring Diagram (Cont'd)

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
85	W	CRANKSHAFT POSITION SENSOR (POS)	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 2.4V 
			ENGINE RUNNING AT 2,000 RPM	APPROX. 2.3V 

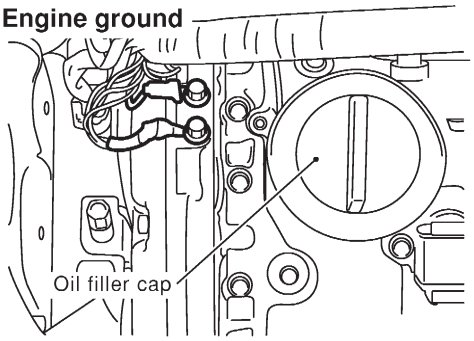
SEF856Y

Diagnostic Procedure

NFEC0297

1	RETIGHTEN GROUND SCERWS

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

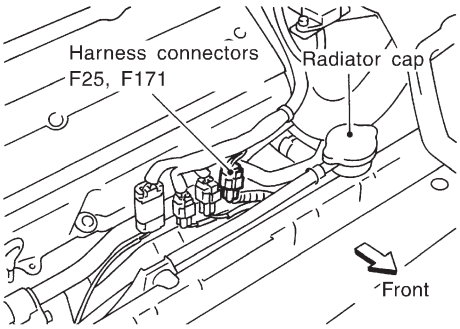


SEF255X

▶	GO TO 2.

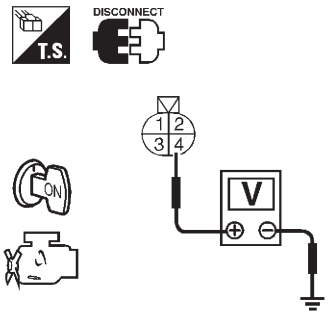
2	CHECK CKPS (POS) POWER SUPPLY CIRCUIT

1. Disconnect harness connectors F25, F171.



SEF511WB

2. Check voltage between harness connector F25 terminal 4 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF323X

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 connectors F25, F171
- Harness connectors E15, F18
- Harness for open or short between ECM and crankshaft position sensor (POS)
- Harness for open or short between ECM relay and crankshaft position sensor (POS)

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

4	CHECK CKPS (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between harness connector F25 terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
2. 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 CKPS (POS) INPUT SIGNAL CIRCUIT

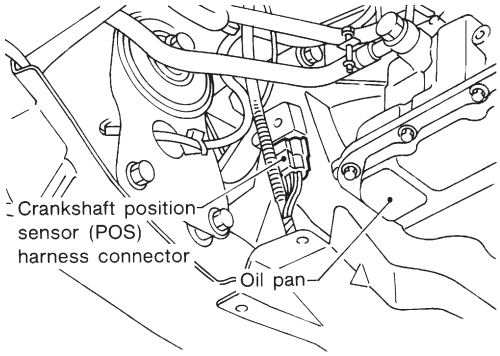
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 85 and harness connector F25 terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK CKPS (POS) SUB-HARNESS CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (POS) harness connector.



SEF367Q

2. Check harness continuity between CKPS (POS) terminals and harness connector F171 terminals as follows.

CKPS (POS) terminal	Harness connector F171 terminal
1	2
2	1
3	4

MTBL0352

Continuity should exist.

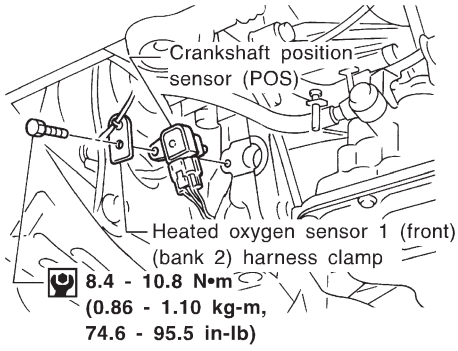
3. Also check harness for short to ground and short to power.

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 CKPS (POS) INSTALLATION

Check that CKPS (POS) and HO2S1 bank 2 harness clamp are installed correctly as shown below.



SEM222FE

OK or NG

OK	▶	GO TO 8.
NG	▶	Install CKPS (POS) correctly.

8	CHECK IMPROPER INSTALLATION

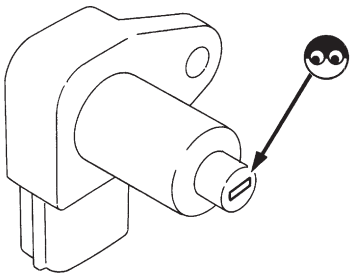
1. Loosen and retighten the fixing bolt of the crankshaft position sensor (POS).
2. Reconnect harness connectors disconnected.
3. Perform "DTC Confirmation Procedure", EC-388 again.

Is a 1st trip DTC P1336 detected?

Yes	▶	GO TO 9.
No	▶	**INSPECTION END**

9	CHECK CRANKSHAFT POSITION SENSOR (POS)

1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



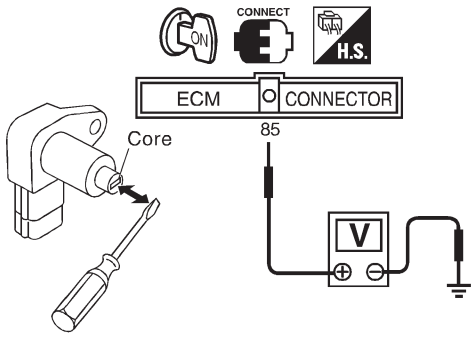
SEF587P

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace crankshaft position sensor (POS).

10	CHECK CRANKSHAFT POSITION SENSOR (POS)-II

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminal 85 and ground by briefly touching the sensor core with a flat-bladed screwdriver.



ECM terminal	Condition	Voltage
85	Contacted	Approximately 5V
	Pulled away	Approximately 0V

There should be a steady 5V as the flat-bladed screwdriver is drawn away slowly.

SEF324X

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace crankshaft position sensor (POS).

Diagnostic Procedure (Cont'd)

11	CHECK CKPS (POS) SHIELD CIRCUIT FOR OPEN AND SHORT	
1. Disconnect harness connectors F25, F171. 2. Check harness continuity between harness connector F25 terminal 3 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to power.		
OK or NG		
OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors F25, F171 ● Joint connector-18 ● Harness for open or short between harness connector F25 and engine ground		
	▶	Repair open circuit or short to power in harness or connectors.

13	CHECK GEAR TOOTH	
Visually check for chipping signal plate (flywheel or drive plate) gear tooth (cog).		
OK or NG		
OK	▶	GO TO 14.
NG	▶	Replace the signal plate (flywheel or drive plate).

14	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.		
	▶	**INSPECTION END**

Component Description

NFEC0849

The malfunction information related to A/T (Automatic Transmission) is transferred through the line (circuit) from TCM (Transmission control module) to ECM. Therefore, be sure to erase the malfunction information such as DTC not only in TCM (Transmission control module) but also ECM after the A/T related repair.

On Board Diagnosis Logic

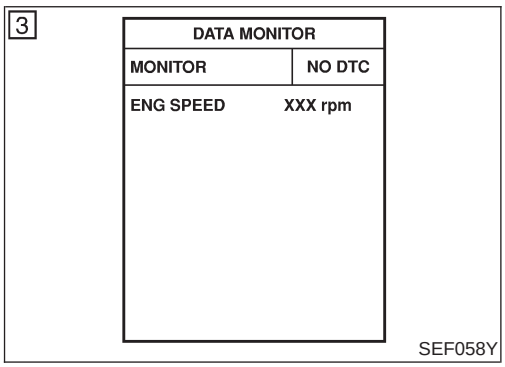
NFEC0850

Malfunction is detected when an incorrect signal from TCM (Transmission control module) is sent to ECM.

Possible Cause

NFEC0851

- Harness or connectors
  [The communication line circuit between ECM and TCM (Transmission control module) is open or shorted.]
- Dead (Weak) battery
- TCM (Transmission control module)



DTC Confirmation Procedure

NFEC0852

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 at idle.

WITH CONSULT-II

NFEC0852S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 40 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-397.

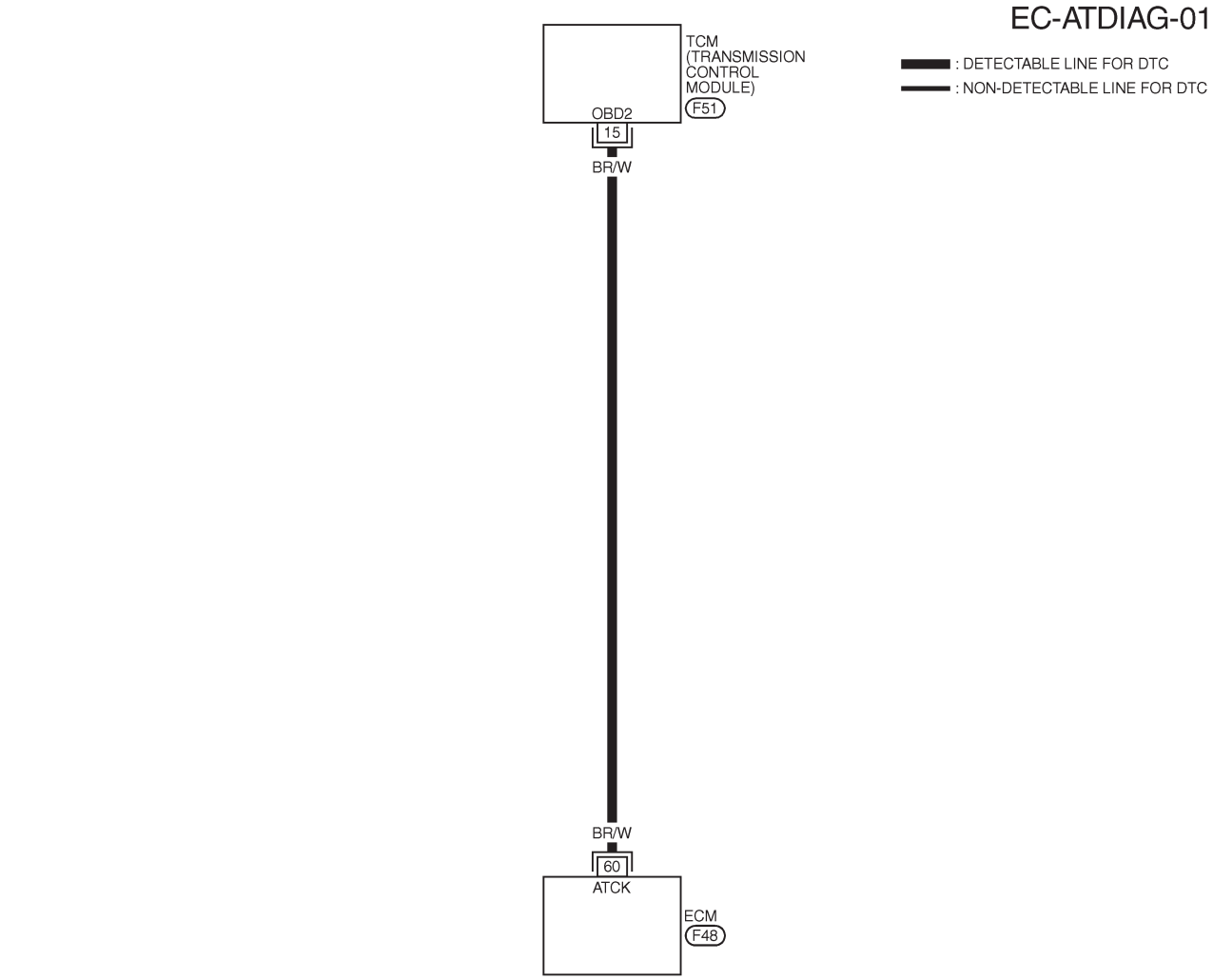
WITH GST

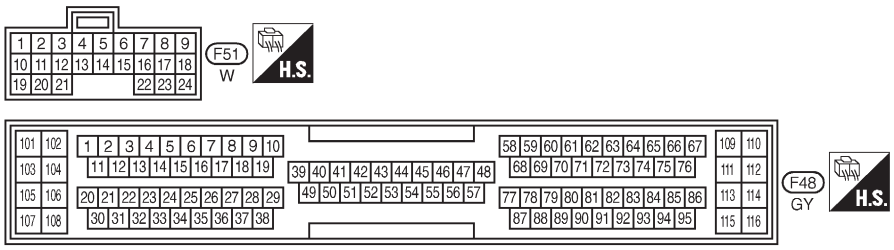
NFEC0852S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

=NFEC0853





MEC009D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
60	BR/W	A/T DIAGNOSIS COMMUNICATION LINE	ENGINE RUNNING AT IDLE SPEED	VOLTAGE FLUCTUATES BETWEEN 0 to 2V.

SEF048YA

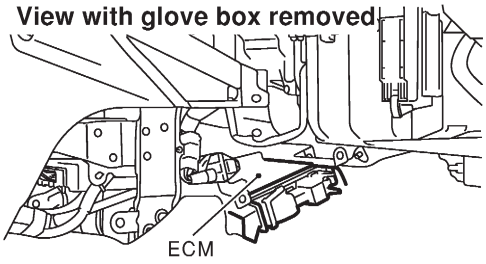
Diagnostic Procedure

NFEC0854

1	CHECK A/T DIAGNOSIS COMMUNICATION LINE INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

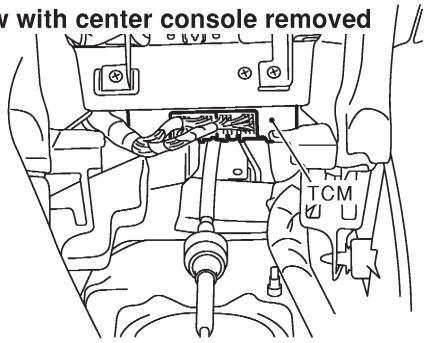
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and TCM (Transmission Control Module) harness connector.

View with glove box removed



SEF270X

View with center console removed



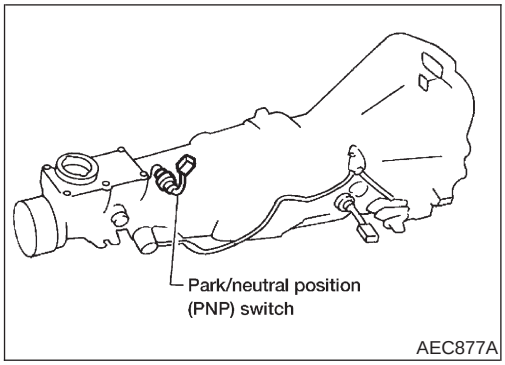
SEF271X

3. Check harness continuity between ECM terminal 60 and TCM terminal 15. 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 2.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

2	CHECK INTERMITTENT INCIDENT
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0855

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.
For A/T models, the park/neutral position (PNP) switch assembly also includes a transmission range switch to detect selector lever position.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0856

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: “P” or “N”	ON
		Except above	OFF

On Board Diagnosis Logic

NFEC0857

Malfunction is detected when the signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.

Possible Cause

NFEC0858

- Harness or connectors
  [The park/neutral position (PNP) switch circuit is open or shorted.]
- Park/neutral position (PNP) switch

DTC Confirmation Procedure

NFEC0859

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.

2

DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

SEF212Y

5

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h
P/N POSI SW	OFF
B/FUEL SCHDL	XXX msec

SEF213Y

WITH CONSULT-II

NFEC0859S01

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.

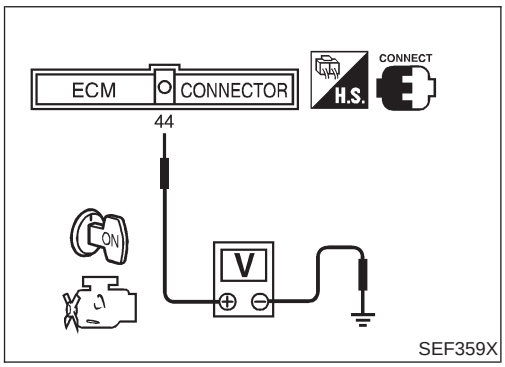
Position (Selector lever)	Known-good signal
"N" and "P" position	ON
Except the above position	OFF

If NG, go to "Diagnostic Procedure", EC-401.
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	1,400 - 4,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2 - 10 msec
VHCL SPEED SE	More than 65 km/h (40 MPH)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-401.



SEF359X

Overall Function Check

NFEC0860

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

NFEC0860S01

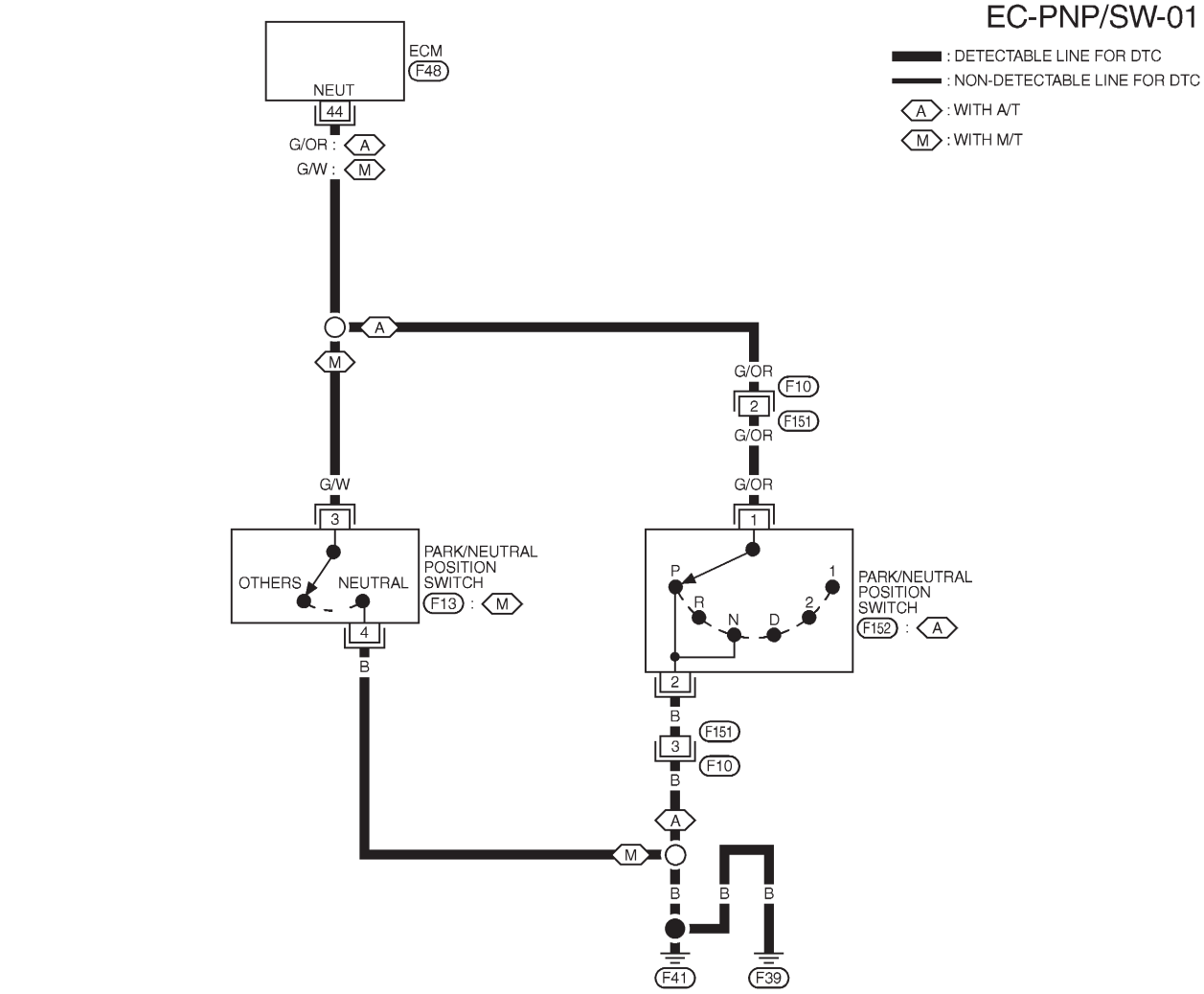
1) Turn ignition switch "ON".
2) Check voltage between ECM terminal 44 and body ground under the following conditions.

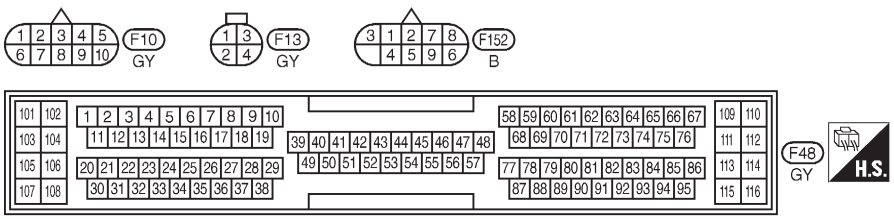
Condition (Gear position)	Voltage V (Known good data)
"P" and "N" position	Approx. 0
Except the above position	Battery voltage

3) If NG, go to "Diagnostic Procedure", EC-401.

Wiring Diagram

NFEC0861





MEC212D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
44	G/OR (A/T) G/W (M/T)	PARK/NEUTRAL POSITION (PNP) SWITCH	IGN ON WITH GEAR POSITION "N" OR "P"(A/T), GEAR POSITION NEUTRAL (M/T)	APPROX. 0V
			IGN ON WITHOUT THE ABOVE GEAR POSITION	BATTERY VOLTAGE

SEF635XC

Diagnostic Procedure

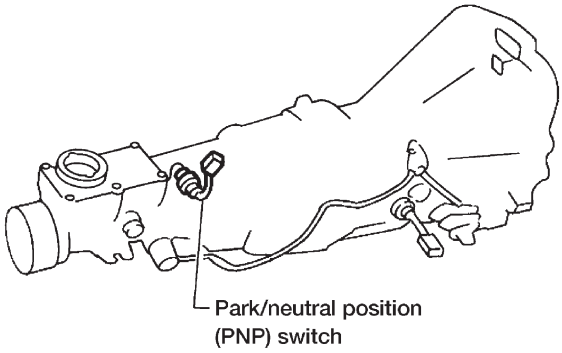
NFEC0862

FOR M/T MODELS

NFEC0862S01

1	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect park/neutral position (PNP) switch harness connector.



AEC877A

3. Check harness continuity between PNP switch terminal 4 and engine 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 44 and PNP switch 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 3.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK PARK/NEUTRAL POSITION (PNP) SWITCH

Refer to MT-9, “Position Switch Check”.

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace park/neutral position (PNP) switch.

4	CHECK INTERMITTENT INCIDENT

Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-126.

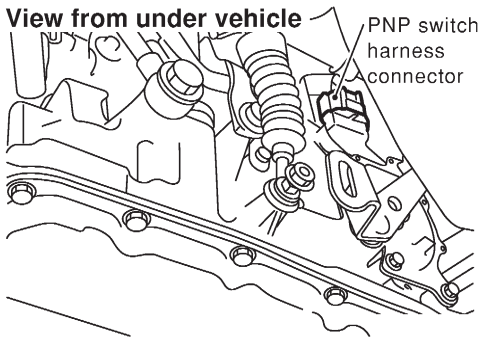
▶ **INSPECTION END**

FOR A/T MODELS

=NFEC0862S02

1	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.



SEF279X

3. Check harness continuity between PNP switch terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F10, F151
- Harness for open or short between park/neutral position (PNP) switch and engine ground

	▶	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 44 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 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F10, F151
- Harness for open or short between ECM and park/neutral position (PNP) switch

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

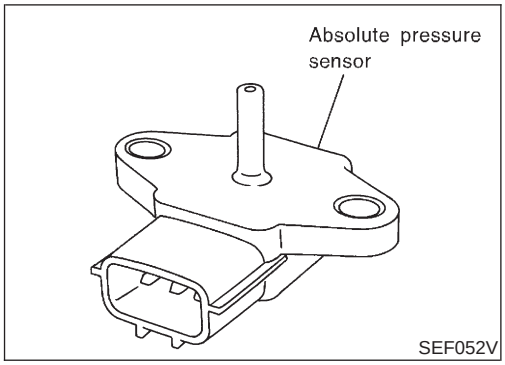
5	CHECK PARK/NEUTRAL POSITION (PNP) SWITCH

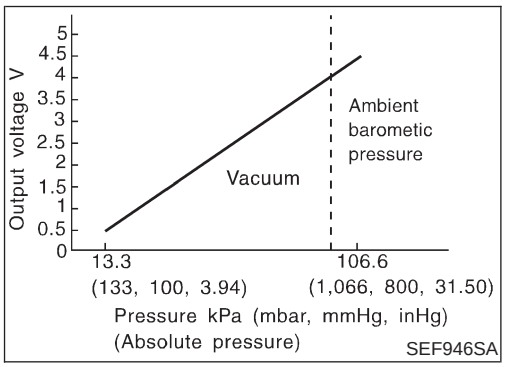
Refer to AT-125, "Diagnostic Procedure".

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace park/neutral position (PNP) switch.

6	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**





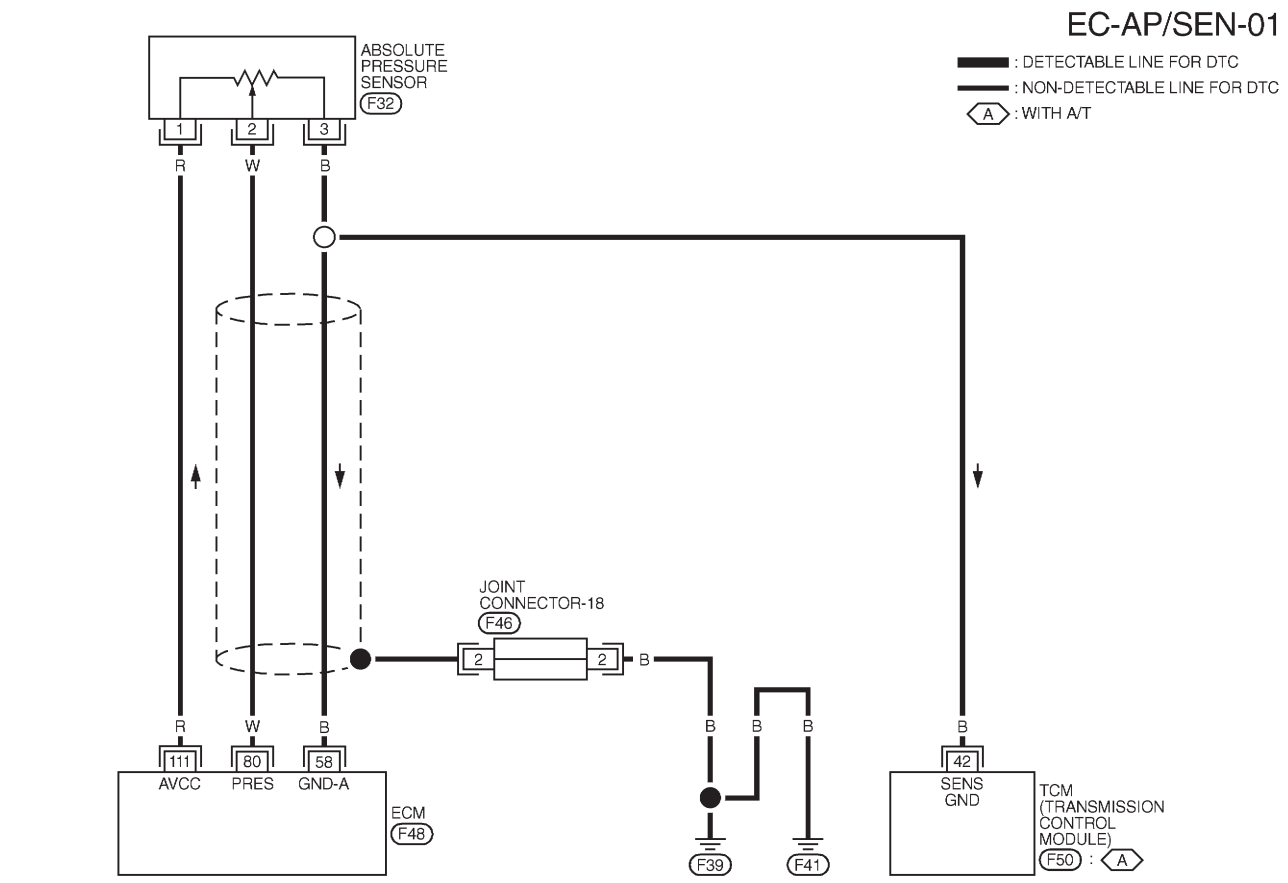
Component Description

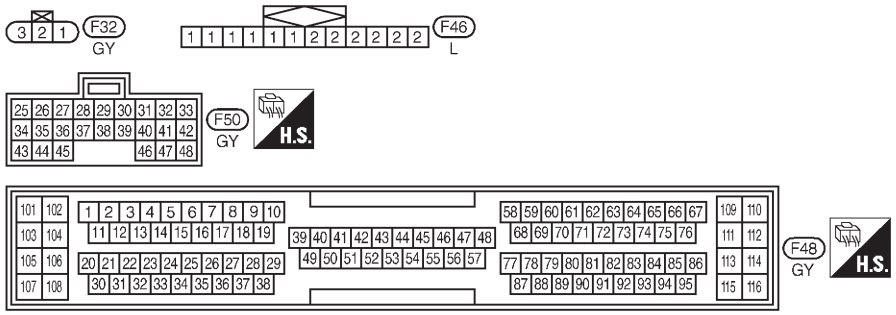
NFEC0644

The absolute pressure sensor detects ambient barometric pressure and sends the voltage signal to the ECM. As the pressure increases, the voltage rises.

Wiring Diagram

NFEC0648





MEC049D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
80	W	ABSOLUTE PRESSURE SENSOR	IGN ON	APPROX. 4.4V
111	R	SENSORS' POWER SUPPLY	IGN ON	APPROX. 5V
58	B	SENSORS' GROUND	IGN ON	APPROX. 0V

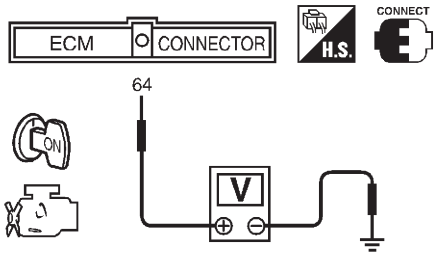
SEF651XB

Diagnostic Procedure

NFEC0647

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 80 and ground with CONSULT-II or tester.



Voltage: 1.0 - 5.0V

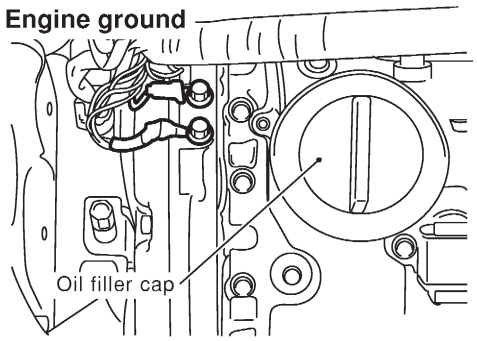
SEF055Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	RETIGHTEN GROUND SCREWS

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

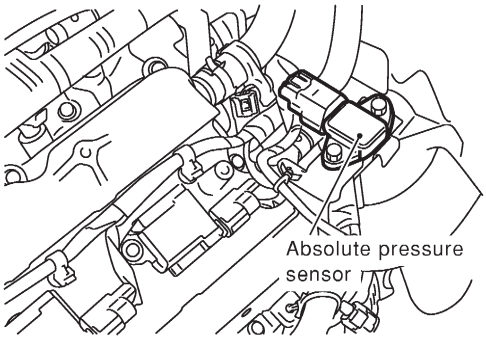


SEF255X

	▶	GO TO 3.

3	CHECK ABSOLUTE PRESSURE SENSOR CONNECTOR FOR WATER

1. Disconnect absolute pressure sensor harness connector.



SEF257X

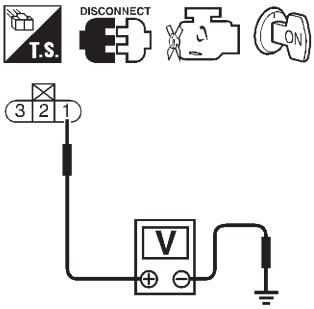
2. Check sensor harness connector for water.
   Water should not exist.

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair or replace harness connector.

4	CHECK ABSOLUTE PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "ON".
2. Check voltage between absolute pressure sensor terminal 1 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF299X

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair harness or connectors.

5	CHECK ABSOLUTE PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check harness continuity between absolute pressure sensor terminal 3 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

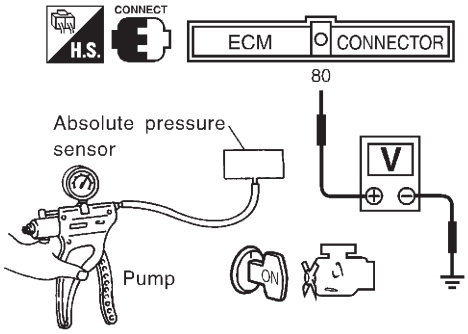
Diagnostic Procedure (Cont'd)

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness for open or short between ECM and absolute pressure sensor ● Harness for open or short between TCM (Transmission Control Module) and absolute pressure sensor	
▶	Repair open circuit or short to power in harness or connectors.

7	CHECK ABSOLUTE PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 80 and absolute pressure sensor terminal 2. **Continuity should exist.** 3. 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 ABSOLUTE PRESSURE SENSOR

1. Remove absolute pressure sensor with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Install a vacuum pump to absolute pressure sensor.
4. Turn ignition switch "ON" and check output voltage between ECM terminal 80 and engine ground under the following conditions.



Applied vacuum kPa (mbar, mmHg, inHg)	Voltage V
Not applied	3.2 - 4.8
–26.7 (–267, –200, –7.87)	1.0 to 1.4V lower than above value

SEF300XB

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below −93.3 kPa (–933 bar, –700 mmHg, –27.56 inHg) or over 101.3 kPa (1,013 bar, 760 mmHg, 29.92 inHg) of pressure.**

OK or NG

OK ▶	GO TO 9.
NG ▶	Replace absolute pressure sensor.

9	CHECK ABSOLUTE PRESSURE SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-18.
3. Check the following.

- Continuity between joint connector terminal 2 and ground
  Refer to Wiring Diagram.
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)

Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-18.

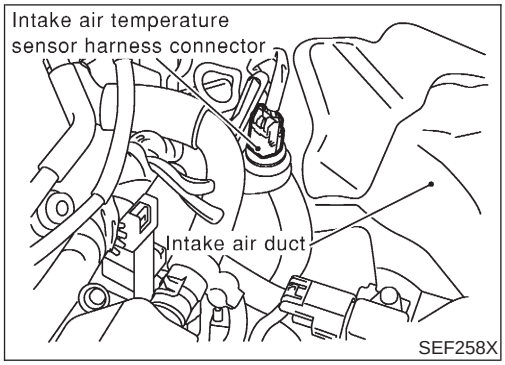
OK or NG

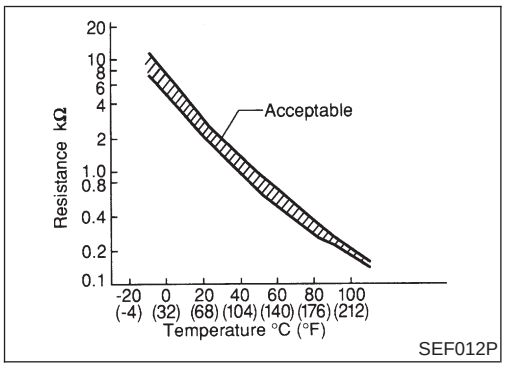
OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**





Component Description

NFEC0064

The intake air temperature sensor is mounted to the air duct housing. 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
20 (68)	3.5	2.1 - 2.9
80 (176)	1.23	0.27 - 0.38

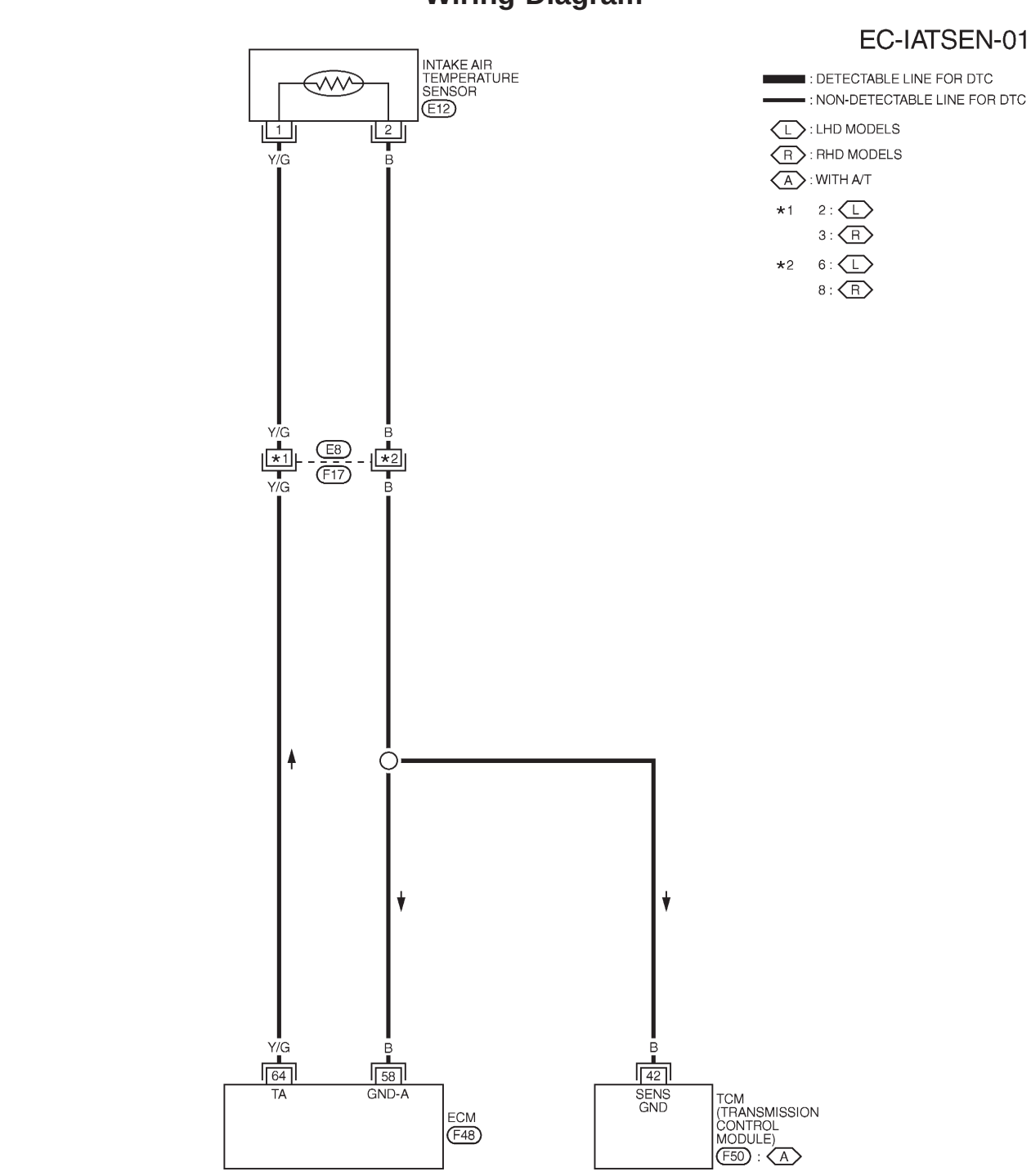
*: These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) and ground.

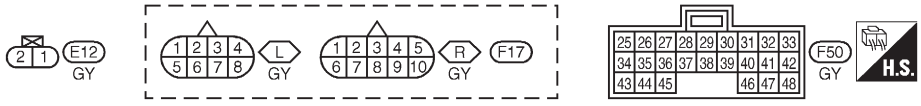
CAUTION:

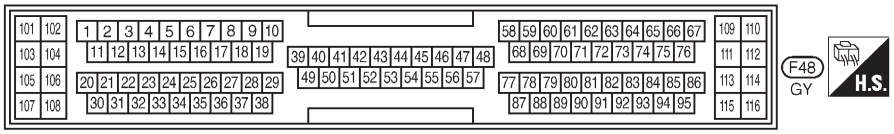
Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

Wiring Diagram

NFEC0067







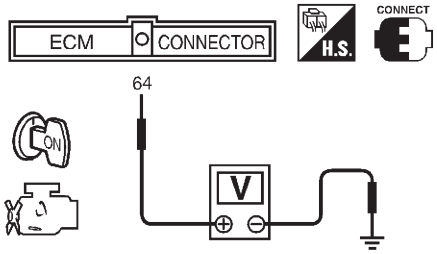
MEC064D

Diagnostic Procedure

NFEC0068

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 64 and ground with CONSULT-II or tester.



Voltage: 0.05 - 4.8V

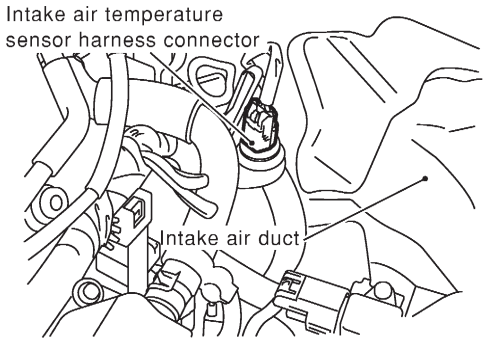
SEF004Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

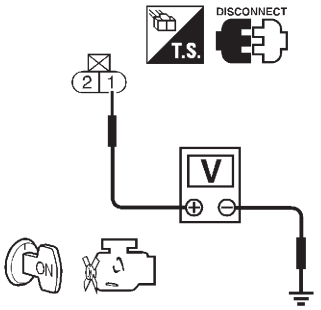
2	CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect intake air temperature sensor harness connector.



SEF258X

3. Turn ignition switch “ON”.
4. Check voltage between terminal 1 and ground.



Voltage: Approximately 5V

SEF301X

OK or NG

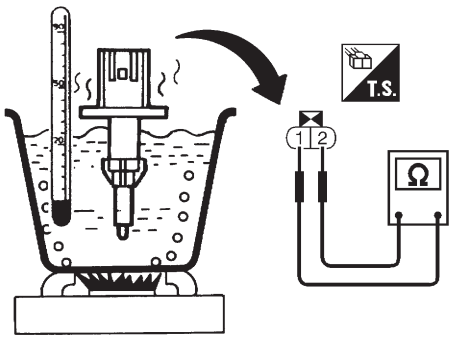
OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E8, F17 ● Harness for open or short between ECM and intake air temperature sensor	
▶	Repair harness or connectors.

4	CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch "OFF". 2. Check harness continuity between sensor 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 6.
NG	▶	GO TO 5.

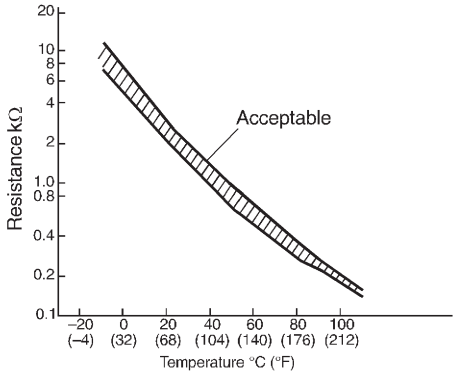
5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E8, F17 ● Harness for open or short between ECM and intake air temperature sensor ● Harness for open or short between TCM (Transmission Control Module) and intake air temperature sensor	
▶	Repair open circuit or short to power in harness or connectors.

6	CHECK INTAKE AIR TEMPERATURE SENSOR	
Check resistance between intake air temperature sensor terminals 1 and 2 as shown in the figure.		
OK or NG		
OK	▶	GO TO 7.
NG	▶	Replace intake air temperature sensor.



<Reference data>

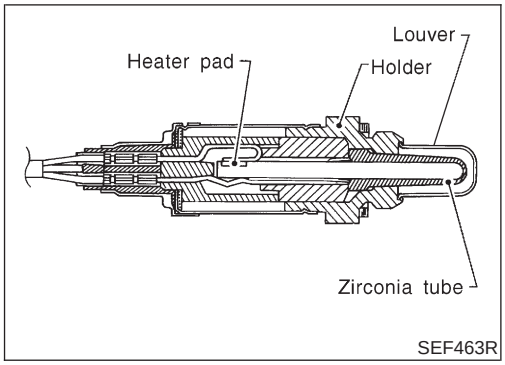
Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38



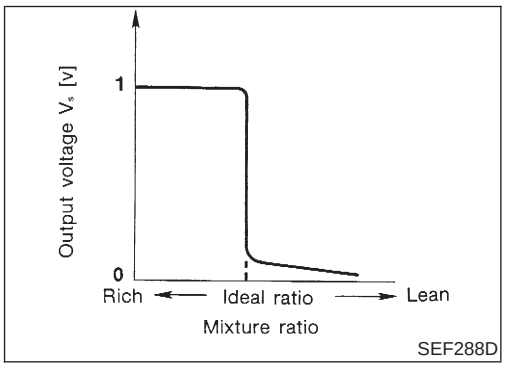
SEF302X

Diagnostic Procedure (Cont'd)

7	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NFEC0108

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) 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 (front) 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

NFEC0109

Specification data are reference values.

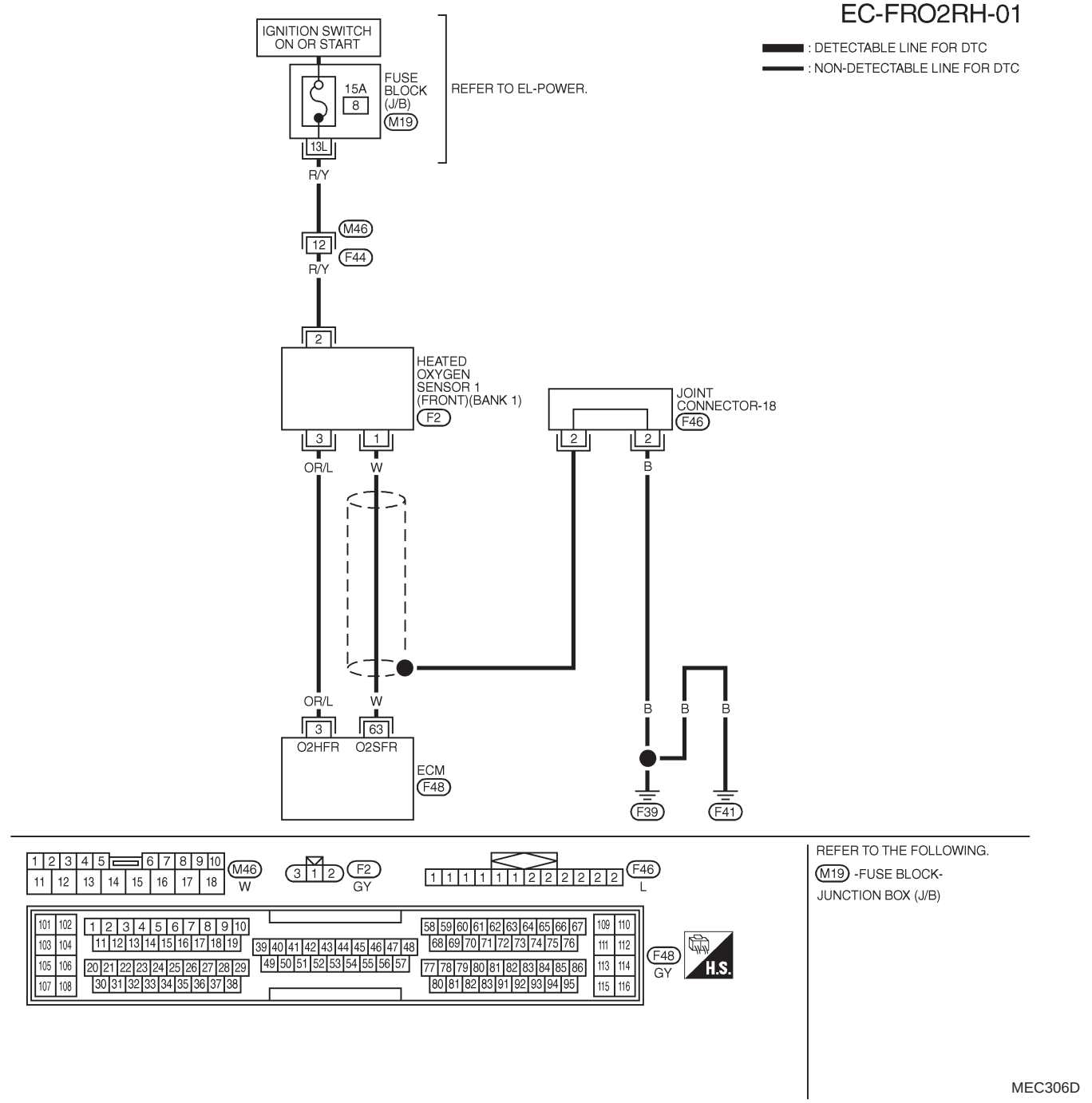
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

Wiring Diagram

NFEC0114

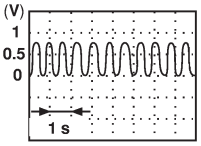
BANK 1

NFEC0114S01



MEC306D

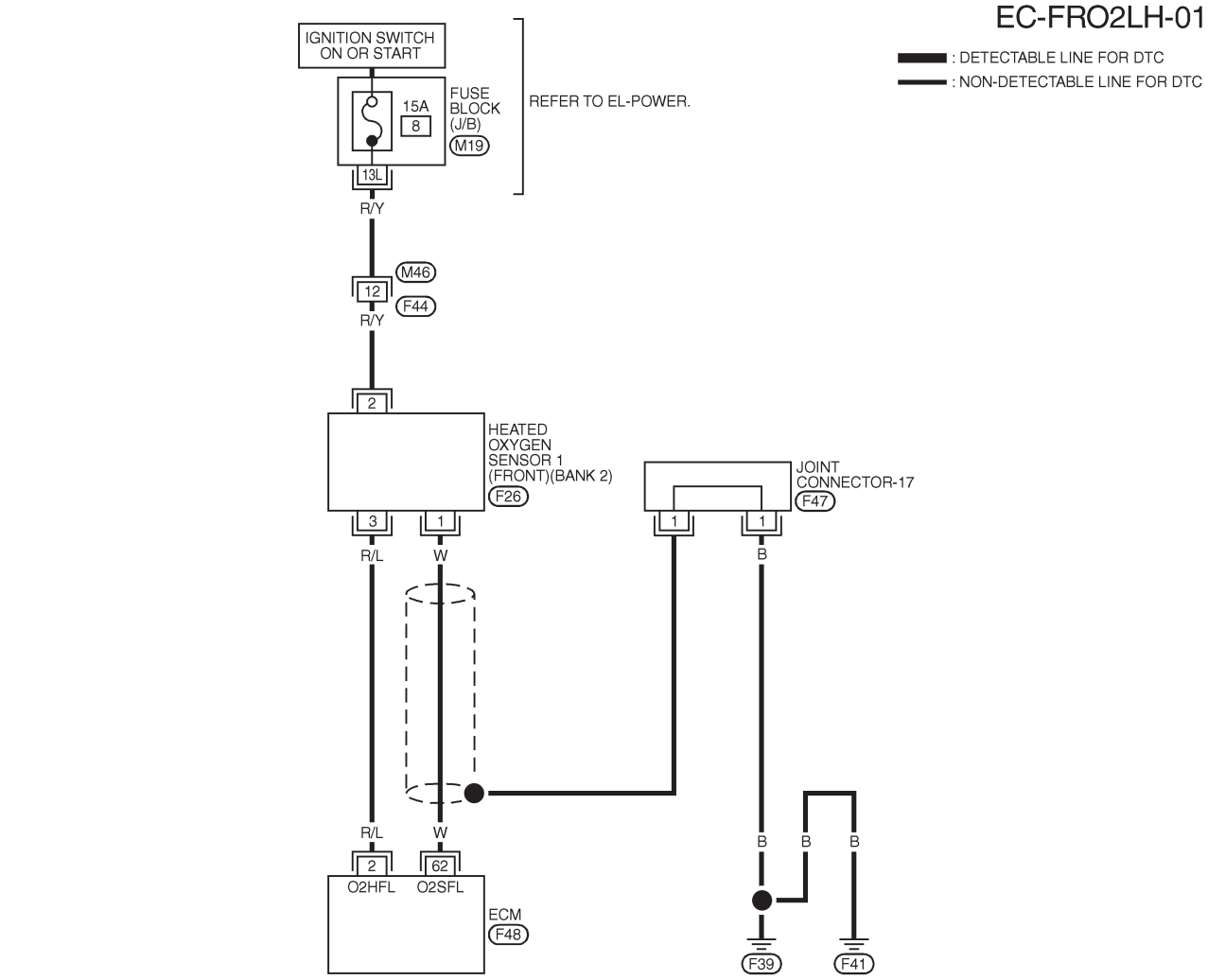
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

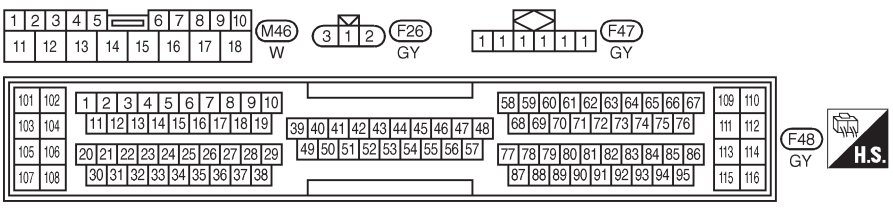
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
63	W	HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1)	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V 

SEF854YC

BANK 2

NFEC0114S02

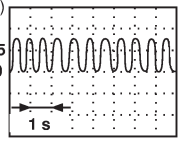




REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC307D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
62	W	HEATED OXYGEN SENSOR 1 (FRONT) (BANK 2)	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V 

SEF855YC

Diagnostic Procedure

NFEC0115

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)” and “HO2S1 MNTR (B2)” 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.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	RICH

1 time: RICH → LEAN → RICH
2 times: RICH → LEAN → RICH → LEAN → RICH

SEF155Z

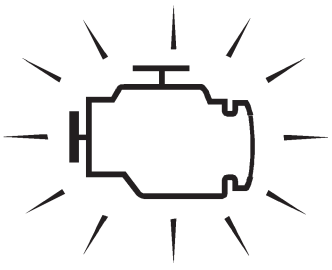
OK or NG

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. Stop engine and wait at least 10 seconds.
3. Set ECM in “Diagnostic test mode II [Heated oxygen sensor 1 monitor (front)]”. Refer to “How to Switch Diagnostic Test Modes”, EC-62.
4. Keep the engine speed at 2,000 rpm under no load, and make sure that the MI comes ON more than five times in 10 seconds.



SAT652J

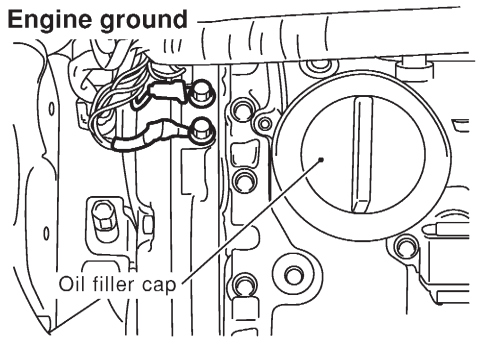
5. Switch the monitored sensor. Refer to “How to Switch Monitored Sensor from Bank 1 to Bank 2 or Vice Versa”, EC-64.
6. Perform step 4 again.

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.



SEF255X

▶	GO TO 5.

5	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)

Loosen and retighten corresponding heated oxygen sensor 1 (front).

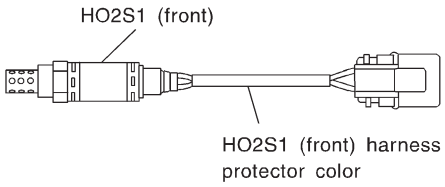
Tightening torque:

40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

▶	GO TO 6.

6	CHECK HEATED OXYGEN SENSOR 1 (FRONT) HARNESS PROTECTOR COLOR

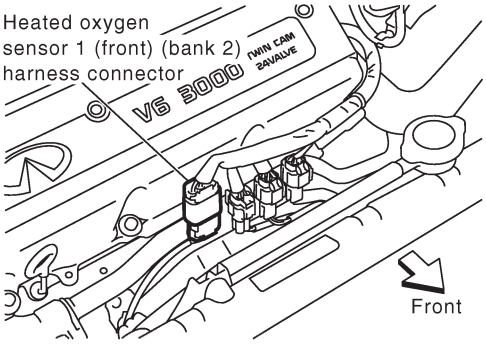
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector.

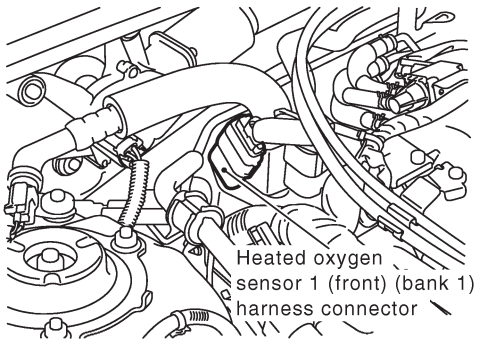


HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.





SEF902XA

▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

Terminals		Bank
ECM	Sensor	
63	1	1
62	1	2

MTBL0511

Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

Terminals		Bank
ECM or Sensor	Ground	
63 or 1	Ground	1
62 or 1	Ground	2

MTBL0512

Continuity should not exist.

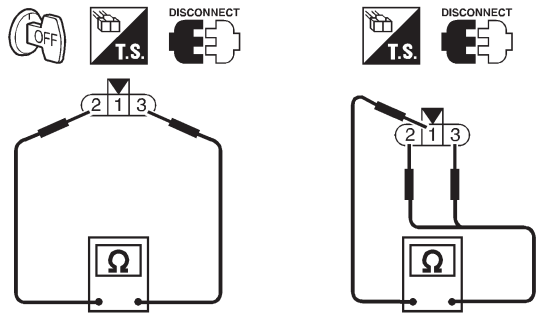
4. Also check harness for short to power.

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 (FRONT)

Check resistance between HO2S1 (front) terminals as follows.



Terminals	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 1 and 3	∞Ω (Continuity should not exist.)

SEF310X

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.

OK or NG

OK (With CONSULT-II)	▶	GO TO 9.
OK (Without CONSULT-II)	▶	GO TO 10.
NG	▶	GO TO 11.

9	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

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)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
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)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below.

Bank 1

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

Bank 2

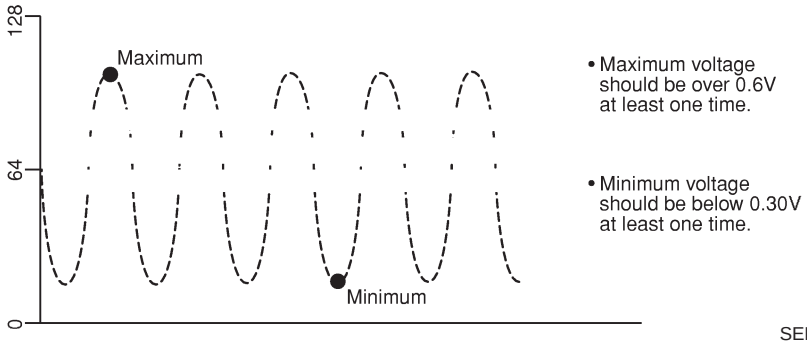
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L	R-L	R-L	R-L	R-L-R

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" 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
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.

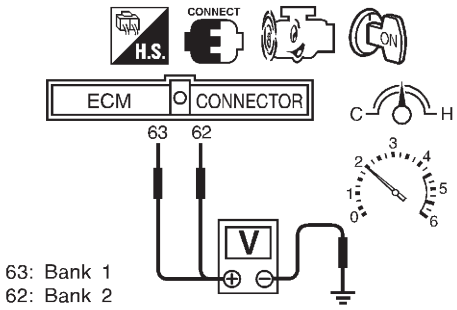
OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

10	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 1 signal) and engine ground.
4. Check the following with engine speed held at 2,000 rpm constant under no load.



- MI comes on more than 5 times within 10 seconds in diagnostic test mode II (Heated oxygen sensor 1 monitor).
- 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.

SEF039YA

CAUTION:

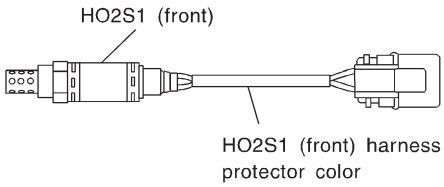
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

11	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

CAUTION:

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

12	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17 or joint connector-18.
3. Check the following.

- Continuity between joint connector terminal 1 or 2 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)

Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-17 or joint connector-18.

OK or NG

OK	▶	GO TO 13.
NG	▶	Repair open circuit or short to power in harness or connectors.

13	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Description

NFEC0123

SYSTEM DESCRIPTION

NFEC0123S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater (front) control	Heated oxygen sensor 1 heater (front)
Crankshaft position sensor (REF)			

The ECM performs ON/OFF control of the heated oxygen sensor 1 heater (front) corresponding to the engine speed.

OPERATION

NFEC0123S02

Engine speed rpm	Heated oxygen sensor 1 heater (front)
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

NFEC0124

Specification data are reference values.

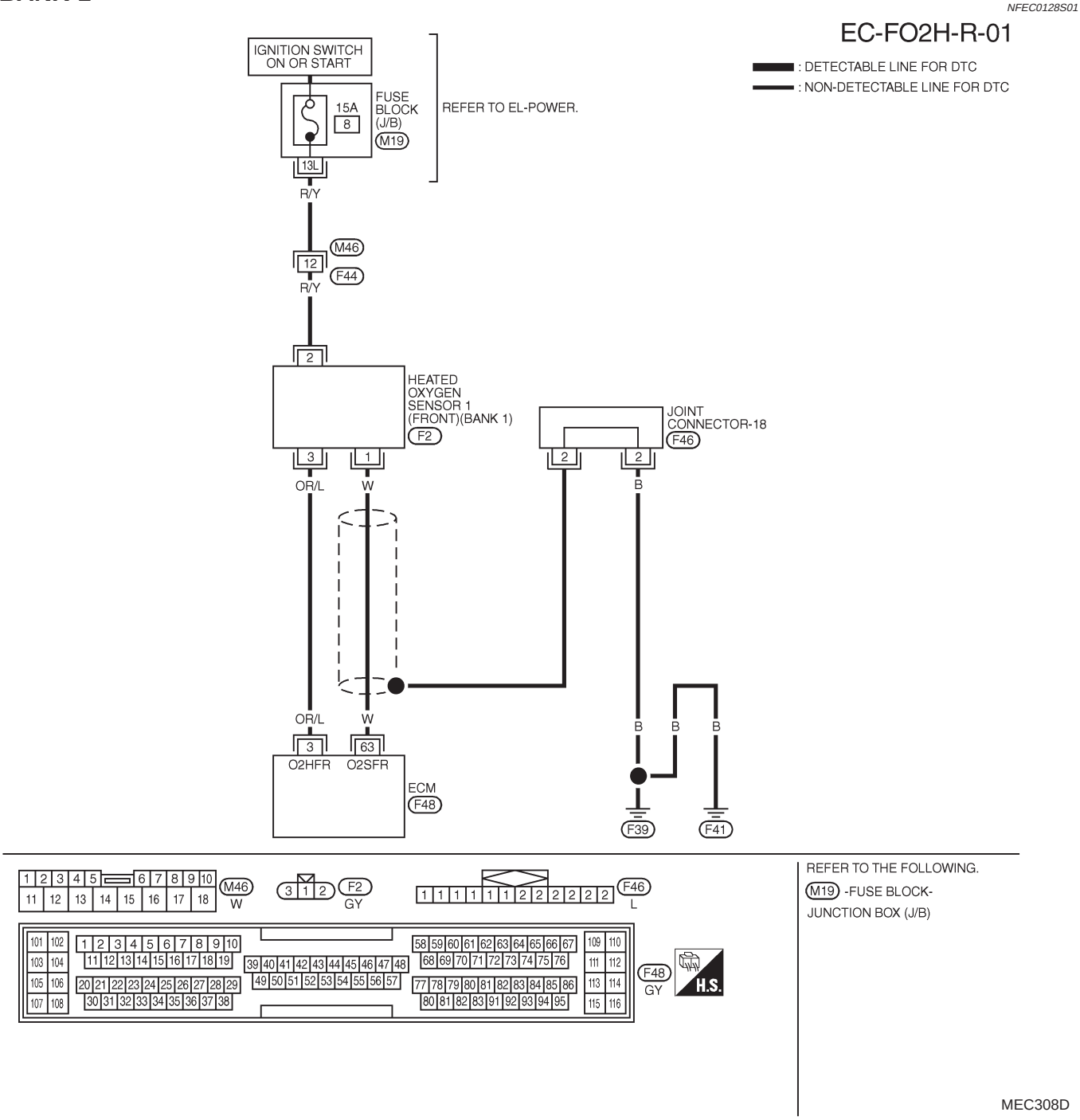
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1) HO2S1 HTR (B2)	● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF

Wiring Diagram

NFEC0128

BANK 1

NFEC0128S01



ECM TERMINALS AND REFERENCE VALUE 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.

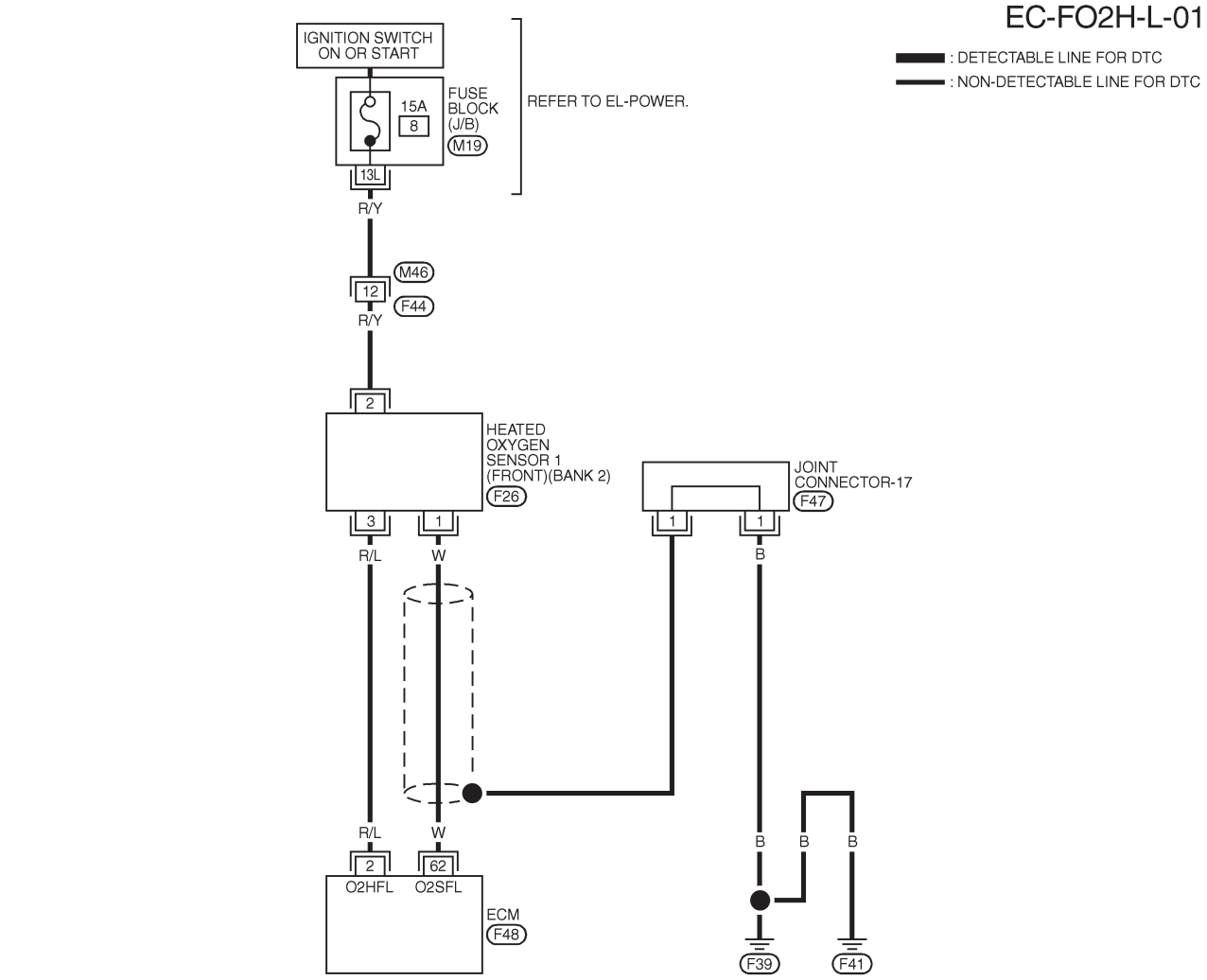
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
3	OR/L	HEATED OXYGEN SENSOR 1 HEATER (FRONT) (BANK 1)	ENGINE RUNNING BELOW 3,600 RPM	0 - 1.0V
			ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE

SEF655XE

Wiring Diagram (Cont'd)

BANK 2

NFEC0128S02



MEC309D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
2	R/L	HEATED OXYGEN SENSOR 1 HEATER (FRONT) (BANK 2)	ENGINE RUNNING BELOW 3,600 RPM	0 - 1.0V
			ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE

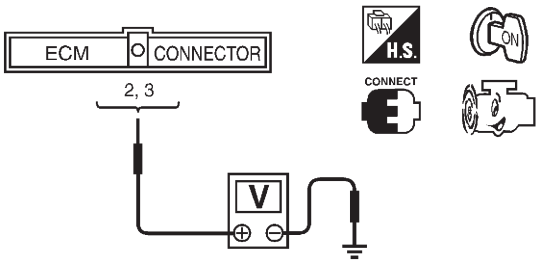
SEF656XE

Diagnostic Procedure

NFEC0129

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Set the tester probe between ECM terminals 3 (HO2S1 heater bank 1 signal), 2 (HO2S1 heater bank 2 signal) and ground.
3. Start engine and let it idle.
4. Check the voltage under the following conditions.



Conditions	Voltage
At idle	0 - 1V
Engine speed is above 3,600 rpm.	Battery voltage

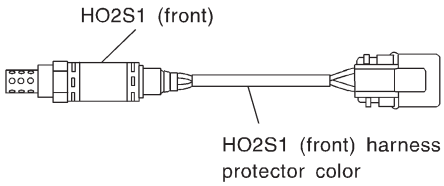
SEF007Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK HEATED OXYGEN SENSOR 1 (FRONT) POWER SUPPLY CIRCUIT

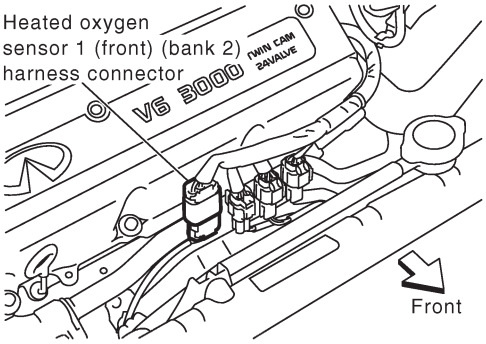
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.

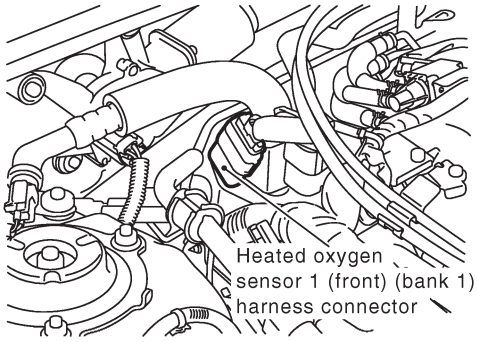


HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

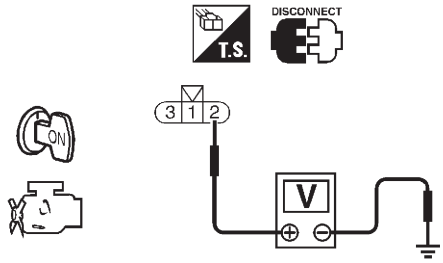
3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.





SEF902XA

4. Turn ignition switch "ON".
5. Check voltage between HO2S1 (front) terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF311X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between heated oxygen sensor 1 (front) and fuse

	▶	Repair harness or connectors.

4	CHECK HEATED OXYGEN SENSOR 1 (FRONT) OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows.
   Refer to Wiring Diagram.

Terminals		Bank
ECM	Sensor	
3	3	1
2	3	2

MTBL0624

Continuity should exist.

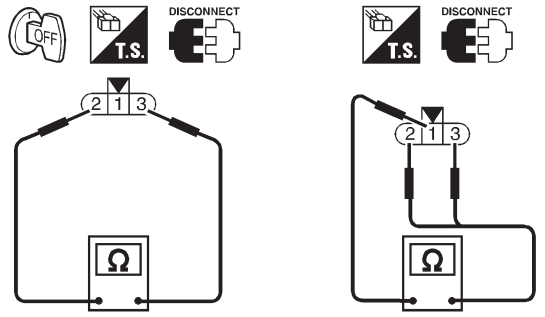
4. Also check harness for short to ground and short to power.

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 (FRONT)

Check resistance between HO2S1 (front) terminals as follows.



Terminals	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 1 and 3	∞Ω (Continuity should not exist.)

SEF310X

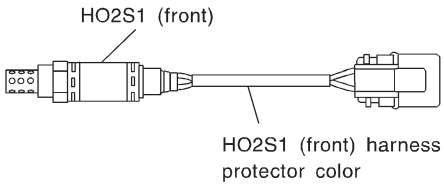
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



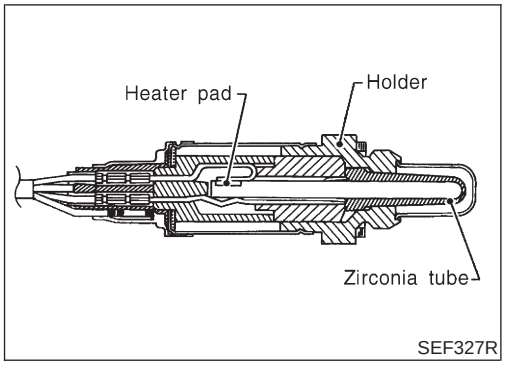
HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505YA

CAUTION:
Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

▶	Replace malfunctioning heated oxygen sensor 1 (front).

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0146

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

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 (rear) is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0147

Specification data are reference values.

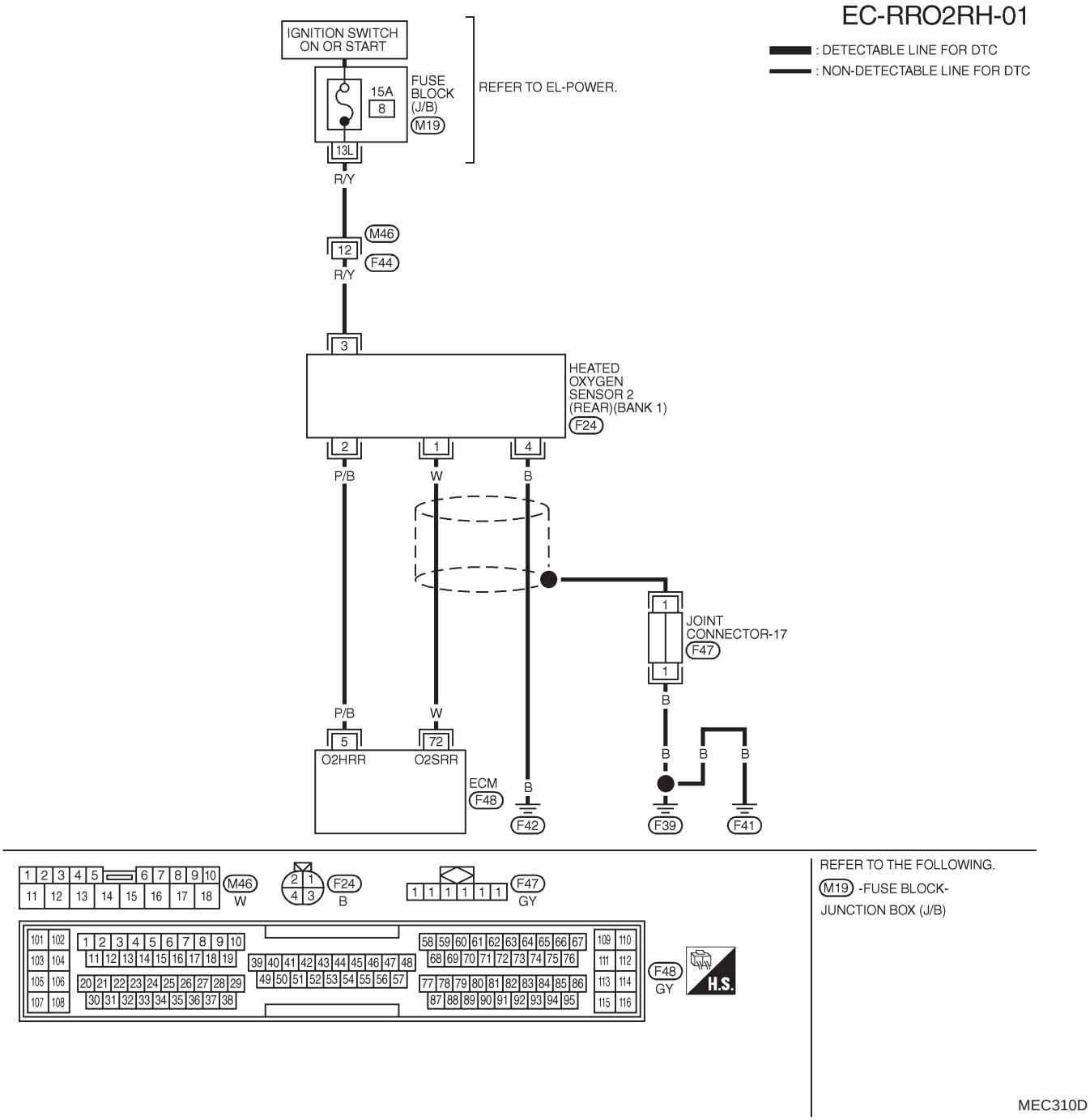
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH

Wiring Diagram

=NFEC0152

BANK 1

NFEC0152S01



MEC310D

ECM TERMINALS AND REFERENCE VALUE 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.

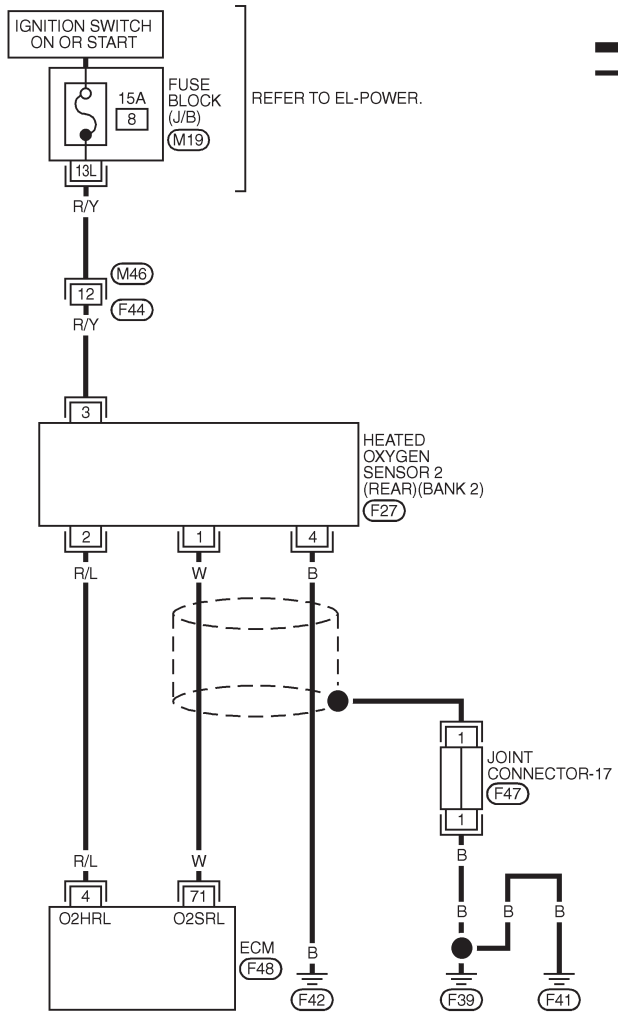
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 1)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

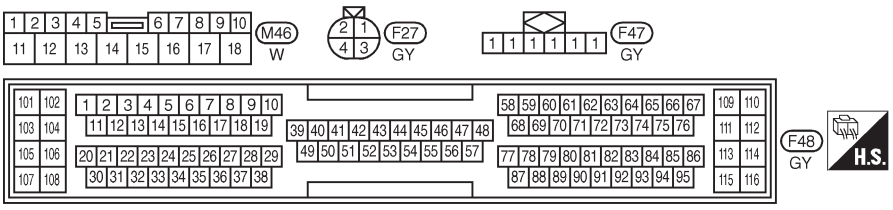
SEF657XE

BANK 2

NFEC0152S02

EC-RRO2LH-01





REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC311D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
71	W	HEATED OXYGEN SENSOR 2 (REAR) (BANK 2)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

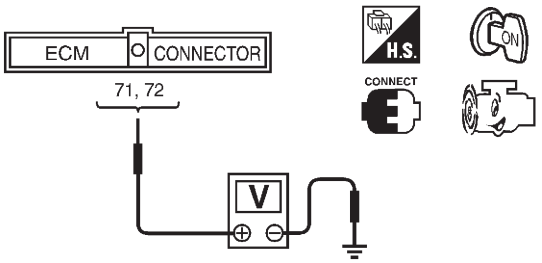
SEF658XE

Diagnostic Procedure

NFEC0153

1	CHECK OVERALL FUNCTION-I

1. Start engine and drive the vehicle at over 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle and keep the engine running.
3. Set voltmeter probes between ECM terminals 72 (HO2S2 bank 1 signal), 71 (HO2S2 bank 2 signal) and ground.
4. 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.

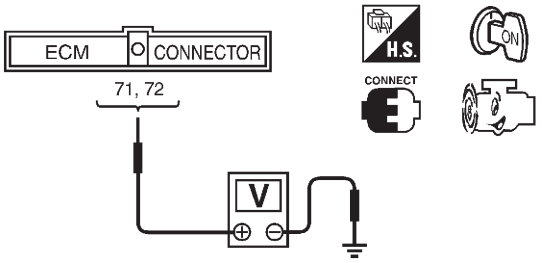
SEF008Y

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 terminals 71, 72 and ground, or check the voltage when coasting at 80 km/h (50 MPH) in 3rd gear (M/T), “D” position with “OD” OFF (A/T).



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

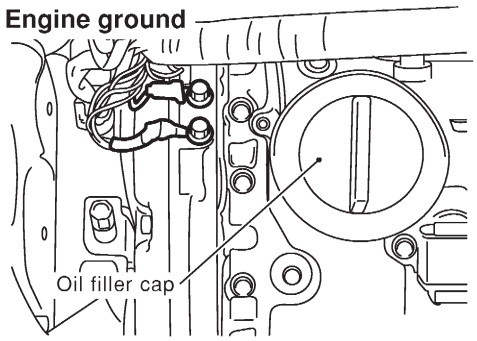
SEF008Y

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.

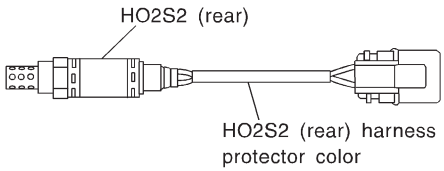


SEF255X

▶	GO TO 4.

4	CHECK HEATED OXYTEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

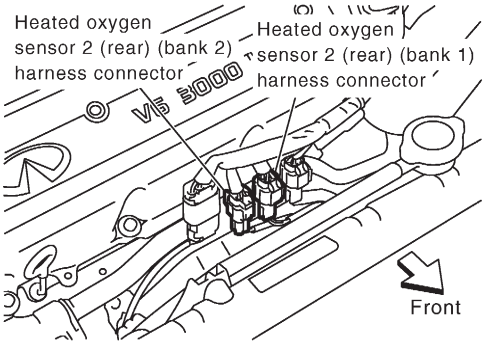
1. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

2. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WB

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

Terminals		Bank
ECM	Sensor	
72	1	1
71	1	2

MTBL0504

Continuity should exist.

5. Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

Terminals		Bank
ECM or Sensor	Ground	
72 or 1	Ground	1
71 or 1	Ground	2

MTBL0505

Continuity should not exist.

6. 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 OXYTEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 (rear) terminal 4 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

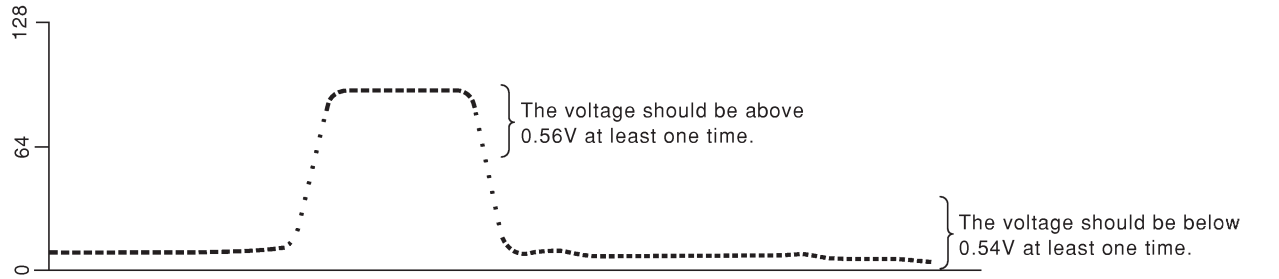
OK (With CONSULT-II)	▶	GO TO 6.
OK (Without CONSULT-II)	▶	GO TO 7.
NG	▶	Repair open circuit or short to power in harness or connectors

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)

With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

"HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.54V 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.

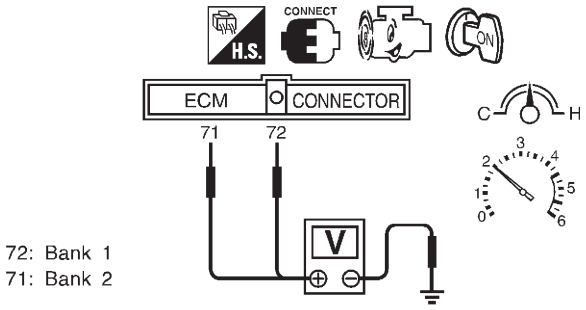
OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
4. 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 0.56V at least once during this procedure.

SEF313XB

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 8.

8	CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

CAUTION:

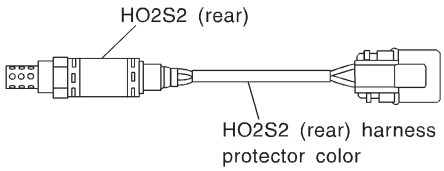
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

1. Stop vehicle and turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

SEF154Z

CAUTION:

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

10	CHECK REAR HO2S SHIELD CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect joint connector-17.
3. Check the following.

- Continuity between joint connector terminal 1 and ground
- Joint connector
  (Refer to EL-377, "HARNESS LAYOUT".)
  Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-17.

OK or NG

OK	▶	GO TO 11.
NG	▶	Repair open circuit or short to power in harness or connectors.

11	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Description

NFEC0162

SYSTEM DESCRIPTION

NFEC0162S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 2 heater (rear) control	Heated oxygen sensor 2 heater (rear)
Crankshaft position sensor (REF)			

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater (rear) corresponding to the engine speed.

OPERATION

NFEC0162S02

Engine speed rpm	Heated oxygen sensor 2 heater (rear)
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

NFEC0163

Specification data are reference values.

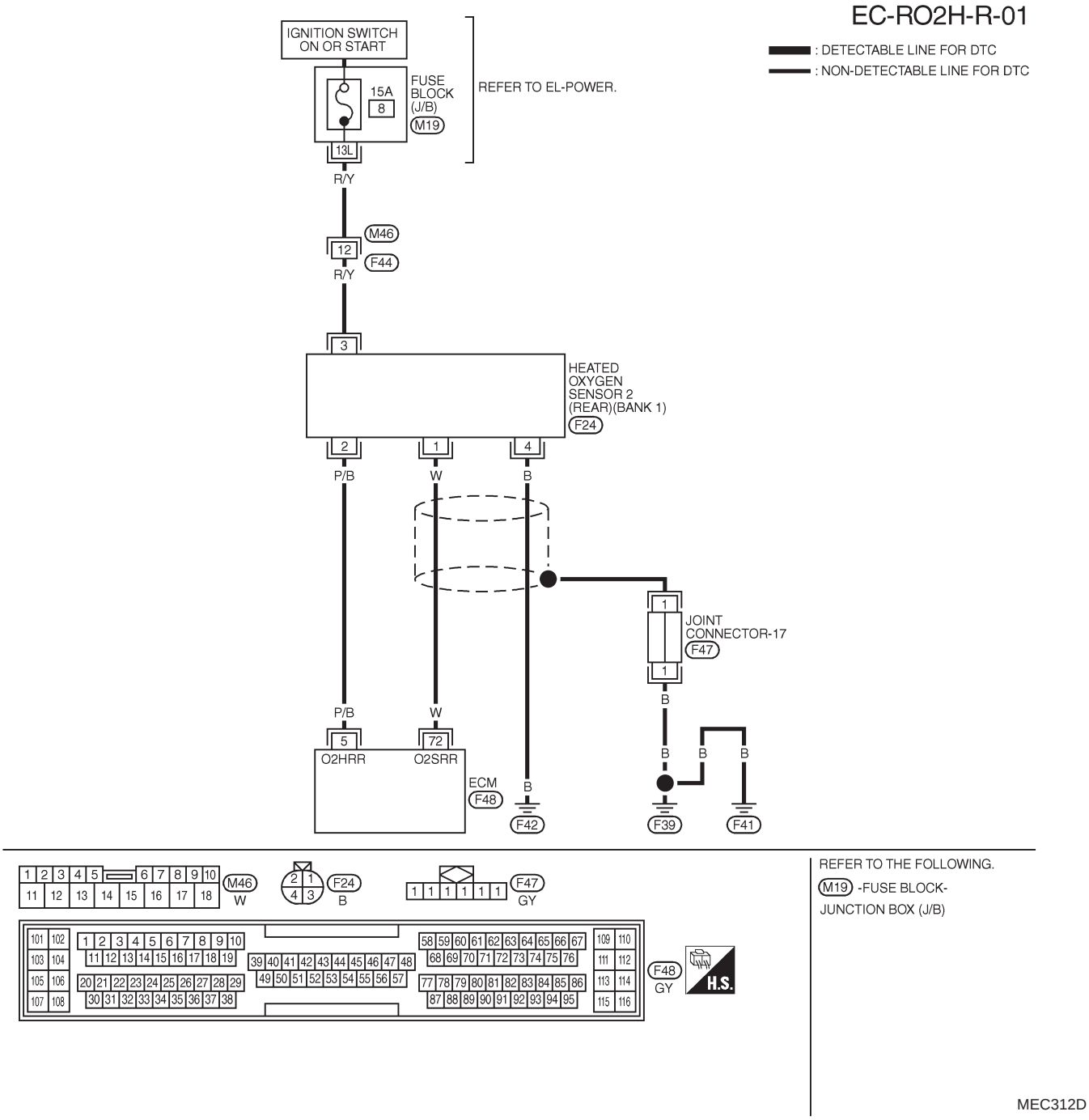
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1) HO2S2 HTR (B2)	● Ignition switch: ON (Engine stopped) ● Engine is running above 3,600 rpm.	OFF
	● Engine is running below 3,600 rpm after driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	ON

Wiring Diagram

NFEC0167

BANK 1

NFEC0167S01



MEC312D

ECM TERMINALS AND REFERENCE VALUE 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.

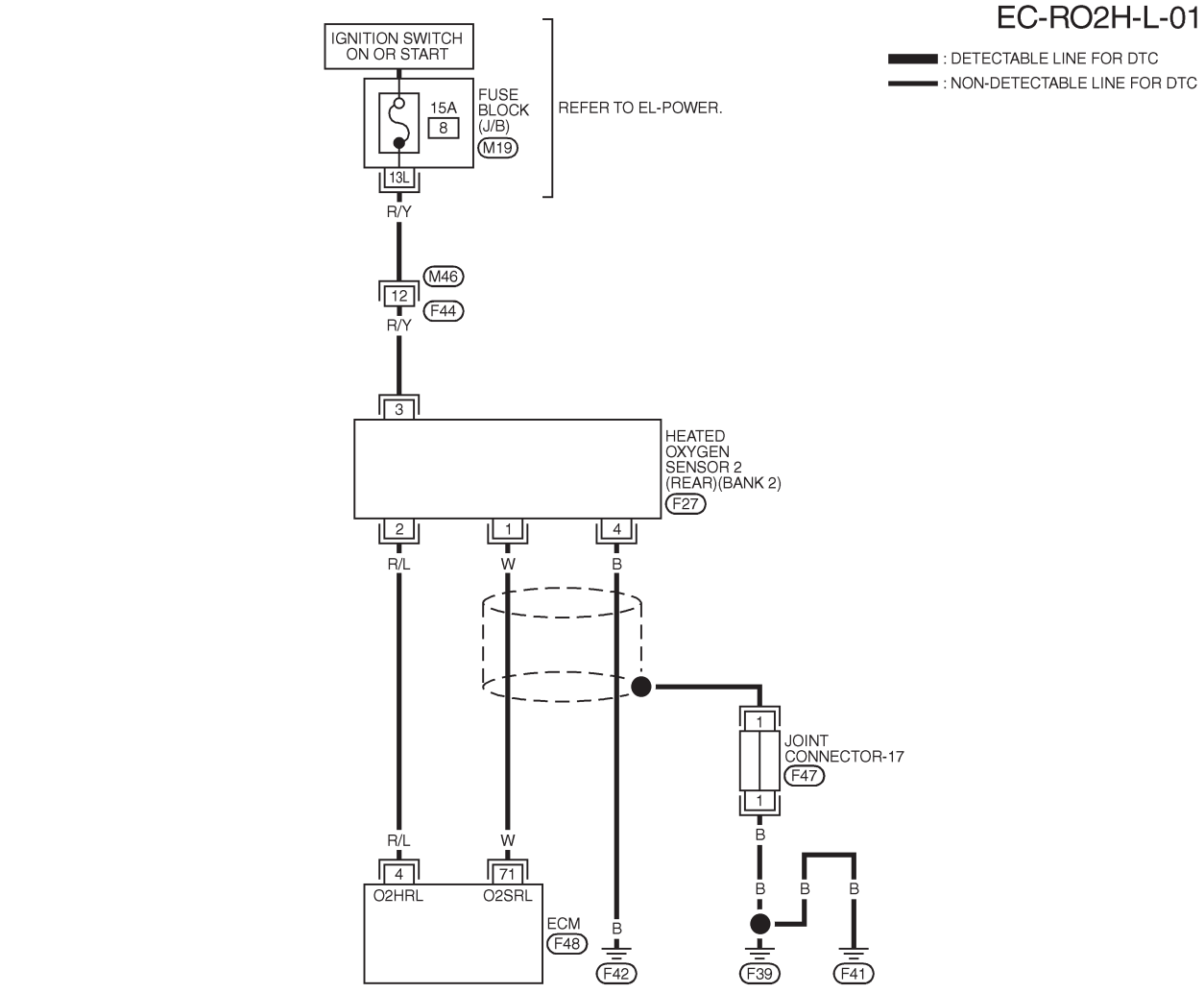
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
5	P/B	HEATED OXYGEN SENSOR 2 HEATER (REAR) (BANK 1)	IGN ON ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE
			ENGINE RUNNING BELOW 3,600 RPM AFTER DRIVING FOR 2 MINITES AT A SPEED OF 70 KM/H (43 MPH) OR MORE	0 - 1.0V

SEF659XE

Wiring Diagram (Cont'd)

BANK 2

NFEC0167S02



MEC313D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
4	R/L	HEATED OXYGEN SENSOR 2 HEATER (REAR) (BANK 2)	IGN ON ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE
			ENGINE RUNNING BELOW 3,600 RPM AFTER DRIVING FOR 2 MINITES AT A SPEED OF 70 KM/H (43 MPH) OR MORE	0 - 1.0V

SEF660XE

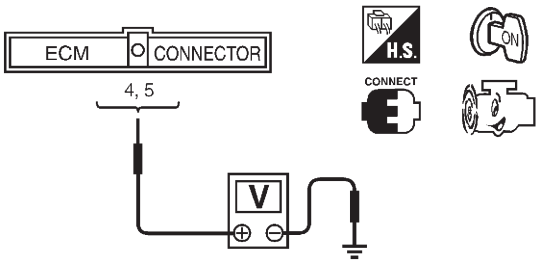
Diagnostic Procedure

NFEC0168

1	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine and drive the vehicle at over 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle and keep the engine running.
3. Set the voltmeter probe between ECM terminals 5 (HO2S2 heater bank 1 signal), 4 (HO2S2 heater bank 2 signal) and ground.
4. Check the voltage under the following conditions.



Conditions	Voltage
At idle	0 - 1V
Engine speed is above 3,600 rpm.	Battery voltage

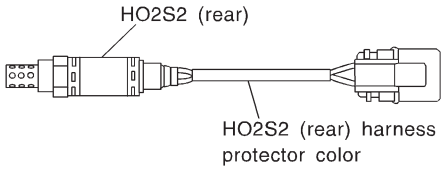
SEF010Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK HEATED OXYGEN SENSOR 2 (REAR) POWER SUPPLY CIRCUIT

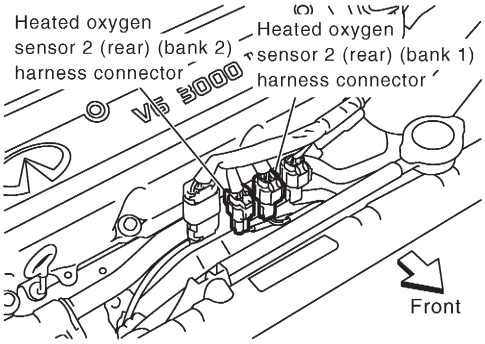
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

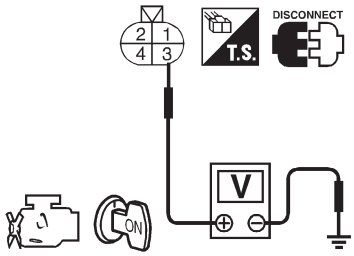
SEF154Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WB

4. Turn ignition switch "ON".
5. Check voltage between HO2S2 (rear) terminal 3 and ground.



Voltage: Battery voltage

SEF314X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between heated oxygen sensor 2 (rear) and fuse

	▶	Repair harness or connectors.

4	CHECK HEATED OXYGEN SENSOR 2 (REAR) OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows.
   Refer to Wiring Diagram.

Terminals		Bank
ECM	Sensor	
5	2	1
4	2	2

MTBL0506

Continuity should exist.

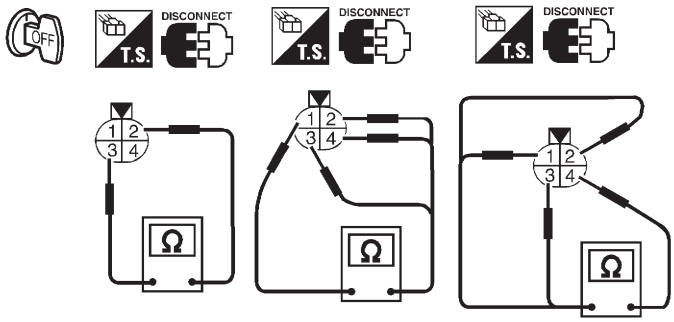
4. Also check harness for short to ground and short to power.

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 (REAR)

Check the resistance between HO2S2 (rear) terminals as follows.



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

SEF315X

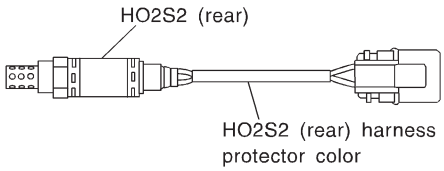
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White
HO2S2 (rear) (bank 2): Red

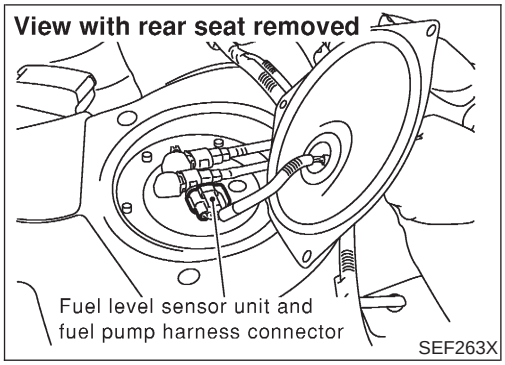
SEF154Z

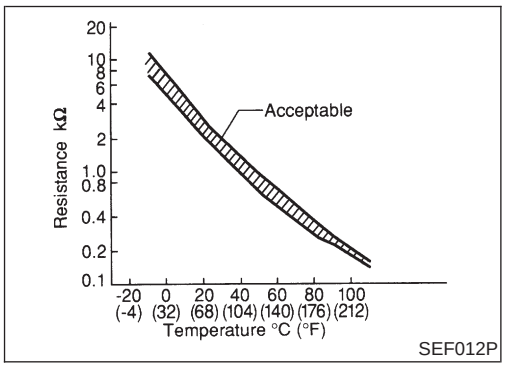
CAUTION:
Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

Diagnostic Procedure (Cont'd)

7	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**





Component Description

NFEC0177

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel 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>

Fuel temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

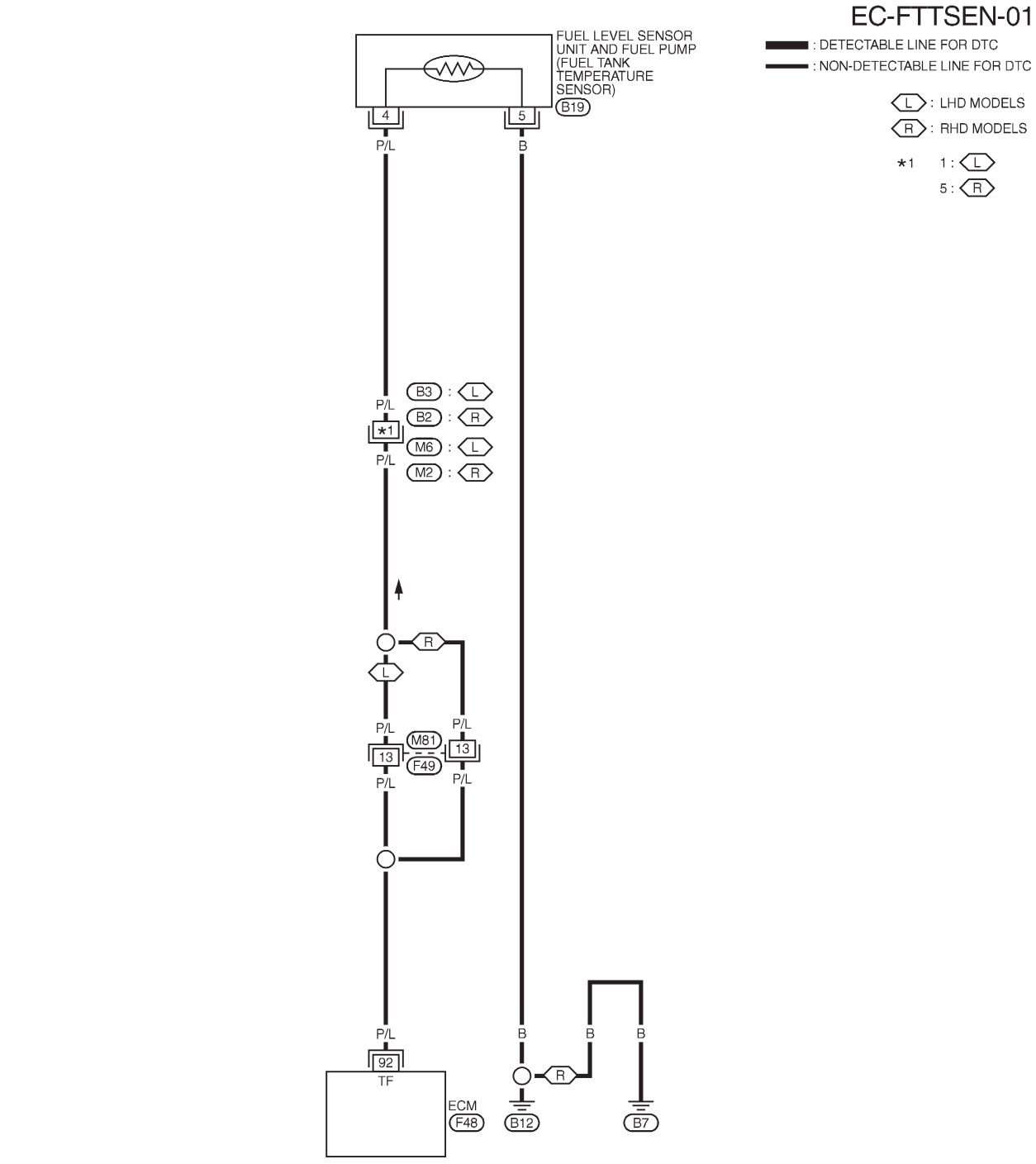
*: These data are reference values and are measured between ECM terminal 92 (Fuel tank temperature sensor) and ground.

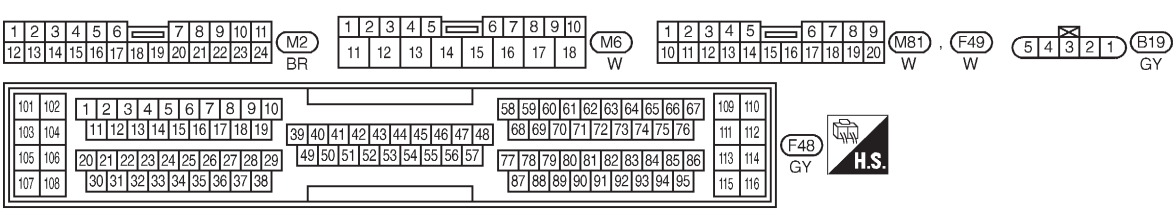
CAUTION:

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.

Wiring Diagram

NFEC0180





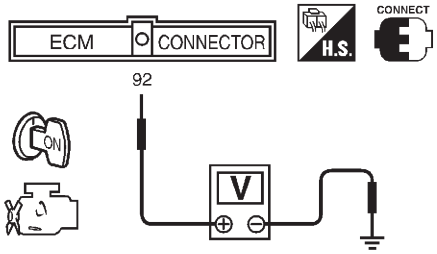
MEC051D

Diagnostic Procedure

NFEC0181

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 92 and ground with CONSULT-II or tester.



Voltage: 0.07 - 4.8V

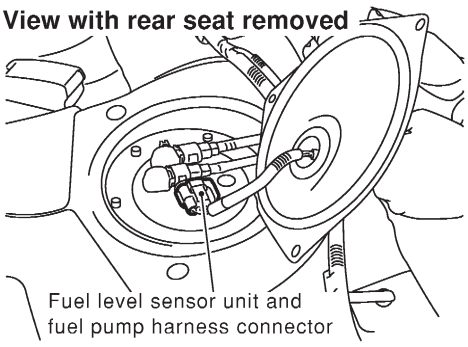
SEF042Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

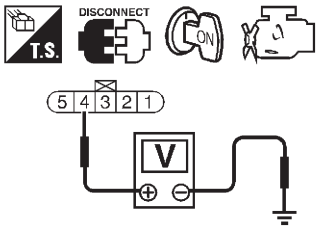
2	CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF263X

3. Turn ignition switch “ON”.
4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF586X

OK or NG

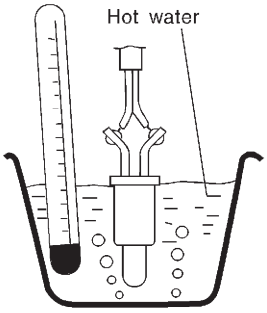
OK	▶	GO TO 4.
NG	▶	GO TO 3.

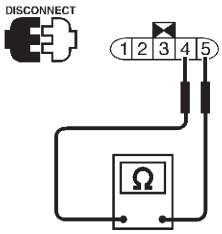
Diagnostic Procedure (Cont'd)

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors B3, M6 or B2, M2 ● Harness connectors M81, F49 ● Harness for open or short between ECM and fuel level sensor unit and fuel pump	
▶	Repair harness or connector.

4	CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram. **Continuity should exist.** 3. 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 FUEL TANK TEMPERATURE SENSOR
1. Remove fuel level sensor unit. 2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.	



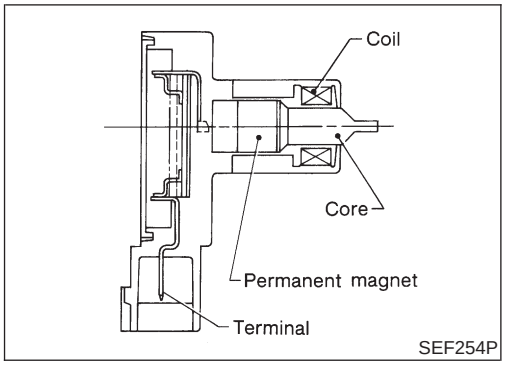


Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

SEF587X

OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace fuel level sensor unit.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0191

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

CONSULT-II Reference Value in Data Monitor Mode

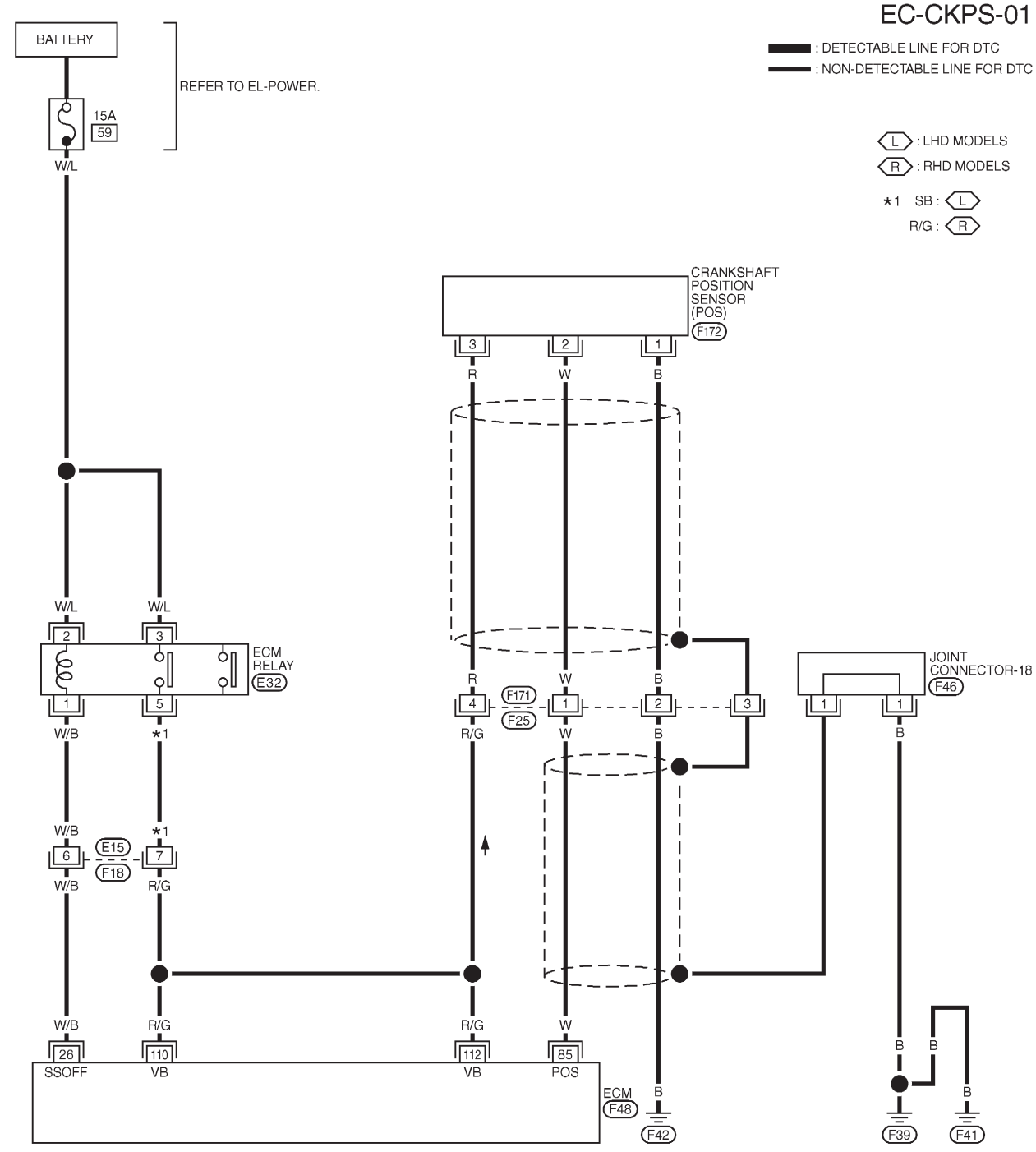
NFEC0492

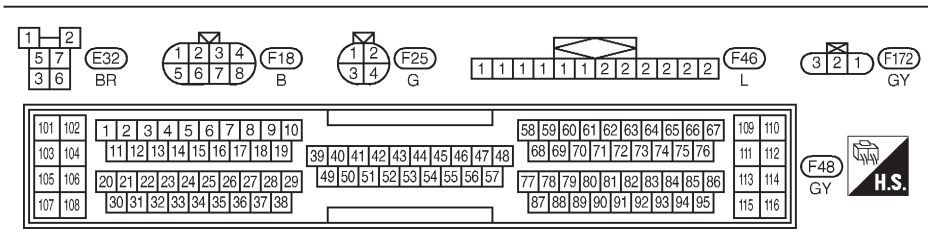
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (POS)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

Wiring Diagram

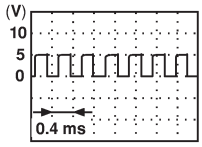
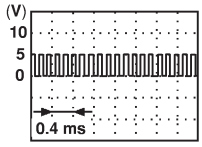
NFEC0195





MEC906C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
85	W	CRANKSHAFT POSITION SENSOR (POS)	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 2.4V 
			ENGINE RUNNING AT 2,000 RPM	APPROX. 2.3V 

SEF856Y

Diagnostic Procedure

NFEC0196

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. Turn ignition switch "ON".
2. Select "POS COUNT" in "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle.
4. Check the "POS COUNT" indication.

DATA MONITOR	
MONITOR	NO DTC
POS COUNT	XXX

"POS COUNT" indicates 179 - 181.

SEF011Y

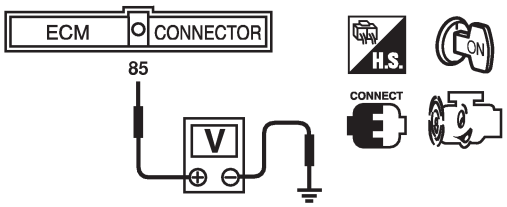
OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

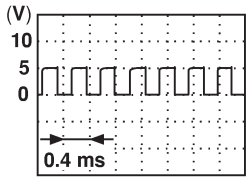
3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine and let it idle.
2. Check voltage between ECM terminal 85 and ground.



Voltage is approximately 2.4V.



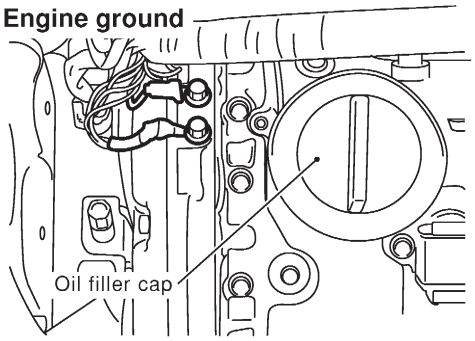
SEF012Y

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.

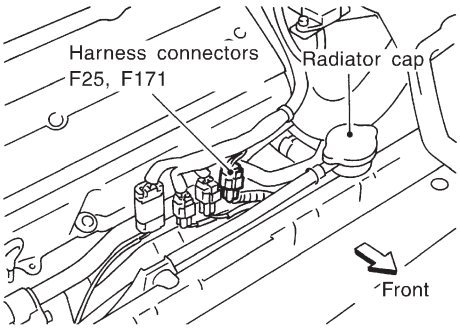


SEF255X

	▶	GO TO 5.

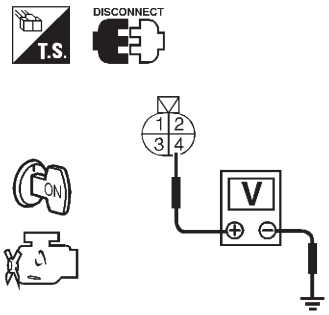
5	CHECK CKPS (POS) POWER SUPPLY CIRCUIT

1. Disconnect harness connectors F25, F171.



SEF511WB

2. Check voltage between harness connector F25 terminal 4 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF323X

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 F25, F171
- Harness connectors E15, F18
- Harness for open or short between ECM and crankshaft position sensor (POS)
- Harness for open or short between ECM relay and crankshaft position sensor (POS)

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

7	CHECK CKPS (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between harness connector F25 terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

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

Diagnostic Procedure (Cont'd)

8	CHECK CKPS (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

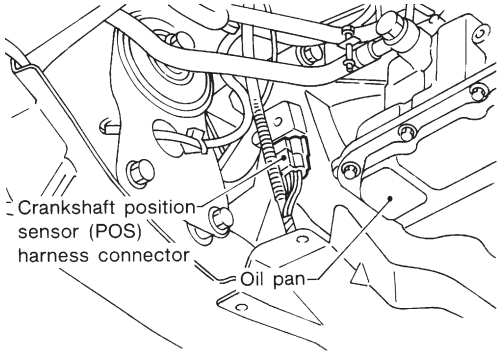
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 85 and harness connector F25 terminal 1.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 9.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

9	CHECK CKPS (POS) SUB-HARNESS CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (POS) harness connector.



SEF367Q

2. Check harness continuity between CKPS (POS) terminals and harness connector F171 terminals as follows.

CKPS (POS) terminal	Harness connector F171 terminal
1	2
2	1
3	4

MTBL0352

Continuity should exist.

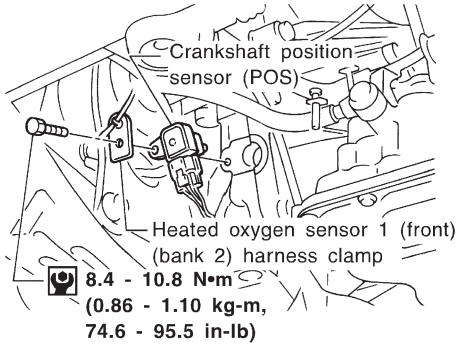
3. Also check harness for short to ground and short to power.

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 CKPS (POS) INSTALLATION

Check that CKPS (POS) and HO2S1 bank 2 harness clamp are installed correctly as shown below.



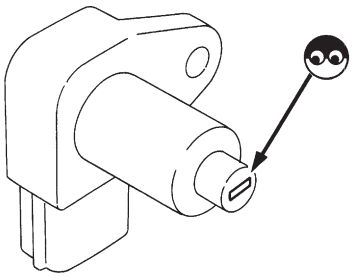
SEM222FE

OK or NG

OK	▶	GO TO 11.
NG	▶	Install CKPS (POS) correctly.

11	CHECK CRANKSHAFT POSITION SENSOR (POS)-I

1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



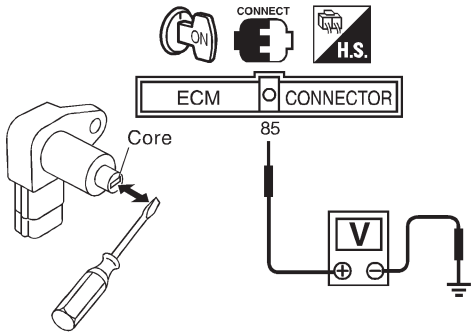
SEF587P

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace crankshaft position sensor (POS).

12	CHECK CRANKSHAFT POSITION SENSOR (POS)-II

1. Reconnect disconnected harness connectors.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal 85 and ground by briefly touching the sensor core with a flat-bladed screwdrivers.



ECM terminal	Condition	Voltage
85	Contacted	Approximately 5V
	Pulled away	Approximately 0V

There should be a steady 5V as the flat-bladed screwdriver is drawn away slowly.

SEF324X

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace crankshaft position sensor (POS).

13	CHECK CKPS (POS) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect harness connectors F25, F171.
2. Check harness continuity between harness connector F25 terminal 3 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 15.
NG	▶	GO TO 14.

14	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F25, F171 ● Joint connector-18 ● Harness for open or short between harness connector F25 and engine ground	
▶	Repair open circuit or short to power in harness or connectors.

15	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Description

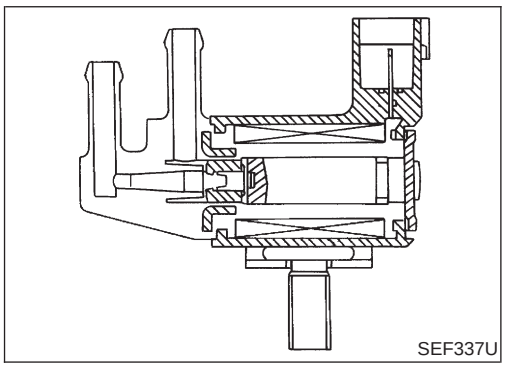
NFEC0221

SYSTEM DESCRIPTION

NFEC0221S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Throttle position switch	Closed throttle position		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor	Vehicle speed		

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.


SEF337U

COMPONENT DESCRIPTION

NFEC0221S02

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

NFEC0222

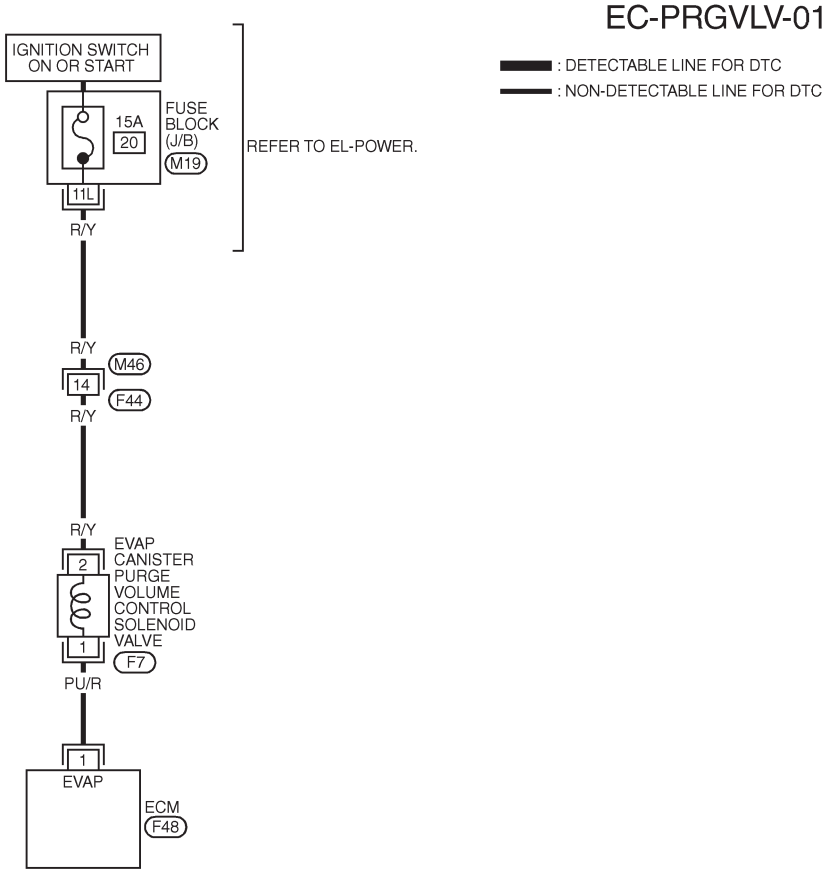
Specification data are reference values.

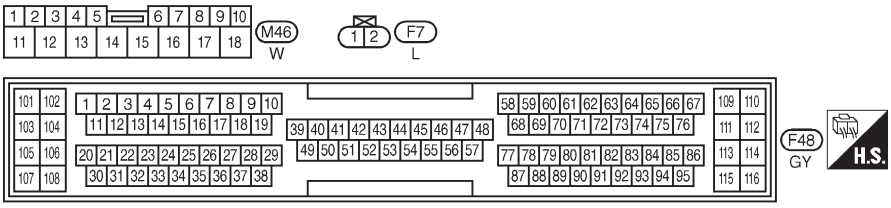
MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch “OFF” ● Shift lever: “N” ● No-load	Idle (Vehicle stopped)	0%
		2,000 rpm	—

Wiring Diagram

NFEC0226

EC-PRGVLV-01

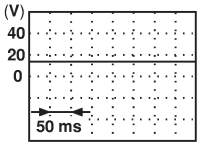
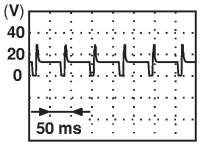




REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC070D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	PU/R	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	ENGINE RUNNING AT IDLE SPEED	BATTERY VOLTAGE 
			ENGINE RUNNING AT 2,000 RPM (MORE THAN 100 SECONDS AFTER STARTING ENGINE)	BATTERY VOLTAGE 

SEF858Y

Diagnostic Procedure

NFEC0227

1	INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes	▶	GO TO 2.
No	▶	GO TO 3.

2	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE CONTROL FUNCTION

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Disconnect the EVAP purge hose connected to the EVAP canister purge volume control solenoid valve at the EVAP canister.
3. Turn ignition switch “ON” and select “PURG VOL CONT/V” in “DATA MONITOR” mode with CONSULT-II.
4. Start engine and let it idle.
5. Change the valve opening percentage “Qu” and “Qd” and check for vacuum existence under the following conditions.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
A/F ALPHA-B2	XX %
HO2S1 MNTR (B1)	LEAN
HO2S1 (B2)	LEAN
THRTL POS SEN	X. XX V

Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.

SEF156Z

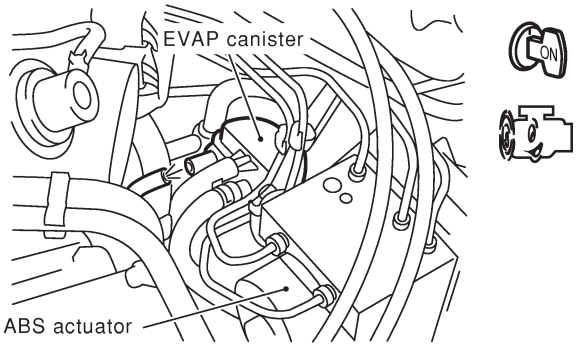
OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 5.

3	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE CONTROL FUNCTION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Disconnect the EVAP purge hose connected to the EVAP canister purge volume control solenoid valve at 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.

SEF019Y

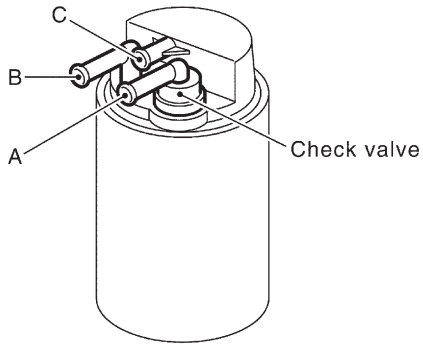
OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 5.

Diagnostic Procedure (Cont'd)

4	CHECK EVAP CANISTER

1. Turn ignition switch "OFF".
2. Remove EVAP canister.
3. Block port B of EVAP canister.
4. Blow air through port A orally, and confirm that air flows freely through port C with check valve resistance.
5. Block port A of EVAP canister.
6. Blow air through port B orally, and confirm that air flows freely through port C.



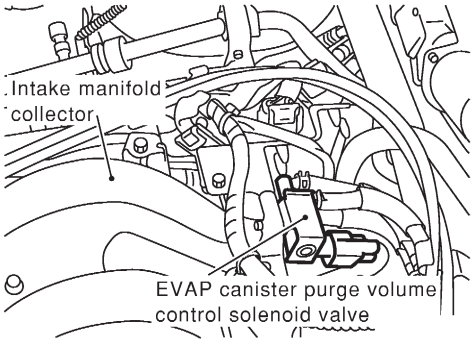
SEF917W

OK or NG

OK	▶	**INSPECTION END**
NG	▶	Replace EVAP canister.

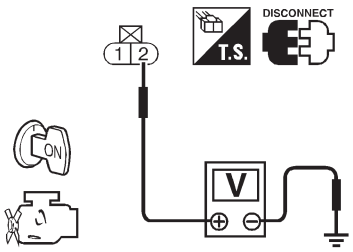
5	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF266X

3. Turn ignition switch "ON".
4. Check voltage between EVAP canister purge volume control solenoid valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF998X

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M46, F44 ● Fuse block (J/B) connector M19 ● 15A fuse ● Harness for open or short between EVAP canister purge volume control solenoid valve and fuse	
▶	Repair harness or connectors.

7	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 1 and EVAP canister purge volume control solenoid valve 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 (With CONSULT-II) ▶	GO TO 8.
OK (Without CONSULT-II) ▶	GO TO 9.
NG ▶	Repair open circuit or short to ground and short to power in harness or connetors.

8	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION
With CONSULT-II 1. Start engine. 2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that engine speed varies according to the valve opening.	

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
A/F ALPHA-B2	XX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	X. XX V

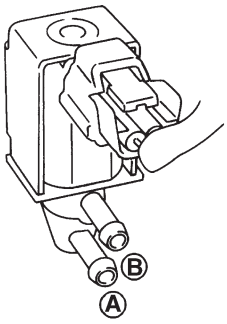
SEF677Y

OK or NG	
OK ▶	GO TO 10.
NG ▶	GO TO 9.

9	CHECK 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.

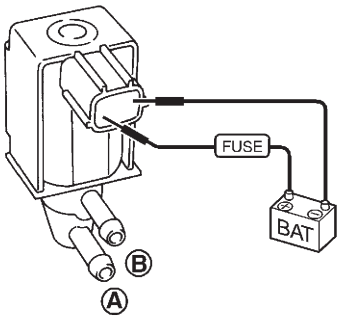


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



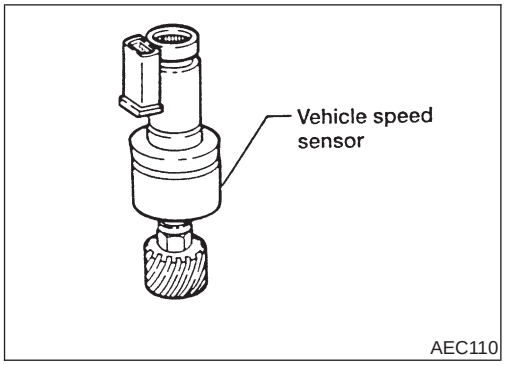
Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

SEF335X

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

10	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



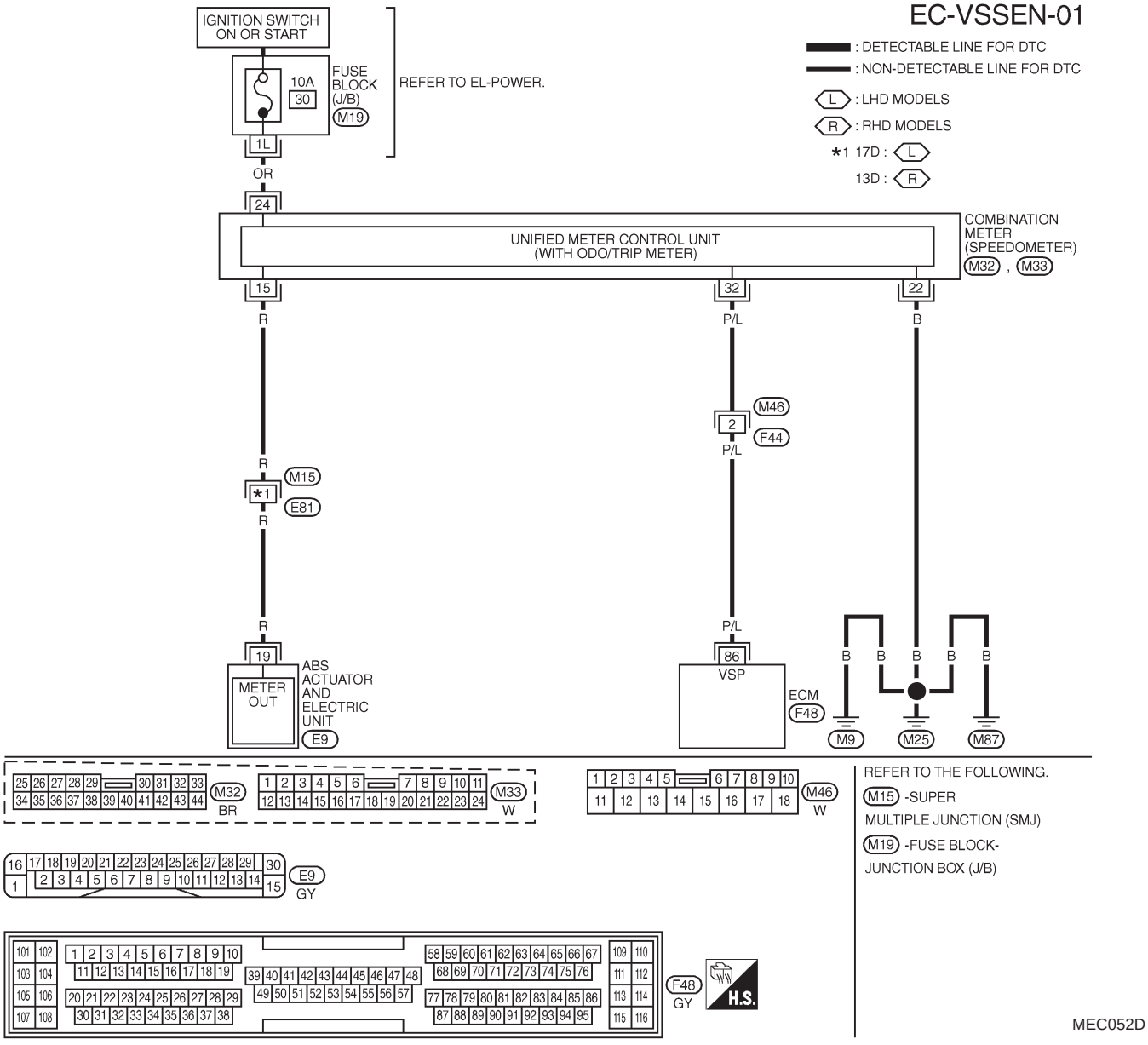
Component Description

=NFEC0242

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

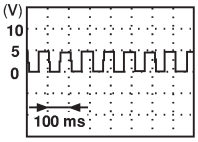
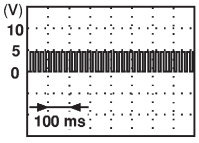
Wiring Diagram

=NFEC0247



MEC052D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
86	P/L	VEHICLE SPEED SENSOR	VEHICLE DRIVING AT 10 KM/H (6 MPH) IN 1ST GEAR POSITION UNDER LIFTED UP CONDITION	APPROX. 2.0V 
			VEHICLE DRIVING AT 30 KM/H (19 MPH) IN 2ND GEAR POSITION UNDER LIFTED UP CONDITION	APPROX. 2.5V 

SEF859Y

Diagnostic Procedure

NFEC0248

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. Turn ignition switch “OFF”.
2. Lift up the vehicle.
3. Start engine and let it idle.
4. Select “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II.
5. Check “VHCL SPEED SE” indication when rotating wheels with suitable gear position.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
B/FUEL SCHDL	XXX msec
PW/ST SIGNAL	OFF
VHCL SPEED SE	XXX km/h

“VHCL SPEED SE” indication should exceed 10 km/h (6 MPH).

SEF020Y

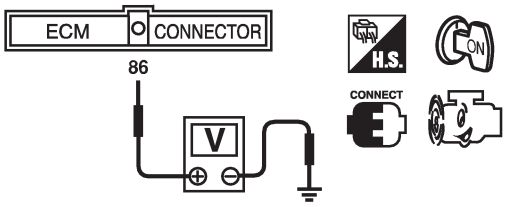
OK or NG

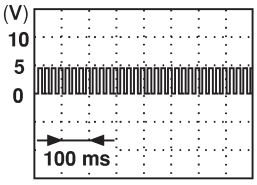
OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Lift up the vehicle.
3. Start engine and let it idle.
4. Read the voltage signal between ECM terminal 86 and ground with an oscilloscope.
5. Verify that the oscilloscope screen shows a signal wave as shown below under the following conditions.



Conditions	Voltage
Vehicle speed is 30 km/h (19 MPH) in 2nd gear position.	

SEF021Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

4	CHECK VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector and combination meter harness connector. 3. Check harness continuity between ECM terminal 86 and combination meter terminal 32. 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 M46, F44 ● Harness for open or short between ECM and combination meter	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK SPEEDOMETER FUNCTION
Make sure that speedometer functions properly. **OK or NG**	
OK ▶	GO TO 8.
NG ▶	GO TO 7.

7	CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT
Check the following. ● Harness connectors M15, E81 ● Harness for open or short between combination meter and ABS actuator and electric unit **OK or NG**	
OK ▶	Check combination meter and ABS actuator and electric unit. Refer to EL or BR section.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Description

SYSTEM DESCRIPTION

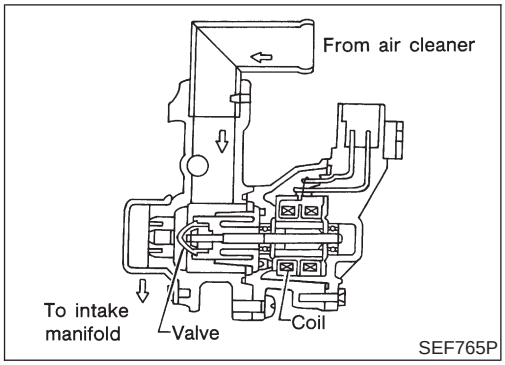
NFEC0249

NFEC0249S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Idle air control	IACV-AAC valve
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Park/neutral position (PNP) switch	Park/neutral position		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed		
Ambient air temperature switch	Ambient air temperature		
Intake air temperature sensor	Intake air temperature		
Absolute pressure sensor	Ambient barometic pressure		

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by takig into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).

NOTE:
If engine idle speed is out of the specified value, perform “Idle Air Volume Learning”, EC-41. For the target idle speed, refer to “Service Data and specifications (SDS)”, EC-559.



COMPONENT DESCRIPTION

NFEC0249S02

IACV-AAC Valve

NFEC0249S0201

The IACV-AAC valve is operated by a step motor for centralized control of auxiliary air supply. This motor has four winding phases and is actuated by the output signals of ECM which turns ON and OFF two windings each in seqeunce. Each time the IACV-AAC valve opens or closes to change tha auxiliary air quantity, the ECM sends a pulse signal to the step motor. When no change in the auxiliary air quantity is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

CONSULT-II Reference Value in Data Monitor Mode

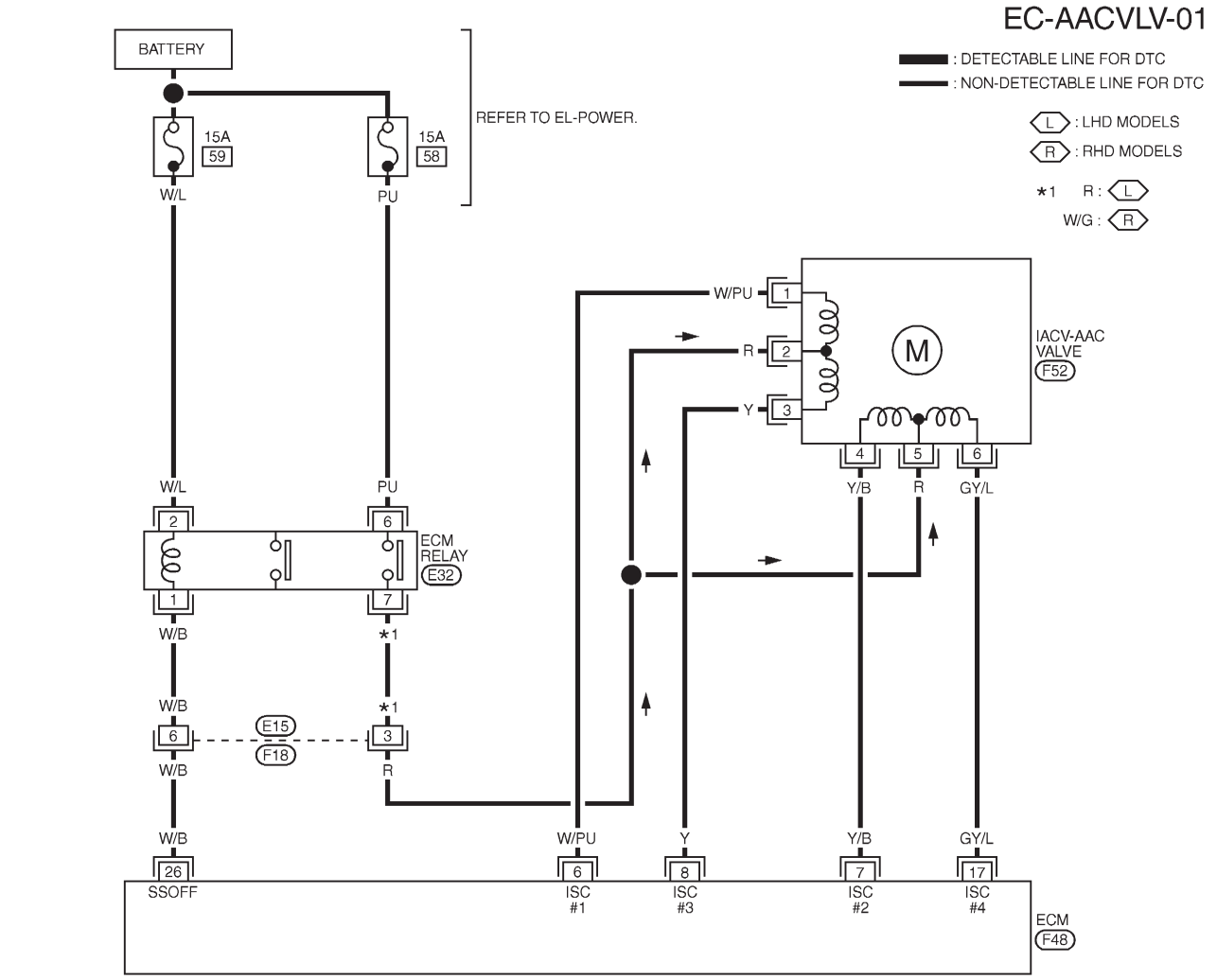
NFEC0250

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	2 - 10 step
		2,000 rpm	—

Wiring Diagram

=NFEC0254



MEC071D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
6	W/PU	IACV-AAC VALVE	ENGINE RUNNING AT IDLE SPEED	0.1 - 14V
7	Y/B			
8	Y			
17	GY/L			

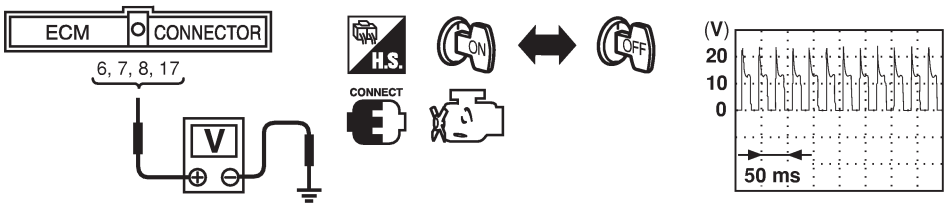
SEF625XB

Diagnostic Procedure

NFEC0255

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “OFF”.
2. Read the voltage signal between ECM terminals 6, 7, 8, 17 (IACV-AAC valve signal) and ground with an oscilloscope.
3. Turn ignition switch “ON”, wait at least 5 seconds and then “OFF”.
4. Verify that the oscilloscope screen shows the signal wave as shown below at least once every 10 seconds after turning ignition switch “OFF”.



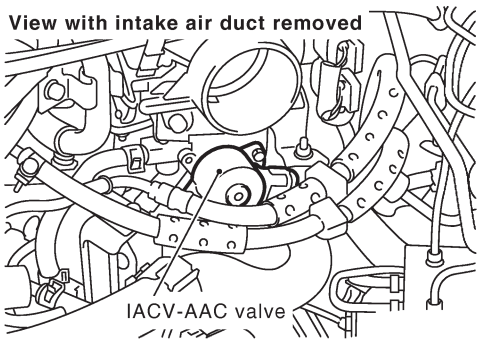
SEF022Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

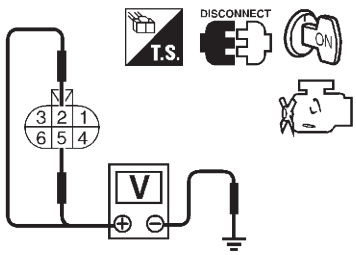
2	CHECK IACV-AAC VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect IACV-AAC valve harness connector.



SEC008C

3. Turn ignition switch “ON”.
4. Check voltage between IACV-AAC valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF343X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E15, F18 ● Harness for open or short between IACV-AAC valve and ECM relay	
▶	Repair harness or connectors.

4	CHECK IACV-AAC VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and IACV-AAC valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	IACV-AAC valve terminal
6	1
7	4
8	3
17	6

MTBL0354

Continuity should exist.

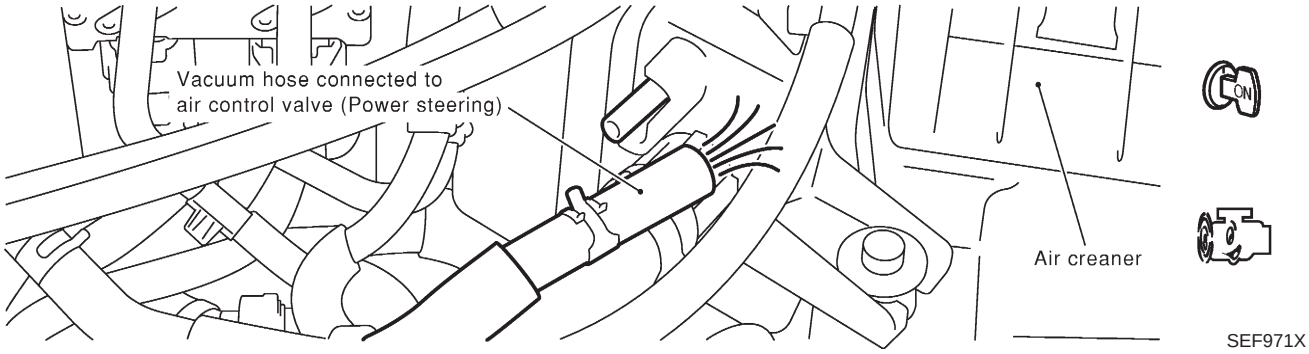
4. Also check harness for short to ground and short to power.

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 AIR CONTROL VALVE (POWER STEERING) OPERATION-I

1. Reconnect the ECM harness connector and IACV-AAC valve harness connector.
2. Disconnect the vacuum hose connected to the air control valve (Power steering) at the intake air duct.
3. Start engine and let it idle.
4. Check vacuum hose for vacuum existence.



SEF971X

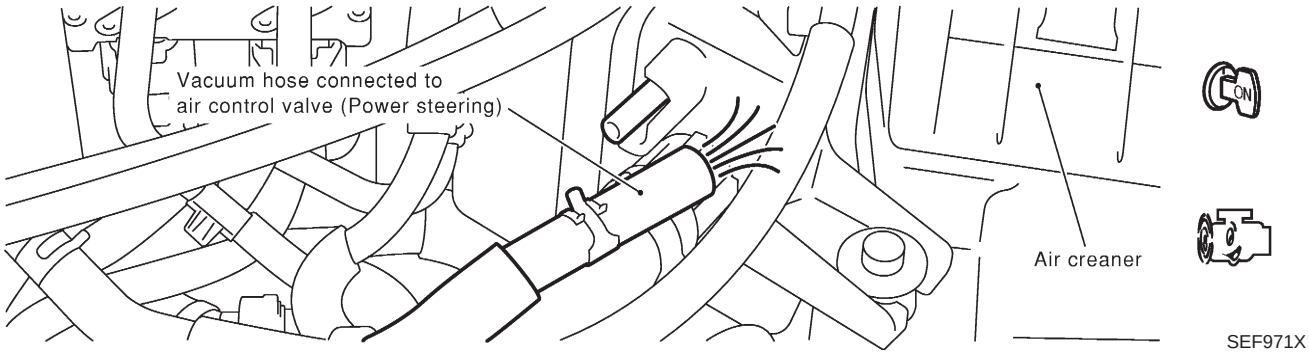
Vacuum slightly exists or does not exist.

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace air control valve (Power steering).

6	CHECK AIR CONTROL VALVE (POWER STEERING) OPERATION-II

Check the vacuum hose for vacuum existence when steering wheel is turned.



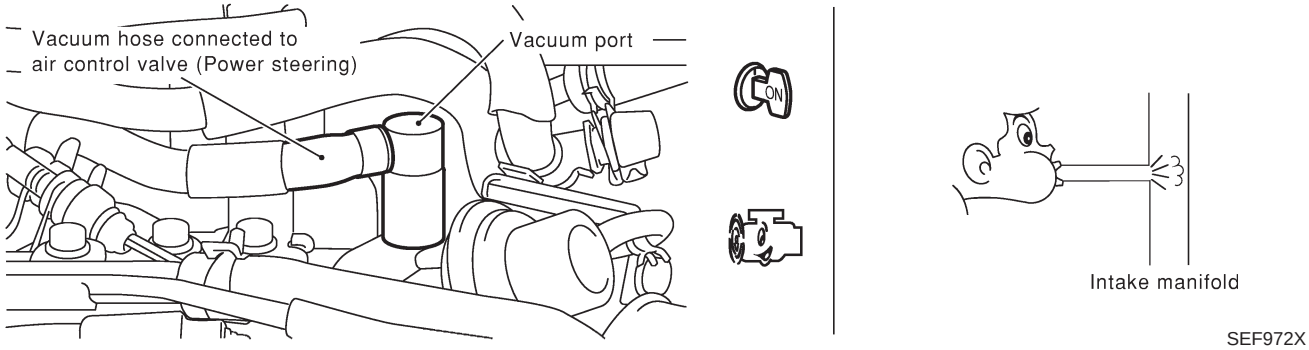
Vacuum should exist.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK VACUUM PORT

1. Stop engine.
2. Disconnect the vacuum hose connected to the air control valve (Power steering) at the vacuum port.
3. Blow air into vacuum port.
4. Check that air flows freely.

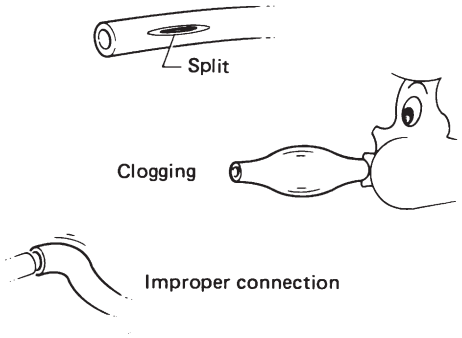


OK or NG

OK	▶	GO TO 8.
NG	▶	Repair or clean vacuum port.

8	CHECK VACUUM HOSES AND TUBES

1. Disconnect vacuum hoses between the air control valve (Power steering) and vacuum port, air control valve (Power steering) and air duct.
2. Check hoses and tubes for cracks, clogging, improper connection or disconnection.



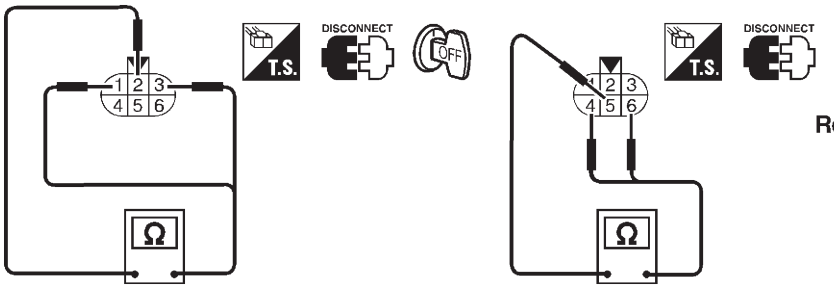
SEF109L

OK or NG

OK	▶	GO TO 9.
NG	▶	Repair hoses or tubes.

9	CHECK IACV-AAC VALVE-I

1. Disconnect IACV-AAC valve harness connector.
2. Check resistance between IACV-AAC valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.



Resistance:
Approximately 22Ω [at 20°C (68°F)]

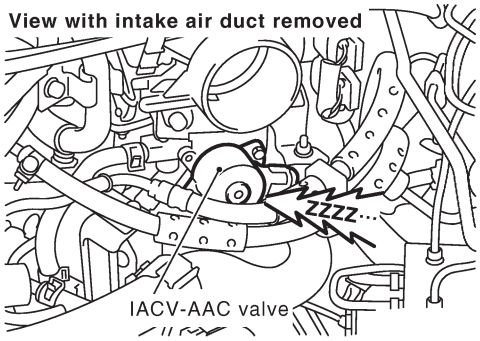
SEF344X

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace IACV-AAC valve assembly.

10	CHECK IACV-AAC VALVE-II

1. Reconnect IACV-AAC valve harness connector and ECM harness connector.
2. Turn ignition switch "ON" and "OFF", and ensure the IACV-AAC valve makes operating sound according to the ignition switch position.



SEC009C

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

11	REPLACE IACV-AAC VALVE

1. Replace IACV-AAC valve assembly.
2. Perform "Idle Air Volume Learning", EC-41.
   Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT	▶	**INSPECTION END**
INCMP	▶	Follow the construction of "Idle Air Volume Learning".

12	CHECK TARGET IDLE SPEED

1. Turn ignition switch "OFF".
2. Reconnect all harness connectors and vacuum hoses.
3. Start engine and warm it up to normal operating temperature.
4. Also warm up transmission to normal operating temperature.

- 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.

5. Stop vehicle with engine running.
6. Check target idle speed.
   M/T: 625±50 rpm (VQ30DE engine models)
   M/T: 675±50 rpm (VQ20DE engine models)
   A/T: 700±50 rpm (in "P" or "N" position)

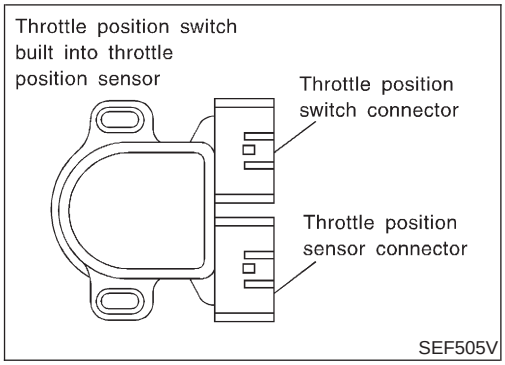
OK or NG

OK	▶	GO TO 13.
NG	▶	Perform "Idle Air Volume Learning", EC-41.

13	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**



Component Description

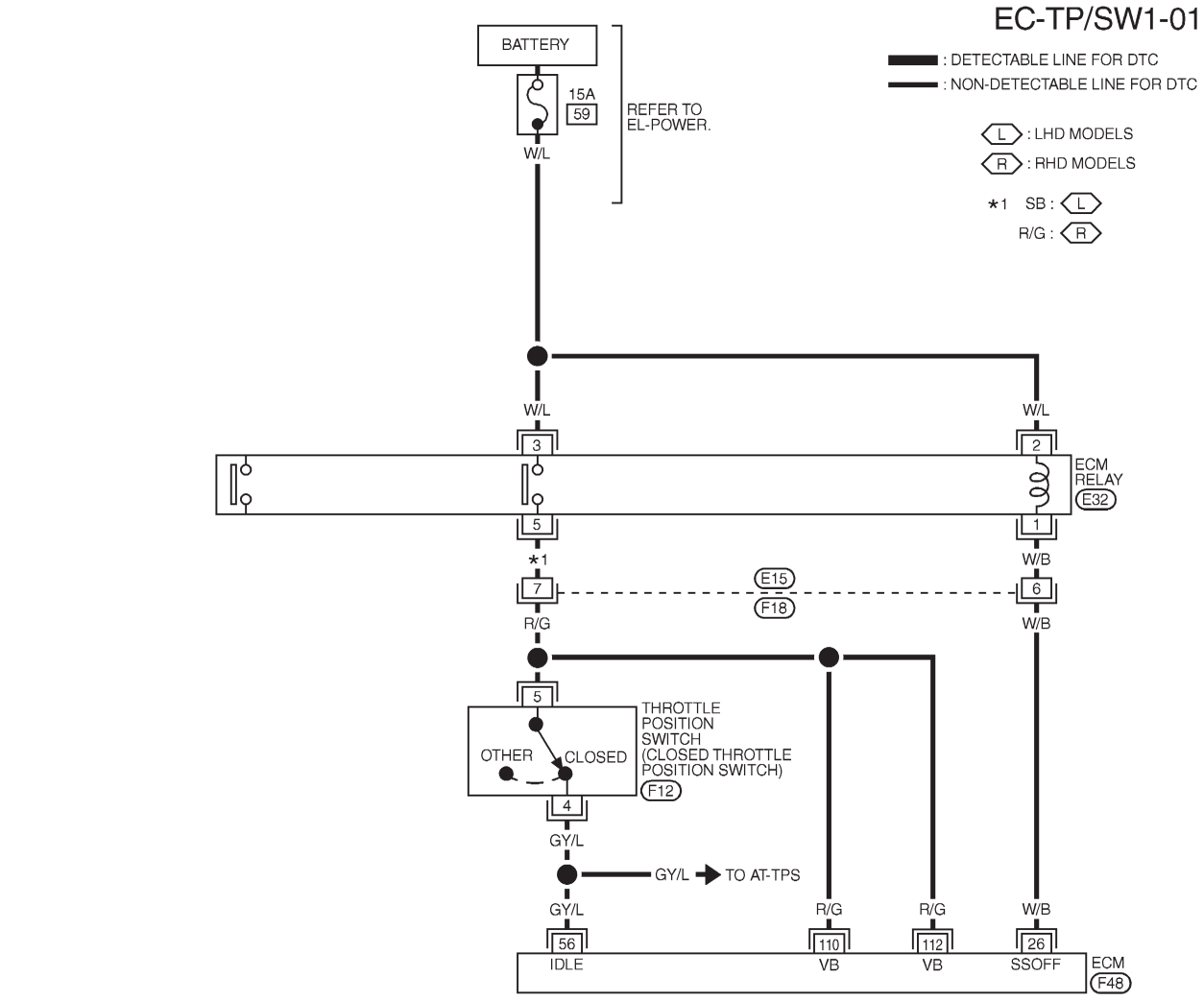
NFEC0256

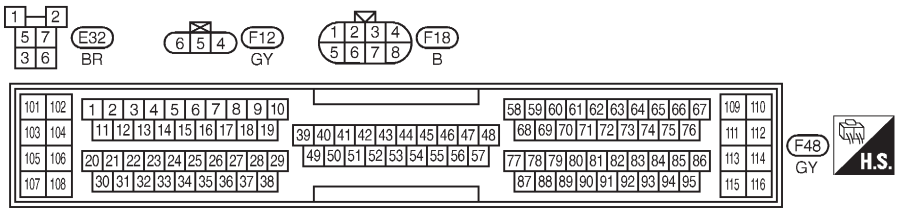
A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is used only for A/T control.

When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge volume control solenoid valve when the throttle position sensor is malfunctioning.

Wiring Diagram

=NFEC0262





MEC072D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
5	GY/L	THROTTLE POSITION SWITCH (CLOSED POSITION)	ENGINE RUNNING WITH ACCELERATOR PEDAL FULLY RELEASED UNDER WARM-UP CONDITION	BATTERY VOLTAGE
			IGN ON WITH ACCELERATOR PEDAL DEPRESSED	APPROX. 0V

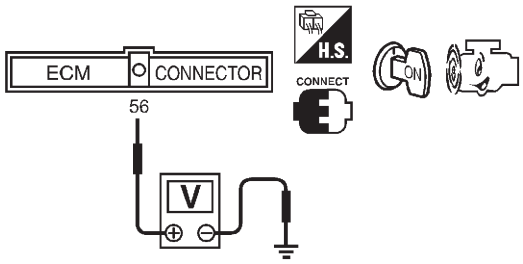
SEF626XD

Diagnostic Procedure

NFEC0263

1	CHECK OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM terminal 56 and ground under the following conditions.



Conditions	Voltage
Accelerator pedal is fully released.	Battery voltage
Accelerator pedal is depressed.	Approximately 0V

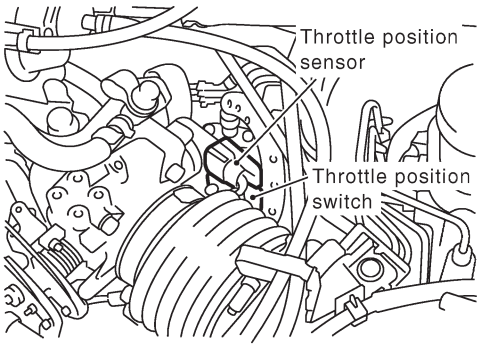
SEF023Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

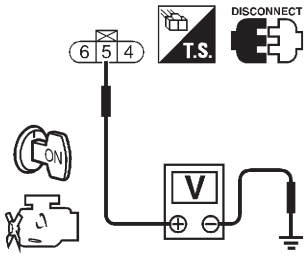
2	CHECK CLOSED THROTTLE POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle position switch harness connector.



SEC001C

3. Turn ignition switch “ON”.
4. Check voltage between throttle position switch terminal 5 and engine ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF346X

OK or NG

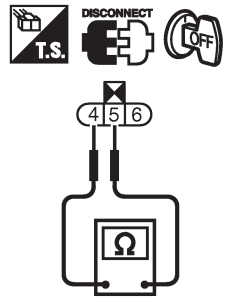
OK	▶	GO TO 4.
NG	▶	GO TO 3.

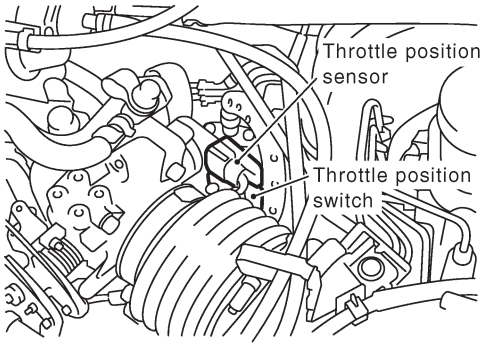
Diagnostic Procedure (Cont'd)

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E15, F18 ● Harness for open or short between throttle position switch and ECM relay ● Harness for open or short between throttle position switch and ECM	
▶	Repair harness or connectors.

4	CHECK CLOSED THROTTLE POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 56 and throttle position switch 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 5.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK THROTTLE POSITION SWITCH
1. Reconnect ECM harness connector and throttle position switch harness connector. 2. Start engine and warm it up to normal operating temperature. 3. Turn ignition switch "OFF". 4. Disconnect closed throttle position switch harness connector. 5. Check continuity between closed throttle position switch terminals 4 and 5 under the following conditions. Resistance measurement must be made with throttle position switch installed in vehicle.	





Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

SEC010C

OK or NG	
OK ▶	GO TO 7.
NG ▶	GO TO 6.

6	ADJUST THROTTLE POSITION SWITCH

Check the following items. Refer to "Basic Inspection", EC-90.

Items	Specifications
Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)

MTBL0623

Is it possible to adjust closed throttle position switch?

Yes or No

Yes	▶	GO TO 1.
No	▶	Replace throttle position switch.

7	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**

System Description

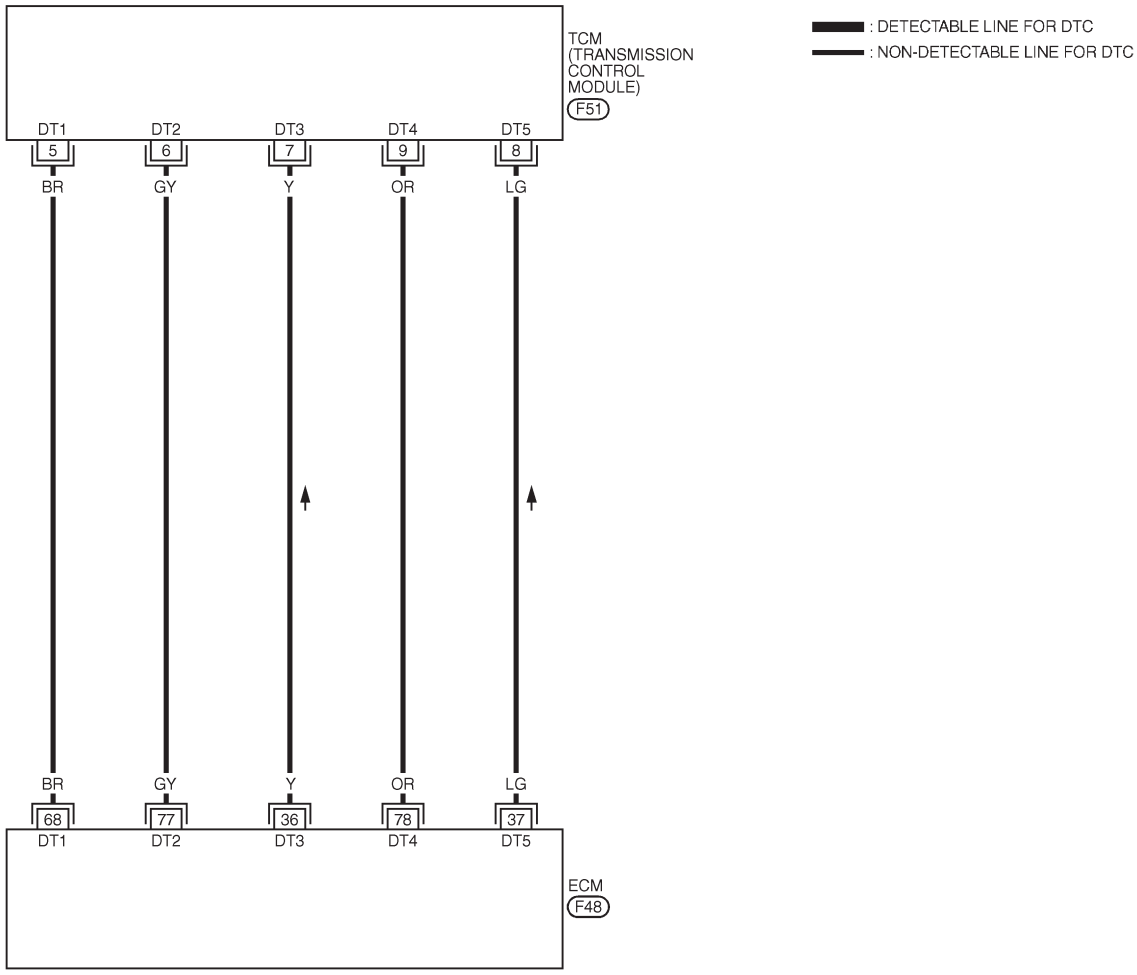
NFEC0264

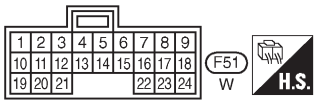
These circuit lines are used to control the smooth shifting up and down of A/T during the hard acceleration/ deceleration.
Voltage signals are exchanged between ECM and TCM (Transmission Control Module).

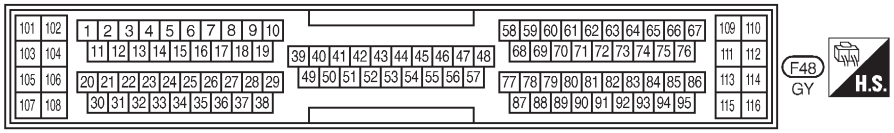
Wiring Diagram

=NFEC0269

EC-ATCONT-01







MEC073D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
36 37 68 77 78	Y LG BR GY OR	A/T COMMUNICATION LINE	ENGINE RUNNING AT IDLE SPEED	VOLTAGE FLUCTUATES BETWEEN 0 to 5V.

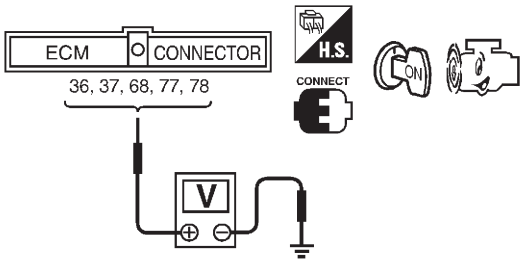
SEF043YA

Diagnostic Procedure

NFEC0270

1	CHECK OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM terminals 36, 37, 68, 77, 78 and ground.



Voltage should fluctuate between 0 to 5V.

SEF024Y

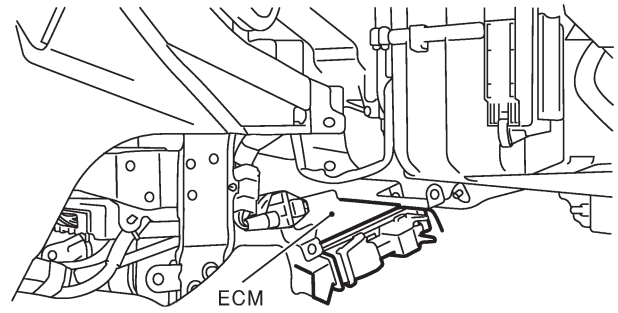
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

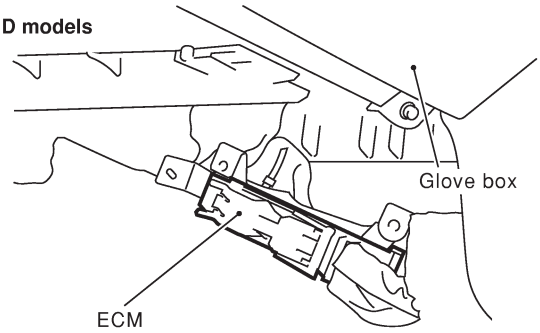
2	CHECK A/T CONTROL INPUT SIGNAL CIRCUIT FOR OPEN

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and TCM (Transmission Control Module) harness connector.

LHD models View with glove box removed

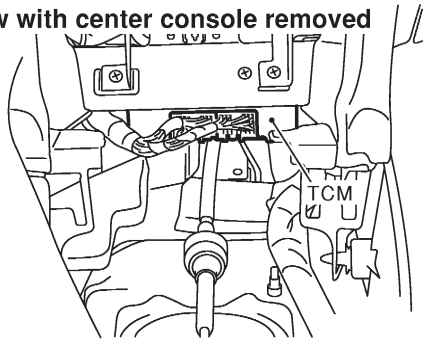


RHD models



SEF044Y

View with center console removed



SEF271X

3. Check harness continuity between the following terminals.

ECM	TCM
68	5
77	6
36	7
78	9
37	8

MTBL0405

Refer to Wiring Diagram.
Continuity should exist.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair harness or connectors.

3	CHECK A/T CONTROL INPUT SIGNAL CIRCUIT FOR SHORT

1. Check harness continuity between ECM terminals 36, 37, 68, 77, 78 and ground.
   Refer to Wiring Diagram.
   Continuity should not exist.
2. Also check harness for short to power.

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair short to ground or short to power in harness or connectos.

4	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Description

NFEC0523

SYSTEM DESCRIPTION

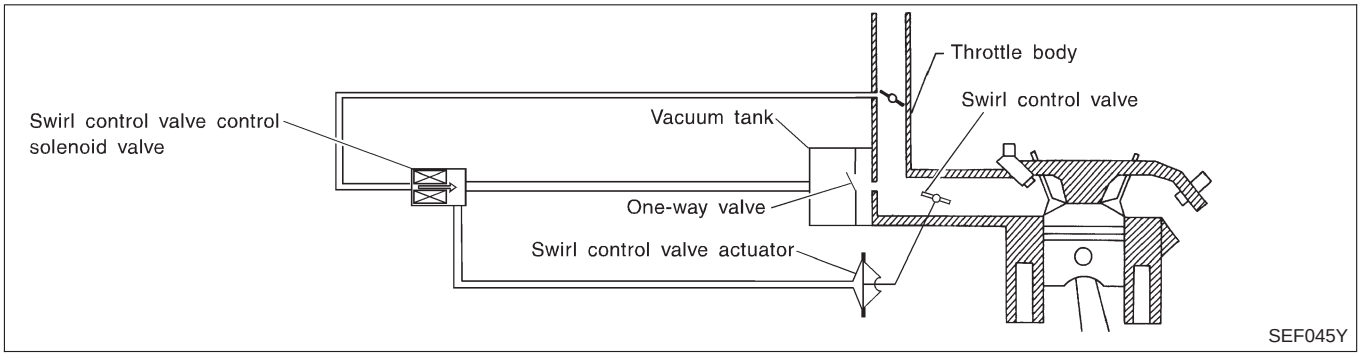
NFEC0523S01

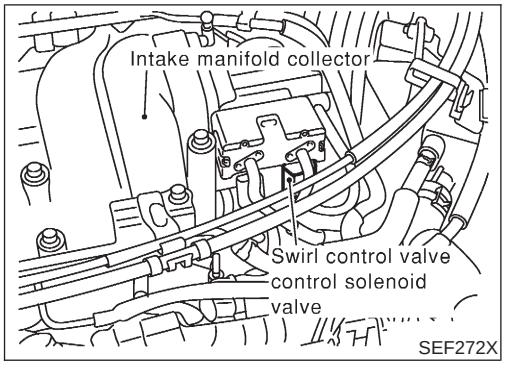
Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position	Swirl control valve control	Swirl control valve control solenoid valve ↓ Vacuum signal Swirl control valve actuator ↓ Swirl control valve
Ignition switch	Start signal		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		

This system has a swirl control valve in the intake passage of each cylinder.
While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.
Also, except when idling and during low engine speed operation, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

Throttle position sensor (Idle position)	Engine speed	Swirl control valve control solenoid valve	Swirl control valve
ON	Below 3,200 rpm	ON	Closed
OFF	Less than 3,200 rpm	ON	Closed
	More than 3,600 rpm	OFF	Open

When engine coolant temperature is below 10°C (50°F) and above 55°C (131°F), swirl control valve is kept open regardless of above condition.





COMPONENT DESCRIPTION

NFEC0523S02

Swirl Control Valve Control Solenoid Valve

NFEC0523S0201

The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply intake manifold vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.

CONSULT-II Reference Value in Data Monitor Mode

NFEC0524

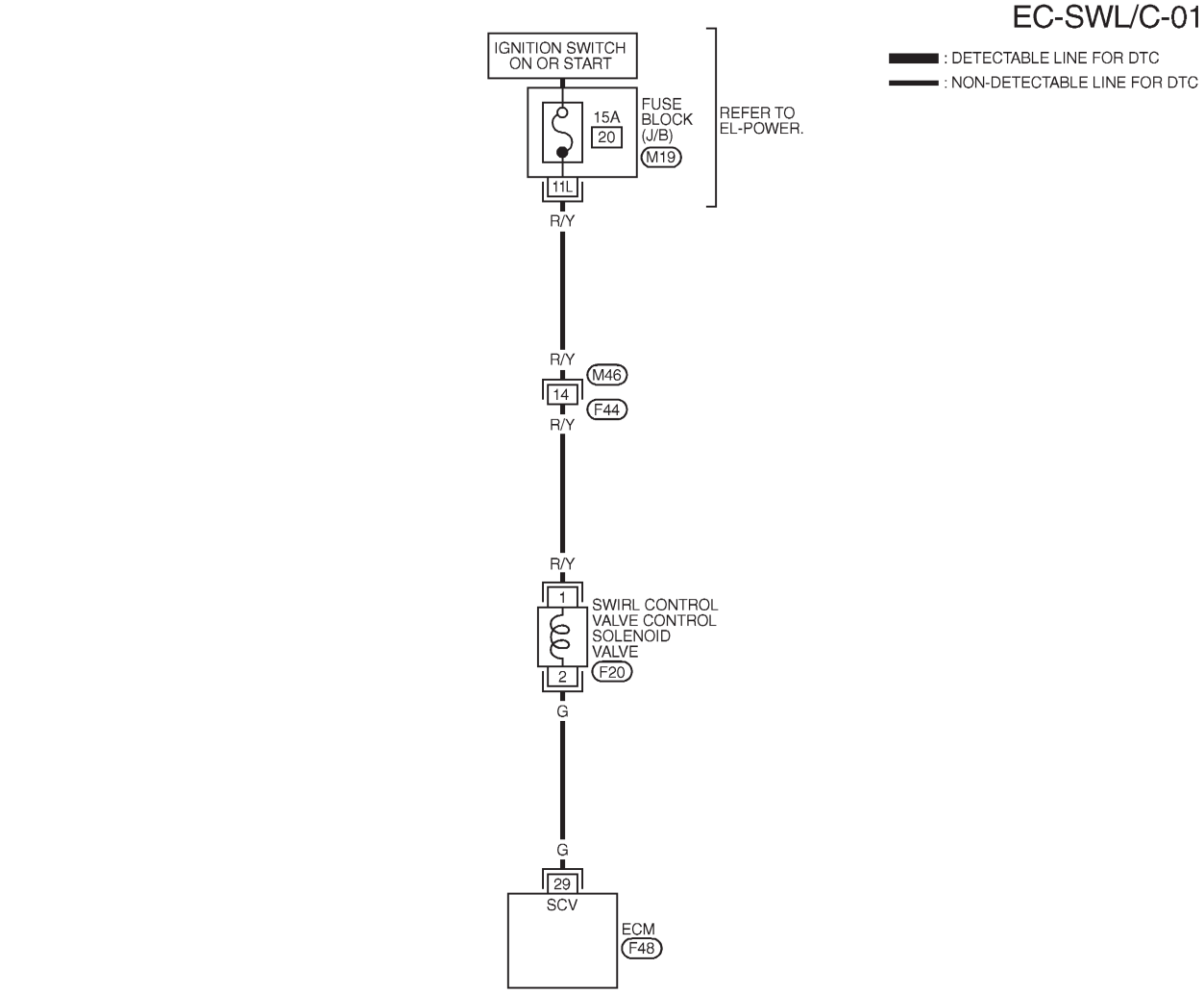
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWRL CONT S/V	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON
		Engine coolant temperature is above 55°C (131°F).	OFF

Wiring Diagram

NFEC0529

EC-SWL/C-01



REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-JUNCTION BOX (J/B)

MEC074D

ECM TERMINALS AND REFERENCE VALUE 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.

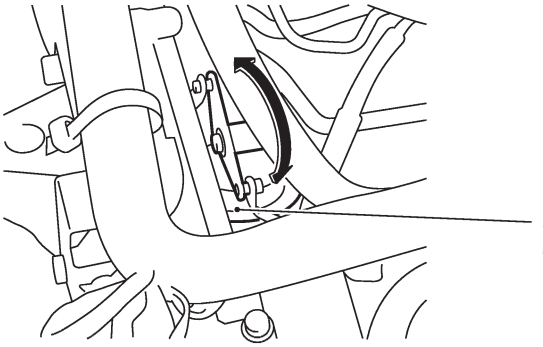
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
29	G	SWIRL CONTROL VALVE CONTROL SOLENOID VALVE	ENGINE RUNNING AT IDLE SPEED WITH ENGINE COOLANT TEMPERATURE BETWEEN 15°C (59°F) AND 50°C (122°F).	0 - 1V
			ENGINE RUNNING AT IDLE SPEED WITH ENGINE COOLANT TEMPERATURE ABOVE 55°C (131°F).	BATTERY VOLTAGE

SEF627XB

Diagnostic Procedure

NFEC0530

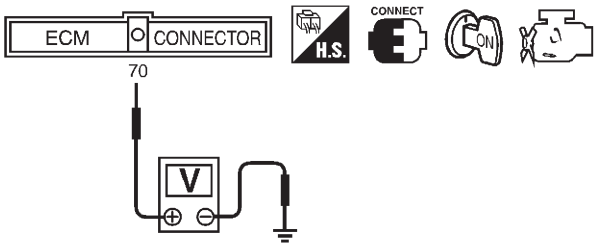
1	INSPECTION START	
Do you have CONSULT-II?		
Yes or No		
Yes	▶	GO TO 2.
No	▶	GO TO 3.

2	CHECK OVERALL FUNCTION	
With CONSULT-II 1. Start engine and let it idle. 2. Select “SWIRL CONT SOL/V” in “ACTIVE TEST” mode with CONSULT-II. 3. Touch “ON” and “OFF” alternately on CONSULT-II screen. 4. Make sure the swirl control valve actuator rod moves according to “SWIRL CONT SOL/V”.		
 SEF621X		
OK or NG		
OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

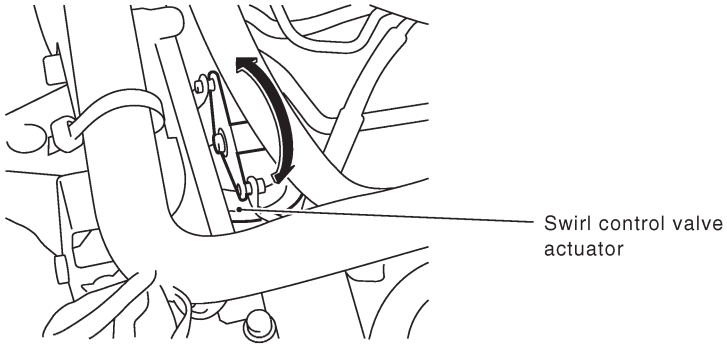
Without CONSULT-II

1. Turn ignition switch "ON".
2. Confirm that the voltage between ECM terminal 70 (Engine coolant temperature sensor signal) and ground is more than 2.72V. If the voltage is out of range, cool the engine down.



SEF016Y

3. Start engine and let it idle.
4. Make sure the swirl control valve actuator rod moves when revving to over 3,200 rpm from idle.



SEF621X

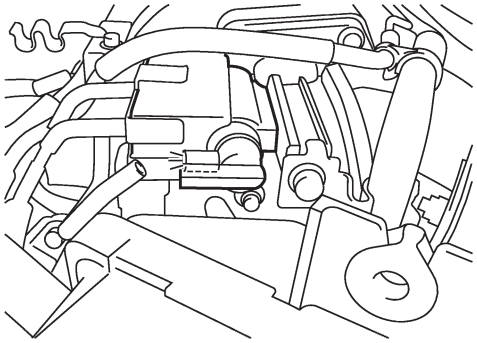
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 5.

4	CHECK VACUUM SOURCE

With CONSULT-II

1. Turn ignition switch "OFF".
2. Disconnect the vacuum hose connected to the swirl control valve actuator at vacuum tank.
3. Start engine and let it idle.
4. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Touch "ON" and "OFF" alternately on CONSULT-II screen.
6. Check vacuum existence under the following conditions.



SWIRL CONT SOL/V	Vacuum
ON	Should exist.
OFF	Should not exist.

SEF026Y

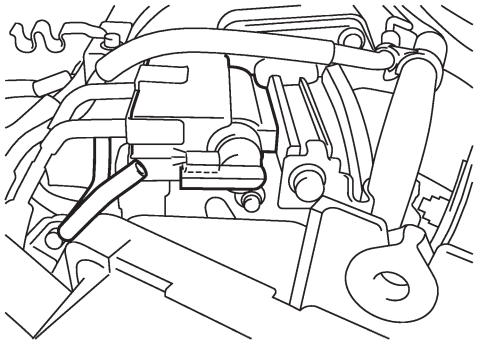
OK or NG

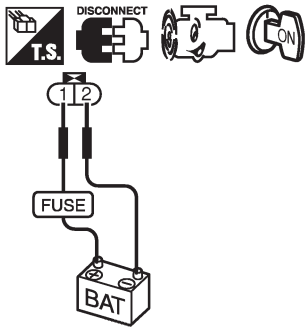
OK	▶	GO TO 6.
NG	▶	GO TO 7.

5	CHECK VACUUM SOURCE

Without CONSULT-II

1. Turn ignition switch "OFF".
2. Disconnect the swirl control valve control solenoid valve harness connector.
3. Disconnect the vacuum hose connected to the swirl control valve actuator at vacuum tank.
4. Start engine and let it idle.
5. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
6. Check vacuum existence under the following conditions.





Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

SEF027Y

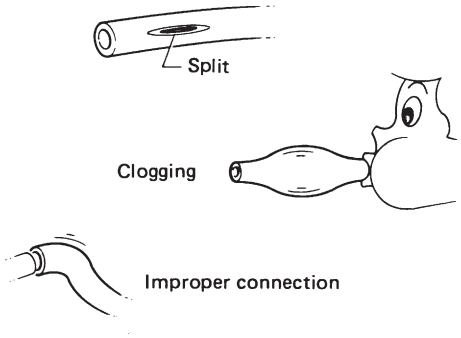
OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 8.

Diagnostic Procedure (Cont'd)

6	CHECK VACUUM HOSES AND TUBES

1. Turn ignition switch "OFF".
2. Remove vacuum hoses between the swirl control valve actuator and the vacuum tank.
3. Check hoses and tubes for cracks, clogging, improper connection or disconnection.



SEF109L

OK or NG

OK	▶	Repair or replace swirl control valve actuator.
NG	▶	Repair or replace vacuum hoses or tubes.

7	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON" and "OFF" alternately on CONSULT-II screen.

ACTIVE TEST	
SWIRL CONT SOL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
IACV-AAC/V	XXX step

SEF069Y

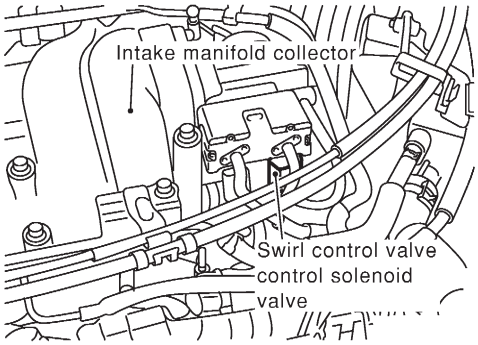
4. Make sure that clicking sound is heard from the swirl control valve control solenoid valve.

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 8.

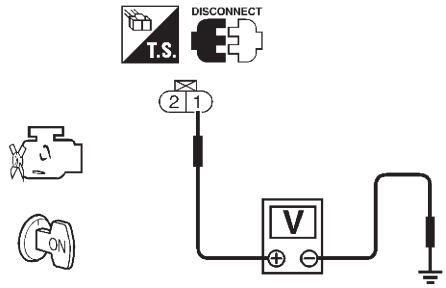
8	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect swirl control valve control solenoid valve harness connector.



SEF272X

3. Turn ignition switch "ON".
4. Check voltage between swirl control valve control solenoid valve terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF619X

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M46, F44
- 15A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse

	▶	Repair harness or connectors.

10	CHECK SWIRL CONTROL VALVE 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 29 and swirl control valve control solenoid valve terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

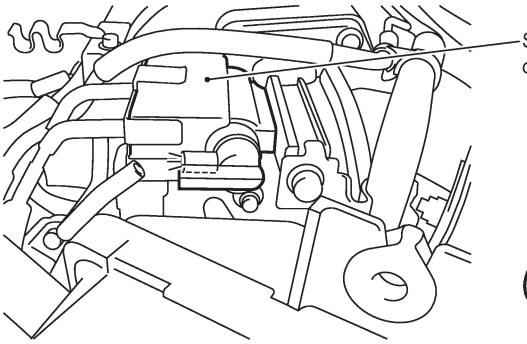
OK or NG

OK	▶	GO TO 11.
NG	▶	Repair open circuit, short to ground or short to power in harness connectors.

11	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

With CONSULT-II

1. Reconnect the disconnected harness connectors.
2. Start engine and let it idle.
3. Remove vacuum hose connected to swirl control valve actuator.
4. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Touch "ON" and "OFF" on CONSULT-II screen.
6. Check vacuum existence and operation delay time under the following conditions.



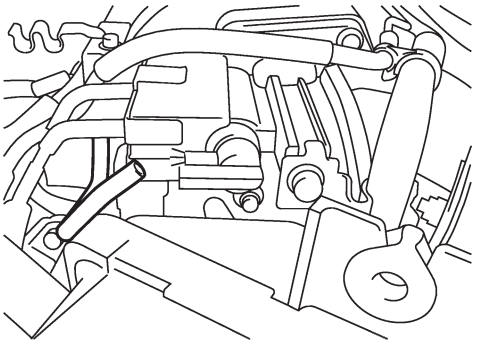
SWIRL CONT SOL/V	Vacuum
ON	should exist.
OFF	should not exist.

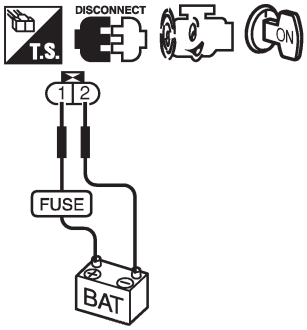
Operation takes less than 1 second.

SEF046Y

Without CONSULT-II

1. Reconnect ECM harness connector.
2. Remove vacuum hose connected to swirl control valve actuator.
3. Start engine and let it idle.
4. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
5. Check vacuum existence and operation delay time under the following conditions.





Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

Operation takes less than 1 second.

SEF047Y

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace intake manifold collector assembly.

12	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

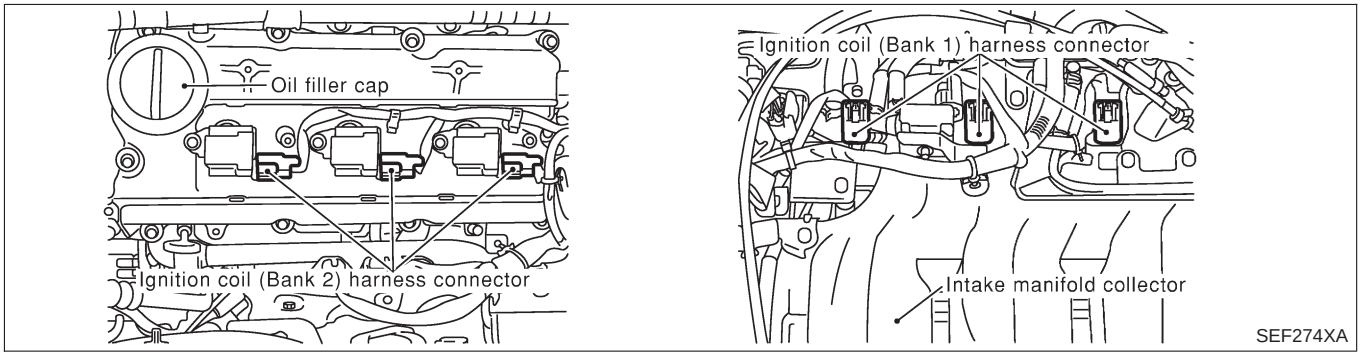
Component Description

NFEC0863

IGNITION COIL & POWER TRANSISTOR

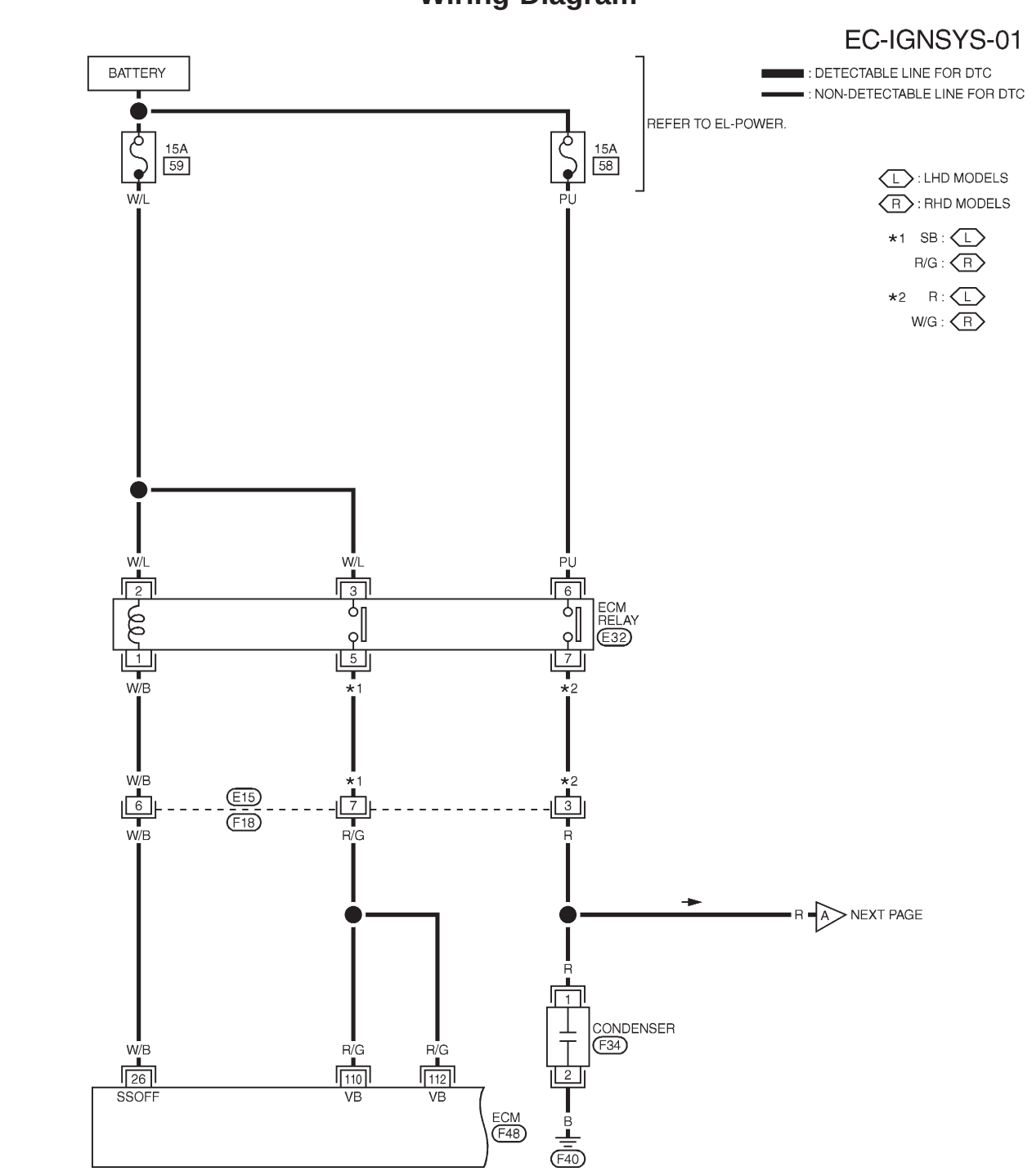
NFEC0863S01

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.



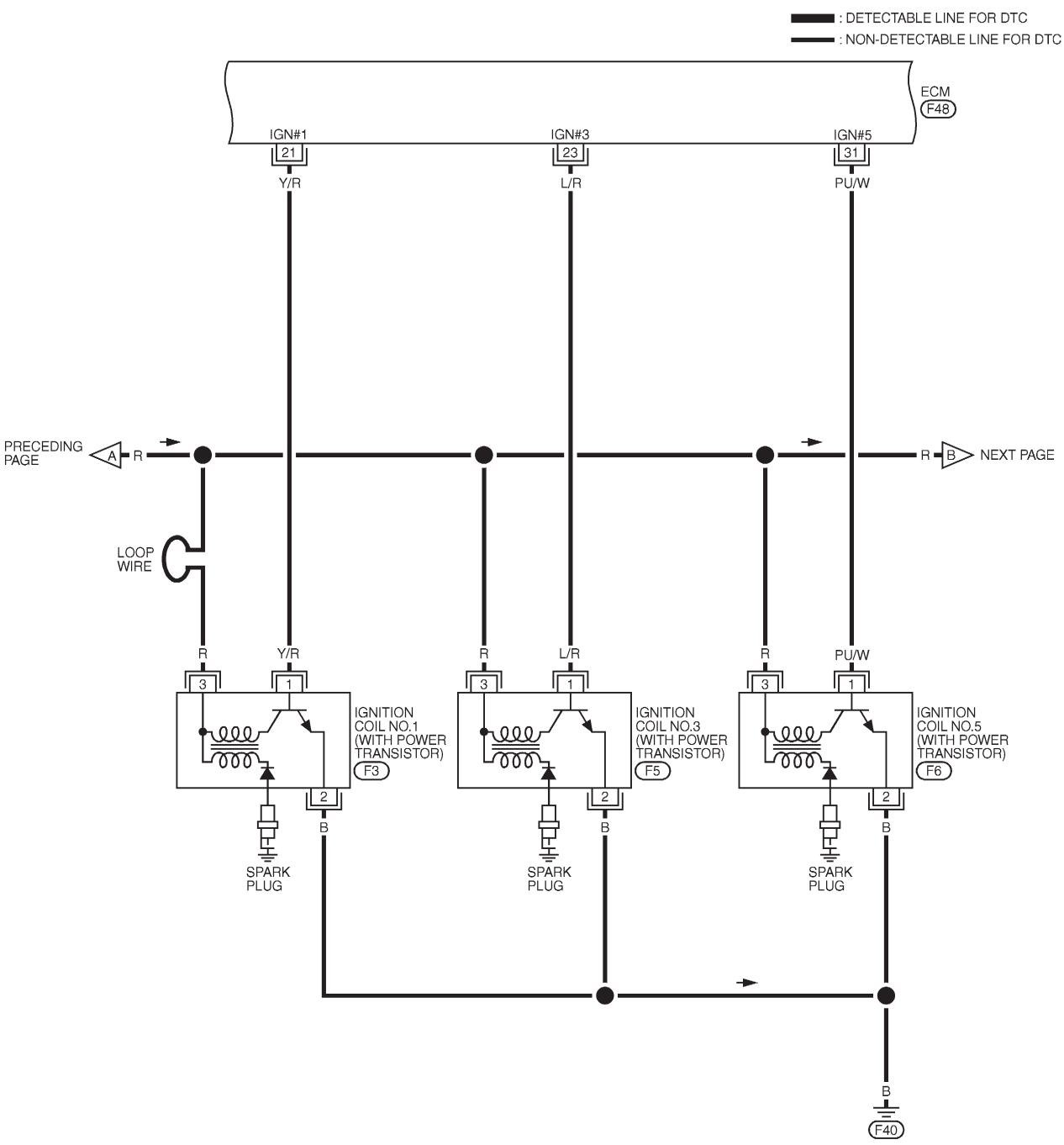
Wiring Diagram

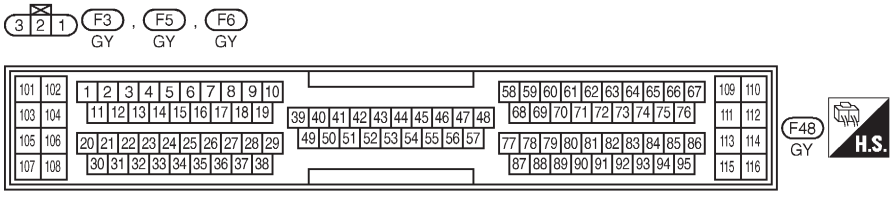
NFEC0864



MEC075D

EC-IGNSYS-02

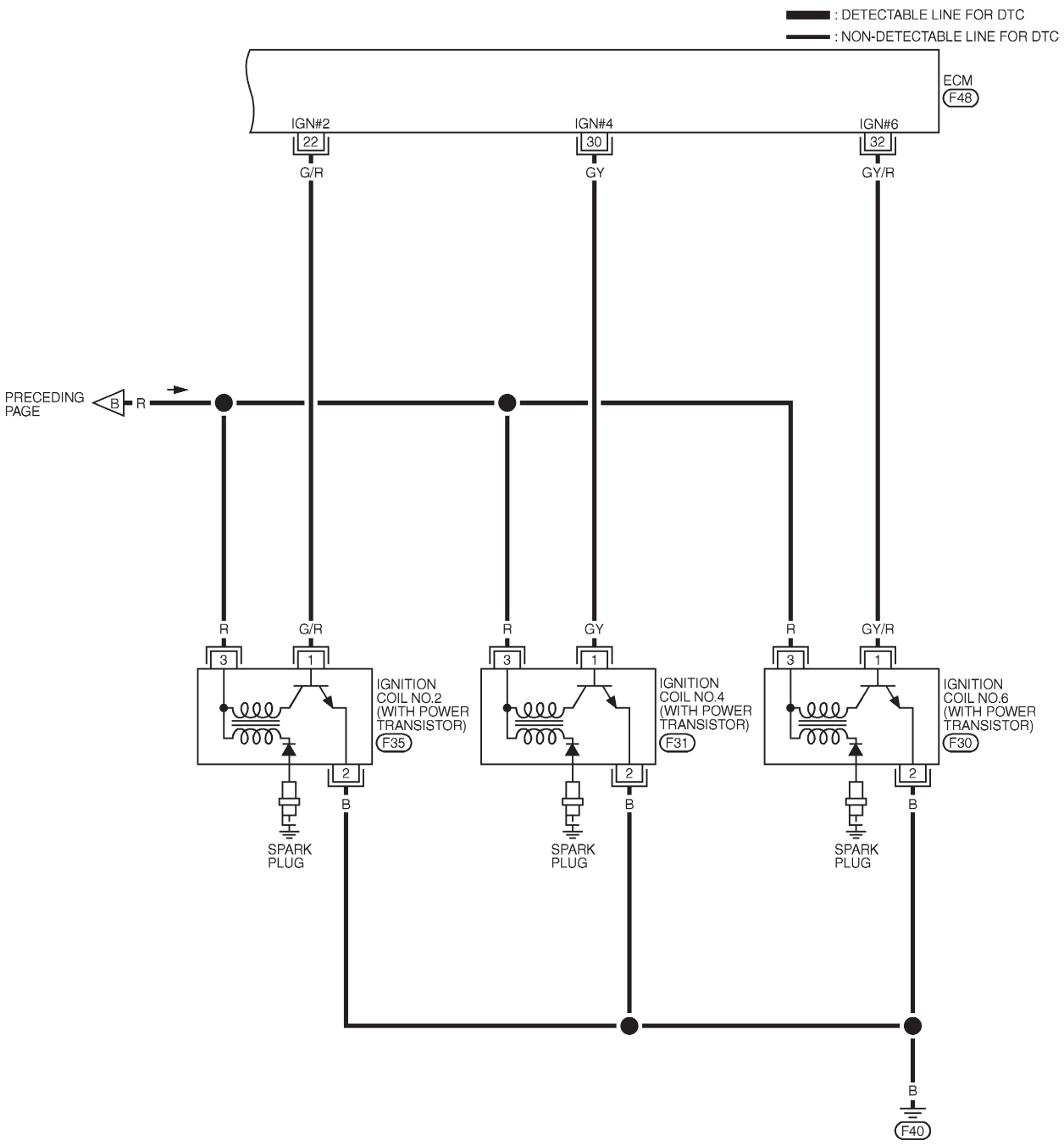


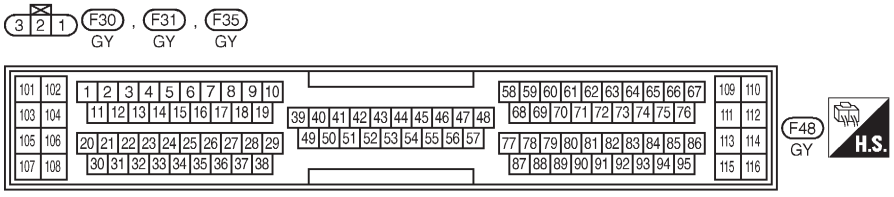


MEC076D

Wiring Diagram (Cont'd)

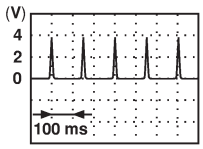
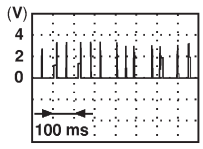
EC-IGNSYS-03





MEC077D

ECM TERMINALS AND REFERENCE VALUE 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 THE ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
21	Y/R	IGNITION SIGNAL NO. 1	ENGINE RUNNING AT IDLE SPEED UNDER THE WARM UP CONDITION	0 - 0.2V★ 
22	G/R	IGNITION SIGNAL NO. 2		
23	L/R	IGNITION SIGNAL NO. 3		
30	GY	IGNITION SIGNAL NO. 4	ENGINE RUNNING AT 2,500 RPM	0 - 0.2V★ 
31	PU/W	IGNITION SIGNAL NO. 5		
32	GY/R	IGNITION SIGNAL NO. 6		

★ : AVERAGE VOLTAGE FOR PULSE SIGNAL (ACUTUAL PULSE SIGNAL CAN BE CONFIRMED BY OSCILLOSCOPE.) SEF860Y

Diagnostic Procedure

NFEC0865

1	INSPECTION 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 all circuits do not produce a momentary engine speed drop.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS AIF SE-B1	XXX V
IACV-AAC/V	XXX step

SEF070Y

OK or NG

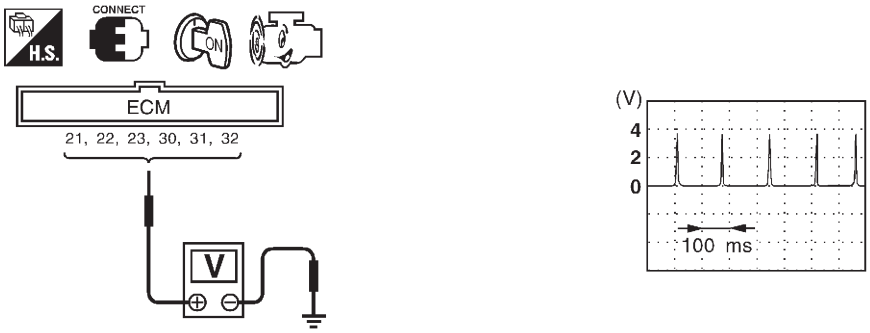
OK	▶	INSPECTION END
NG	▶	GO TO 13.

Diagnostic Procedure (Cont'd)

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 21, 22, 23, 30, 31, 32 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



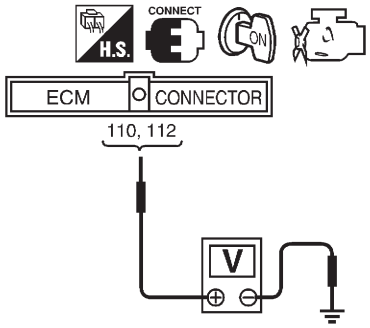
SEF071Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 13.

4	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check voltage between ECM terminals 110, 112 and ground with CONSULT-II or tester.



Voltage: Battery voltage

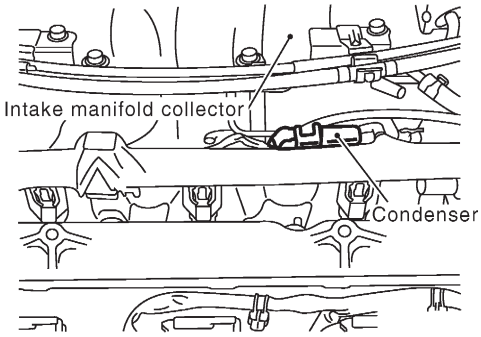
SEF366X

OK or NG

OK	▶	GO TO 5.
NG	▶	Go to TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-127.

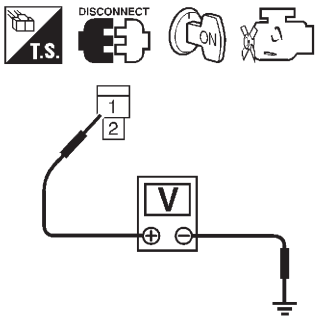
5	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.



SEF275X

3. Turn ignition switch ON.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

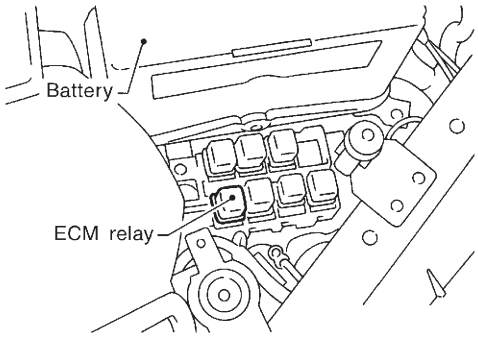
SEF367X

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 6.

6	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect ECM relay.



SEF589PB

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.

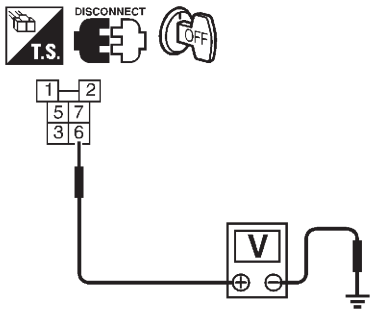
OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

Diagnostic Procedure (Cont'd)

7	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F18, E15 ● 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

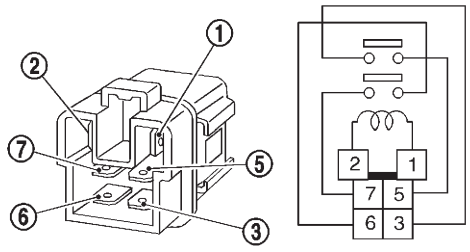
SEF368X

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART
Check the following. ● 15A fuse ● Harness for open and short between ECM relay and fuse	
▶	Repair or replace harness or connectors.

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



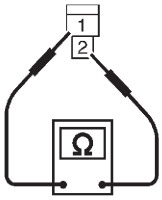
Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

SEF296X

OK or NG

OK	▶	GO TO 18.
NG	▶	Replace ECM relay.

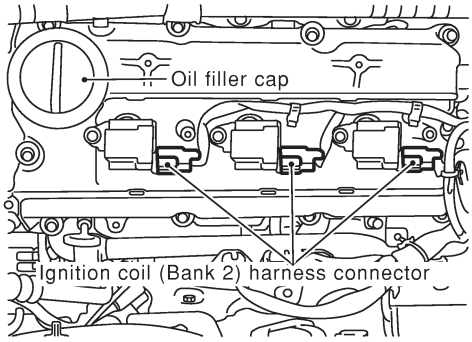
11	CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch OFF. 2. Check harness continuity between condenser terminal 2 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to power. **OK or NG**		
OK	▶	GO TO 12.
NG	▶	Repair open circuit or short to power in harness or connectors.

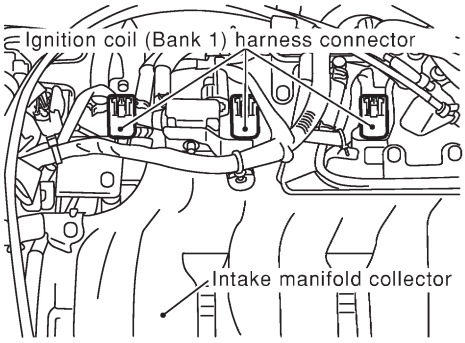
12	CHECK CONDENSER	
Check resistance between condenser terminals 1 and 2.   **Resistance: Above 1MΩ at 25°C (77°F)** SEF369X **OK or NG**		
OK	▶	GO TO 13.
NG	▶	Replace condenser.

Diagnostic Procedure (Cont'd)

13	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

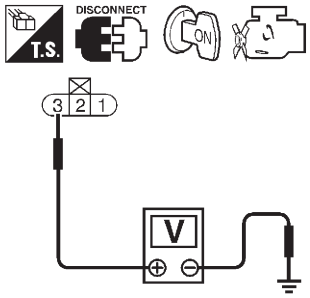
1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect ignition coil harness connector.





SEF274XA

4. Turn ignition switch ON.
5. Check voltage between ignition coil terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF370X

OK or NG

OK	▶	GO TO 15.
NG	▶	GO TO 14.

14	DETECT MALFUNCTIONING PART

Check the harness for open or short between ignition coil and harness connector F18.

	▶	Repair or replace 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

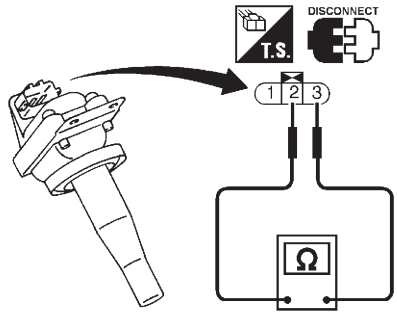
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 21, 22, 23, 30, 31, 32 and ignition coil terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

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

Check resistance between ignition coil terminals 2 and 3.



Terminals	Resistance	Result
2 and 3	Not 0Ω	OK
	0Ω	NG

SEF371X

OK or NG

OK	▶	GO TO 18.
NG	▶	Replace ignition coil with power transistor.

18	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

▶ **INSPECTION END**

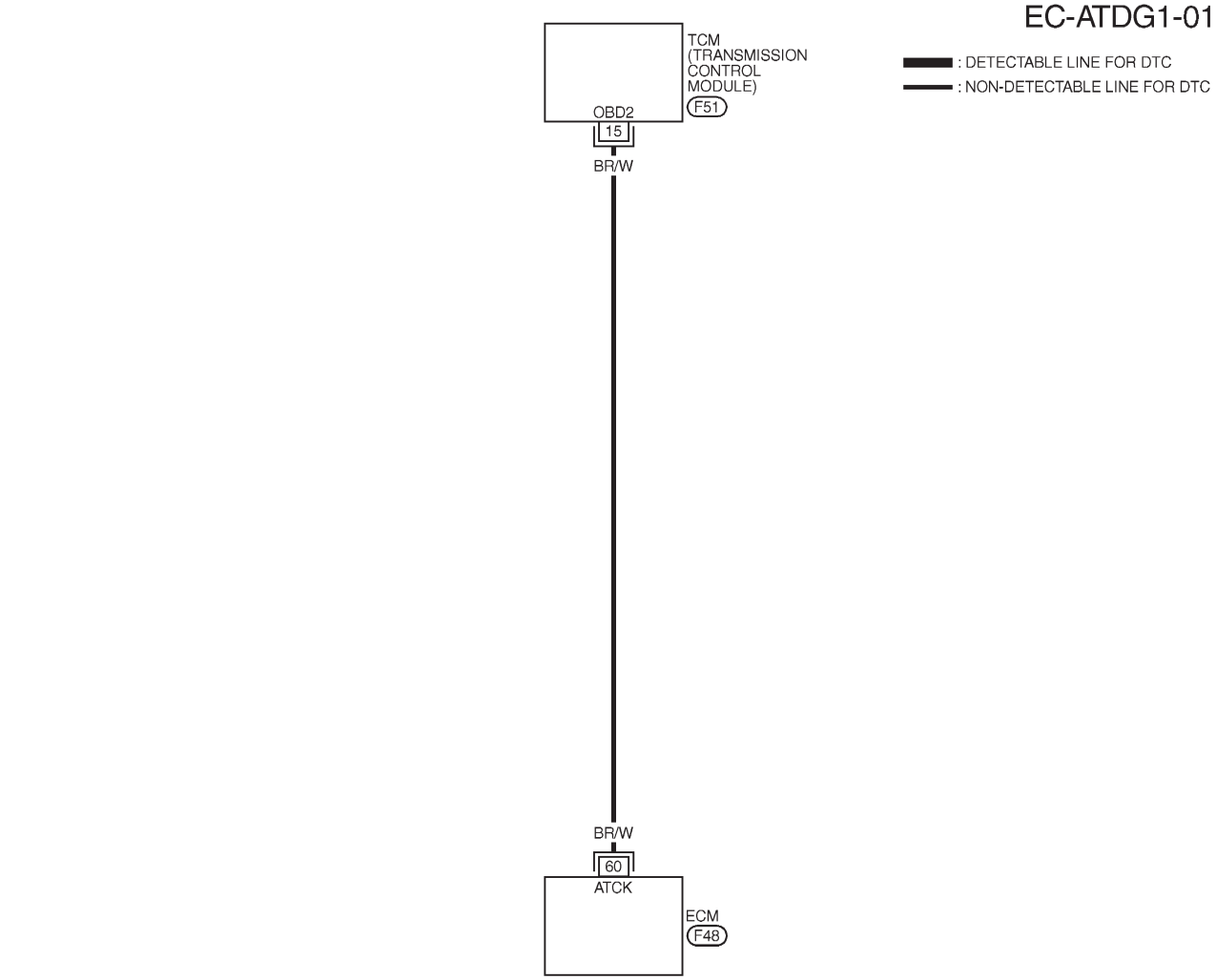
Component Description

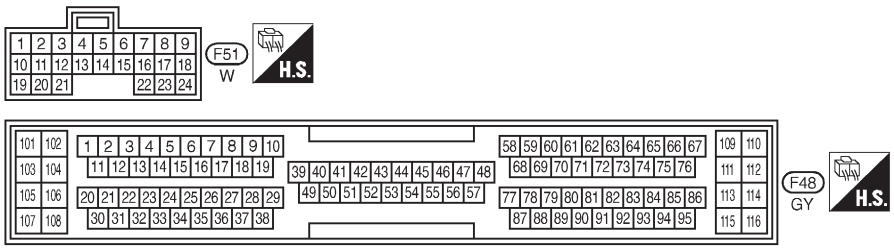
NFEC0361

The malfunction information related to A/T (Automatic Transmission) is transferred through the line (circuit) from TCM (Transmission control module) to ECM.

Wiring Diagram

=NFEC0365





MEC078D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
60	BR/W	A/T DIAGNOSIS COMMUNICATION LINE	ENGINE RUNNING AT IDLE SPEED	VOLTAGE FLUCTUATES BETWEEN 0 to 2V.

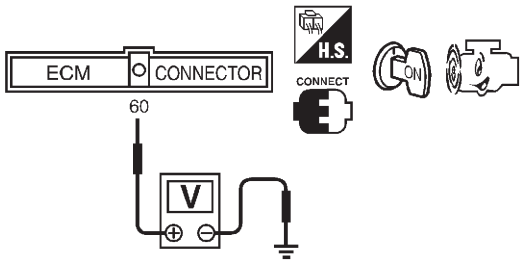
SEF048YA

Diagnostic Procedure

NFEC0366

1	CHECK OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM terminal 60 and ground.



Voltage should fluctuate between 0 - 2V.

SEF025Y

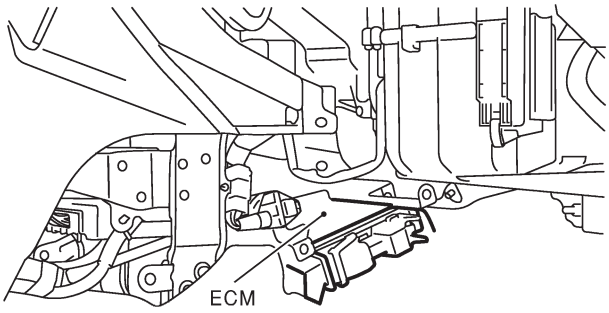
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

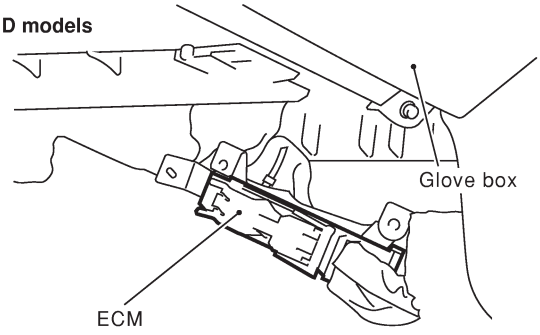
2	CHECK A/T DIAGNOSIS COMMUNICATION LINE INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and TCM (Transmission Control Module) harness connector.

LHD models View with glove box removed

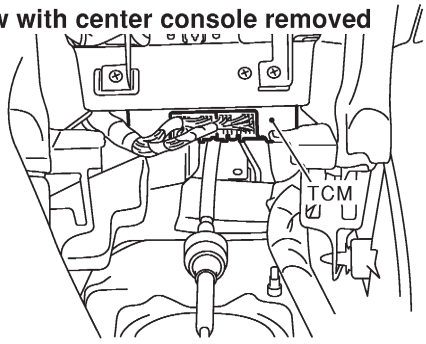


RHD models



SEF044Y

View with center console removed



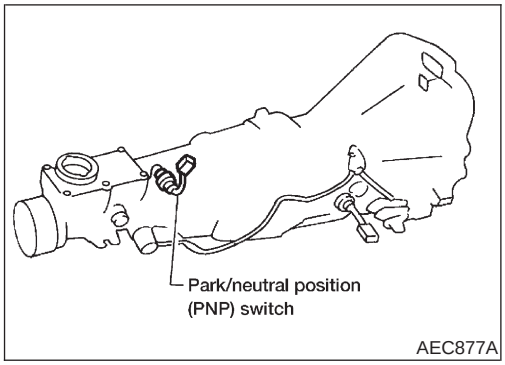
SEF271X

3. Check harness continuity between ECM terminal 60 and TCM terminal 15. 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 INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Component Description

NFEC0367

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.
For A/T models, the park/neutral position (PNP) switch assembly also includes a transmission range switch to detect selector lever position.

CONSULT-II Reference Value in Data Monitor Mode

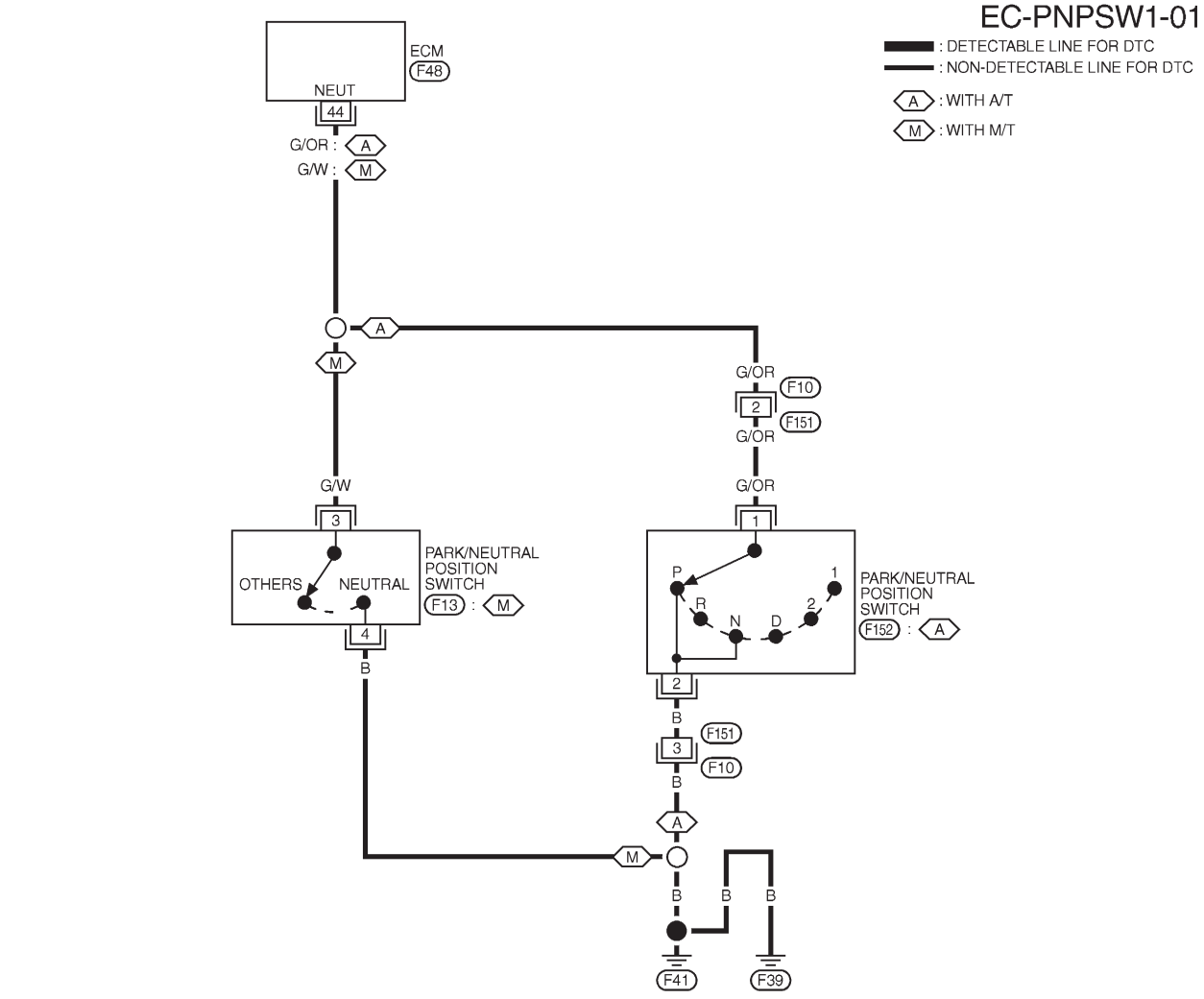
NFEC0368

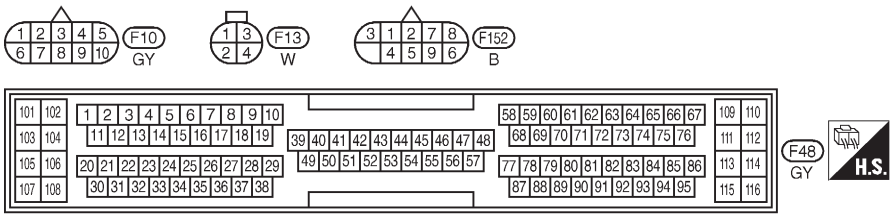
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: “P” or “N” (A/T models) Neutral (M/T models)	ON
		Except above	OFF

Wiring Diagram

NFEC0373





MEC053D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
44	G/OR (A/T) G/W (M/T)	PARK/NEUTRAL POSITION (PNP) SWITCH	IGN ON WITH GEAR POSITION "N" OR "P"(A/T), GEAR POSITION NEUTRAL (M/T)	APPROX. 0V
			IGN ON WITHOUT THE ABOVE GEAR POSITION	BATTERY VOLTAGE

SEF635XC

Diagnostic Procedure

NFEC0374

FOR M/T MODELS

NFEC0374S01

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. 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.

DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

Shift lever position	P/N POSI SW
Neutral position	ON
Except the above position	OFF

SEF049Y

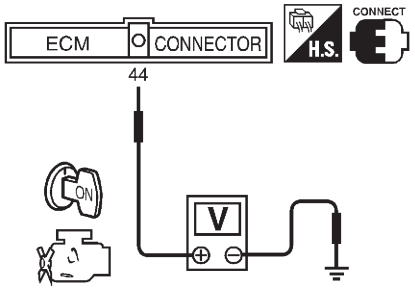
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 44 and ground under the following conditions.



Shift lever position	Voltage
Neutral position	Apporox. 0V
Except the above position	Battery voltage

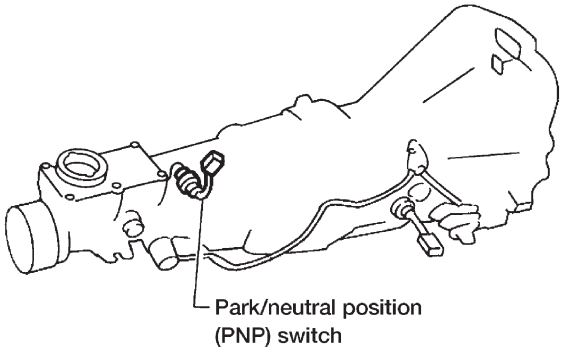
SEF050Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.



AEC877A

3. Check harness continuity between PNP switch terminal 4 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 PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 44 and PNP switch 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 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK PARK/NEUTRAL POSITION (PNP) SWITCH

Refer to MT-9, "Position Switch Check".

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace park/neutral position (PNP) switch.

7	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

	▶	**INSPECTION END**

Diagnostic Procedure (Cont'd)

FOR A/T MODELS

=NFEC0374S02

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. 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.

DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

Selector lever position	P/N POSI SW
"N" and "P" position	ON
Except the above position	OFF

SEF028Y

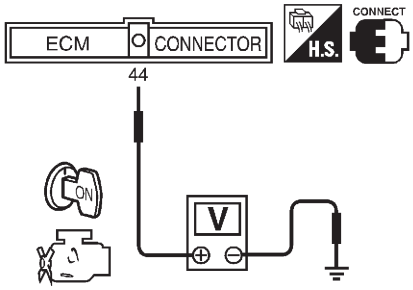
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 44 and ground under the following conditions.



Selector lever position	Voltage
"P" and "N" position	Apporox. 0V
Except the above position	Battery voltage

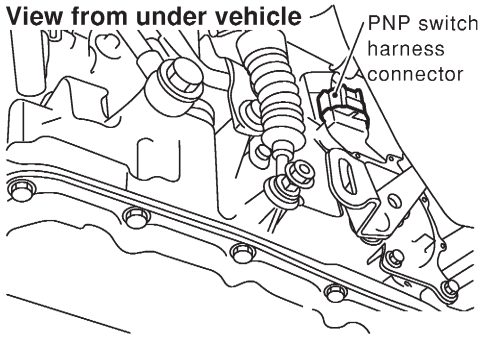
SEF029Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.



SEF279X

3. Check harness continuity between PNP switch terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F10, F151
- Harness for open or short between park/neutral position (PNP) switch and engine ground

	▶	Repair open circuit or short to power in harness or connectors.

6	CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 44 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 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F10, F151
- Harness for open or short between ECM and park/neutral position (PNP) switch

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

8	CHECK PARK/NEUTRAL POSITION (PNP) SWITCH

Refer to AT-125, "Diagnostic Procedure".

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace park/neutral position (PNP) switch.

Diagnostic Procedure (Cont'd)

9	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

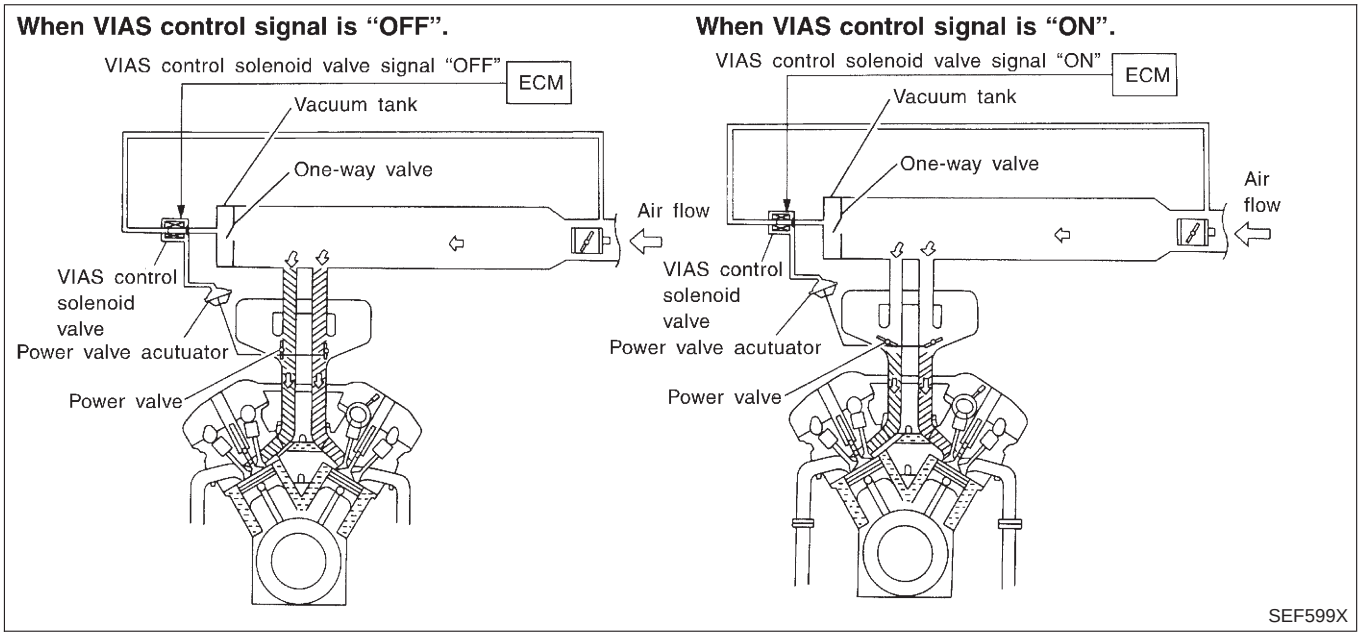
Description

SYSTEM DESCRIPTION

NFEC0596

NFEC0596S01

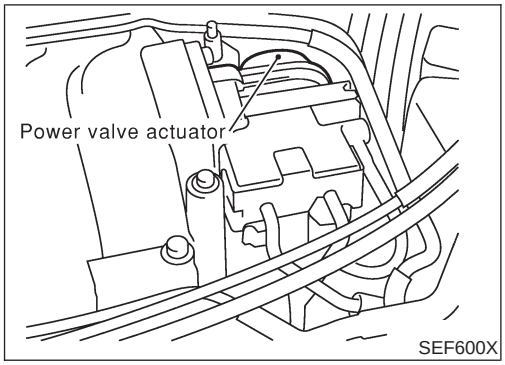
Sensor	Input Signal to ECM	ECM function	Actuator
Mass air flow sensor	Amount of intake air	VIAS control	VIAS control solenoid valve
Throttle position sensor	Throttle position		
Closed throttle position	Throttle valve idle position		
Ignition switch	Start signal		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Engine coolant temperature sensor	Engine coolant temperature		

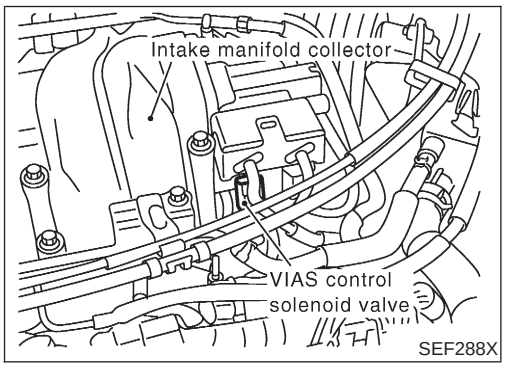


When the engine is running at low or medium speed, the power valve is fully closed. Under this condition, the effective suction port length is equivalent to the total length of the intake manifold collector's suction port including the intake valve. This long suction port provides increased air intake which results in improved suction efficiency and higher torque generation.

The surge tank and one-way valve are provided. When engine is running at high speed, the ECM sends the signal to the VIAS control solenoid valve. This signal introduces the intake manifold vacuum into the power valve actuator and therefore opens the power valve to two suction passages together in the collector.

Under this condition, the effective port length is equivalent to the length of the suction port provided independently for each cylinder. This shortened port length results in enhanced engine output with reduced suction resistance under high speeds.





COMPONENT DESCRIPTION

NFEC0596S02

Power Valve

NFEC0596S0201

The power valve is installed in intake manifold collector and used to control the suction passage of the variable induction air control system. It is set in the fully closed or fully opened position by the power valve actuator operated by the vacuum stored in the surge tank. The vacuum in the surge tank is controlled by the VIAS control solenoid valve.

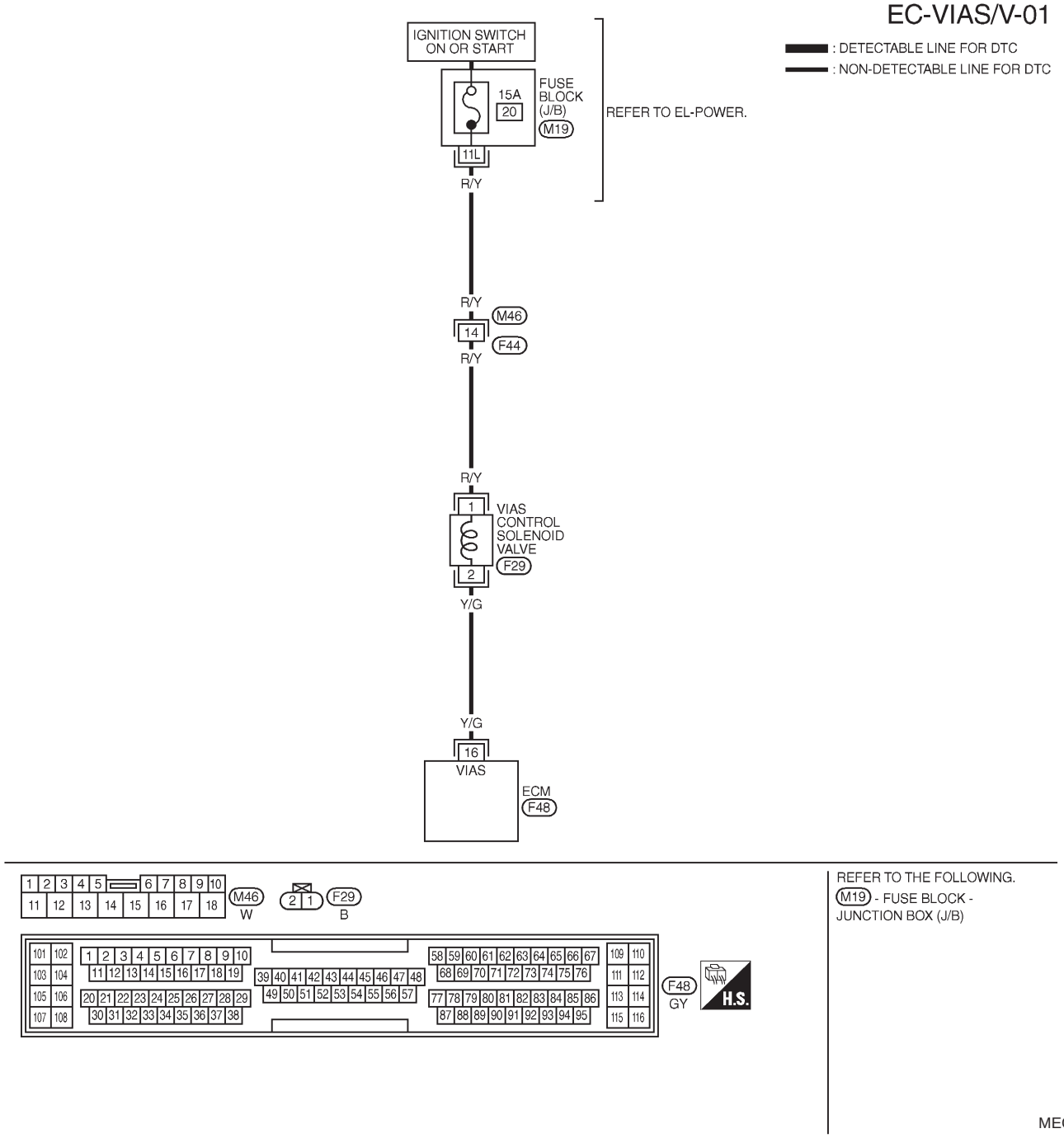
VIAS Control Solenoid Valve

NFEC0596S0202

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and feeds the vacuum signal to the power valve actuator.

Wiring Diagram

NFEC0597



MEC862C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
16	Y/G	VIAS CONTROL SOLENOID VALVE	ENGINE RUNNING AT IDLE SPEED	BATTERY VOLTAGE
			ENGINE RUNNING ABOVE 5,000 RPM	0 - 1.0V

SEF636XB

Diagnostic Procedure

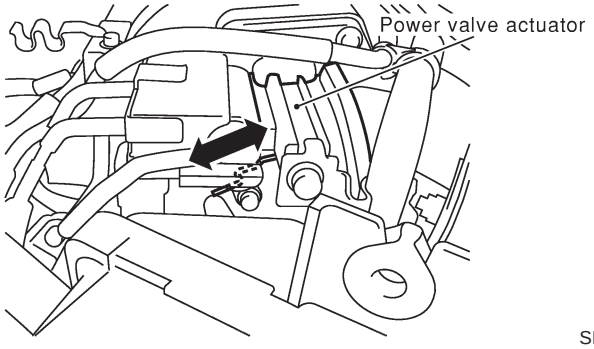
NFEC0598

1 CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode with CONSULT-II.
3. Turn VIAS control solenoid valve “ON” and “OFF”, and make sure that power valve actuator rod moves.

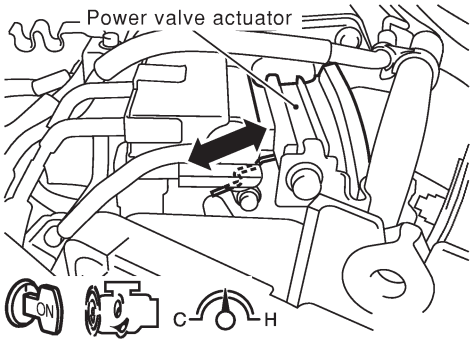
ACTIVE TEST	
VIAS SOL VALVE	OFF
MONITOR	
ENG SPEED	XXX rpm
IACV-AAC/V	XXX step



SEC236C

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Rev engine quickly up to above 5,000 rpm and make sure that power valve actuator rod moves.



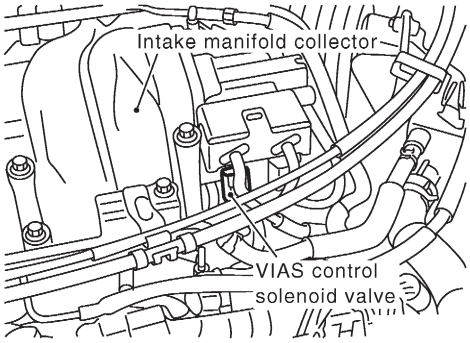
SEF052Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

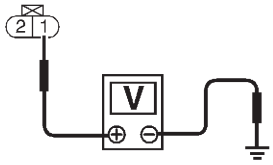
2	CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Stop engine.
2. Disconnect VIAS control solenoid valve harness connector.



SEF288X

3. Turn ignition switch "ON".
4. Check voltage between terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF603X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M46, F44
- 15A fuse
- Harness continuity between fuse and VIAS control solenoid valve

	▶	Repair harness or connectors.

4	CHECK VIAS 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 16 and terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

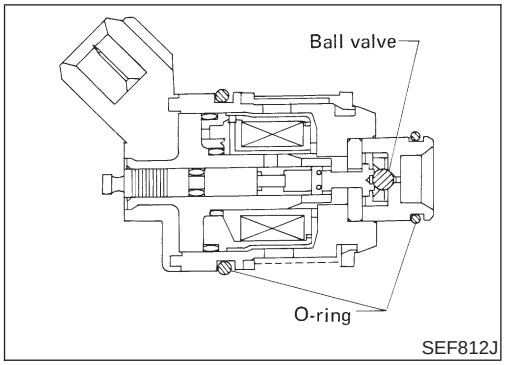
OK or NG

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

Diagnostic Procedure (Cont'd)

5	RETEST OVERALL FUNCTION	
1. Reconnect harness connectors disconnected. 2. Perform Test No. 1 again. **OK or NG**		
OK	▶	**INSPECTION END**
NG	▶	GO TO 6.

6	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126. **OK or NG**		
OK	▶	Replace VIAS control solenoid valve as intake manifold collector assembly.
NG	▶	Repair or replace harness or connectors.



Component Description

NFEC0383

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

NFEC0384

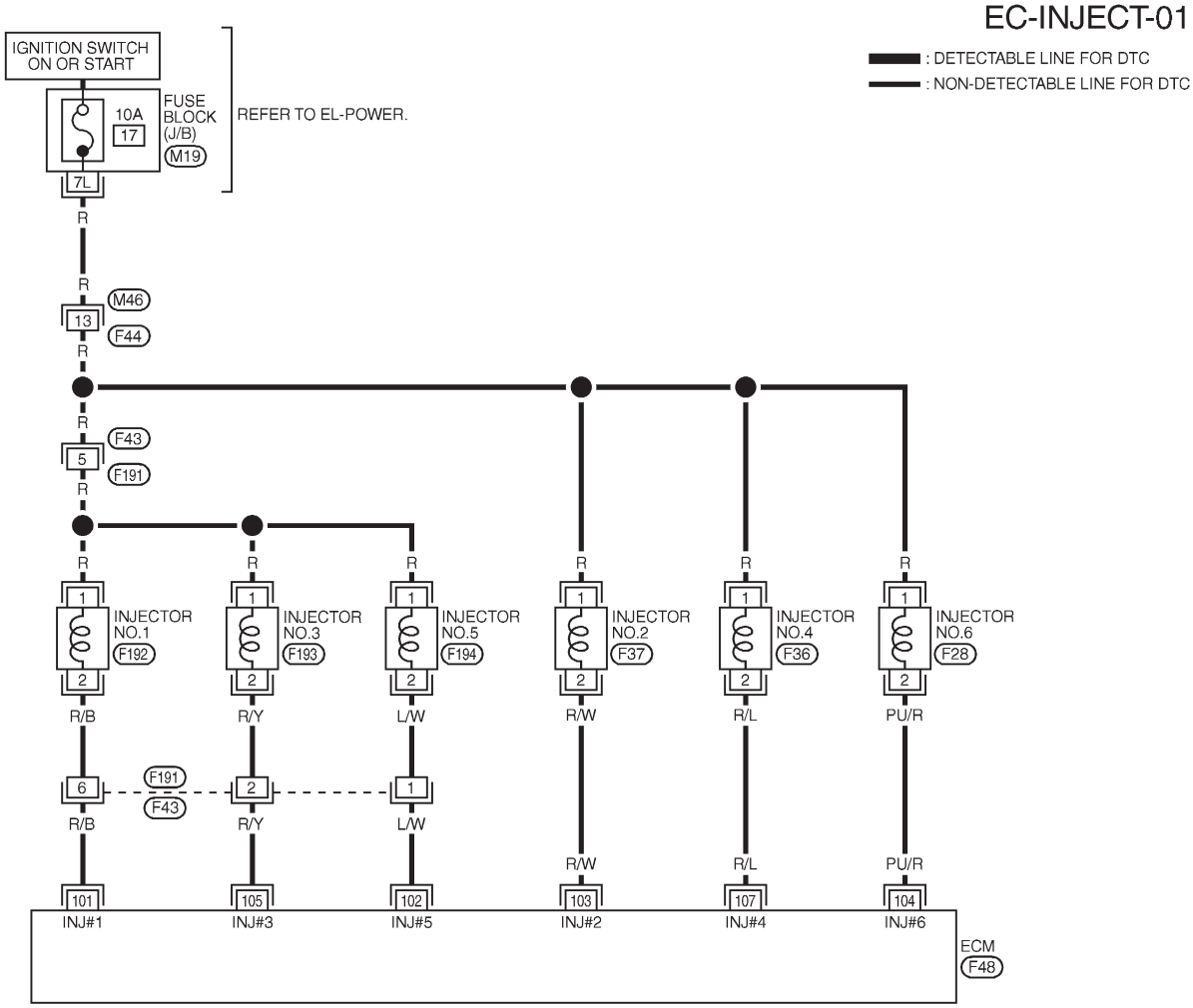
Specification data are reference values.

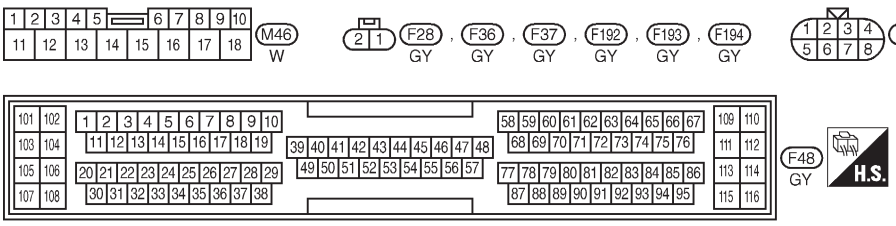
MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE-B2 INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 2.8 msec
B/FUEL SCHDL	ditto	Idle	2.0 - 3.2 msec
		2,000 rpm	1.4 - 2.6 msec

Wiring Diagram

NFEC0386

EC-INJECT-01

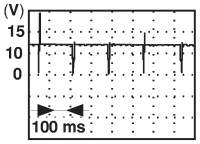




REFER TO THE FOLLOWING.
M19 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC863C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
101	R/B	INJECTOR NO. 1	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	BATTERY VOLTAGE 
102	L/W	INJECTOR NO. 5		
103	R/W	INJECTOR NO. 2		
104	PU/R	INJECTOR NO. 6		
105	R/Y	INJECTOR NO. 3		
107	R/L	INJECTOR NO. 4		

SEF862Y

Diagnostic Procedure

NFEC0387

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.

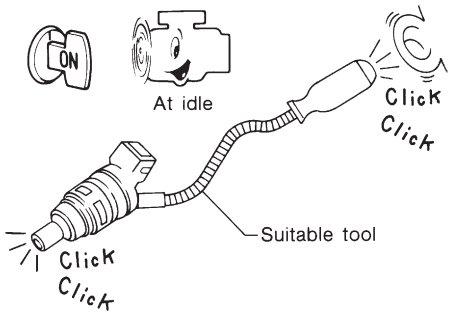
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS AIF SE-B1	XXX V
IACV-AAC/V	XXX step

SEF070Y

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.



MEC703B

Clicking noise should be heard.

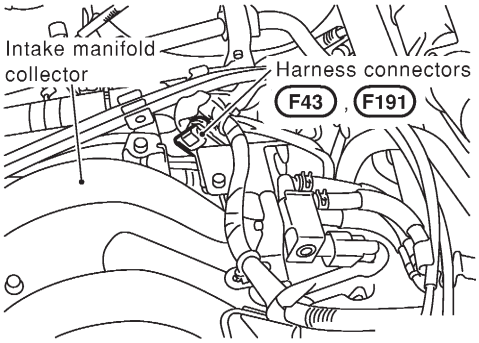
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 3.

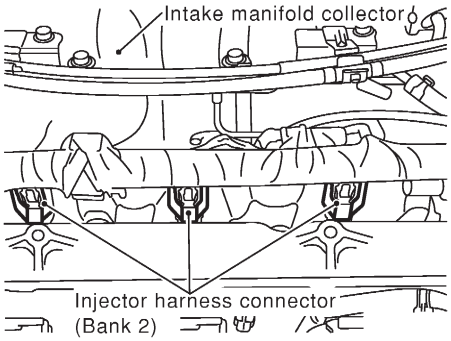
Diagnostic Procedure (Cont'd)

3	CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect injector harness connectors (bank 2) and harness connectors F43, F191 (bank 1).

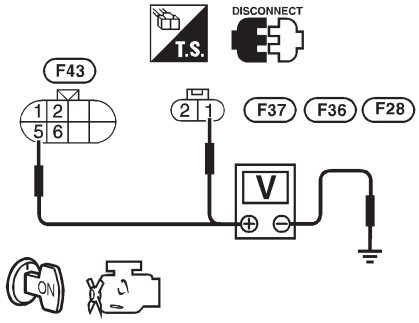


SEF276X



SEF281XA

3. Turn ignition switch "ON".
4. Check voltage between injector terminal 1 and ground, harness connector F43 terminal 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF897X

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Harness connectors F43, F191
- Fuse block (J/B) connector M19
- 10A fuse
- Harness for open or short between injector and fuse
- Harness for open or short between harness connector F43 and fuse

	▶	Repair 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 103, 104, 107, harness connector F191 terminals 6, 2, 1 and ECM terminals 101, 105, 102. 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	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F43, F191
- Harness for open or short between harness connector F191 and ECM
- Harness for open or short between ECM and injector

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

7	CHECK SUB-HARNESS CIRCUIT FOR OPEN AND SHORT (BANK 1)

1. Remove intake manifold collector.
2. Disconnect injector harness connectors (bank 1).
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

Harness connector F191	Injector F192, F193, F194
5	1
6, 2, 1	2

MTBL0359

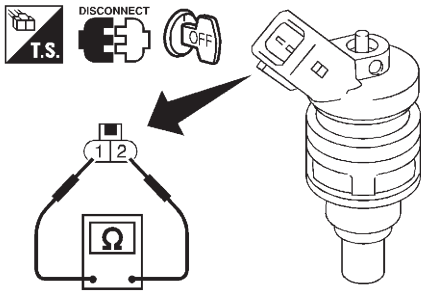
Continuity should exist.

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 INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.



Resistance: 13.5 - 17.5 Ω [at 20°C (68°F)]

SEF964XA

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace injector.

Diagnostic Procedure (Cont'd)

9	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

CONSULT-II Reference Value in Data Monitor Mode

NFEC0388

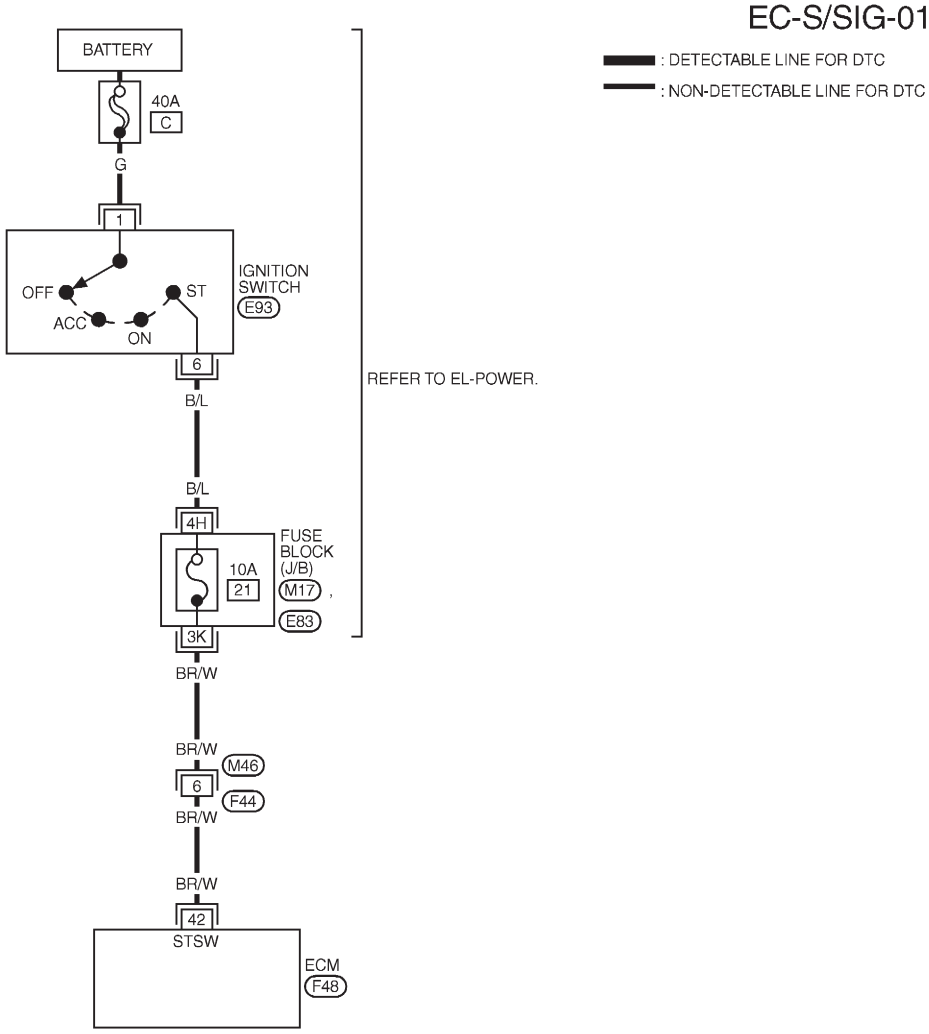
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

Wiring Diagram

=NFEC0390

EC-S/SIG-01



MEC864C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
42	BR/W	START SIGNAL	IGN ON	APPROX 0V
			IGN START	9 - 12V

SEF638XB

Diagnostic Procedure

NFEC0391

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. Turn ignition switch “ON”.
2. Check “START SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
START SIGNAL	OFF
CLSD THL POS	ON
AIR COND SIG	OFF
P/N POSI SW	ON

Condition	“START SIGNAL”
Ignition switch “ON”	OFF
Ignition switch “START”	ON

SEF072Y

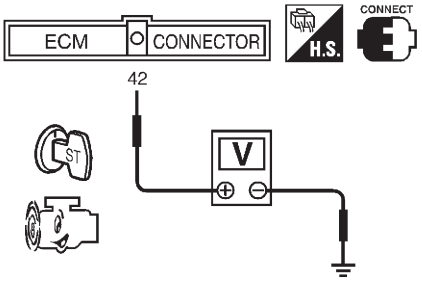
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

Check voltage between ECM terminal 42 and ground under the following conditions.



Condition	Voltage
Ignition switch “START”	Battery voltage
Other positions	Approximately 0V

SEF362X

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	CHECK STARTING SYSTEM

Turn ignition switch “OFF”, then turn it to “START”.

Does starter motor operate?

Yes or No

Yes	▶	GO TO 5.
No	▶	Refer to SC-12, “STARTING SYSTEM”.

Diagnostic Procedure (Cont'd)

5	CHECK FUSE
1. Turn ignition switch "OFF". 2. Disconnect 10A fuse. 3. Check if 10A fuse is OK.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace 10A fuse.

6	CHECK START SIGNAL INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Disconnect ignition switch harness connector. 3. Check harness continuity between ECM terminal 42 and fuse block, ignition switch and fuse block. 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 M46, F44 ● Fuse block (J/B) connectors M17, E83 ● Harness for open or short between ignition switch and 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.

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

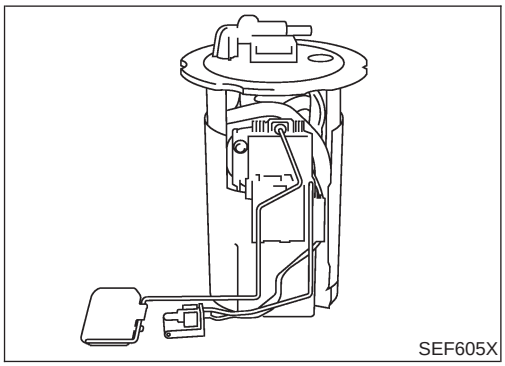
System Description

NFEC0392

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Fuel pump control	Fuel pump relay
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Ignition switch	Start signal		

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 120° signal from the crankshaft position sensor (REF), it knows that the engine is rotating, and causes the pump to operate. If the 120° 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.


SEF605X

Component Description

NFEC0393

The fuel pump with a fuel damper is an in-tank type (the pump and damper are located in the fuel tank).

CONSULT-II Reference Value in Data Monitor Mode

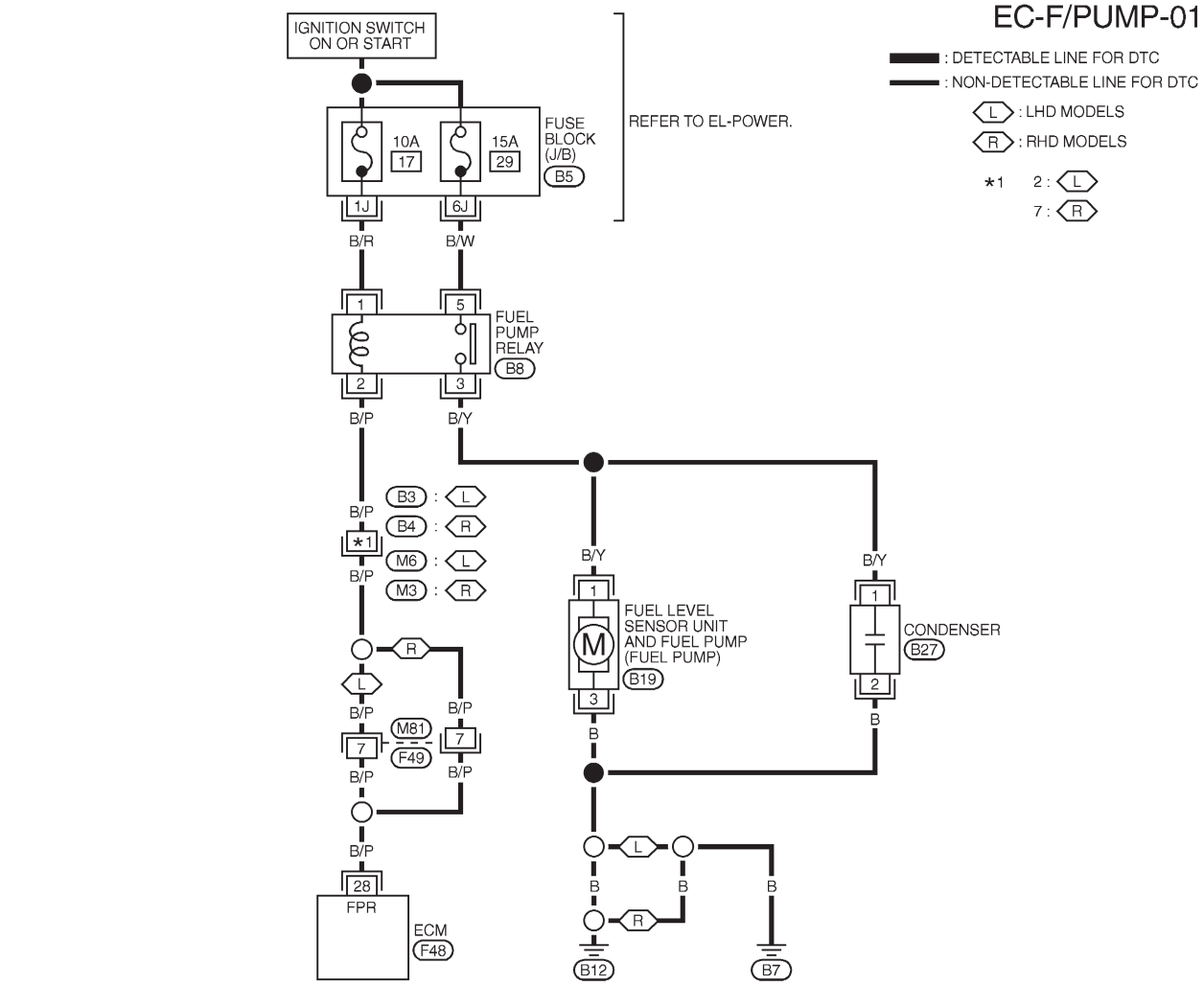
NFEC0394

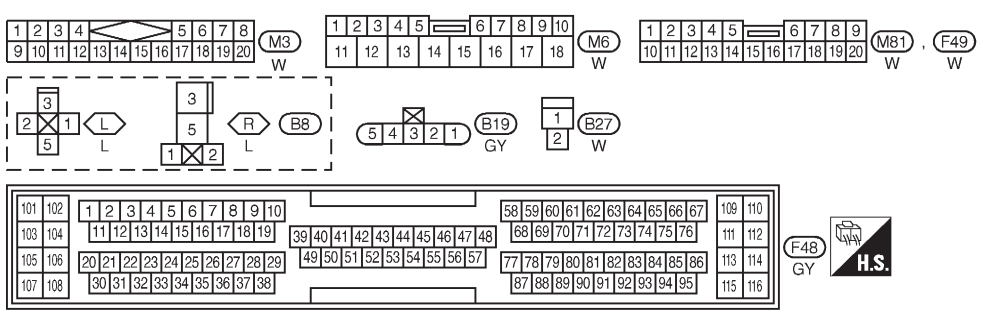
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON. (Operates for 1 second.) ● Engine running and cranking	ON
	Except as shown above	OFF

Wiring Diagram

NFEC0396





REFER TO THE FOLLOWING.
B5 -FUSE BLOCK-
JUNCTION BOX (J/B)

MEC048D

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
28	B/P	FUEL PUMP RELAY	FOR 1 SECOND AFTER IGN ON	0 - 1.5V
			ENGINE RUNNING	
			MORE THAN 1 SECOND AFTER IGN ON	BATTERY VOLTAGE (11 - 14V)

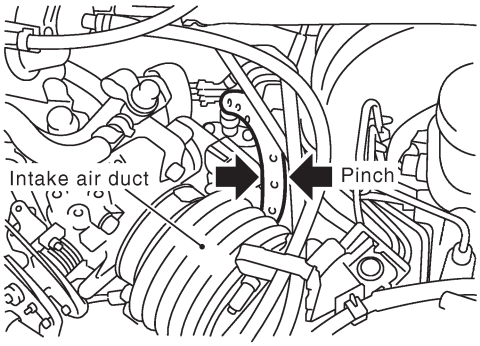
SEF639XB

Diagnostic Procedure

NFEC0397

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Pinch fuel feed hose with two fingers.



SEC013C

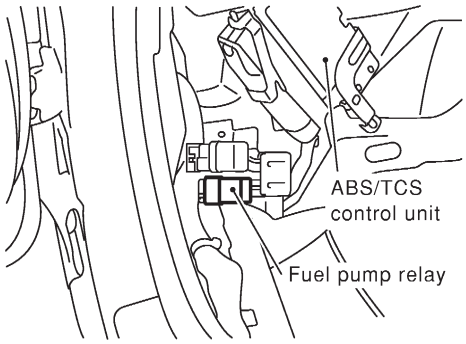
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned “ON”.

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

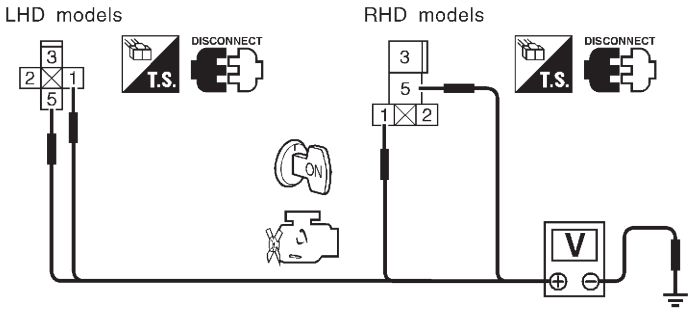
2	CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel pump relay.



SEF284X

3. Turn ignition switch “ON”.
4. Check voltage between terminals 1, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF310Y

OK or NG

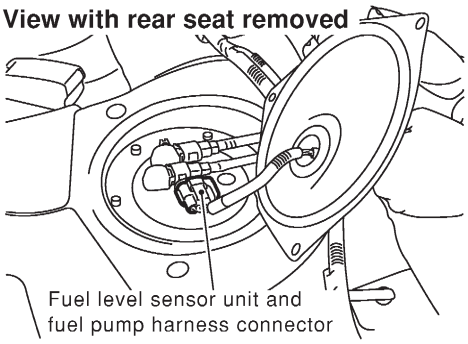
OK	▶	GO TO 4.
NG	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	DETECT MALFUNCTIONING PART
Check the following. ● Fuse block (J/B) connector B5 ● 10A fuse ● 15A fuse ● Harness for open or short between fuse and fuel pump relay	
▶	Repair 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.



SEF263X

3. Check harness continuity between fuel pump terminal 3 and body ground, fuel pump terminal 1 and fuel pump relay 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 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness for open or short between fuel pump relay and fuel pump ● Harness for open or short between 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 28 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 B3, M6 or B4, M3 ● Harness connectors M81, F49 ● 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

With CONSULT-II

1. Reconnect fuel pump relay, fuel level sensor unit and fuel pump harness connector and ECM harness connector.
2. Turn ignition switch "ON".
3. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT-II and check operating sound.

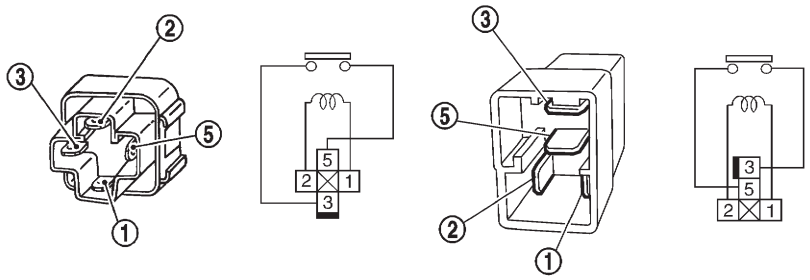
ACTIVE TEST	
FUEL PUMP RELAY	ON
MONITOR	
ENG SPEED	XXX rpm

SEF073Y

Without CONSULT-II

Check continuity between terminals 3 and 5 under the following conditions.

LHD models **RHD models**



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

SEF367Z

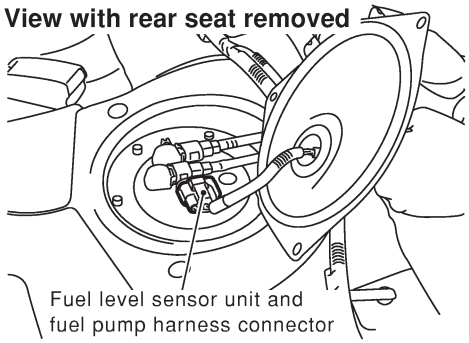
OK or NG

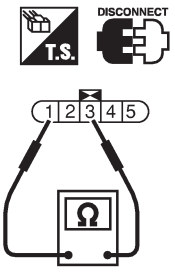
OK	▶	GO TO 9.
NG	▶	Replace fuel pump relay.

9	CHECK 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 1 and 3.

View with rear seat removed





Resistance: 0.2 - 5.0 Ω [at 25°C (77°F)]

SEF609X

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace fuel pump.

Diagnostic Procedure (Cont'd)

10	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

System Description

NFEC0599

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Engine mount control	Electronic controlled engine mount
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Vehicle speed sensor	Vehicle speed		

The ECM controls the engine mount operation corresponding to the engine speed and the vehicle speed. The control system has 2-step control [soft/hard].

Vehicle condition	Engine mount control
Idle (with vehicle stopped)	Soft
Driving	Hard

CONSULT-II Reference Value in Data Monitor Mode

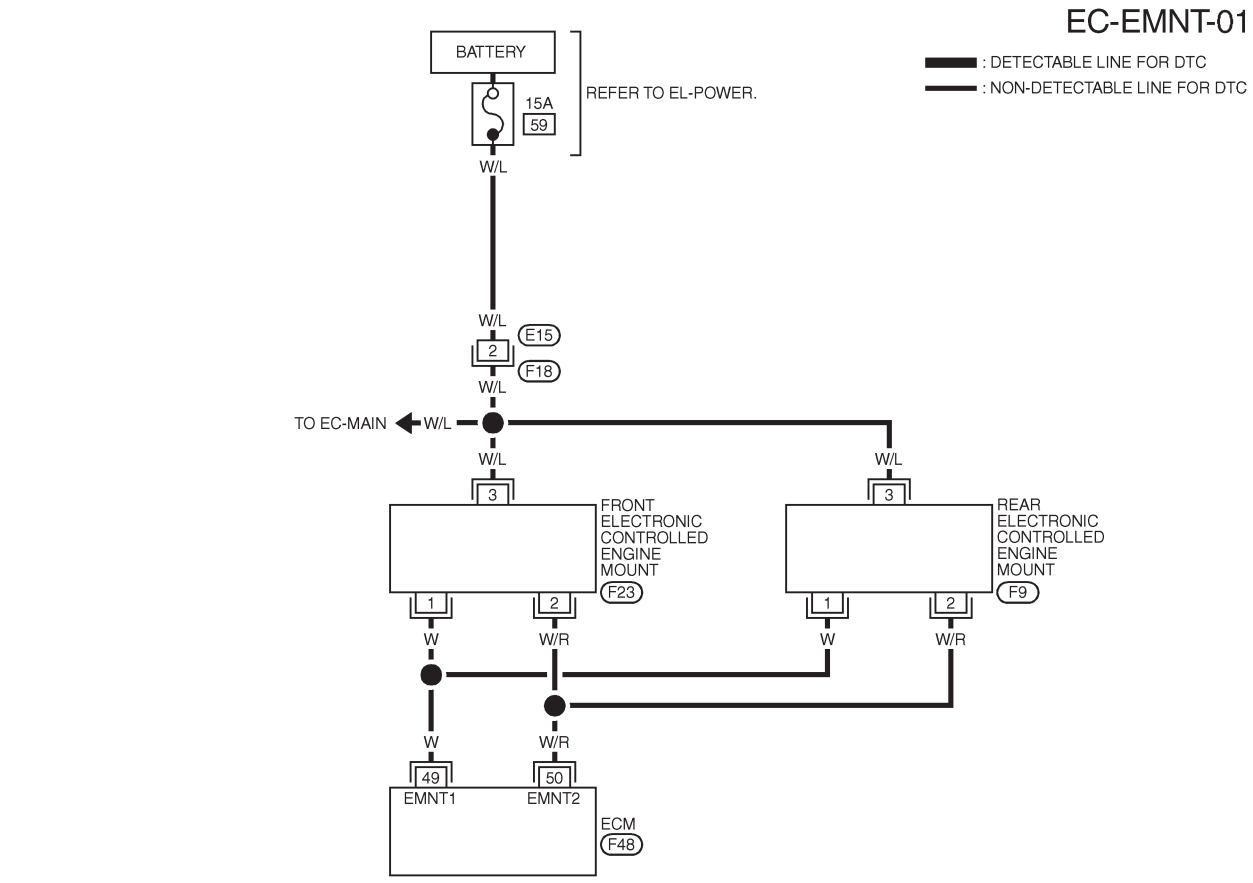
NFEC0600

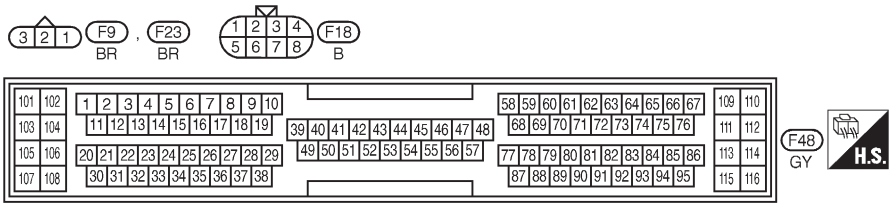
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ENGINE MOUNT	● Engine: Running	Idle	“IDLE”
		2,000 rpm	“TRVL”

Wiring Diagram

NFEC0602





MEC866C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
49	W	ELECTRONIC CONTROLLED ENGINE MOUNT-1	ENGINE RUNNING AT IDLE SPEED	0 - 1.0V
			ENGINE RUNNING AT 2,000 RPM	BATTERY VOLTAGE
50	W/R	ELECTRONIC CONTROLLED ENGINE MOUNT-2	ENGINE RUNNING AT IDLE SPEED	BATTERY VOLTAGE
			ENGINE RUNNING AT 2,000 RPM	0 - 1.0V

SEF640XB

Diagnostic Procedure

NFEC0603

1	CHECK THE OVERALL FUNCTION

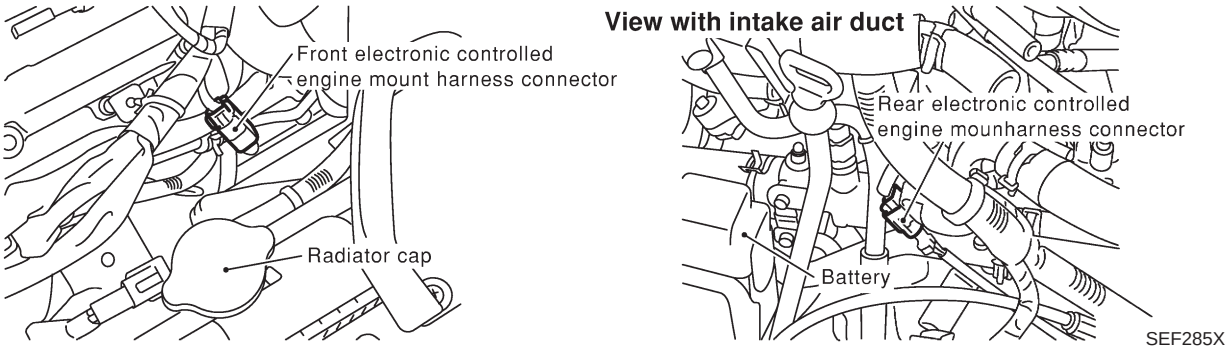
With CONSULT-II

1. After warming up engine, run it at idle speed.
2. Shift selector lever to “D” range while depressing the brake pedal and pulling the parking brake control lever.
3. Perform “ENGINE MOUNTING” in “ACTIVE TEST” mode with CONSULT-II and check that the body vibration changes according to switching the condition (With vehicle stopped).

SEC237C

Without CONSULT-II

1. After warming up engine, run it at idle speed.
2. Shift selector lever to “D” range while depressing the brake pedal and pulling the parking brake control lever.
3. Disconnect front or rear electronic controlled engine mount harness connector when engine speed is more than 1,000 rpm.



SEF285X

4. When returning engine speed to idle speed, check that the body vibration increases, compared with the condition of the above step 2 (With vehicle stopped).

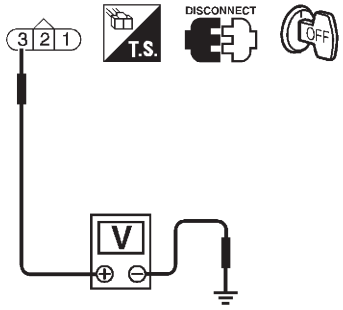
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

Diagnostic Procedure (Cont'd)

2	CHECK ELECTRONIC CONTROLLED ENGINE MOUNT POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect front or rear electronic controlled engine mount harness connector.
3. Check voltage between electronic controlled engine mount terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF899X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E15, F18
- 15A fuse
- Harness for open or short between electronic controlled engine mount and battery

	▶	Repair harness or connectors.

4	CHECK ELECTRONIC CONTROLLED ENGINE MOUNT OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 49 and electronic controlled engine mount terminal 1, ECM terminal 50 and electronic controlled engine mount 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 5.
NG	▶	Repair open circuit, short to ground or short to power in harness connectors.

5	CHECK ELECTRONIC CONTROLLED ENGINE MOUNT

Visually check front and rear electronic controlled engine mount.

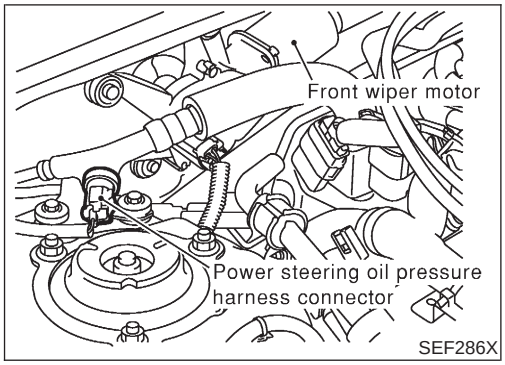
OK or NG

OK	▶	GO TO 6.
NG	▶	Replace front or rear engine mount assembly.

6	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

	▶	**INSPECTION END**



Component Description

NFEC0398

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

CONSULT-II Reference Value in Data Monitor Mode

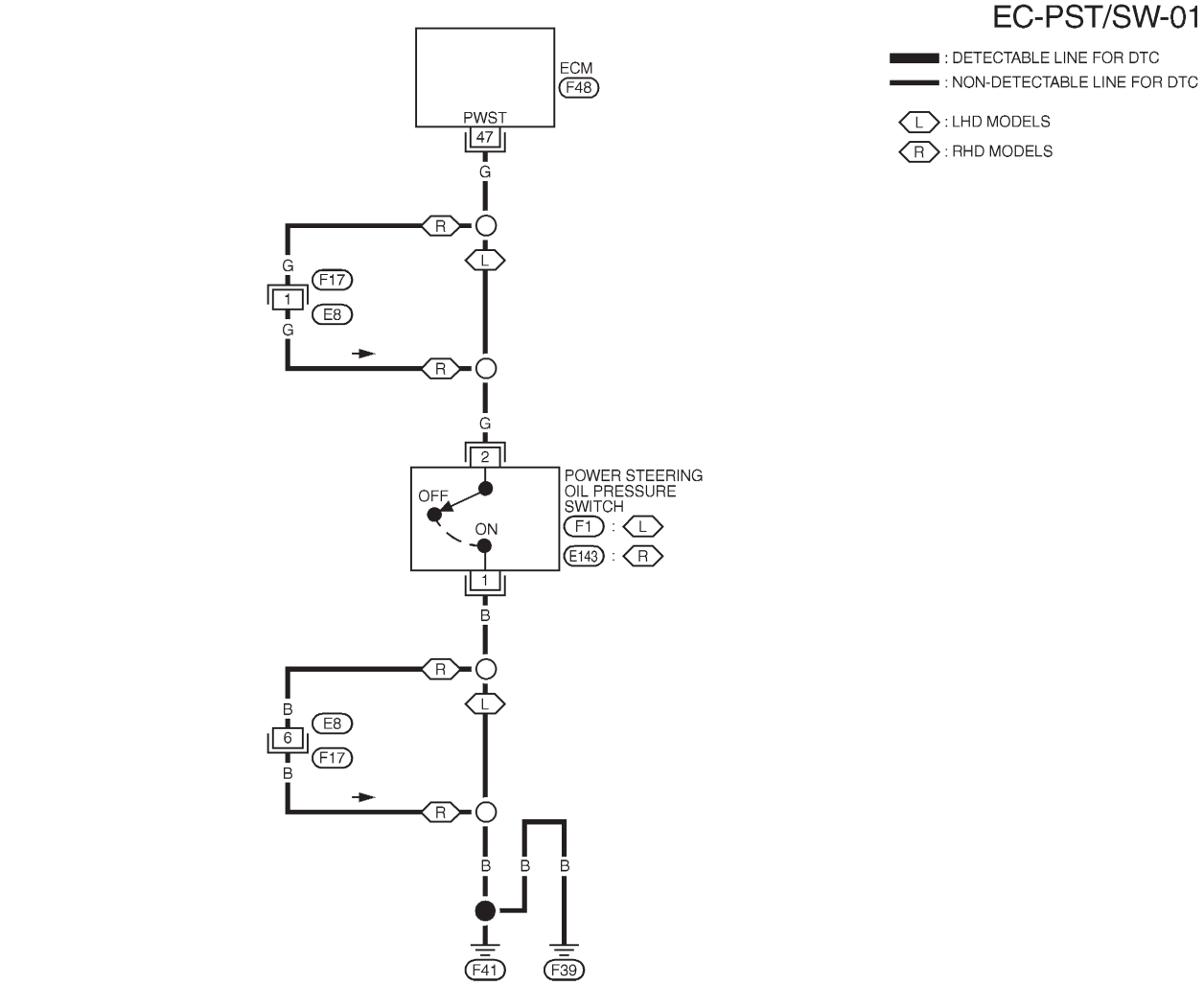
NFEC0399

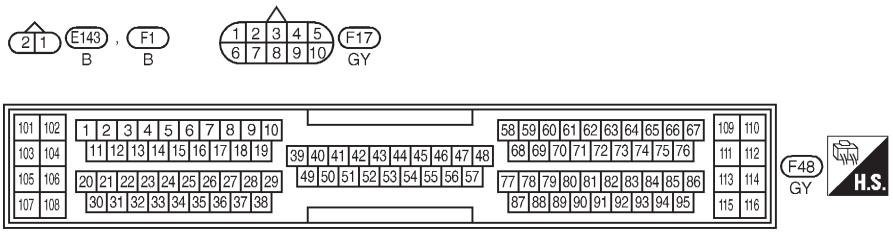
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is fully turned.	ON

Wiring Diagram

NFEC0401





MEC931C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
47	G	POWER STEERING OIL PRESSURE SWITCH	ENGINE RUNNING WITH STEERING WHEEL BEING FULLY TURNED	0 - 1.0V
			ENGINE RUNNING WITH STEERING WHEEL NOT BEING TURNED	BATTERY VOLTAGE

SEF641XB

Diagnostic Procedure

NFEC0402

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.
2. Check “PW/ST SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
PW/ST SIGNAL	OFF

Conditions	PW/ST SIGNAL
Steering is in neutral position	OFF
Steering is turned	ON

SEF311Y

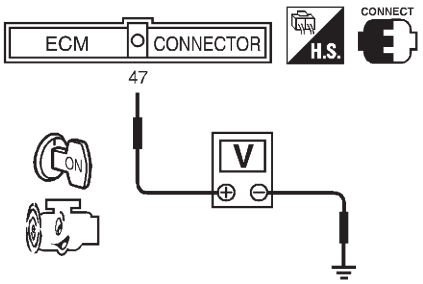
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 47 and ground under the following conditions.



Conditions	Voltage
Steering is neutral position.	Approximately 5V
Steering is turned to full position.	Approximately 0V

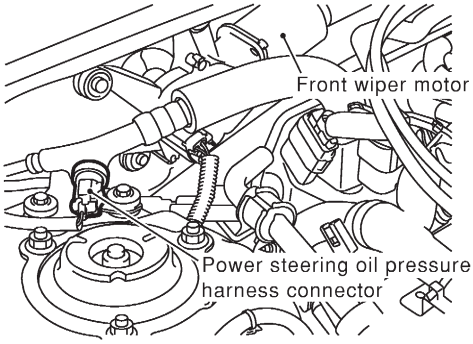
SEF363X

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	CHECK POWER STEERING OIL PRESSURE SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.



SEF286X

3. Check harness continuity between power steering oil pressure switch terminal 1 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F17, E8 (RHD models)
- Harness for open or short between power steering oil pressure switch and body ground

	▶	Repair open circuit or short to power in harness or connectors.

6	CHECK POWER STEERING OIL PRESSURE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 47 and power steering oil pressure switch 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.

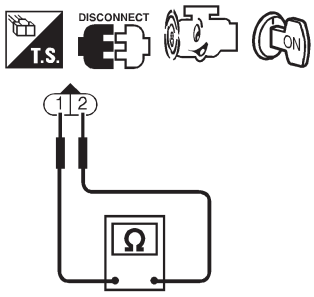
7	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F17, E8 (RHD models)
- Harness for open or short between power steering oil pressure switch and ECM

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

8	CHECK POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between power steering oil pressure switch terminals 1 and 2 under the following conditions.



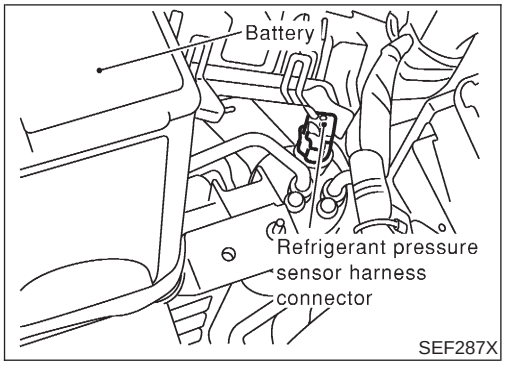
Conditions	Continuity
Steering wheel is being fully turned.	Yes
Steering wheel is not being turned.	No

SEF364X

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace power steering oil pressure switch.

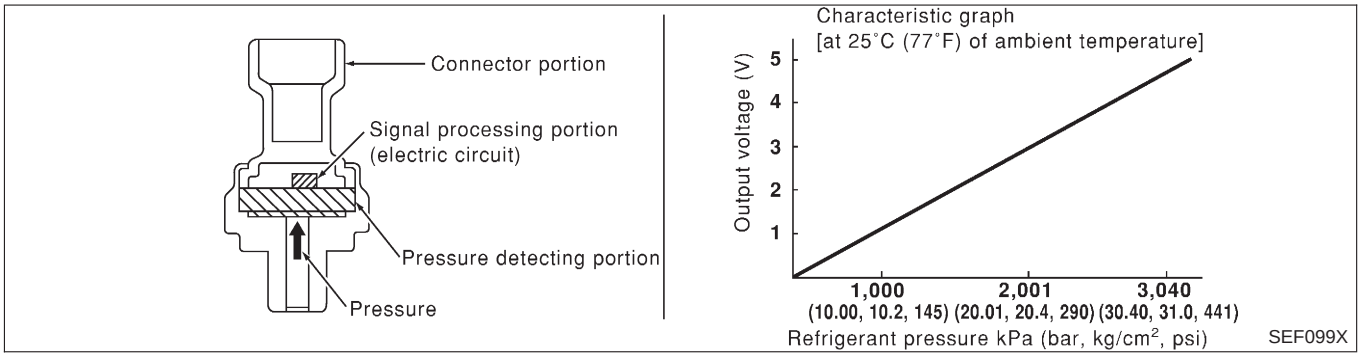
9	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**



Description

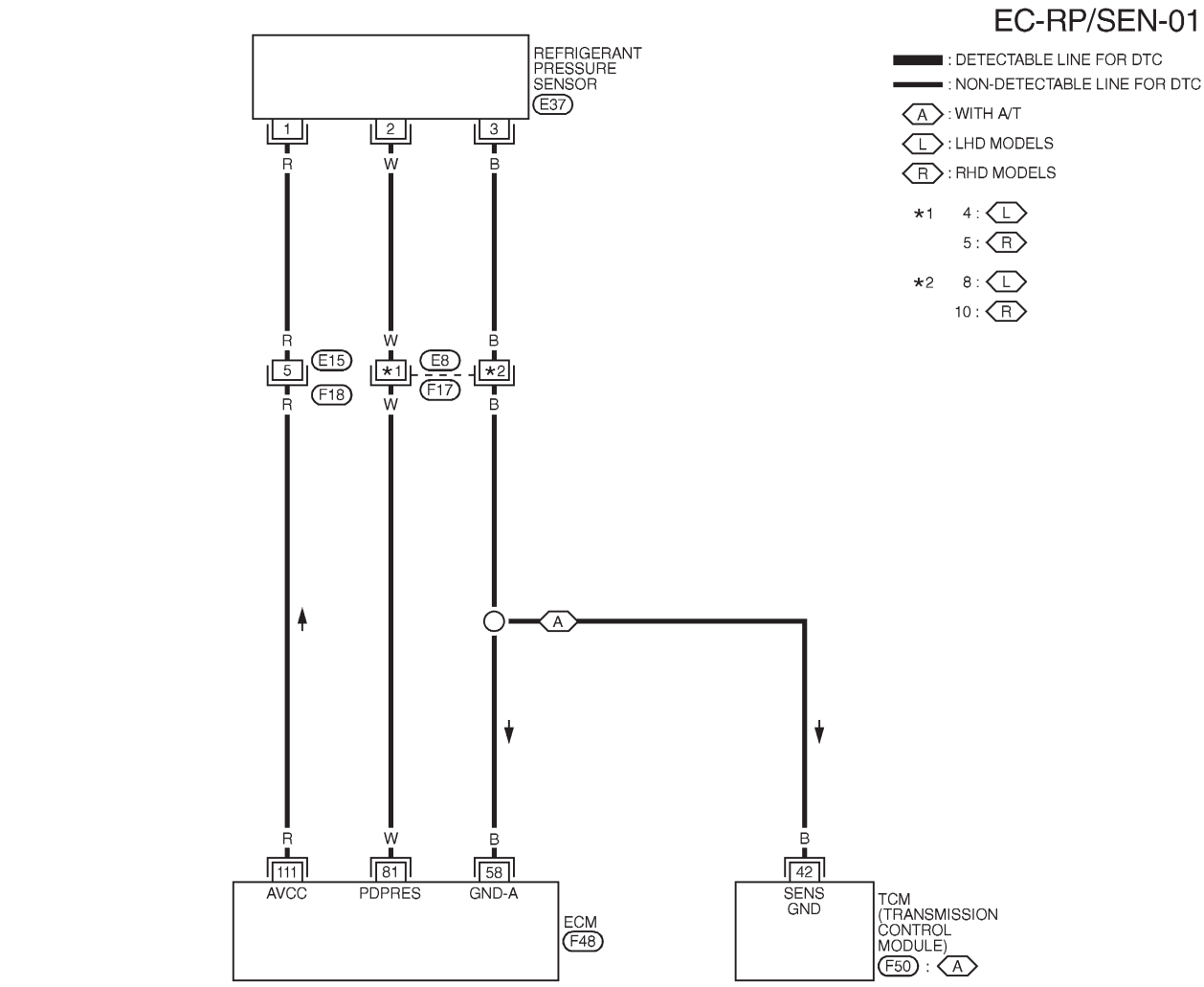
NFEC0636

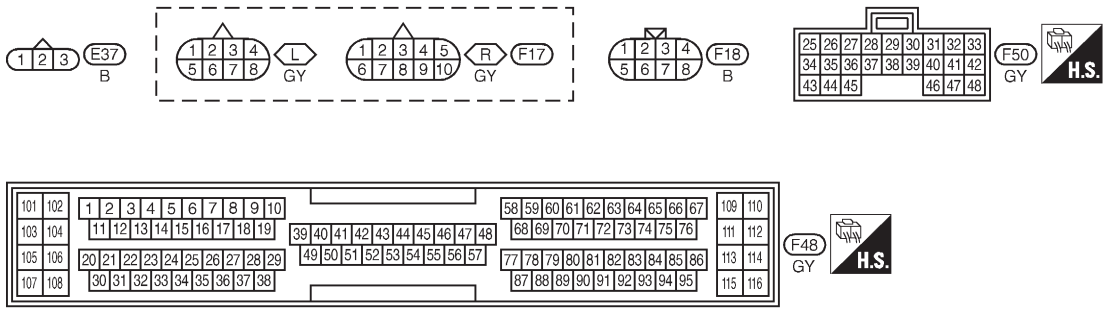
The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



Wiring Diagram

NFEC0637





MEC868C

ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
58	B	SENSOR'S GROUND	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	0V
81	W	REFRIGERANT PRESSURE SENSOR	ENGINE RUNNING UNDER WARM-UP CONDITION WITH A/C SWITCH AND BLOWER SWITH ON	1.0 - 4.0V
111	R	SENSOR'S POWER SUPPLY	IGN ON	APPROX. 5V

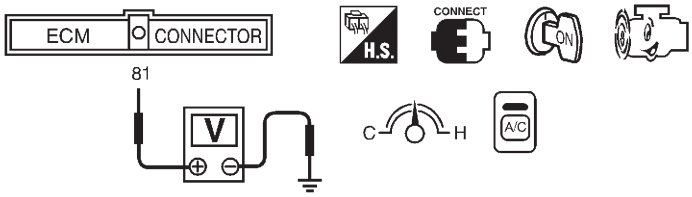
SEF643XC

Diagnostic Procedure

NFEC0638

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 81 and ground with CONSULT-II or tester.



Voltage: 1.0 - 4.0V

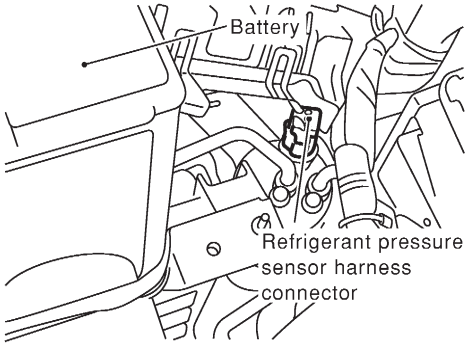
SEC014C

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

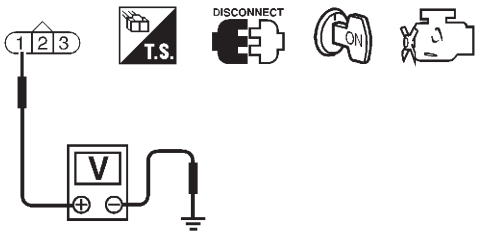
2	CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.



SEF287X

4. Turn ignition switch “ON”.
5. Check voltage between refrigerant pressure sensor terminal 1 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF618X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E15, F18 ● Harness for open or short between ECM and refrigerant pressure sensor	
▶	Repair harness or connectors.

4	CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check harness continuity between refrigerant pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to power. **OK or NG**	
OK ▶	GO TO 6.
NG ▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E8, F17 ● Harness for open or short between ECM and refrigerant pressure sensor ● Harness for open or short between TCM (Transmission control module) and refrigerant pressure sensor	
▶	Repair open circuit or short to power in harness or connectors.

6	CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 81 and refrigerant pressure sensor 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 E8, F17 ● 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 REFRIGERANT PRESSURE SENSOR
Refer to HA-82, "Refrigerant pressure sensor". **OK or NG**	
OK ▶	GO TO 9.
NG ▶	Replace refrigerant pressure sensor.

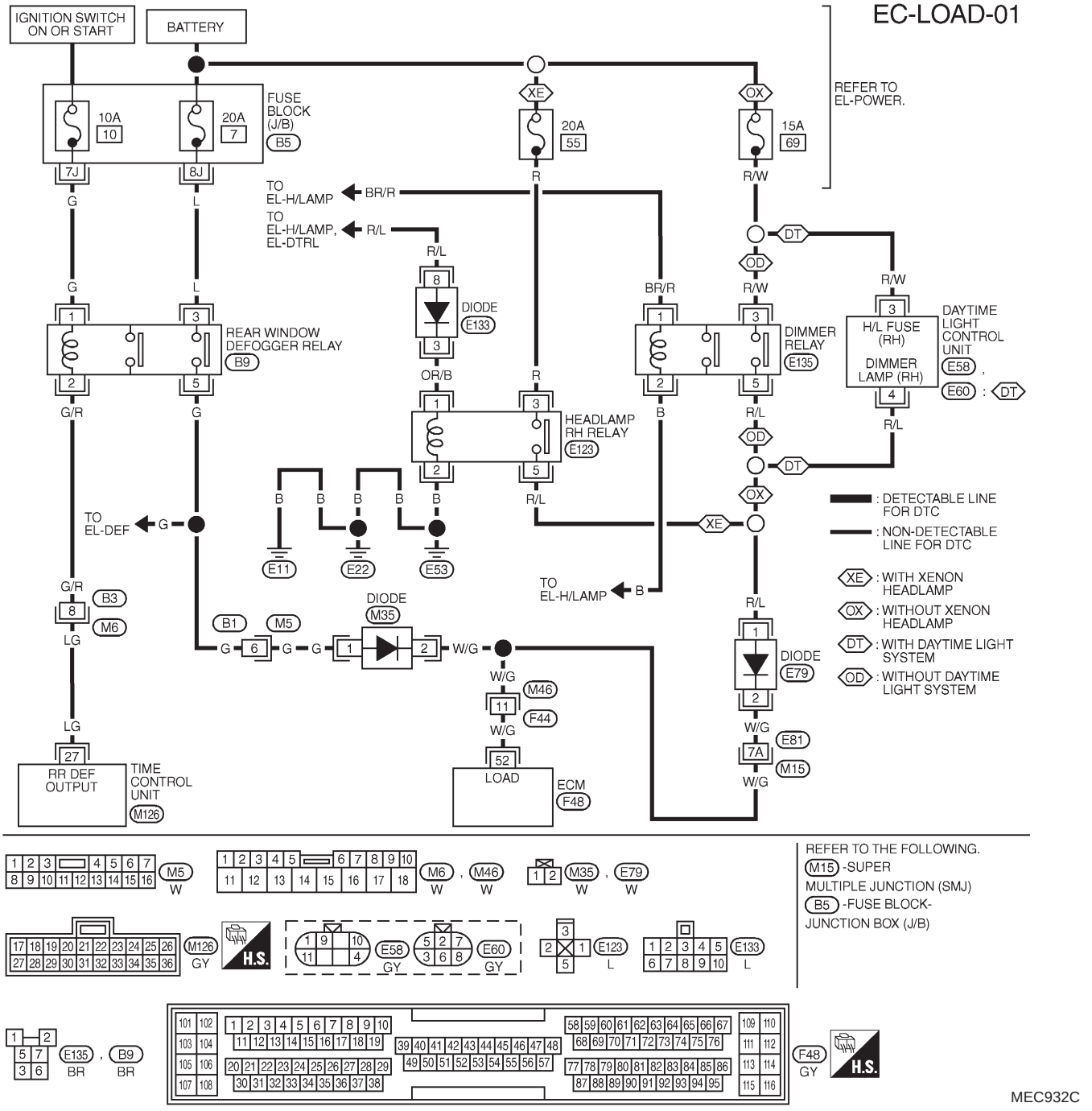
9	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Wiring Diagram

NFEC0604

LHD MODELS

NFEC0604S01



MEC932C

ECM TERMINALS AND REFERENCE VALUE 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.

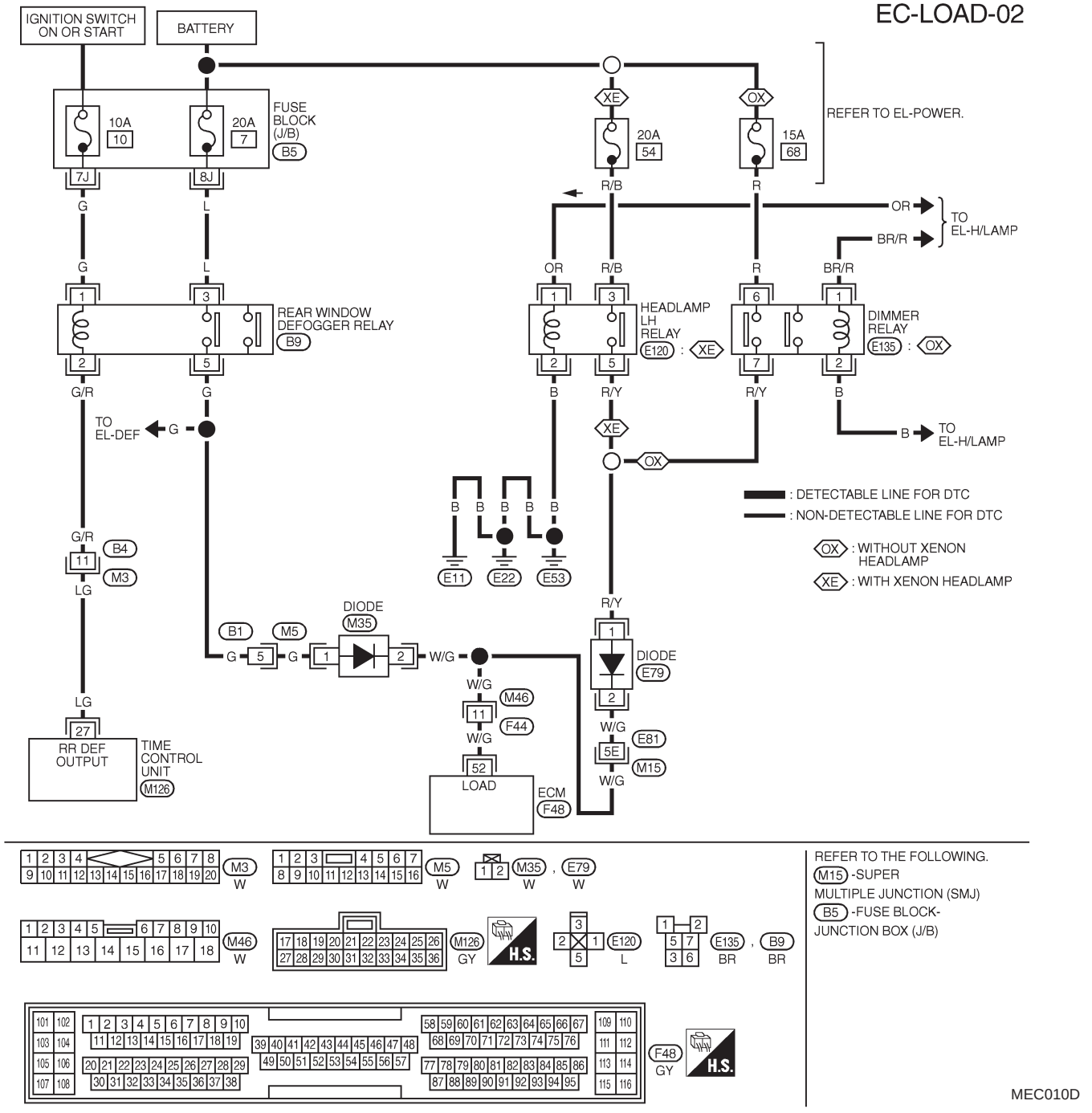
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
52	W/G	ELECTRICAL LOAD SIGNAL	IGN ON WITH REAR WINDOW DEFOGGER SWITCH ON OR LIGHTING SWITCH ON AT 1ST POSITION	BATTERY VOLTAGE
			IGN ON UNDER EXCEPT ABOVE CONDITION	0V

SEF642XB

RHD MODELS

NFEC0604S02

EC-LOAD-02



ECM TERMINALS AND REFERENCE VALUE 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	WIRE COLOR	ITEM	CONDITION	DATA (DC)
52	W/G	ELECTRICAL LOAD SIGNAL	IGN ON WITH REAR WINDOW DEFOGGER SWITCH ON OR LIGHTING SWITCH ON AT 1ST POSITION	BATTERY VOLTAGE
			IGN ON UNDER EXCEPT ABOVE CONDITION	0V

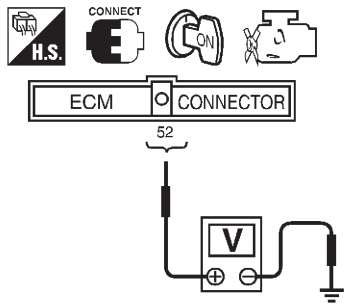
SEF642XB

Diagnostic Procedure

NFEC0605

1	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 52 and ground under the following conditions.



Condition	Voltage
Rear window defogger switch “ON”	BATTERY VOLTAGE
Rear window defogger switch “OFF”	0V

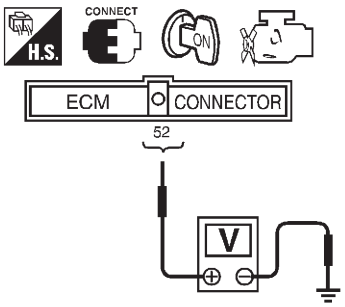
SEF610X

OK or NG

OK	▶	GO TO 2.
NG	▶	GO TO 3.

2	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Check voltage between ECM terminal 52 and ground under the following conditions.



Condition	Voltage
Lighting switch “ON” at 2nd position	BATTERY VOLTAGE
Lighting switch “OFF”	0V

SEF611XA

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 7.

3	CHECK REAR WINDOW DEFOGGER FUNCTION

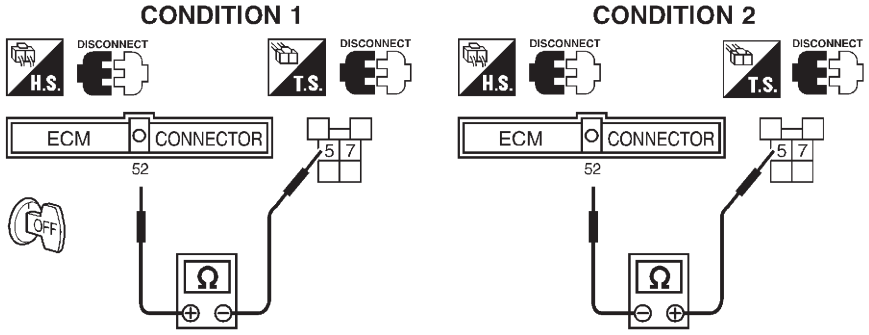
1. Start engine.
2. Turn “ON” the rear window defogger switch.
3. Check the rear windshield. Is the rear windshield heated up?

Yes or No

Yes	▶	GO TO 4.
No	▶	Refer to EL-174, “Rear Window Defogger”.

4	CHECK REAR WINDOW DEFOGGER INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect rear window defogger relay.
4. Check harness continuity between ECM terminal 52 and rear window defogger relay terminal 5.



CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF002Y

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 B1, M5
- Harness connectors M46, F44
- Diode M35
- Harness for open and short between ECM and rear window defogger relay

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

6	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.

	▶	**INSPECTION END**

7	CHECK HEADLAMP FUNCTION

1. Start engine.
2. Turn the lighting switch "ON" at 2nd position with high beam.
3. Check that headlamps are illuminated.

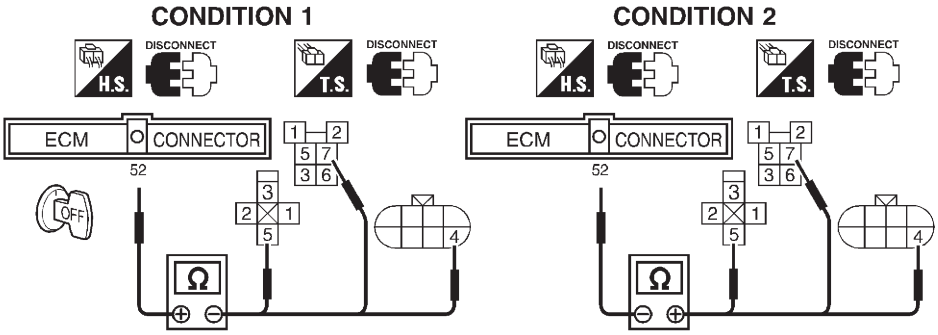
OK or NG

OK (Models with conventional type headlamp)	▶	GO TO 8.
OK (Models with xenon type headlamp)	▶	GO TO 10.
NG	▶	Refer to EL-41, EL-47, "System Description".

Diagnostic Procedure (Cont'd)

8	CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect daytime light control unit harness connector (Models with daytime light system), dimmer relay (Models without daytime light system).
4. Check harness continuity between ECM terminal 52 and daytime light control unit terminal 4 or dimmer relay terminal 5 (LHD models), 7 (RHD models) under the following conditions.



CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF368Z

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

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 9.

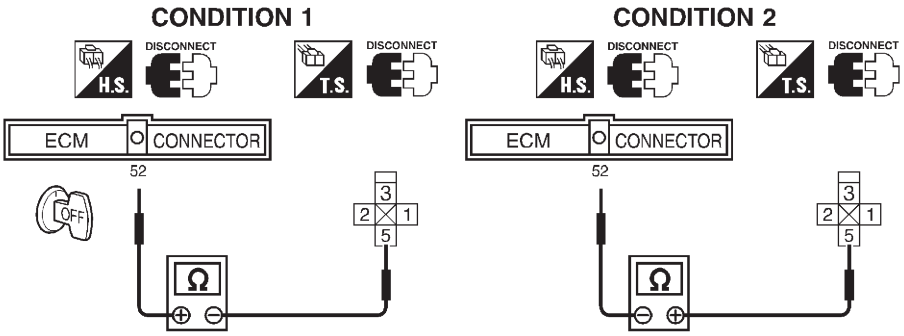
9	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E81, M15
- Harness connectors M46, F44
- Diode E79
- Harness for open and short between ECM and headlamp RH relay or dimmer relay

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

10	CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect headlamp RH relay (LHD models), headlamp LH relay (RHD models).
4. Check harness continuity between ECM terminal 52 and headlamp RH relay terminal or headlamp LH relay terminal 5 under the following conditions.



CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF369Z

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

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

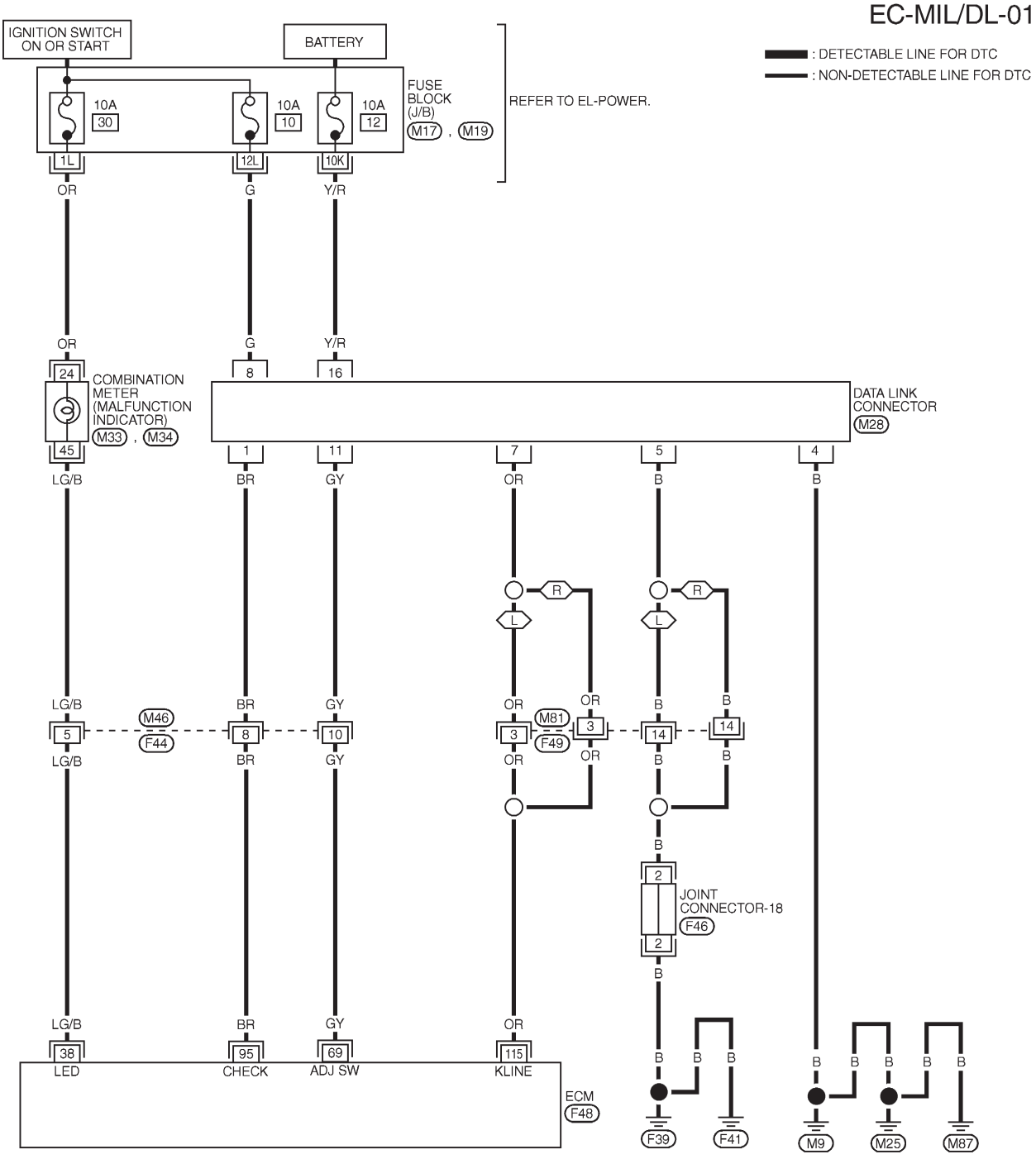
11	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E81, M15 ● Harness connectors M46, F44 ● Diode E79 ● Harness for open and short between ECM and headlamp RH relay or headlamp LH relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

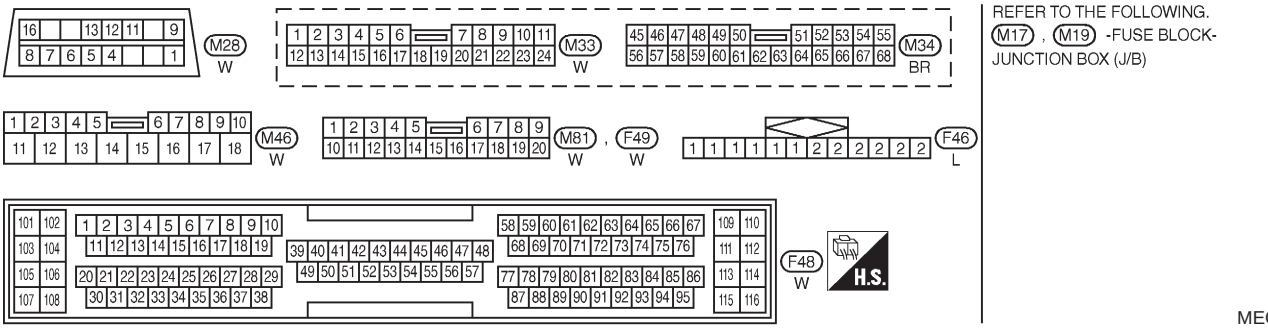
12	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-126.	
▶	**INSPECTION END**

Wiring Diagram

NFEC0407

EC-MIL/DL-01





REFER TO THE FOLLOWING.
M17 , M19 -FUSE BLOCK-JUNCTION BOX (J/B)

MEC214D

Fuel Pressure Regulator

NFEC0408

Fuel pressure at idling kPa (bar, kg/cm^2, psi)	
Vacuum hose is connected.	Approximately 235 (2.35, 2.4, 34)
Vacuum hose is disconnected.	Approximately 294 (2.94, 3.0, 43)

Idle Speed and Ignition Timing

NFEC0409

Target idle speed*1	No-load*2 (in “P” or N” position)	M/T: 625±50 rpm (VQ30DE) M/T: 675±50 rpm (VQ20DE) A/T: 700±50 rpm
Air conditioner: ON	In “P” or N” position	825 rpm or more
Ignition timing*1	In “P” or N” position	9°±5° BTDC (VQ20DE) 15°±5° BTDC (VQ30DE)
Throttle position sensor idle position		0.15 - 0.85V

*1: Throttle position sensor harness connector connected
*2: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Mass Air Flow Sensor

NFEC0411

Supply voltage	Battery voltage (11 - 14)V
Output voltage at idle	1.2 - 1.8*V
Mass air flow (Using CONSULT-II)	2.0 - 6.0 g·m/sec at idle* 7.0 - 20.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Engine Coolant Temperature Sensor

NFEC0412

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 (front)

NFEC0414

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Fuel Pump

NFEC0415

Resistance [at 25°C (77°F)]	0.2 - 5.0Ω

IACV-AAC Valve

NFEC0416

Resistance [at 20°C (77°F)]	Approximately 22Ω

Injector

NFEC0417

Resistance [at 20°C (68°F)]	14 - 15Ω

Resistor

NFEC0418

Resistance [at 25°C (77°F)]	Approximately 2.2 kΩ

Throttle Position Sensor

NFEC0419

Throttle valve conditions	Voltage (at normal operating temperature, engine off, ignition switch ON, throttle opener disengaged)
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

Calculated Load Value

NFEC0420

	Calculated load value % (Using CONSULT-II)
At idle	14.0 - 33.0
At 2,500 rpm	12.0 - 25.0

Intake Air Temperature Sensor

NFEC0421

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

Heated Oxygen Sensor 2 Heater (rear)

NFEC0422

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (REF)

NFEC0423

Resistance [at 20°C (68°F)]	470 - 570Ω

Fuel Tank Temperature Sensor

NFEC0424

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

Camshaft Position Sensor (PHASE)

NFEC0639

Resistance [at 20°C (68°F)]	HITACHI make	1,440 - 7,760Ω
	MITSUBISHI make	2,090 - 2,550Ω