ENGINE CONTROL SYSTEM

SECTION EC

CONTENTS

QG18DE

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Alphabetical & P No. Index for DTC

NLEC0001

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

Type approval number	Model
Available	With Euro-OBD system
Not available	Without Euro-OBD system

MODELS WITH EURO-OBD SYSTEM

Alphabetical Index for DTC

NLEC0001S03

NLEC0001S0301

Items (CONSULT-II screen terms)	DTC*6		Reference page
	CONSULT-II GST*2	ECM*1	
Unable to access ECM	—	—	EC-123
AIR TEMP SEN/CIRC	P0110	0110	EC-161
CMP SEN/CIRCUIT	P0340	0340	EC-302
CLOSED TP SW/CIRC (where fitted)	P0510	0510	EC-352
COOLANT T SEN/CIRC*3	P0115	0115	EC-169
CKP SEN/CIRCUIT	P0335	0335	EC-295
CYL 1 MISFIRE	P0301	0301	EC-285
CYL 2 MISFIRE	P0302	0302	EC-285
CYL 3 MISFIRE	P0303	0303	EC-285
CYL 4 MISFIRE	P0304	0304	EC-285
ECM	P0605	0605	EC-358
EGR SYSTEM (where fitted)	P0400	0400	EC-310
EGR SYSTEM (where fitted)	P1402	1402	EC-393
EGR TEMP SEN/CIRC (where fitted)	P1401	1401	EC-386
EGR VOL CON/V CIR (where fitted)	P0403	0403	EC-319
ENG OVER TEMP	P1217	1217	EC-373
FUEL SYS-LEAN/BK1	P0171	0171	EC-269
FUEL SYS-RICH/BK1	P0172	0172	EC-277
HO2S1 HTR (B1)	P0135	0135	EC-221
HO2S1 (B1)	P0130	0130	EC-184
HO2S1 (B1)	P0131	0131	EC-192
HO2S1 (B1)	P0132	0132	EC-198
HO2S1 (B1)	P0133	0133	EC-204
HO2S1 (B1)	P0134	0134	EC-214
HO2S2 (B1)	P0137	0137	EC-227
HO2S2 (B1)	P0138	0138	EC-237
HO2S2 (B1)	P0139	0139	EC-246
HO2S2 (B1)	P0140	0140	EC-256

Items (CONSULT-II screen terms)	DTC*6		Reference page
	CONSULT-II GST*2	ECM*1	
HO2S2 HTR (B1)	P0141	0141	EC-263
IACV/AAC VLV/CIRC	P0505	0505	EC-343
INT/V TIM V/CIR-B1	P1111	1111	EC-360
KNOCK SEN/CIRC-B1	P0325	0325	EC-291
MAF SEN/CIRCUIT*3	P0100	0100	EC-154
MULTI CYL MISFIRE	P0300	0300	EC-285
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EL-334
NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED	**—**	**0000**	**—**
NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED	—	Flashing*5	EC-73
P-N POS SW/CIRCUIT	P1706	1706	EC-402
PURG VOLUME CONT/V	P0443	0443	EC-332
SWRL CONT SOL/V (where fitted)	P1131	1131	EC-366
THRTL POS SEN/CIRC*3	P0120	0120	EC-175
TW CATALYST SYS-B1	P0420	0420	EC-327
VEH SPEED SEN/CIRC*4	P0500	0500	EC-338

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by ISO 15031-6.
*3: When the fail-safe operation occurs, the MI illuminates.
*4: The MI illuminates when the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.
*5: While engine is running.
*6: 1st trip DTC No. is the same as DTC No.

P No. Index for DTC

NLEC0001S0302

DTC*6		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*1		
—	—	Unable to access ECM	EC-123
—	Flashing*5	NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED.	EC-73
—	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED.**	**—**
P0100	0100	MAF SEN/CIRCUIT*3	EC-154
P0110	0110	AIR TEMP SEN/CIRC	EC-161
P0115	0115	COOLANT T SEN/CIRC*3	EC-169
P0120	0120	THRTL POS SEN/CIRC*3	EC-175
P0130	0130	HO2S1 (B1)	EC-184
P0131	0131	HO2S1 (B1)	EC-192
P0132	0132	HO2S1 (B1)	EC-198

DTC*6		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*1		
P0133	0133	HO2S1 (B1)	EC-204
P0134	0134	HO2S1 (B1)	EC-214
P0135	0135	HO2S1 HTR (B1)	EC-221
P0137	0137	HO2S2 (B1)	EC-227
P0138	0138	HO2S2 (B1)	EC-237
P0139	0139	HO2S2 (B1)	EC-246
P0140	0140	HO2S2 (B1)	EC-256
P0141	0141	HO2S2 HTR (B1)	EC-263
P0171	0171	FUEL SYS-LEAN/BK1	EC-269
P0172	0172	FUEL SYS-RICH/BK1	EC-277
P0300	0300	MULTI CYL MISFIRE	EC-285
P0301	0301	CYL 1 MISFIRE	EC-285
P0302	0302	CYL 2 MISFIRE	EC-285
P0303	0303	CYL 3 MISFIRE	EC-285
P0304	0304	CYL 4 MISFIRE	EC-285
P0325	0325	KNOCK SEN/CIRC-B1	EC-291
P0335	0335	CKP SEN/CIRCUIT	EC-295
P0340	0340	CMP SEN/CIRCUIT	EC-302
P0400 (where fitted)	0400	EGR SYSTEM	EC-310
P0403 (where fitted)	0403	EGR VOL CON/V CIR	EC-319
P0420	0420	TW CATALYST SYS-B1	EC-327
P0443	0443	PURG VOLUME CONT/V	EC-332
P0500	0500	VEH SPEED SEN/CIRC*4	EC-338
P0505	0505	IACV/AAC VLV/CIRC	EC-343
P0510 (where fitted)	0510	CLOSED TP SW/CIRC	EC-352
P0605	0605	ECM	EC-358
P1111	1111	INT/V TIM V/CIR-B1	EC-360
P1131 (where fitted)	1131	SWRL CONT SOL/V	EC-366
P1217	1217	ENG OVER TEMP	EC-373
P1401 (where fitted)	1401	EGR TEMP SEN/CIRC	EC-386
P1402 (where fitted)	1402	EGR SYSTEM	EC-393
P1610 - 1615	1610 - 1615	NATS MALFUNCTION	EL-334
P1706	1706	P-N POS SW/CIRCUIT	EC-402

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.

*2: These numbers are prescribed by ISO 15031-6

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

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

*5: While engine is running.

*6: 1st trip DTC No. is the same as DTC No.

MODELS WITHOUT EURO-OBD SYSTEM

Alphabetical Index for DTC

NLEC0001S04

NLEC0001S0401

Items (CONSULT-II screen terms)	DTC*6		Reference page
	CONSULT-II GST*2	ECM*1	
Unable to access ECM	—	—	EC-123
CMP SEN/CIRCUIT	P0340	0340	EC-302
COOLANT T SEN/CIRC*3	P0115	0115	EC-169
ENG OVER TEMP	P1217	1217	EC-373
HO2S1 (B1)	P0130	0130	EC-184
KNOCK SEN/CIRC-B1	P0325	0325	EC-291
MAF SEN/CIRCUIT*3	P0100	0100	EC-154
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EL-334
NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED	**—**	**0000**	**—**
NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED	—	Flashing*5	EC-73
THRTL POS SEN/CIRC*3	P0120	0120	EC-175
VEH SPEED SEN/CIRC*4	P0500	0500	EC-338

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by ISO 15031-6.
*3: When the fail-safe operation occurs, the MI illuminates.
*4: The MI illuminates when the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.
*5: While engine is running.
*6: 1st trip DTC No. is the same as DTC No.

P No. Index for DTC

NLEC0001S0402

DTC*6		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*1		
—	—	Unable to access ECM	EC-123
—	Flashing*5	NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED.	EC-73
—	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED.**	**—**
P0100	0100	MAF SEN/CIRCUIT*3	EC-154
P0115	0115	COOLANT T SEN/CIRC*3	EC-169
P0120	0120	THRTL POS SEN/CIRC*3	EC-175
P0130	0130	HO2S1 (B1)	EC-184
P0325	0325	KNOCK SEN/CIRC-B1	EC-291
P0340	0340	CMP SEN/CIRCUIT	EC-302
P0500	0500	VEH SPEED SEN/CIRC*4	EC-338
P1217	1217	ENG OVER TEMP	EC-373

DTC*6		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*1		
P1610 - 1615	1610 - 1615	NATS MALFUNCTION	EL-334

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.

*2: These numbers are prescribed by ISO 15031-6

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

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

*5: While engine is running.

*6: 1st trip DTC No. is the same as DTC No.

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

NLEC1262

The Supplemental Restraint System “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
In addition to the supplemental air bag modules for a frontal collision, the supplemental side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The supplemental side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (one of components of supplemental air bags for a frontal collision), wiring harness, warning lamp (one of components of supplemental 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 must 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.**
- **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).**

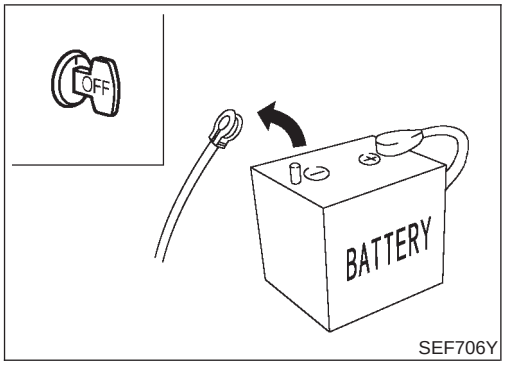
Precautions for On Board Diagnostic (OBD) System of Engine

NLEC0003

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 connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.**

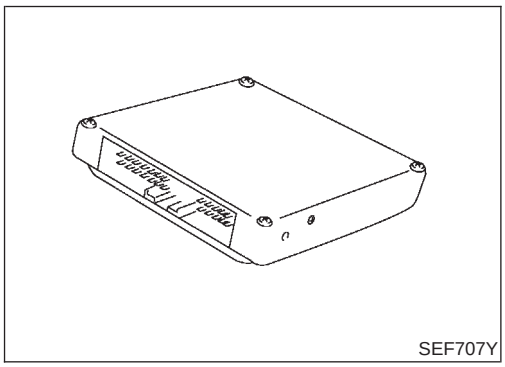


SEF706Y

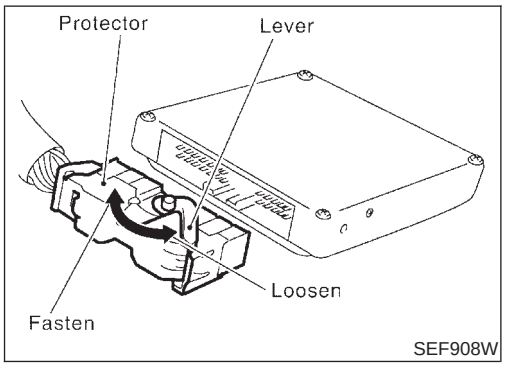
Engine Fuel & Emission Control System

=NLEC0004

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect 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.**

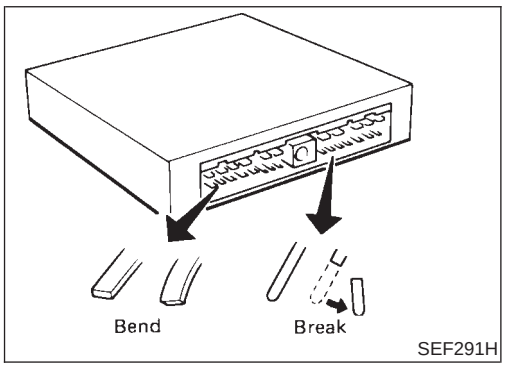

SEF707Y

- **Do not disassemble ECM.**
- **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.



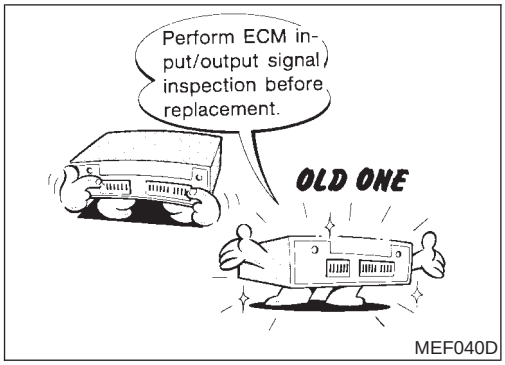
SEF908W

- **When connecting or disconnecting ECM harness connector, use lever as shown.**
  When connecting, fasten connector securely with lever moved until it stops.



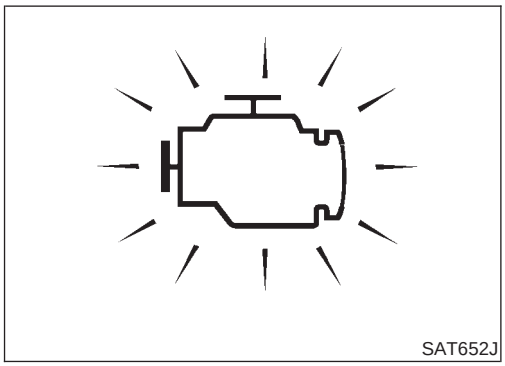
SEF291H

- **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 terminals when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A Poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep ECM harness at least 10 cm (4 in) away from adjacent harness, to prevent an ECM system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep ECM parts and harness dry.**

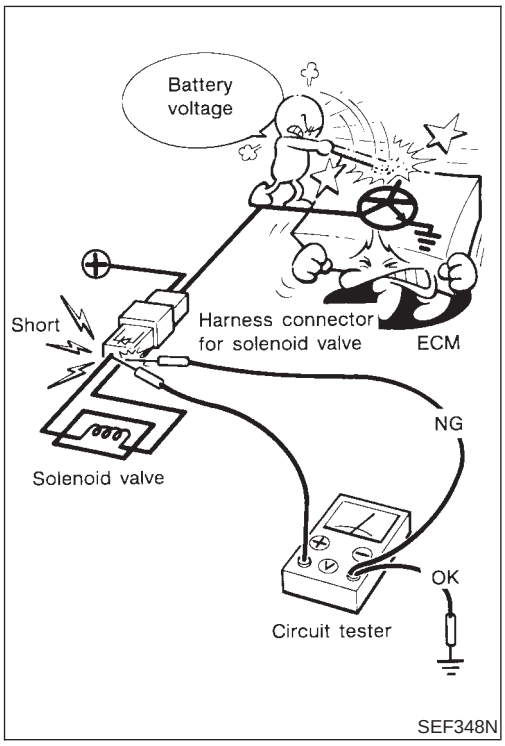


MEF040D

- **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 IAC valve-AAC valve.**
- **Even a slight leak in the air intake system can cause serious problems.**
- **Do not shock or jar the camshaft position sensor and crankshaft position sensor.**
- **Before replacing ECM, perform refer to "ECM Terminals and Reference Value" inspection and make sure ECM functions properly, EC-133.**

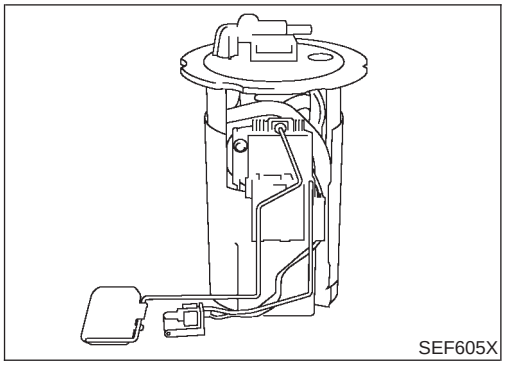

SAT652J

- **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.



SEF348N

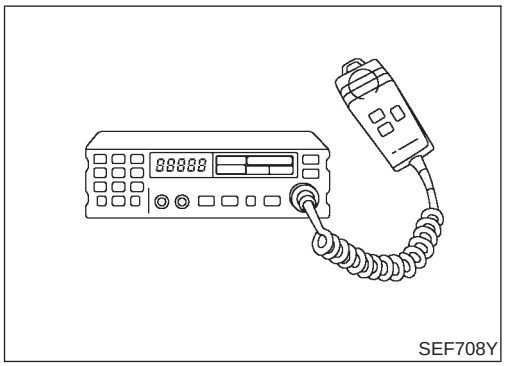
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**


SEF605X

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


SEF709Y

- **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.**


SEF708Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**

1) **Keep the antenna as far as possible from the electronic control units.**
2) **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
   Do not let them run parallel for a long distance.
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.**

Wiring Diagrams and Trouble Diagnosis

NLEC0006

When you read Wiring diagrams, refer to the following:

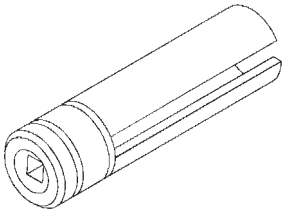
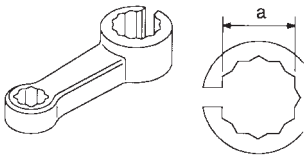
- GI-11, "HOW TO READ WIRING DIAGRAMS"
- EL-10, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

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

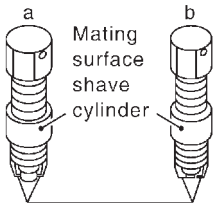
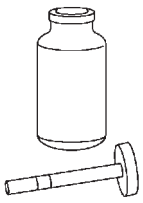
Special Service Tools

NLEC0007

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 NT379	Loosening or tightening heated oxygen sensor 1 (front) with 22 mm hexagon nut
KV10114400 Heated oxygen sensor wrench	 NT636	Loosening or tightening heated oxygen sensor 2 (rear) **a: 22 mm**

Commercial Service Tools

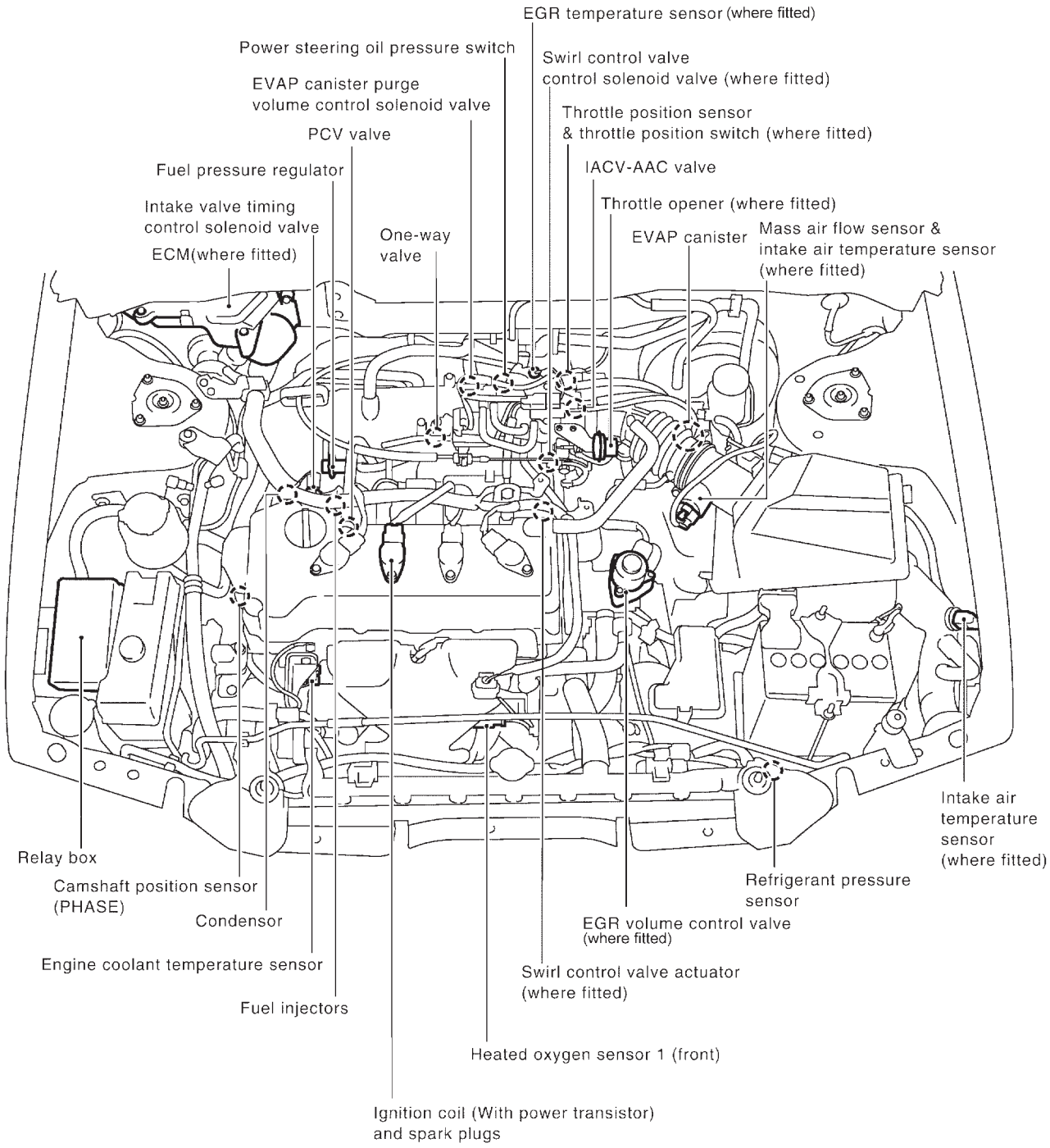
NLEC0008

Tool name	Description	
Fuel filler cap adapter	 NT653	Checking fuel tank vacuum relief valve opening pressure
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**
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

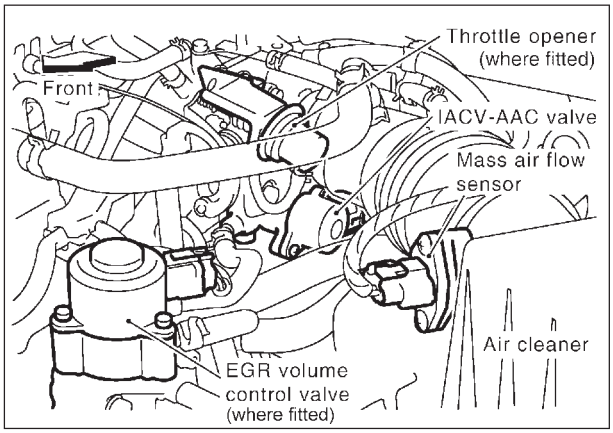
NLEC0009

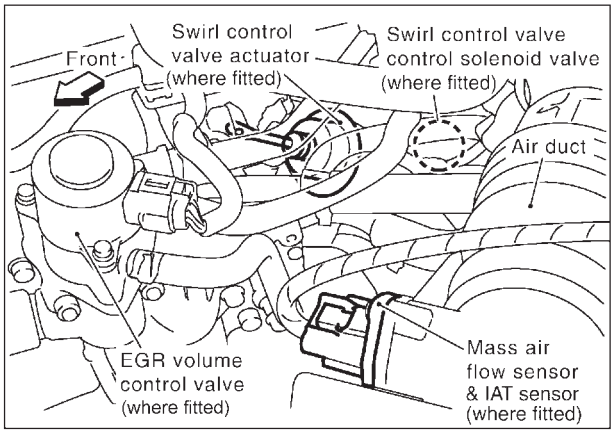
For more details for ECM location, refer to “ELECTRICAL UNIT LOCATION” in EL section.

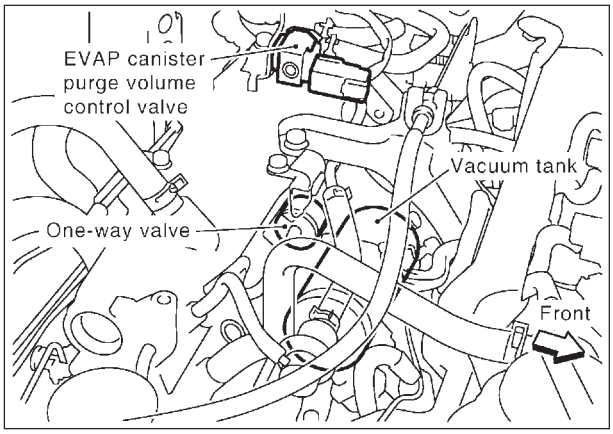


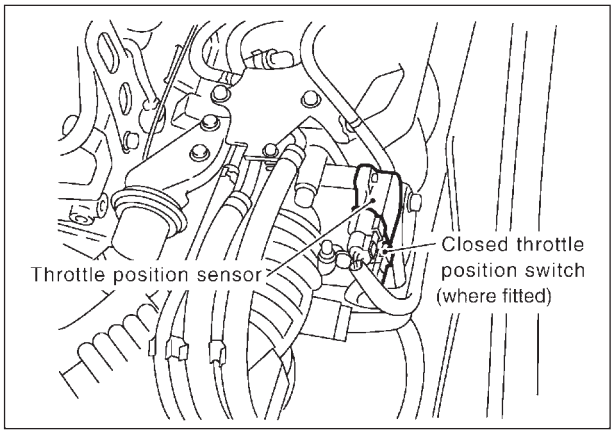
View with engine cover removed

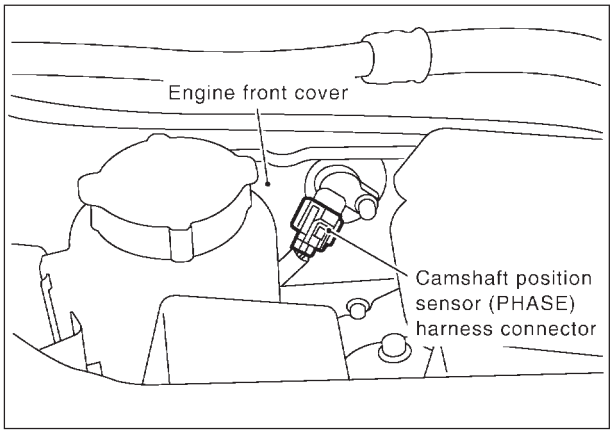
NEF310A

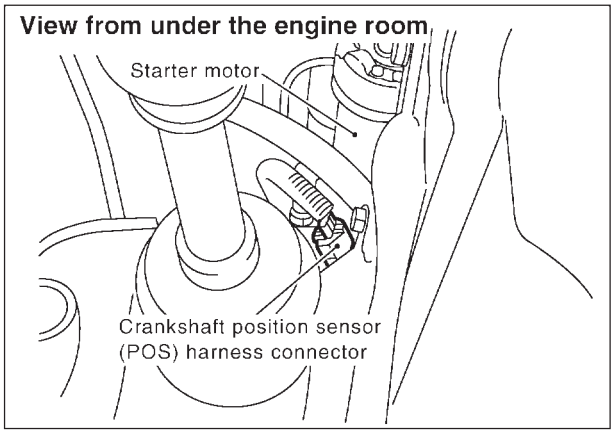

Throttle opener
(where fitted)
Front
IACV-AAC valve
Mass air flow
sensor
Air cleaner
EGR volume
control valve
(where fitted)

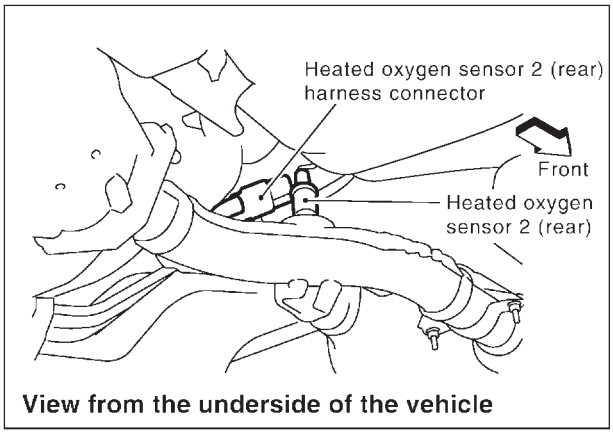

Swirl control
valve actuator
(where fitted)
Front
Swirl control valve
control solenoid valve
(where fitted)
Air duct
EGR volume
control valve
(where fitted)
Mass air
flow sensor
& IAT sensor
(where fitted)


EVAP canister
purge volume
control valve
Vacuum tank
One-way valve
Front


Throttle position sensor
Closed throttle
position switch
(where fitted)

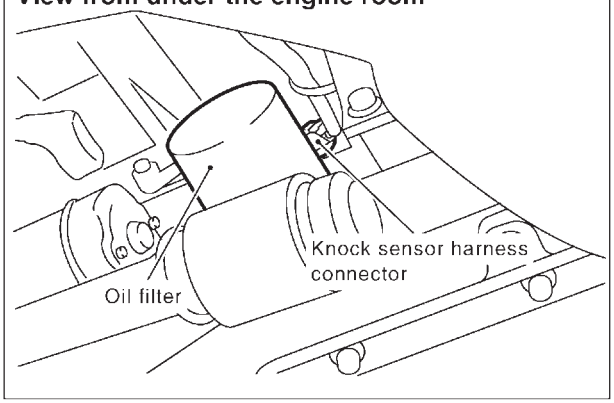

Engine front cover
Camshaft position
sensor (PHASE)
harness connector


View from under the engine room
Starter motor
Crankshaft position sensor
(POS) harness connector

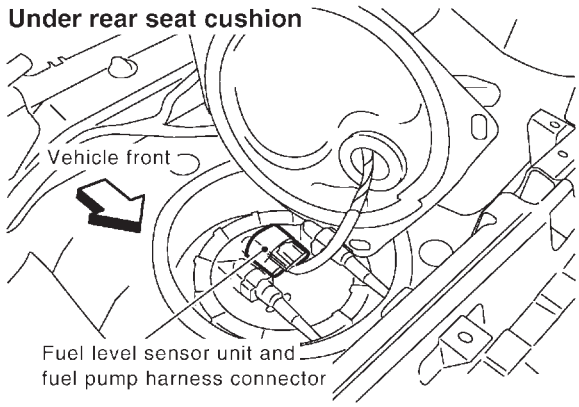

Heated oxygen sensor 2 (rear)
harness connector
Front
Heated oxygen
sensor 2 (rear)
View from the underside of the vehicle

NEF311A

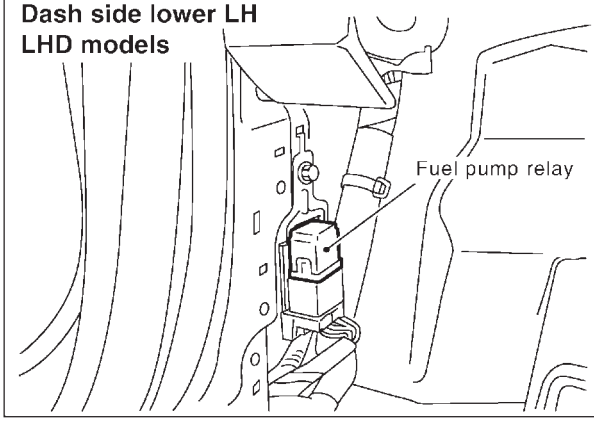
View from under the engine room



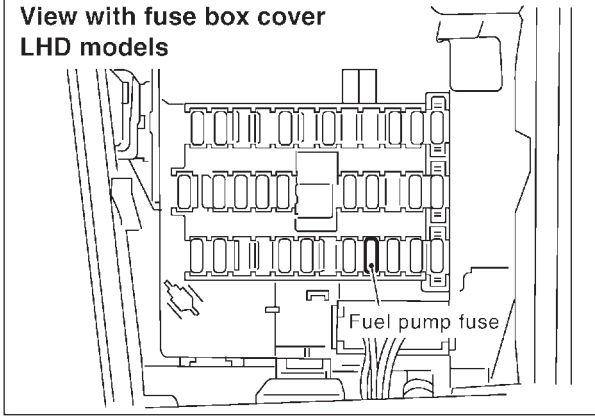
Under rear seat cushion



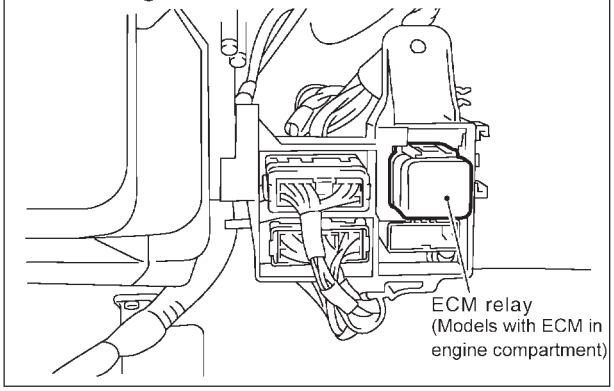
Dash side lower LH
LHD models

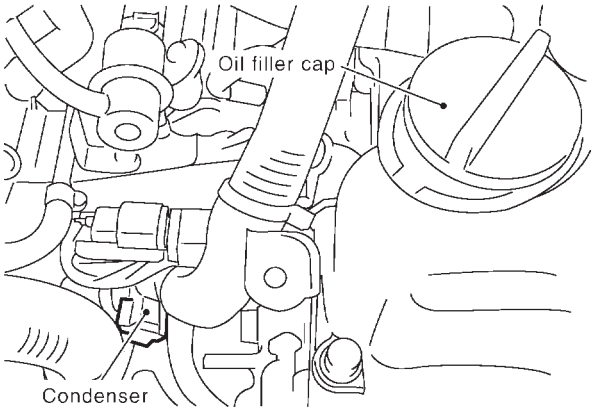


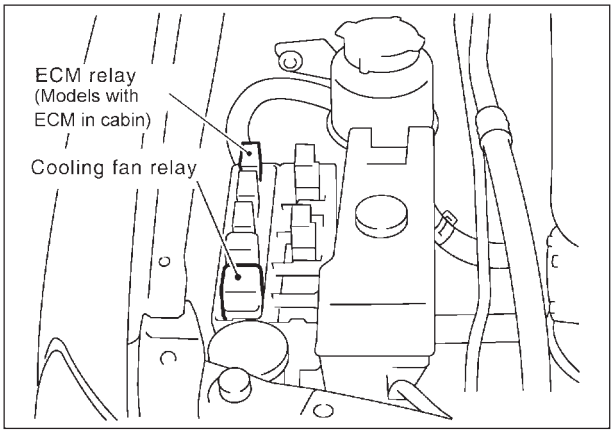
View with fuse box cover
LHD models

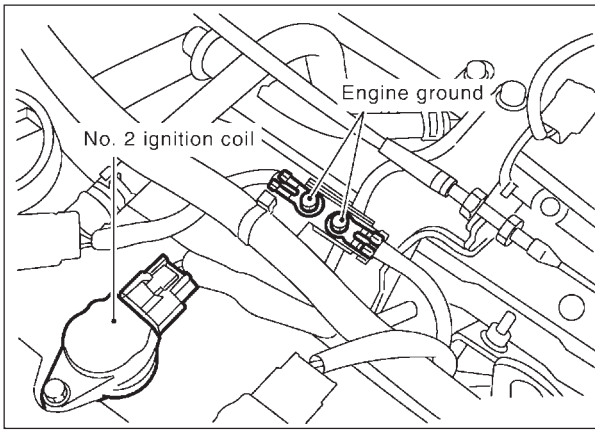


View with glove box and box cover removed

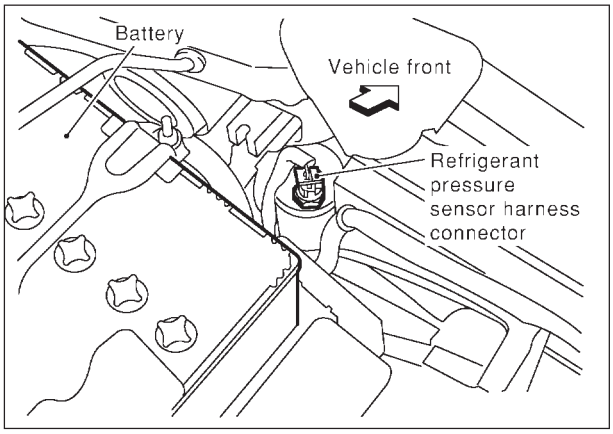


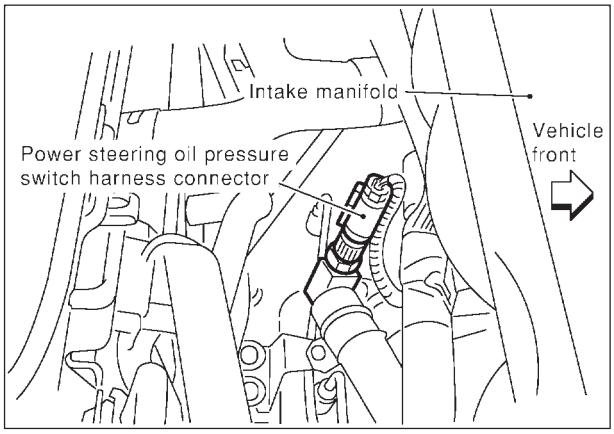


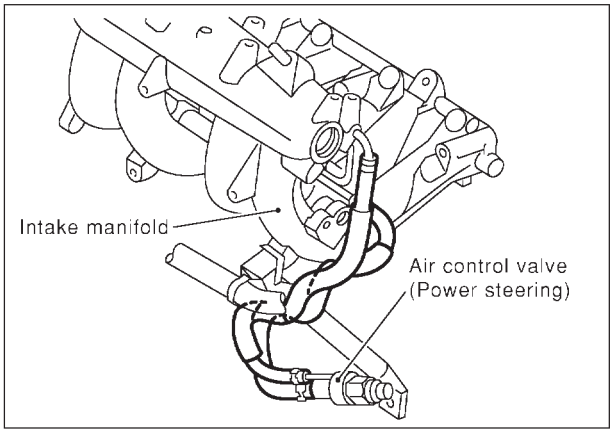


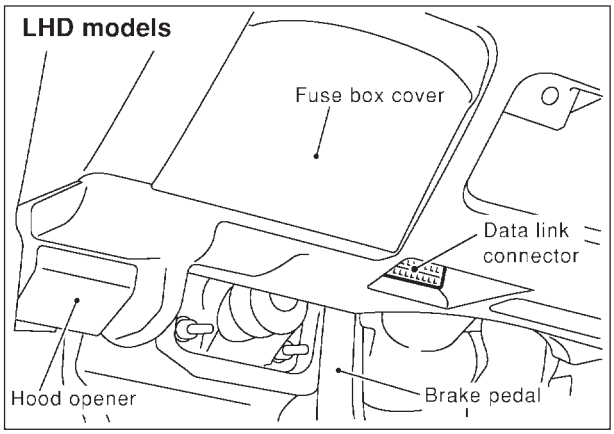


NEF312A


Battery
Vehicle front
Refrigerant pressure sensor harness connector


Intake manifold
Power steering oil pressure switch harness connector
Vehicle front


Intake manifold
Air control valve (Power steering)


LHD models
Fuse box cover
Data link connector
Hood opener
Brake pedal

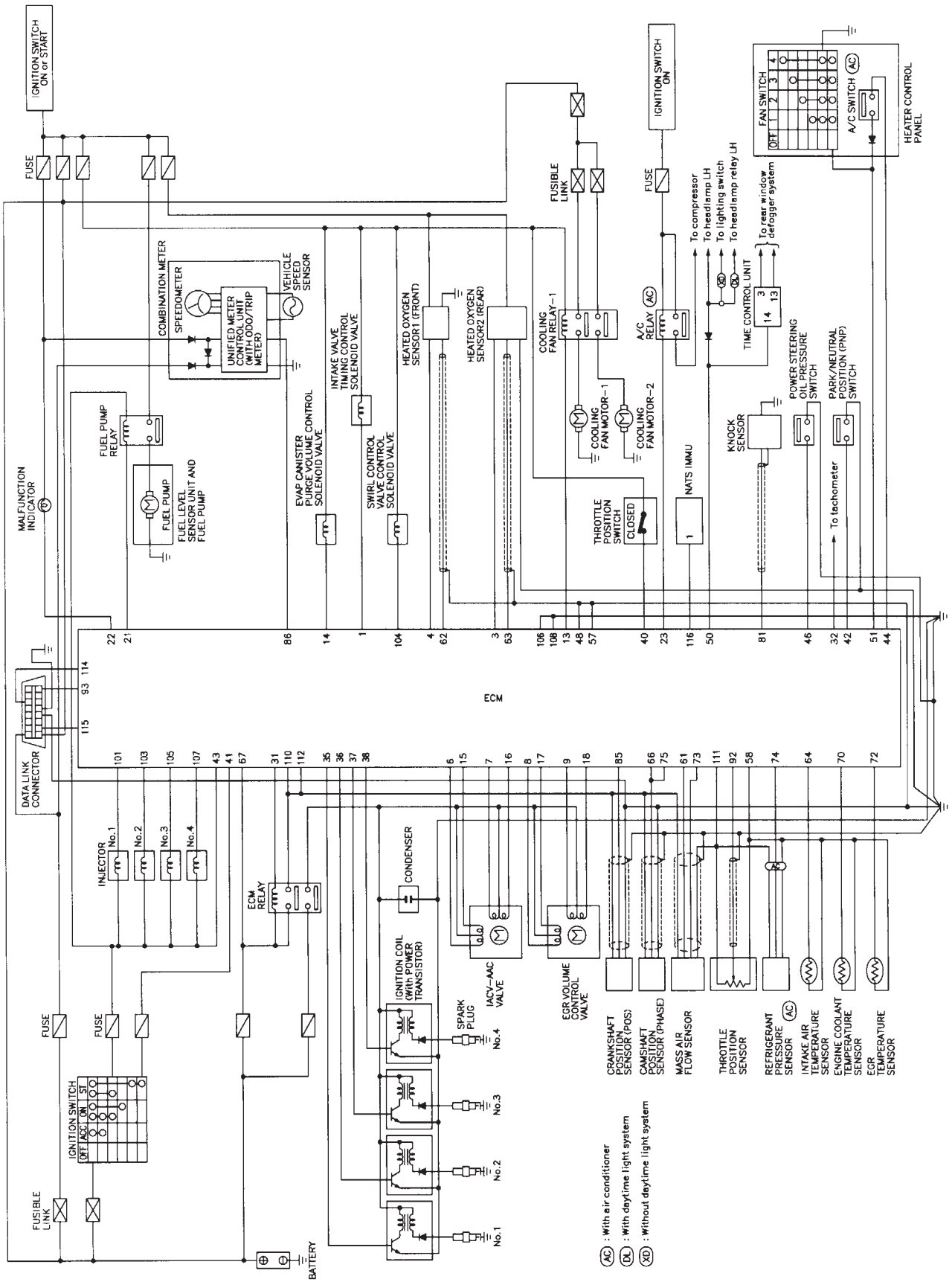
SEF599Y

Circuit Diagram

NLEC0010

MODELS WITH THROTTLE POSITION SWITCH AND SWIRL CONTROL VALVE

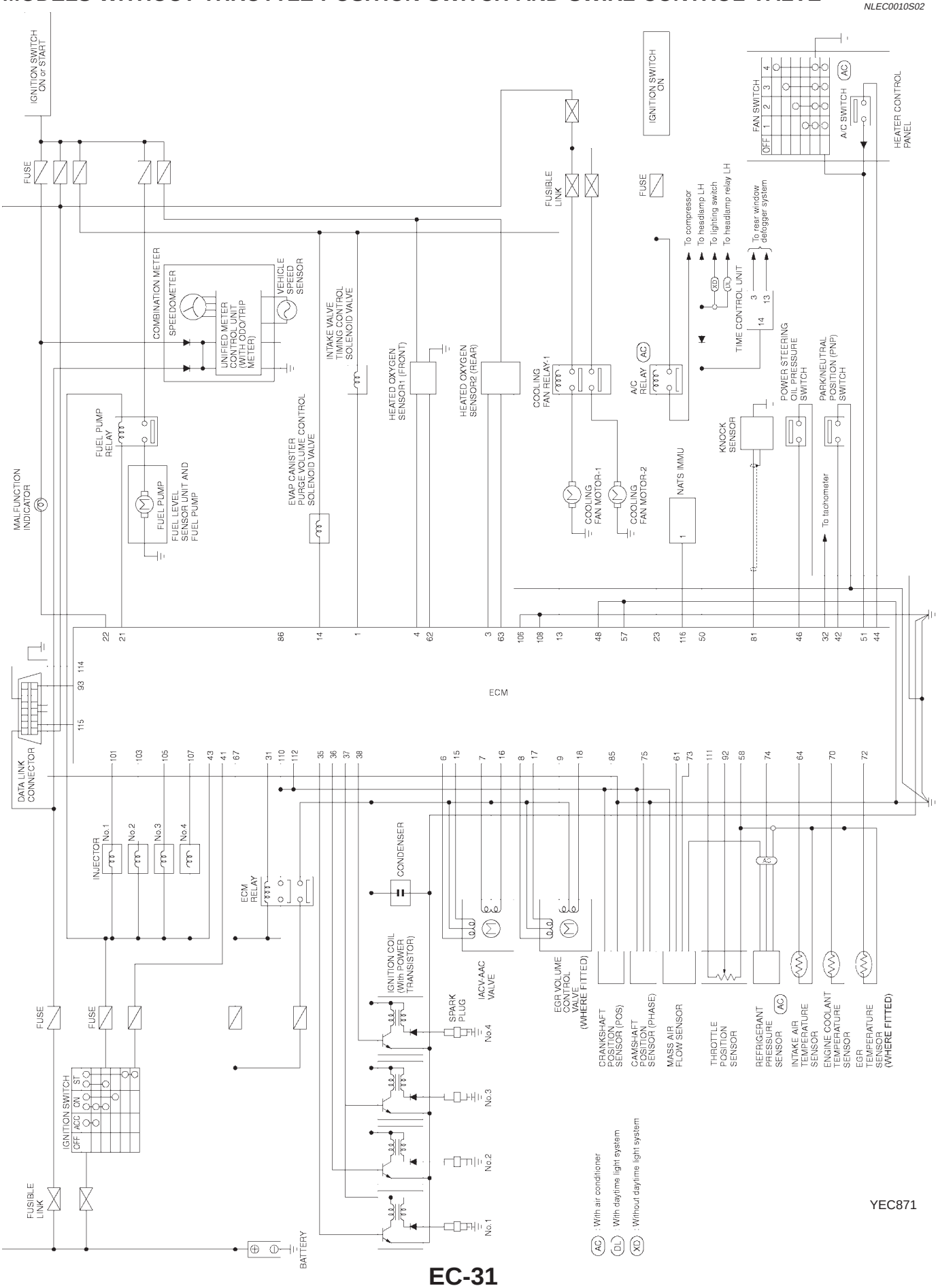
NLEC0010S01



YEC649

MODELS WITHOUT THROTTLE POSITION SWITCH AND SWIRL CONTROL VALVE

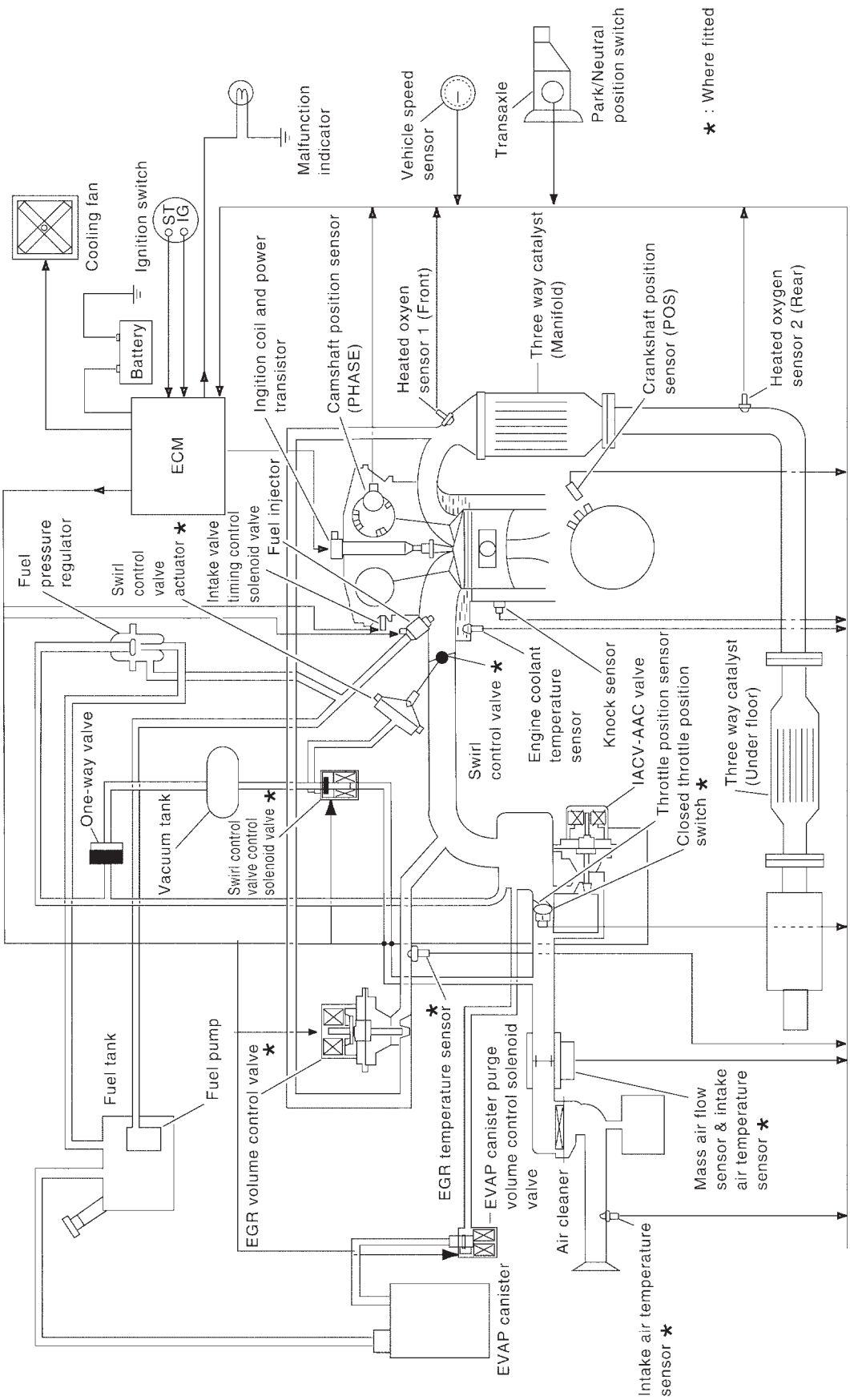
NLEC0010S02



YEC871

System Diagram

NLEC0011

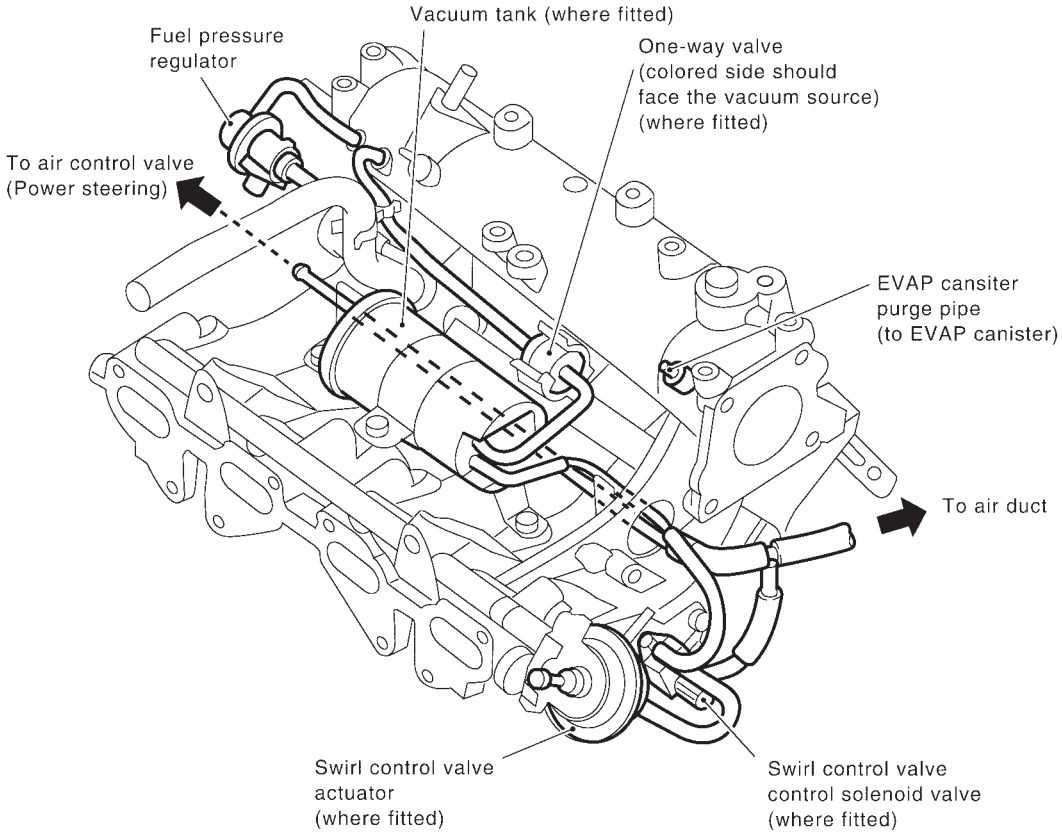


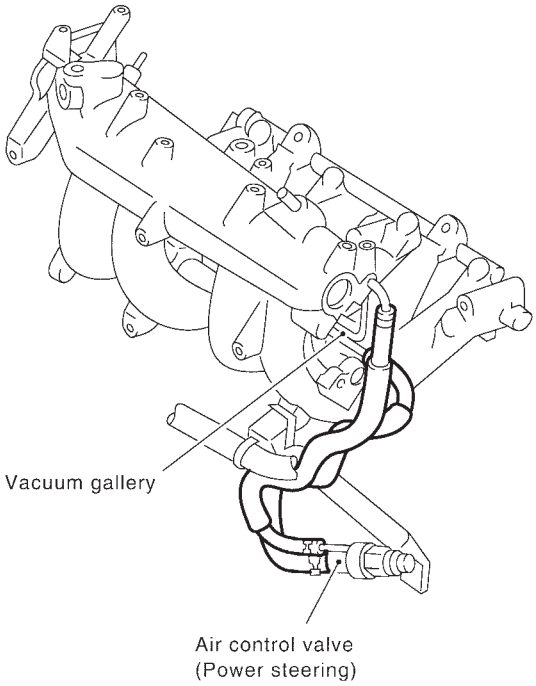
NEF313A

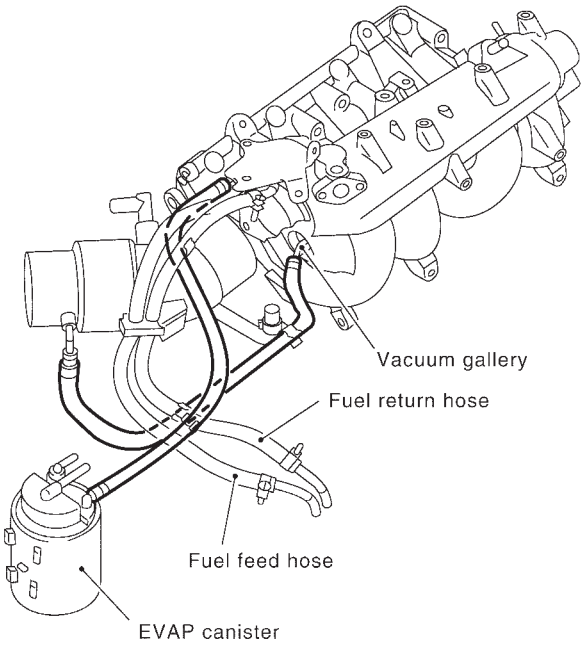
Vacuum Hose Drawing

NLEC0012

Refer to “System Diagram” on EC-32 for vacuum control system.







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

NEF314A

System Chart

NLEC0013

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

*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.
*2: Under normal conditions, this sensor is not for engine control operation.

Multiport Fuel Injection (MFI) System

DESCRIPTION

NLEC0014

Input/Output Signal Chart

NLEC0014S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Fuel injection & mixture ratio control	Injector
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
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		
PNP switch	Gear position		
Vehicle speed sensor	Vehicle speed		
Ignition switch	Start signal		
Air conditioner switch	Air conditioner operation		
Knock sensor	Engine knocking condition		
Electrical load	Electrical load signal		
Battery	Battery voltage		
Power steering oil pressure switch	Power steering operation		
Heated oxygen sensor 2 (rear)*	Density of oxygen in exhaust gas		

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

Basic Multiport Fuel Injection System

NLEC0014S02

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 camshaft position sensor and the mass air flow sensor.

Various Fuel Injection Increase/Decrease Compensation

NLEC0014S03

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

<Fuel increase>

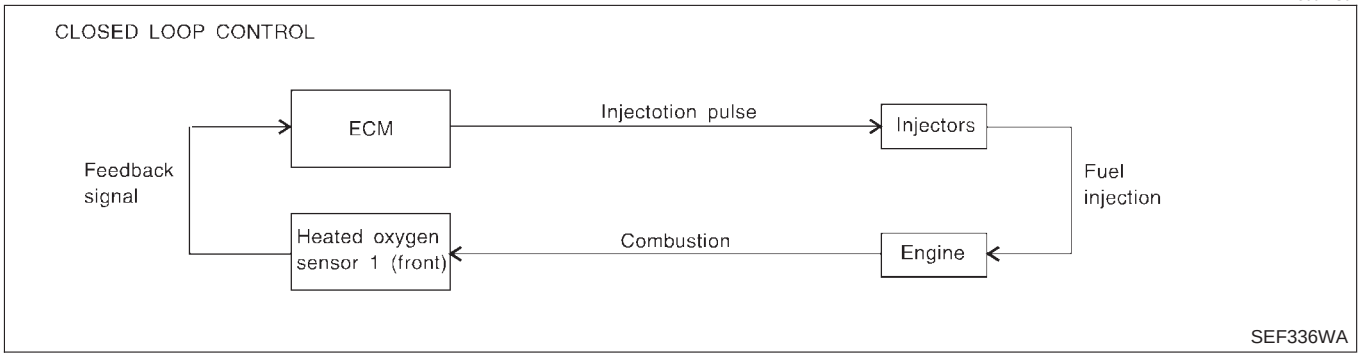
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation
- During high vehicle speed operation
- Extremely high engine coolant temperature

Mixture Ratio Feedback Control (Closed loop control)

NLEC0014S04



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst 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-184. 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. 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

NLEC0014S05

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
- When starting the engine

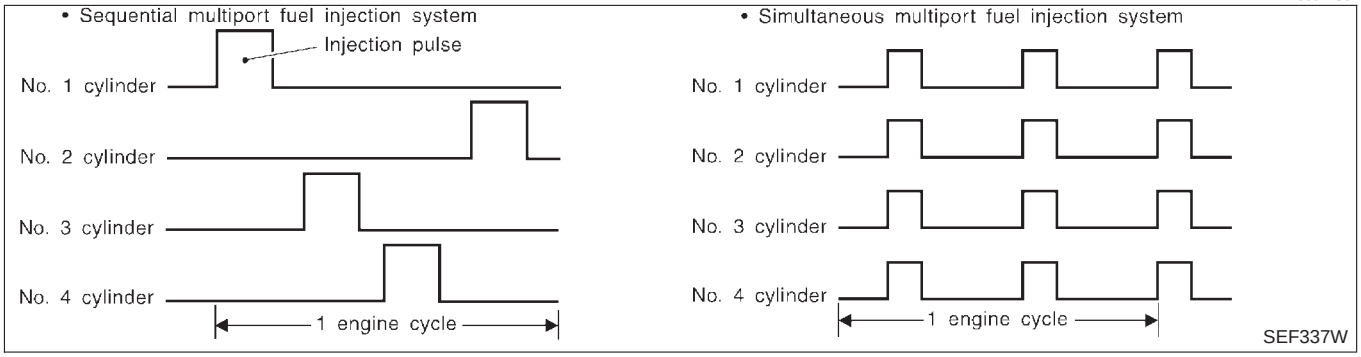
Mixture Ratio Self-learning Control

NLEC0014S06

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

NLEC0014S07



Two types of systems are used.

Sequential Multiport Fuel Injection System

NLEC0014S0701

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

NLEC0014S0702

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

Fuel Shut-off

NLEC0014S08

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

Electronic Ignition (EI) System

DESCRIPTION

NLEC0015

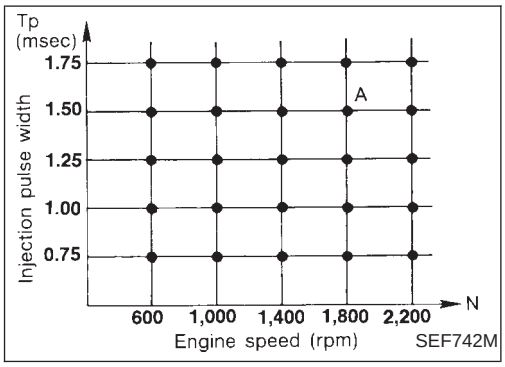
Input/Output Signal Chart

NLEC0015S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Ignition timing control	Power transistor
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
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		
PNP switch	Gear position		
Battery	Battery voltage		

System Description

NLEC0015S02



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 above.
The ECM receives information such as the injection pulse width, crankshaft position sensor signal 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
- 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

NLEC0016

Input/Output Signal Chart

NLEC0016S01

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		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		
Vehicle speed sensor	Vehicle speed		
Power steering oil pressure switch	Power steering operation		

System Description

NLEC0016S02

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

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.

- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When the refrigerant pressure is excessively high or low.

Fuel Cut Control (at no load & high engine speed)

DESCRIPTION

NLEC0017

Input/Output Signal Chart

NLEC0017S01

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Fuel cut control	Injectors
PNP switch	Neutral position		
Throttle position sensor	Throttle position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS)	Engine speed		
Camshaft position sensor (PHASE)	Engine speed and cylinder number		

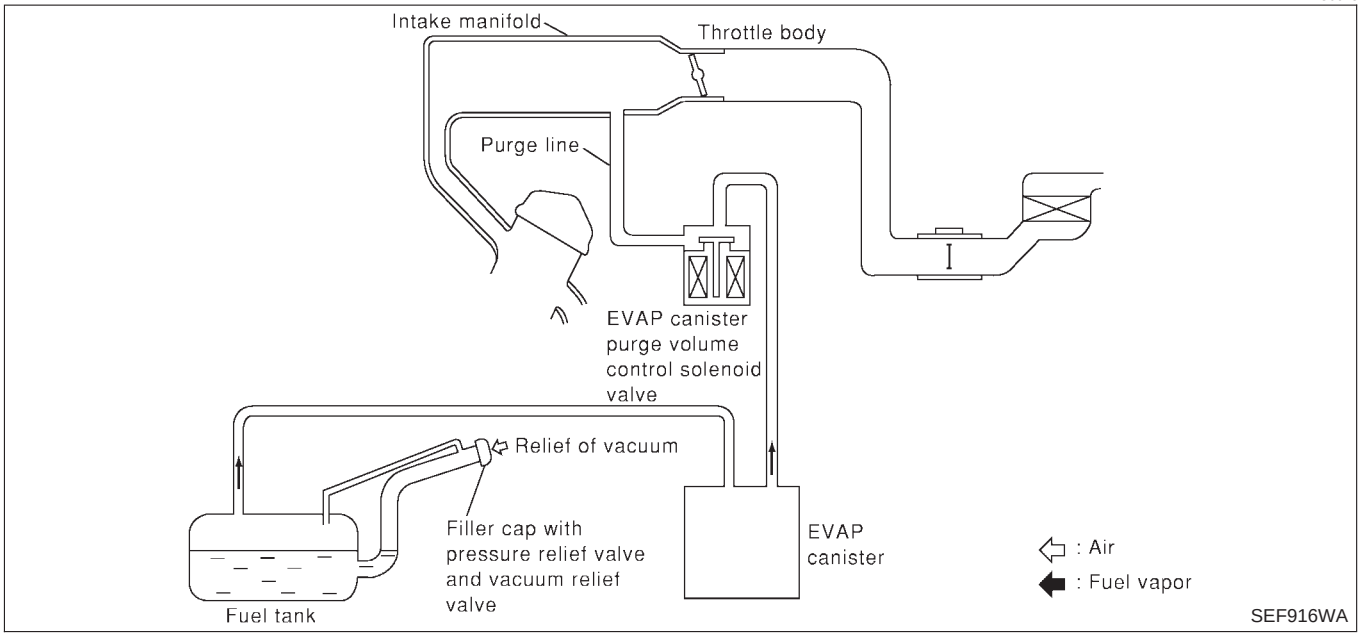
If the engine speed is above 3,950 rpm with no load, (for example, in Neutral and engine speed over 4,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,150 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-35.

Evaporative Emission System

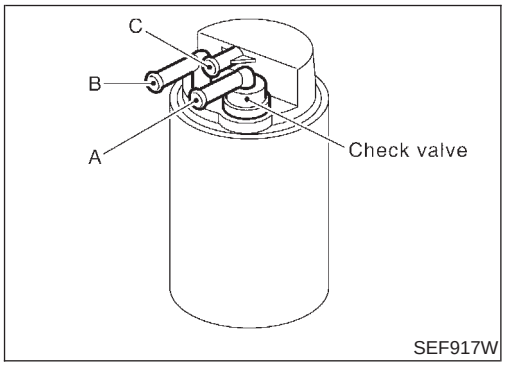
DESCRIPTION

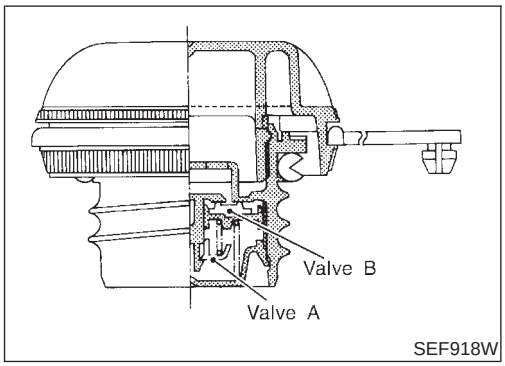
NLEC0018

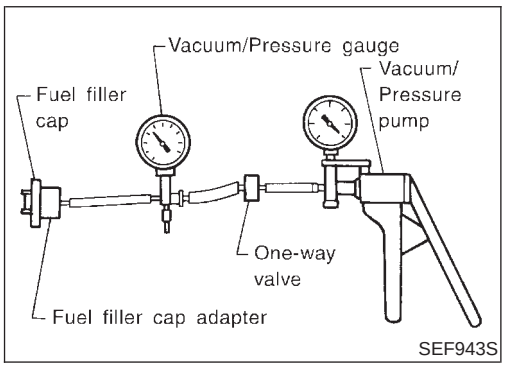


The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon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

NLEC0019

EVAP Canister

NLEC0019S01

Check EVAP canister as follows:

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

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

NLEC0019S03

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

   Pressure:

   16.0 - 20.0 kPa (0.16 - 0.20 bar, 0.163 - 0.204 kg/cm^2, 2.32 - 2.90 psi)

   Vacuum:

   −6.0 to −3.5 kPa (−0.060 to −0.035 bar, −0.061 to −0.036 kg/cm^2, −0.87 to −0.51 psi)
3. If out of specification, replace fuel filler cap as an assembly.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve

NLEC0019S07

Refer to EC-337.

Checking EVAP Vapour Lines

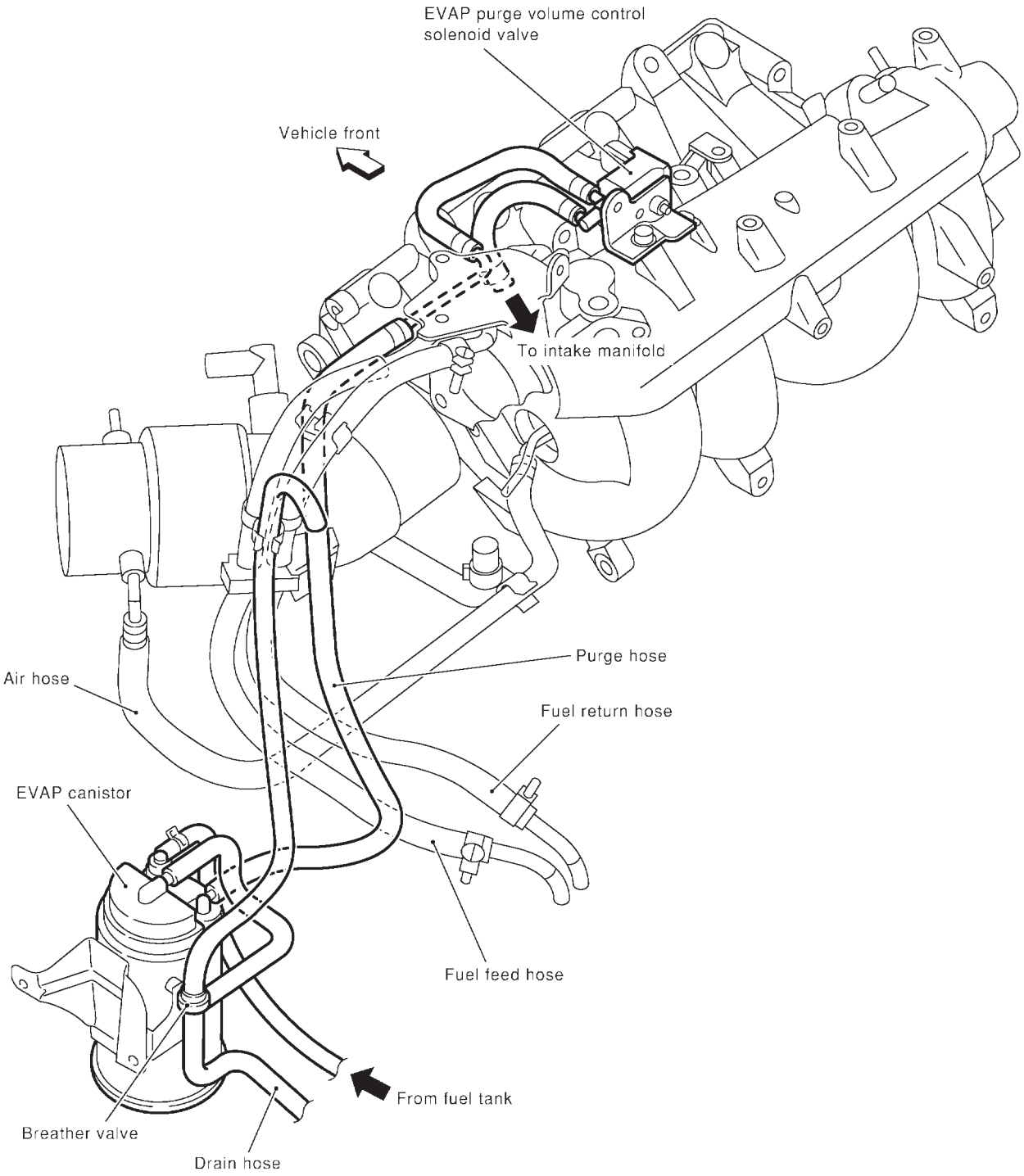
NLEC0019S13

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

=NLEC0020

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

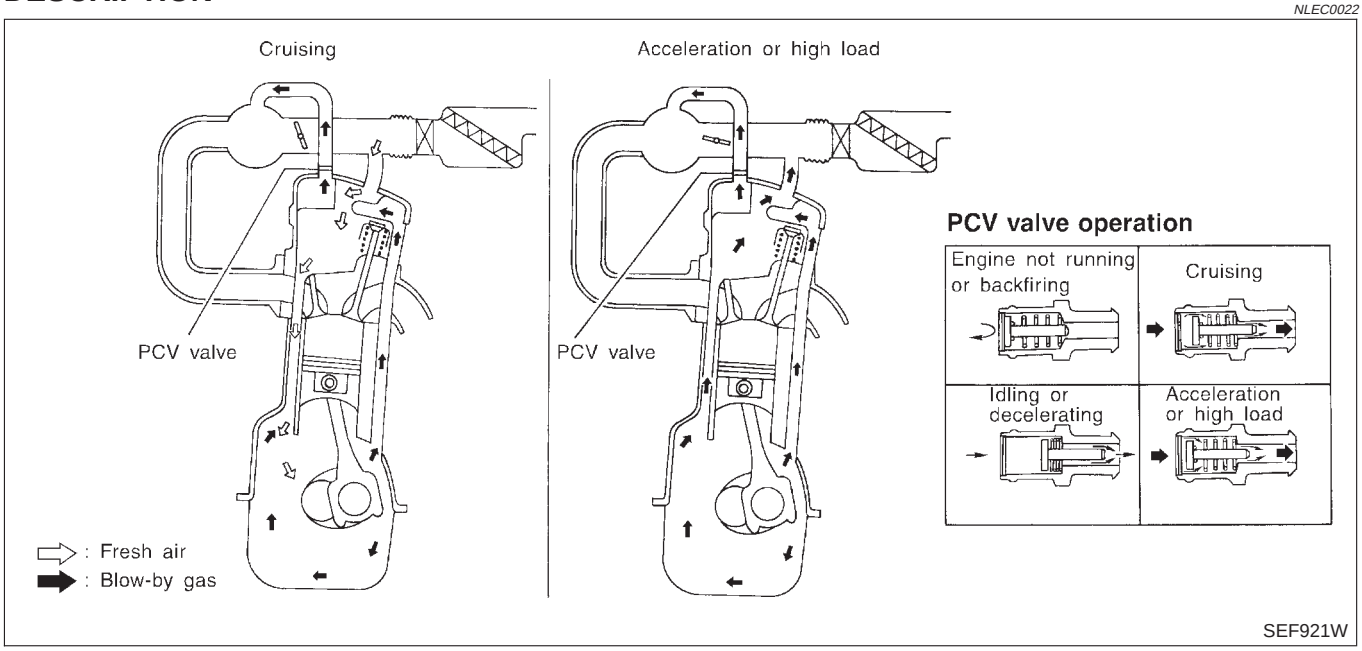


SEF600Y

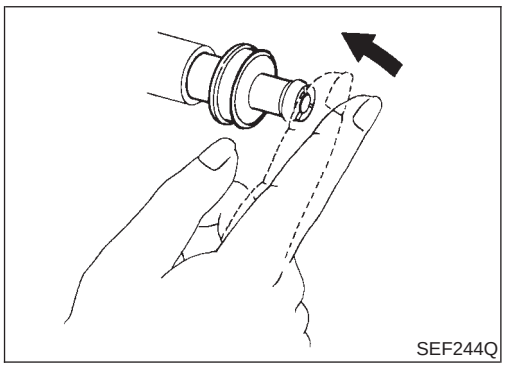
Positive Crankcase Ventilation

DESCRIPTION

NLEC0022



This system returns blow-by gas to the intake collector.
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 duct 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 intake collector under all conditions.



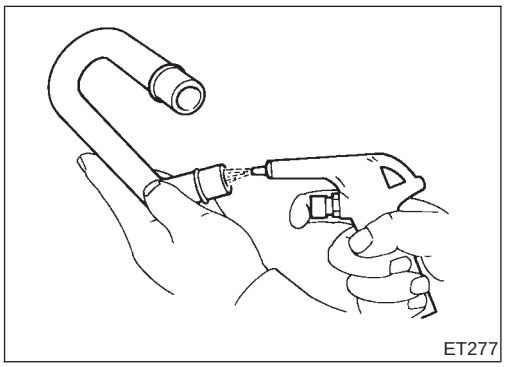
INSPECTION

NLEC0023

PCV (Positive Crankcase Ventilation) Valve

NLEC0023S01

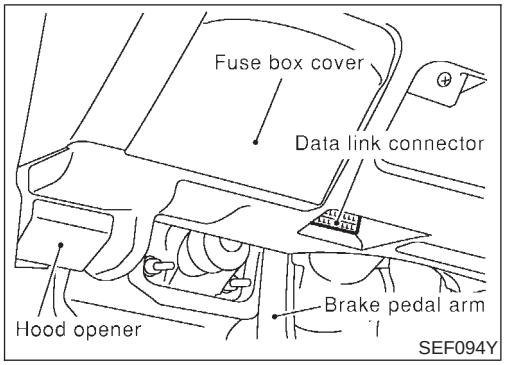
With engine running at idle, remove PCV valve from breather separator. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.



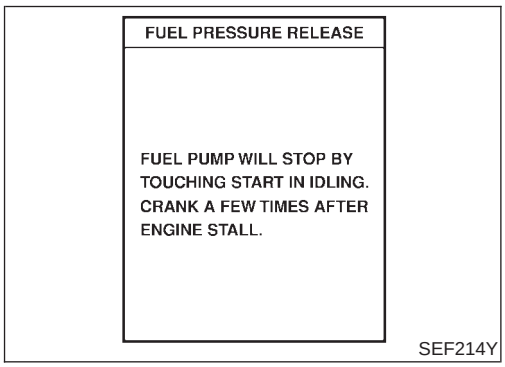
Ventilation Hose

NLEC0023S02

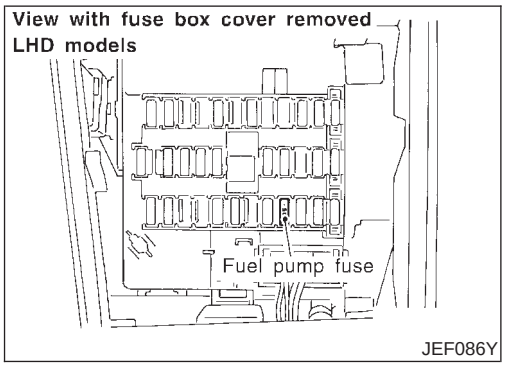
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



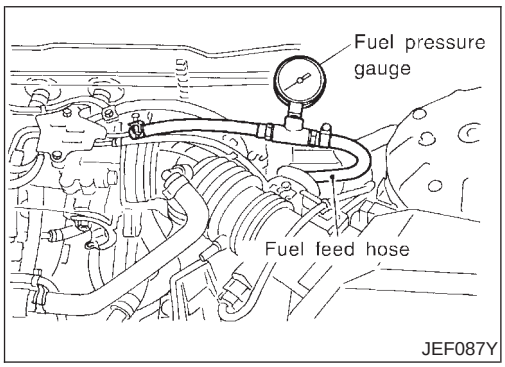
SEF094Y



SEF214Y



JEF086Y



JEF087Y

Fuel Pressure Release

NLEC0024

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

WITH CONSULT-II

NLEC0024S01

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

WITHOUT CONSULT-II

NLEC0024S02

1. Remove fuse for fuel pump. Refer to fuse block cover for fuse location.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF and reconnect fuel pump fuse.

Fuel Pressure Check

NLEC0025

- **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 hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

At idle speed:

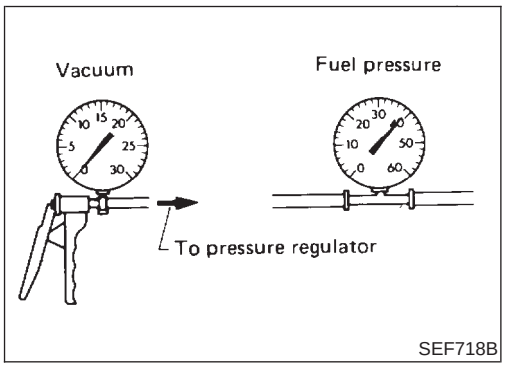
With vacuum hose connected

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, EC-44.

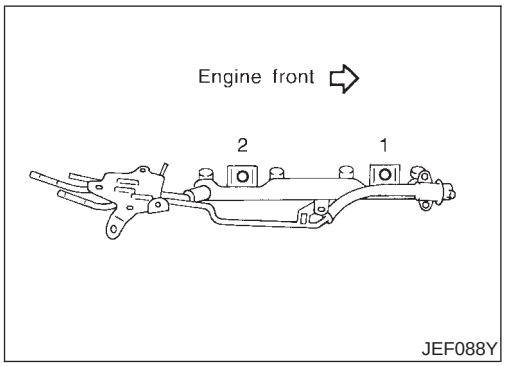


Fuel Pressure Regulator Check

NLEC0026

1. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
2. Plug intake manifold with a rubber 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

NLEC0027

1. Release fuel pressure to zero.
2. Remove fuel tube assemblies in numerical sequence as shown in the Figure at left.
3. Expand and remove clips securing fuel injectors.
4. Extract fuel injectors straight from fuel tubes.

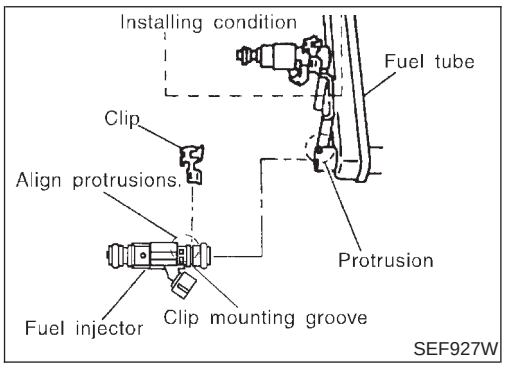
- **Be careful not to damage injector nozzles during removal.**
- **Do not bump or drop fuel injectors.**

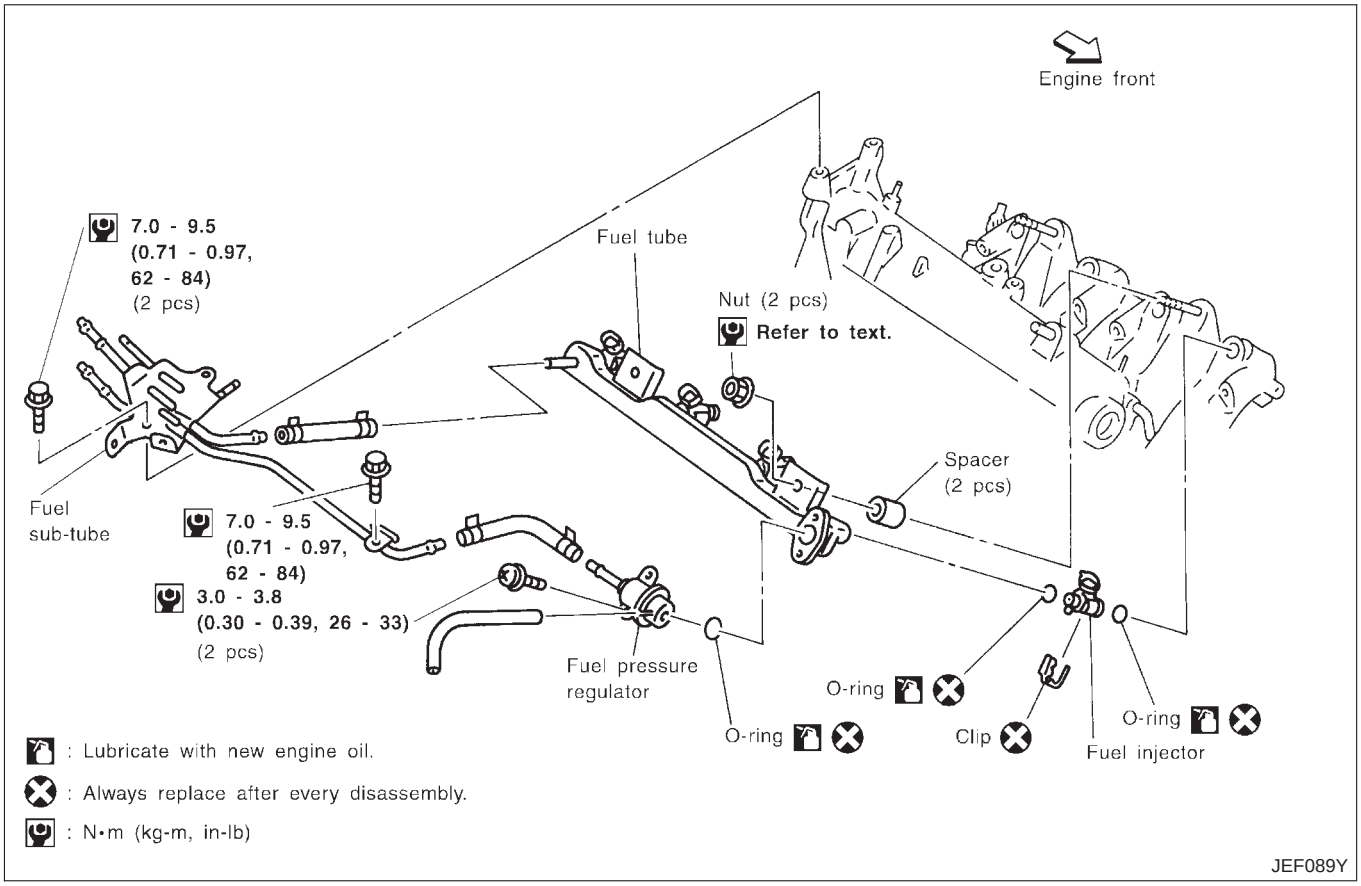
5. Install fuel injectors.
   Carefully install O-rings, including the one used with the pressure regulator.

- **Lubricate O-rings with a smear of engine oil.**
- **Be careful not to damage O-rings with service tools or finger nails or clips. Do not expand or twist O-rings.**
- **Discard old clips; replace with new ones.**

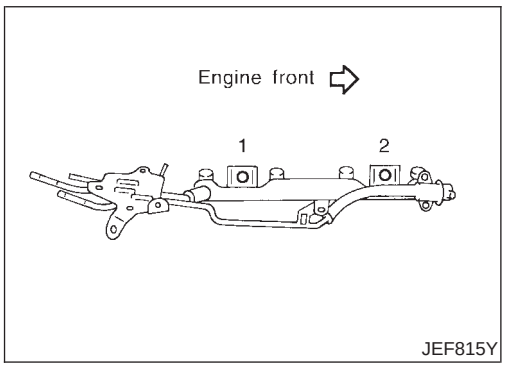
6. Position clips in grooves on fuel injectors.

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





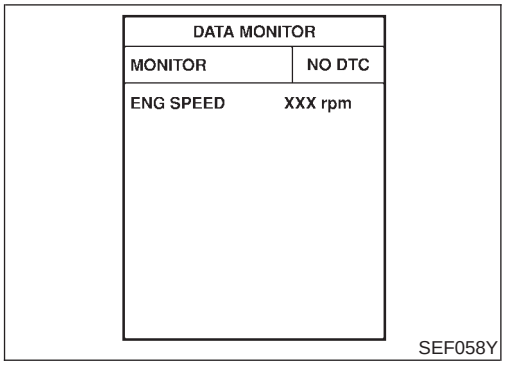
7. Align protrusions of fuel tubes with those of fuel injectors. Insert fuel injectors straight into fuel tubes.
8. After properly inserting fuel injectors, check to make sure that fuel tube protrusions are engaged with those of fuel injectors, and that flanges of fuel tubes are engaged with clips.



9. 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:
   12 - 13 (1.2 - 1.4, 9 - 10)
   2nd stage:
   17 - 23 (1.7 - 2.4, 13 - 17)
10. Insert fuel hoses into fuel tubes so that ends of fuel hoses butt up against fuel tubes; fasten with clamps, avoiding bulges.

CAUTION:

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



SEF058Y

How to Check Idle Speed and Ignition Timing

NLEC0028

IDLE SPEED

NLEC0028S05

- **Using CONSULT-II**
  Check idle speed in “DATA MONITOR” mode with CONSULT-II.
- **With GST**
  Check idle speed in “MODE 1” with GST.

IGNITION TIMING

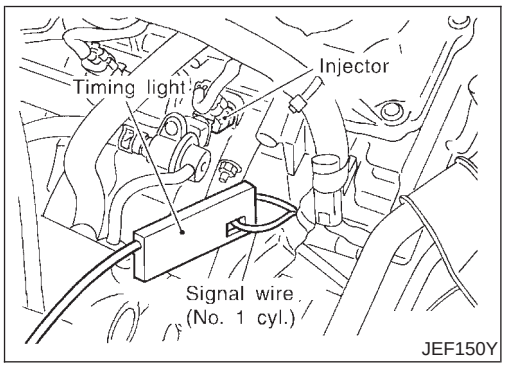
NLEC0028S06

Any of following two methods may be used.

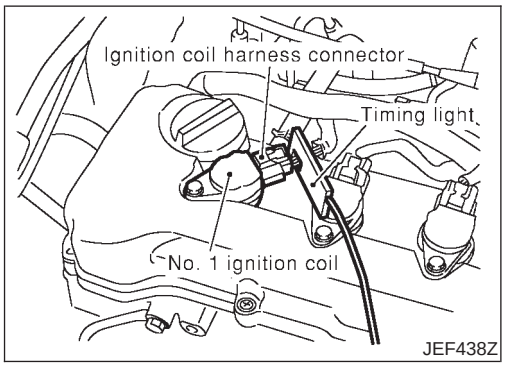
- **Method A**

a) Attach timing light to loop wire or, combine the three No. 1 ignition coil harnesses and attach the timing light sensor (attach from above the harness protector) as shown.

b) Check ignition timing.



JEF150Y



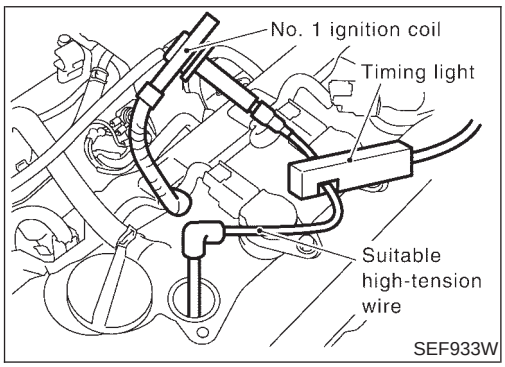
JEF438Z

- **Method B**

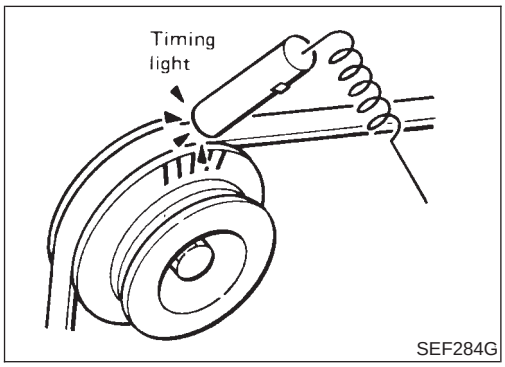
a) Remove No. 1 ignition coil.

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.

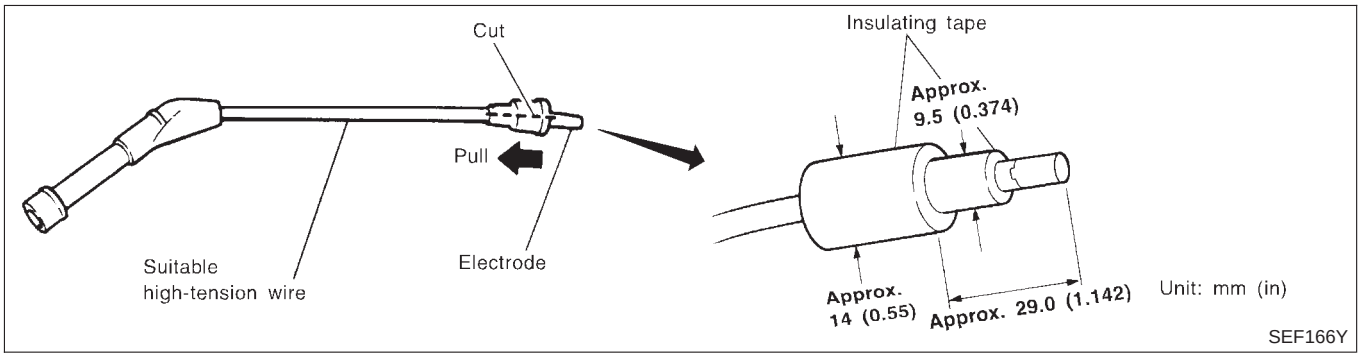
c) Check ignition timing.



SEF933W



SEF284G



Preparation

NLEC0592

- **Make sure that the following parts are in good order.**

a) **Battery**
b) **Ignition system**
c) **Engine oil and coolant levels**
d) **Fuses**
e) **ECM harness connector**
f) **Vacuum hoses**
g) **Air intake system**
(Oil filler cap, oil level gauge, etc.)
h) **Fuel pressure**
i) **Engine compression**
j) **EGR valve operation**
k) **Throttle valve**
l) **EVAP system**

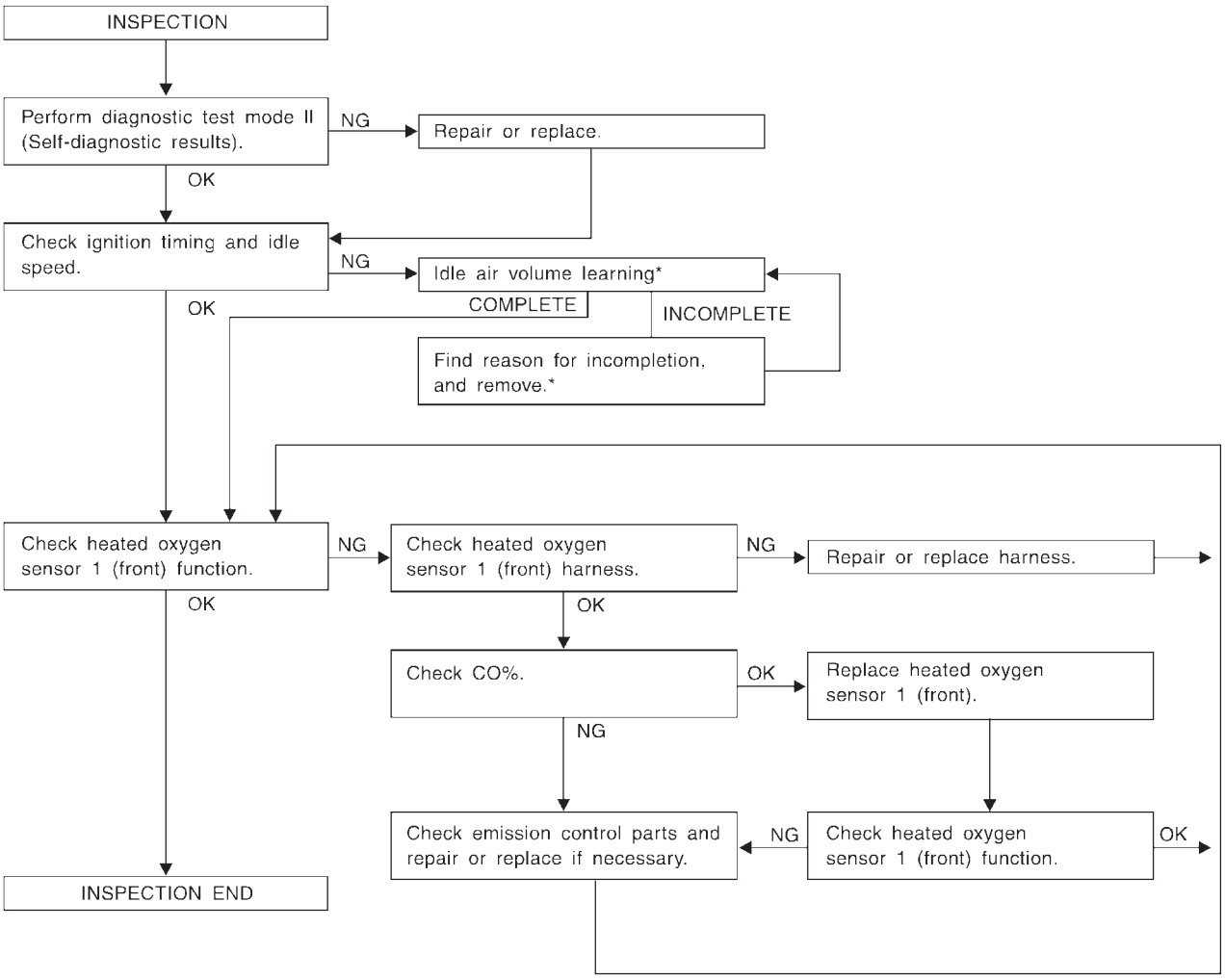
- **On models equipped with air conditioner, checks should be carried out while the air conditioner is "OFF".**
- **When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.**
- **Turn off headlamps, heater blower, rear window defogger.**
- **On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.**
- **Keep front wheels pointed straight ahead.**
- **If engine stops immediately after starting or idle condition is unstable, perform the following to initialize IACV-AAC valve:**

a) **Stop engine and wait 9 seconds.**
b) **Turn ignition "ON" and wait 1 second.**
c) **Turn ignition "OFF" and wait 9 seconds.**

- **Make sure the cooling fan has stopped.**

OVERALL INSPECTION SEQUENE

NLEC0592S01



SEF104XA

*: Refer to EC-57.

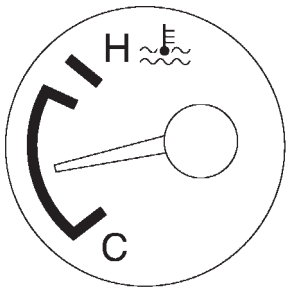
Inspection Procedure

NLEC0593

1	INSPECTION START

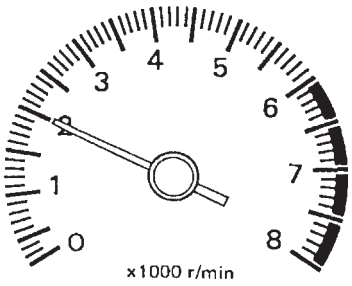
1. Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- EGR valve operation
- Electrical connectors
- Gasket
- Throttle valve and throttle position sensor operation

2. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. Ensure engine stays below 1,000 rpm.



SEF090Y

3. Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.



SEF977U

4. Make sure that no DTC is displayed with CONSULT-II, GST or without CONSULT-II (Method refers to EC-75.)

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

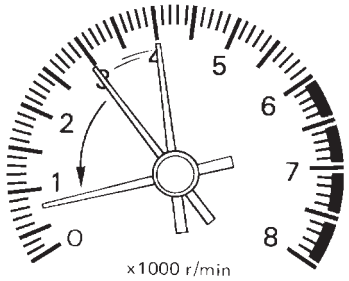
2	REPAIR OR REPLACE

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

	▶	GO TO 3.

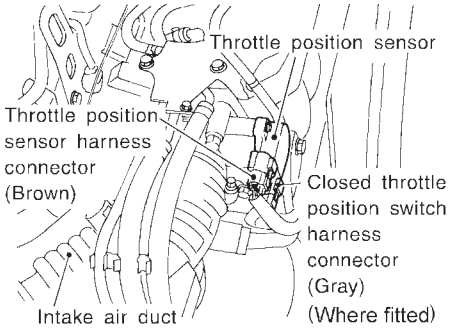
3	CHECK IGNITION TIMING

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



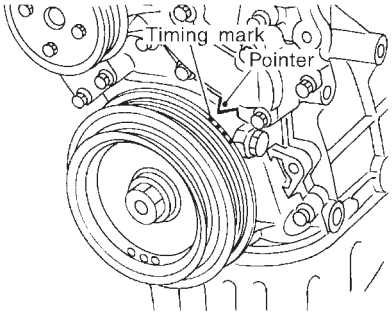
SEF978U

3. Turn off engine and disconnect throttle position sensor harness connector.



NEF309A

4. Start and rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run at idle speed.
5. Check ignition timing with a timing light.



SEM872F

8±2° BTDC

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit, repair or replace if necessary. Refer to EC-302.
- Check crankshaft position sensor (POS) and circuit, repair or replace if necessary. Refer to EC-295.
- Check ECM function by substituting another known-good ECM.
  (ECM may be the cause of a problem, but this is rarely the case.)

	▶	GO TO 3.

5	CHECK TARGET IDLE SPEED

With CONSULT-II

1. Turn off engine and connect throttle position sensor harness connector.
2. Start engine and make sure that electrical load switches are "OFF".
3. Rev engine (2,000 to 3,000 rpm) 2 or 3 times under no-load then run at idle speed.
4. Read idle speed in "DATA MONITOR" mode with CONSULT-II.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

700±50 rpm

Without CONSULT-II

1. Turn off engine and connect throttle position sensor harness connector.
2. Start engine and make sure that electrical load switches are "OFF".
3. Rev engine (2,000 to 3,000 rpm) 2 or 3 times under no-load then run at idle speed.
4. Check idle speed.

700±50 rpm

OK or NG

OK (With CONSULT-II) ▶	GO TO 8.
OK (Without CONSULT-II) ▶	GO TO 9.
NG ▶	GO TO 6.

6	CHECK TARGET IDLE SPEED AGAIN

Perform test No. 5 again.

OK or NG

OK (With CONSULT-II) ▶	GO TO 8.
OK (Without CONSULT-II) ▶	GO TO 9.
NG ▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.

- Check IACV-AAC valve and replace if necessary. Refer to EC-343.
- Check IACV-AAC valve harness and repair if necessary. Refer to EC-343.
- Check ECM function by substituting another known-good ECM.
  (ECM may be the cause of a problem, but this is rarely the case.)

With CONSULT-II ▶	GO TO 8.
Without CONSULT-II ▶	GO TO 9.

8	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SIGNAL

With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. See "HO2S1 MNTR (B1)" in "DATA MONITOR" mode.
3. Running engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
HO2S1 MNTR (B1)	RICH

SEF820Y

1 time: RICH → LEAN → RICH
2 times: RICH → LEAN → RICH → LEAN → RICH

OK or NG

OK	▶	**INSPECTION END**
NG (Monitor does not fluctuate.)	▶	GO TO 12.
NG (Monitor fluctuates less than 5 times.)	▶	GO TO 10.

9	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SIGNAL

Without CONSULT-II

1. Set "Heated oxygen sensor 1 monitor (front)" in the Diagnostic Test Mode II. Refer to EC-73.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintain engine at 2,000 rpm under no-load and check that MI goes on more than five times within 10 seconds.

OK or NG

OK	▶	**INSPECTION END**
NG (MI does not go on.)	▶	GO TO 12.
NG (MI goes on less than 5 times.)	▶	GO TO 10.

10	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SIGNAL

With CONSULT-II

1. Stop engine.
2. Replace heated oxygen sensor 1 (front).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. See "HO2S1 MNTR (B1)" in "DATA MONITOR" mode.
6. Running engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

Without CONSULT-II

1. Stop engine.
2. Replace heated oxygen sensor 1 (front).
3. Set "Heated oxygen sensor 1 monitor (front)" in the Diagnostic Test Mode II. Refer to EC-73.
4. Run engine at about 2,000 rpm for about 2 minutes under no-load.
5. Maintain engine at 2,000 rpm under no-load and check that MI goes on more than five times within 10 seconds.

OK or NG

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

11	DETECT MALFUNCTIONING PART

Check the following.

1. Check fuel pressure regulator. Refer to EC-44.
2. Check mass air flow sensor and its circuit. Refer to EC-154.
3. Check injector and its circuit. Refer to EC-494.
   Clean or replace if necessary.
4. Check engine coolant temperature sensor and its circuit. Refer to EC-169.
5. Check ECM function by substituting another known-good ECM.
   (ECM may be the cause of a problem, but this is rarely the case.)

	▶	GO TO 3.

12	CHECK HEATED OXYGEN SENSOR 1 (FRONT) HARNESS

1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect heated oxygen sensor 1 (front) harness connector.
4. Check harness continuity between ECM terminal 62 and heated oxygen sensor 1 (front) harness connector terminal 1. Refer to Wiring Diagram, EC-184.
   Continuity should exist.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	REPAIR OR REPLACE

Repair or replace harness between ECM and heated oxygen sensor 1 (front).

	▶	GO TO 5.

14	PREPARATION FOR "CO" % CHECK

With CONSULT-II

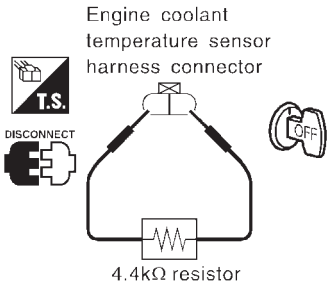
1. Reconnect ECM harness connector.
2. Turn ignition switch "ON".
3. Select "COOLANT TEMP" in "ACTIVE TEST" mode.
4. Set "COOLANT TEMP" to 5°C (41°F) by touching "DWN" and "Qd".

ACTIVE TEST	
ENG COOLANT TEMP	XXX °C
MONITOR	
ENG SPEED	XXX rpm
INJ PULSE-B1	XXX msec
IGN TIMING	XXX BTDC

SEF172Y

Without CONSULT-II

1. Disconnect ECM harness connector.
2. Disconnect engine coolant temperature sensor harness connector.
3. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.

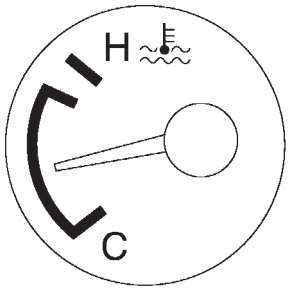


SEF982UA

▶	GO TO 15.

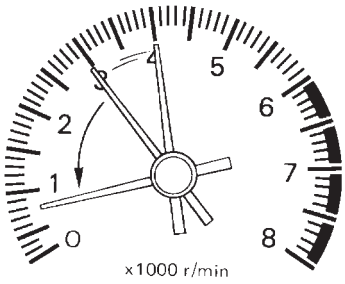
15	CHECK "CO" %

1. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.



SEF090Y

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



SEF978U

3. Check "CO" %.
   Idle CO: 3 - 11%
4. ⊗ **Without CONSULT-II**
   After checking CO%,

a. Disconnect the resistor from terminals of engine coolant temperature sensor.
b. Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 17.

16	CHECK HEATED OXYGEN SENSOR 1 (FRONT) SIGNAL

With CONSULT-II

1. Stop engine.
2. Replace heated oxygen sensor 1 (front).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. See "HO2S1 MNTR (B1)" in "DATA MONITOR" mode.
6. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

Without CONSULT-II

1. Stop engine.
2. Replace heated oxygen sensor 1 (front).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. Set voltmeter probe between ECM terminal 62 and ground.
6. Make sure that voltage fluctuates between 0 - 0.3V and 0.6 - 1.0V more than 5 times during 10 seconds at 2,000 rpm.
   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

OK or NG

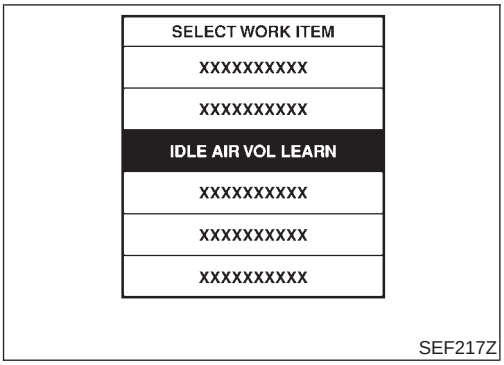
OK	▶	GO TO 5.
NG	▶	GO TO 17.

17	DETECT MALFUNCTIONING PART

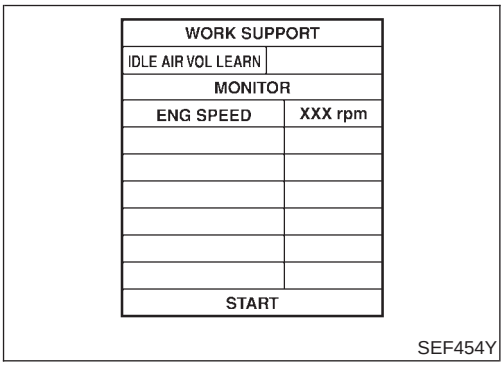
Check the following.

- Connect heated oxygen sensor 1 (front) harness connectors to heated oxygen sensors 1 (front).
- Check fuel pressure regulator. Refer to EC-44.
- Check mass air flow sensor and its circuit. Refer to EC-154.
- Check injector and its circuit. Refer to EC-494.
  Clean or replace if necessary.
- Check engine coolant temperature sensor and its circuit. Refer to EC-169.
- Check ECM function by substituting another known-good ECM.
  (ECM may be the cause of a problem, but this is rarely the case.)

	▶	GO TO 5.



SEF217Z



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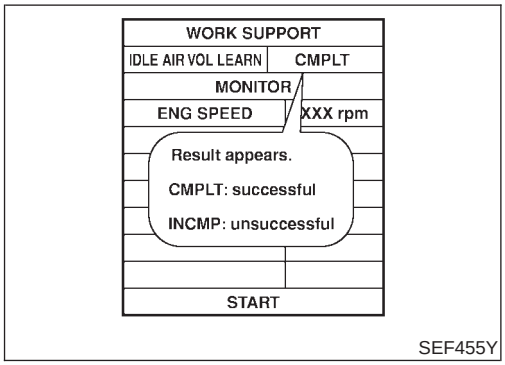


SEF455Y

Idle Air Volume Learning

NLEC0562

DESCRIPTION

NLEC0562S01

"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

NLEC0562S02

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
  M/T models, drive vehicle for 10 minutes.

OPERATION PROCEDURE

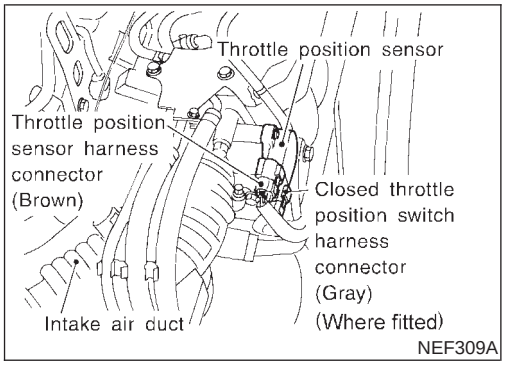
NLEC0562S03

With CONSULT-II

NLEC0562S0301

1. Start engine and warm it up to normal operating temperature.
2. Check that all items listed under the topic "PRE-CONDITIONING" (previously mentioned) are in good order.
3. Turn ignition switch "OFF" and wait at least 9 seconds.
4. Start the engine and let it idle for at least 28 seconds.
5. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
6. Touch "START" and wait 20 seconds.
7. Make sure that "CMPLT" is displayed on CONSULT-II screen. If "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.
8. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

ITEM	SPECIFICATION
Idle speed	700±50 rpm
Ignition timing	8±2° BTDC



Without CONSULT-II

NLEC0562S0302

1. Start engine and warm it up to normal operating temperature.
2. Check that all items listed under the topic "PRE-CONDITIONING" (previously mentioned) are in good order.
3. Turn ignition switch "OFF" and wait at least 9 seconds.
4. Start the engine and let it idle for at least 28 seconds.
5. Disconnect throttle position sensor harness connector (brown), then reconnect it within 5 seconds.
6. Wait 20 seconds.
7. 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.
8. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

ITEM	SPECIFICATION
Idle speed	700±50 rpm
Ignition timing	8±2° BTDC

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

1) **Check that throttle valve is fully closed.**
2) **Check that downstream of throttle valve is free from air leakage.**
3) **Adjust closed throttle position switch and reset memory. (Refer to Basic Inspection, EC-99.)**
4) **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
5) **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

NLEC0029

MODELS WITH EURO-OBD SYSTEM

NLEC0029S01

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
ECM*3	X	X*1	—	—	—	—
CONSULT-II	X	X	X	X	X	—
GST	X	X*2	X	—	X	X

*1: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.
*2: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.
*3: In diagnostic test mode II (Self-diagnostic results), DTC is displayed on MI. DTC uses a set of four digit numbers.

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-123.)

MODELS WITHOUT EURO-OBD SYSTEM

NLEC0029S02

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*1	X	X*2	—	—

*1: In diagnostic test mode II (Self-diagnostic results), (1st trip) DTC is displayed on the MI by a set of four digit numbers.
*2: 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

NLEC0030

MODELS WITH EURO-OBD SYSTEM

NLEC0030S01

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>.

Two Trip Detection Logic (Cont'd)

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.

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 - P0304 is being detected	X	—	—	—	—	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	X	—	—	X	—	—
Fail-safe items (Refer to EC-123.)	—	X	—	—	X*1	—	X*1	—
Except above	—	—	—	X	—	X	X	—

*1: Except "ECM".

MODELS WITHOUT EURO-OBD SYSTEM

NLEC0030S02

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-123), the DTC is stored in the ECM memory even in the 1st trip.

Emission-related Diagnostic Information

NLEC0031

MODELS WITH EURO-OBD SYSTEM

NLEC0031S01

DTC and 1st Trip DTC

NLEC0031S0101

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-69.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-68. 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-97. 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

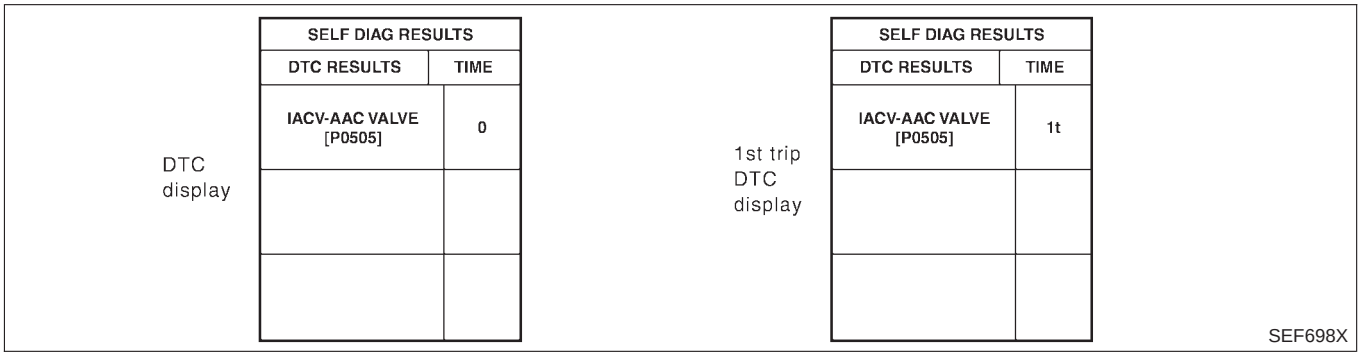
DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II/GST 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

NLEC0031S0102

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-85.
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 (0300 - 0304) Fuel Injection System Function — DTC: P0171 (0171), P0172 (0172)
2		Except the above 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-69.

System Readiness Test (SRT) Code

NLEC0031S0103

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15031-5.
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

NLEC0031S0107

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
O2 SENSOR	3	Heated oxygen sensor 1 (front) (circuit)	P0130
		Heated oxygen sensor 1 (front) (lean shift monitoring)	P0131
		Heated oxygen sensor 1 (front) (rich shift monitoring)	P0132
		Heated oxygen sensor 1 (front) (response monitoring)	P0133
		Heated oxygen sensor 1 (front) (high voltage)	P0134
		Heated oxygen sensor 2 (rear) (min. voltage monitoring)	P0137
		Heated oxygen sensor 2 (rear) (max. voltage monitoring)	P0138
		Heated oxygen sensor 2 (rear) (response monitoring)	P0139
		Heated oxygen sensor 2 (rear) (high voltage)	P0140
O2 SEN HEATER	3	Heated oxygen sensor 1 heater (front)	P0135
		Heated oxygen sensor 1 heater (rear)	P0141
EGR SYSTEM (where fitted)	3	EGR function (close)	P0400
	1	EGR function (open)	P1402

*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

NLEC0031S0108

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

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

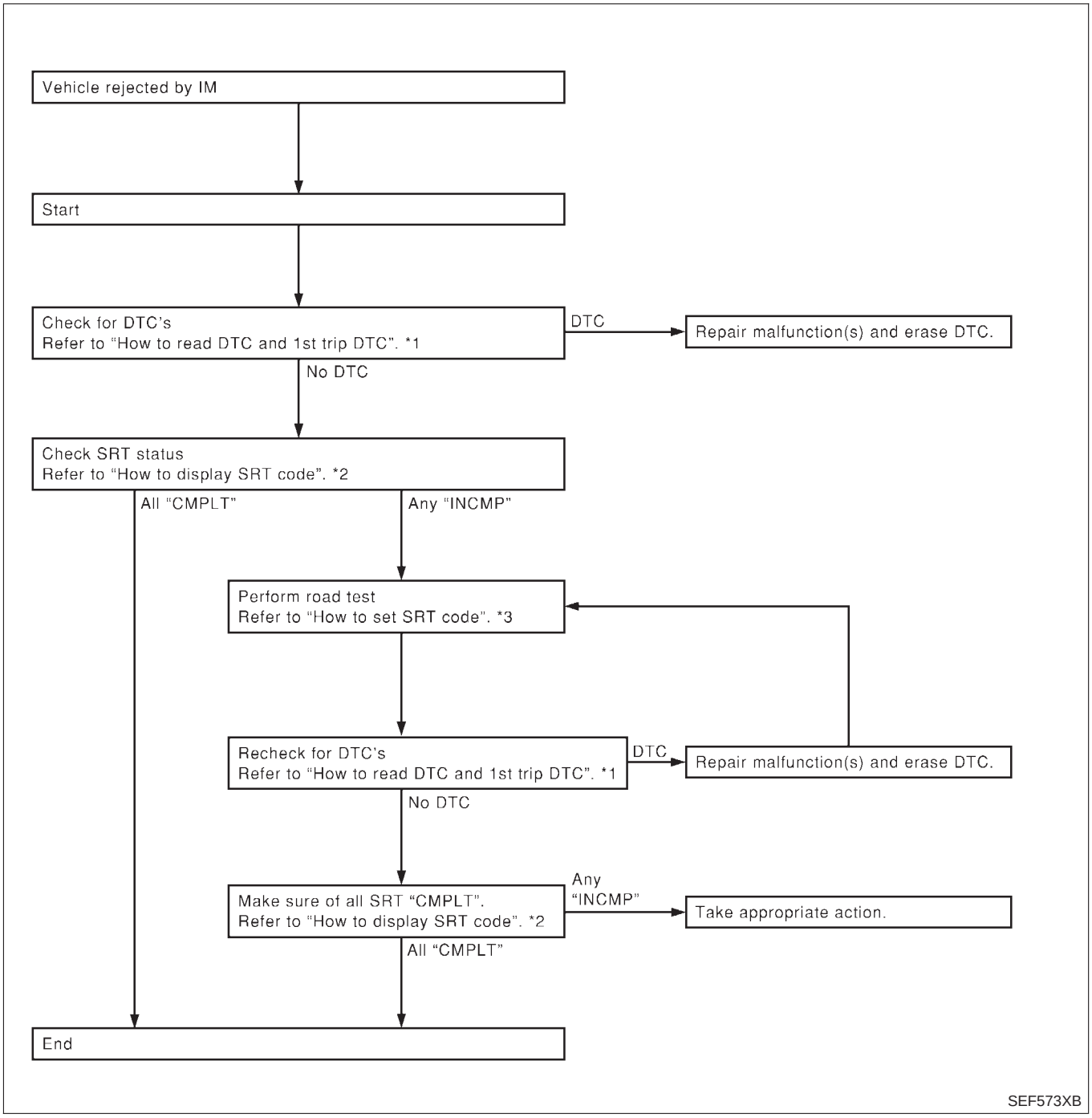
- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory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

NLEC0031S0109

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.

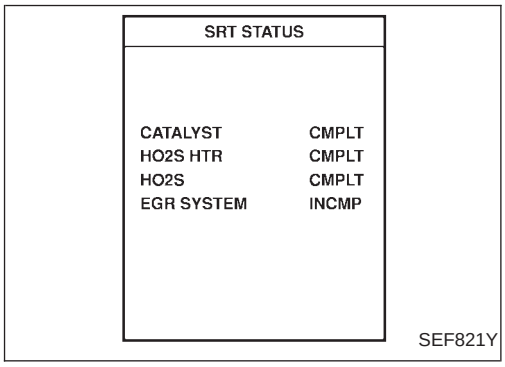


*1 EC-60 *2 EC-64 *3 EC-65

How to Display SRT Code

NLEC0031S0110

1. **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.



2. GST **With GST**
   Selecting Mode 1 with GST (Generic Scan Tool)

How to Set SRT Code

NLEC0031S0111

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-122.

Without CONSULT-II

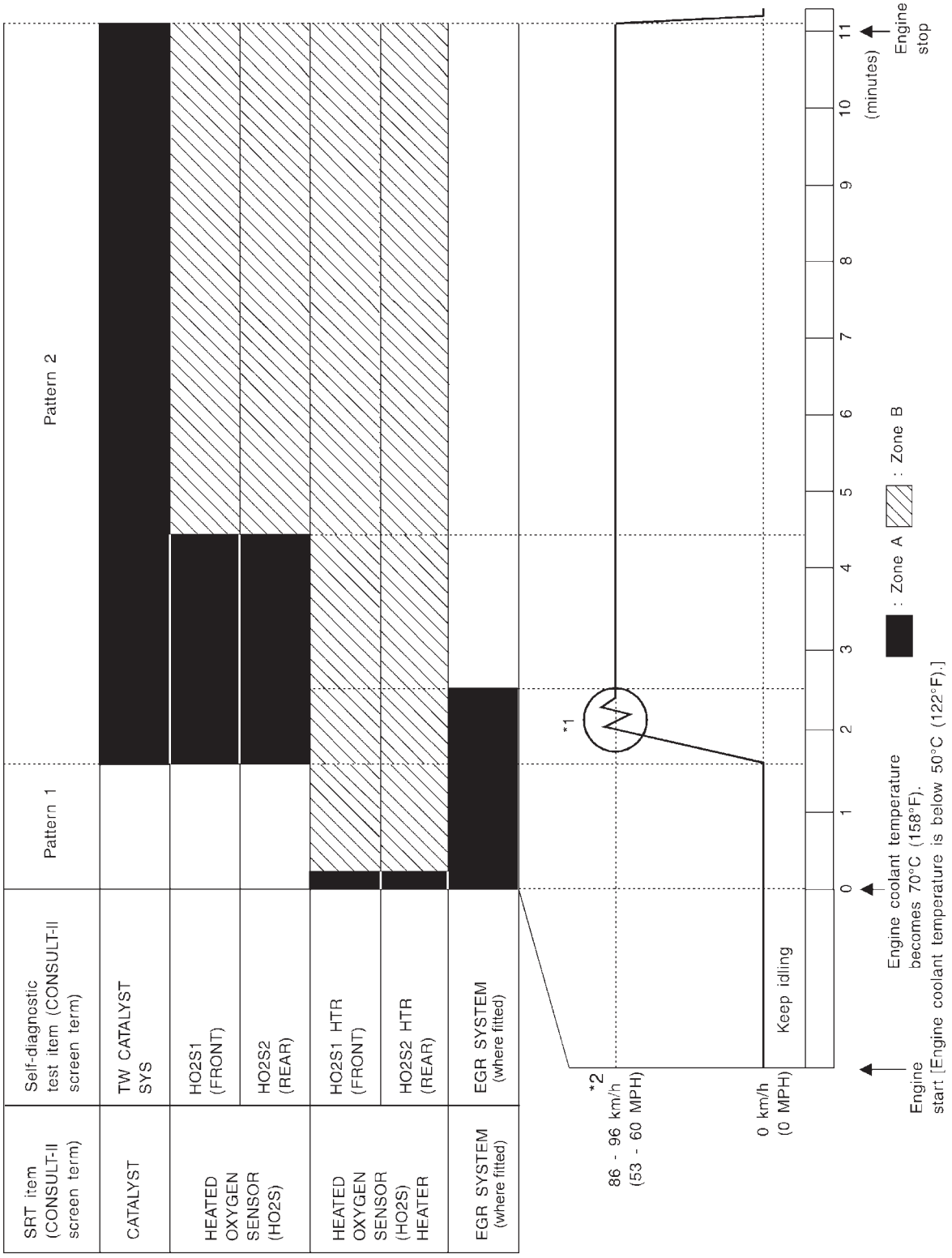
The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern

=NLEC0031S0112

Driving pattern

Note: Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws.
Refer to next page for more information and explanation of chart.



NEF321A

- 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 terminals 70 and 58 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 terminals 70 and 58 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 82 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.

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

Suggested upshift speeds

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.

Gear change	ACCEL shift point km/h (MPH)
1st to 2nd	15 (9)
2nd to 3rd	35 (22)
3rd to 4th	50 (31)
4th to 5th	70 (43)

Test Value and Test Limit (GST only — not applicable to CONSULT-II)

NLEC0031S0104

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 (14 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	01H	01H	Max.	X
		02H	81H	Min.	X

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
HO2S	Heated oxygen sensor 1 (front)	09H	04H	Max.	X
		0AH	84H	Min.	X
		0BH	04H	Max.	X
		0CH	04H	Max.	X
		0DH	04H	Max.	X
	Heated oxygen sensor 2 (rear)	19H	86H	Min.	X
		1AH	86H	Min.	X
		1BH	06H	Max.	X
		1CH	06H	Max.	X
HO2S HTR	Heated oxygen sensor 1 heater (front)	29H	08H	Max.	X
		2AH	88H	Min.	X
	Heated oxygen sensor 2 heater (rear)	2DH	0AH	Max.	X
		2EH	8AH	Min.	X
EGR SYSTEM (where fitted)	EGR function	31H	8CH	Min.	X
		32H	8CH	Min.	X
		33H	8CH	Min.	X
		34H	8CH	Min.	X
		35H	0CH	Max.	X

Emission-related Diagnostic Information Items

NLEC0031S0105

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 SELF DIAGNOSTIC FAILURE INDICATED	**P0000**	—	—	—	—
MAF SEN/CIRCUIT	P0100	—	—	X	EC-154
AIR TEMP SEN/CIRC	P0110	—	—	X	EC-161
COOLANT T SEN/CIRC	P0115	—	—	X	EC-169
THRTL POS SEN/CIRC	P0120	—	—	X	EC-175
HO2S1 (B1)	P0130	X	X	X*2	EC-184
HO2S1 (B1)	P0131	X	X	X*2	EC-192
HO2S1 (B1)	P0132	X	X	X*2	EC-198
HO2S1 (B1)	P0133	X	X	X*2	EC-204
HO2S1 (B1)	P0134	X	X	X*2	EC-214
HO2S1 HTR (B1)	P0135	X	X	X*2	EC-221
HO2S2 (B1)	P0137	X	X	X*2	EC-227
HO2S2 (B1)	P0138	X	X	X*2	EC-237
HO2S2 (B1)	P0139	X	X	X*2	EC-246

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/Test limit (GST only)	1st trip DTC*1	Reference page
HO2S2 (B1)	P0140	X	X	X*2	EC-256
HO2S2 HTR (B1)	P0141	X	X	X*2	EC-263
FUEL SYS-LEAN/BK1	P0171	—	—	X	EC-269
FUEL SYS-RICH/BK1	P0172	—	—	X	EC-277
MULTI CYL MISFIRE	P0300	—	—	X	EC-285
CYL 1 MISFIRE	P0301	—	—	X	EC-285
CYL 2 MISFIRE	P0302	—	—	X	EC-285
CYL 3 MISFIRE	P0303	—	—	X	EC-285
CYL 4 MISFIRE	P0304	—	—	X	EC-285
KNOCK SEN/CIRC-B1	P0325	—	—	—	EC-291
CKP SEN/CIRCUIT (POS)	P0335	—	—	X	EC-295
CMP SEN/CIRCUIT (PHS)	P0340	—	—	X	EC-302
EGR SYSTEM (where fitted)	P0400	X	X	X*2	EC-310
EGR VOL CONT/V CIRC (where fitted)	P0403	—	—	X	EC-319
TW CATALYST SYS-B1	P0420	X	X	X*2	EC-327
PURG VOLUME CONT/V	P0443	—	—	X	EC-332
VEH SPEED SEN/CIRC	P0500	—	—	X	EC-338
IACV/AAC VLV/CIRC	P0505	—	—	X	EC-343
CLOSED TP SW/CIRC (where fitted)	P0510	—	—	X	EC-352
ECM	P0605	—	—	X	EC-358
INT/V TIM V/CIR-B1	P1111	—	—	X	EC-360
SWIRL CONT SOL/V (where fitted)	P1131	—	—	X	EC-366
ENG OVER TEMP	P1217	—	—	X	EC-373
EGR TEMP SEN/CIRC (where fitted)	P1401	—	—	X	EC-386
EGR SYSTEM (where fitted)	P1402	X	X	X*2	EC-393
P-N POS SW/CIRCUIT	P1706	—	—	X	EC-402

*1: 1st trip DTC No. is the same as DTC No.
*2: These are not displayed with GST.

How to Erase Emission-related Diagnostic Information

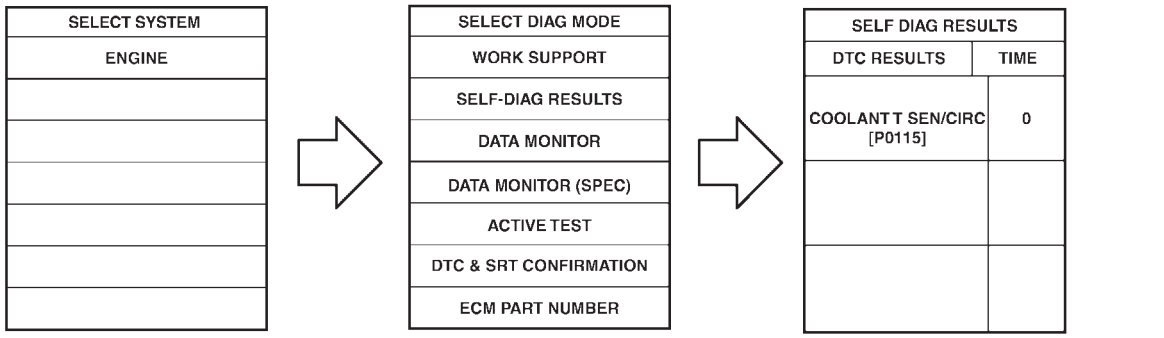
NLEC0031S0106

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 9 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 9 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.)

SEF630Z

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

How to Erase DTC (GST With GST)

1) If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 9 seconds and then turn it "ON" (engine stopped) again.
2) Select Mode 4 with GST (Generic Scan Tool).

The emission-related diagnostic information can be erased by selecting Mode 4 with GST (Generic Scan Tool).

NOTE:

- **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 or GST is easier and quicker than switching the 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) 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

NLEC0031S07

DTC and 1st Trip DTC

NLEC0031S0701

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-71.
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-97. 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

NLEC0031S0702

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-85.
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-71.

How to Erase Emission-related Diagnostic Information

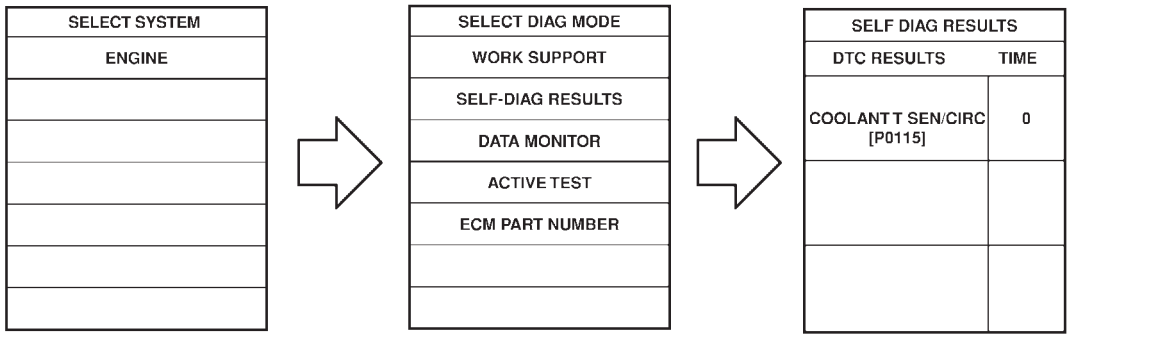
NLEC0031S0706

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 9 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.)

SEF993XA

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)

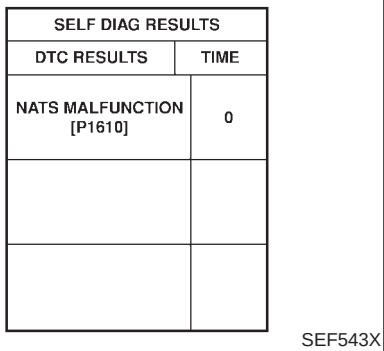
1) If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
2) Change the diagnostic test mode from Mode II to Mode I by using the data link connector. (See EC-75.)

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.



SEF543X

NATS (Nissan Anti-theft System)

NLEC0591

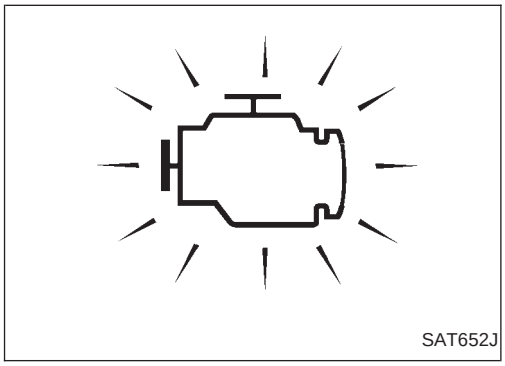
- **If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to NATS (Nissan Anti-Theft System) in EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and**

registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.
Therefore, be sure to receive all keys from vehicle owner.
Regarding the procedure of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

Malfunction Indicator (MI)

DESCRIPTION

NLEC0032



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-155, "WARNING LAMPS" or see EC-545.

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

On Board Diagnostic System Function

NLEC0032S01

The on board diagnostic system has the following four functions.

Diagnostic Test Mode I

1. BULB CHECK:
   This function checks the MI bulb for damage (blown, open circuit, etc.).
   If the MI does not come on, check MI circuit and ECM test mode selector. (See the following page.)
2. MALFUNCTION WARNING:

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

Diagnostic Test Mode II

3. SELF-DIAGNOSTIC RESULTS:
   This function allows DTCs and 1st trip DTCs to be read.
4. 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

NLEC0032S0101

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM test mode following "How to Switch Diagnostic Test Modes".
How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-75.)

Malfunction Indicator (MI) (Cont'd)

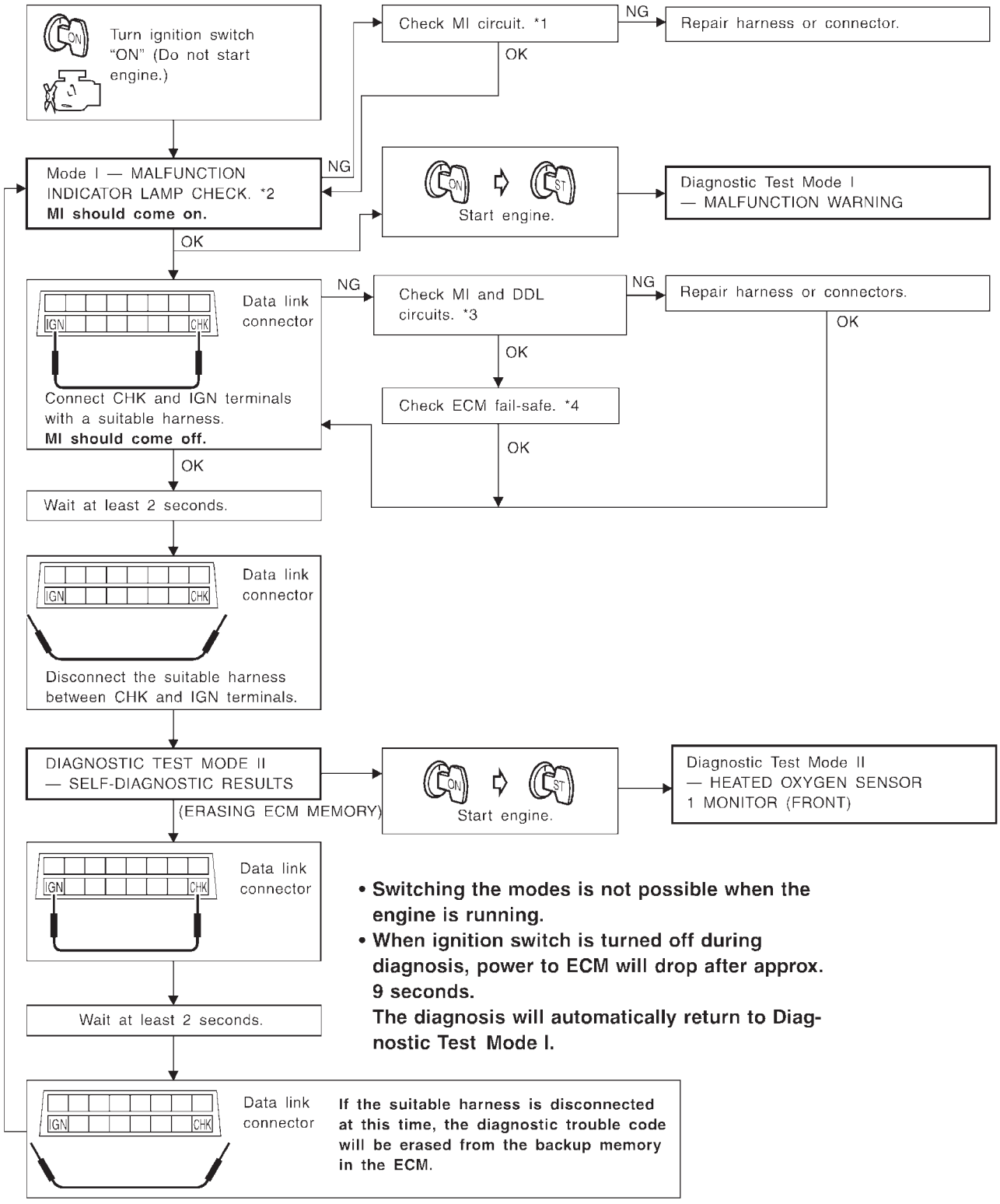
Condition		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in "ON" position 	Engine stopped 	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running 	MALFUNCTION WARNING	HEATED OXYGEN SENSOR 1 MONITOR (FRONT)

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

How to Switch Diagnostic Test Modes

NLEC0032S02



SEF951WA

*1: EC-545
*2: EC-73
*3: EC-545
*4: EC-123

Diagnostic Test Mode I — Bulb Check

NLEC0032S03

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the MI bulb. Refer to EL-155, "WARNING LAMPS" or see EC-545.

Diagnostic Test Mode I — Malfunction Warning

NLEC0032S04

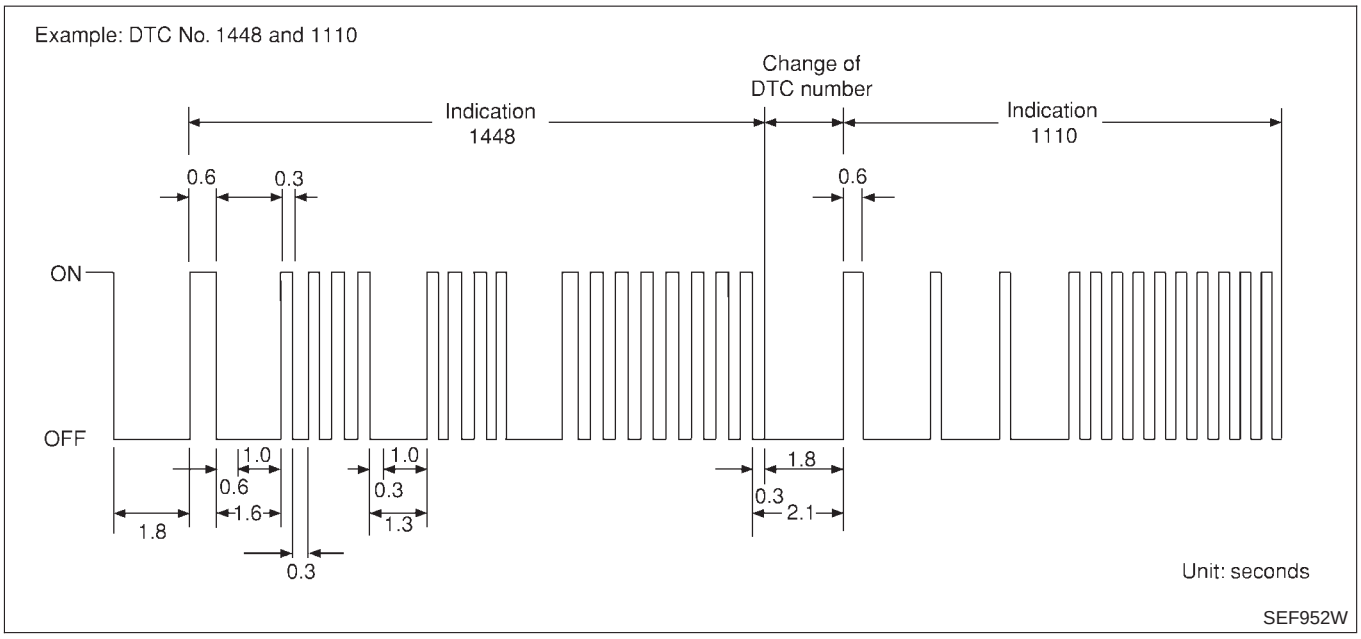
MI	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

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

Diagnostic Test Mode II — Self-diagnostic Results

NLEC0032S05

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



A particular trouble code can be identified by the number of four-digit numeral flashes. The "zero" is indicated by the number of ten flashes. The length of time the 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 trouble code to another occurs at an interval of 1.8 second off.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0000" refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-16.)

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

NLEC0032S0501

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-75.)

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

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

NLEC0032S06

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.

OBD System Operation Chart (With Euro-OBD Models Only)

NLEC0033

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

NLEC0033S01

- 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-59.
- 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

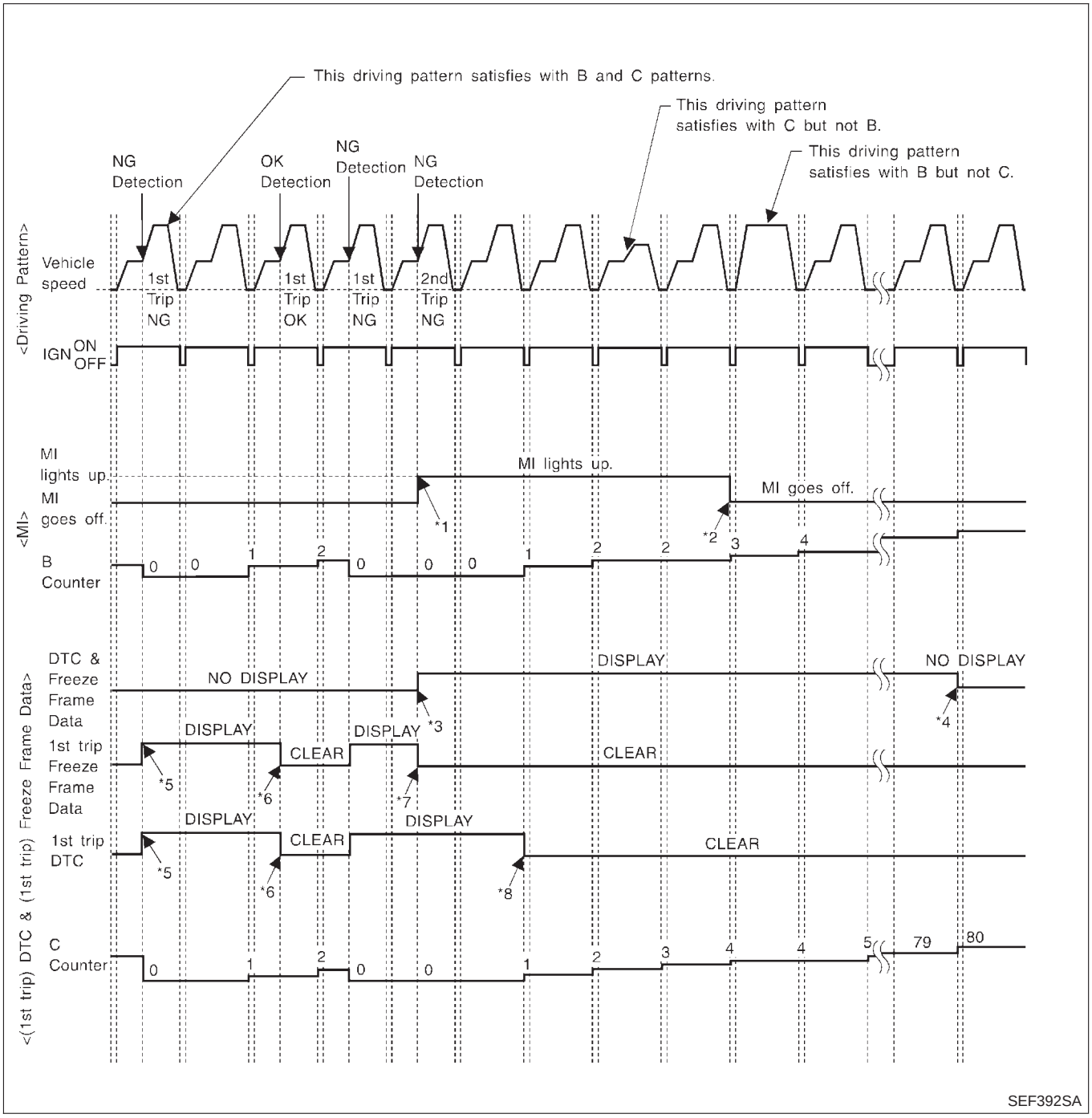
NLEC0033S02

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-79.
For details about patterns "A" and "B" under "Other", see EC-81.
*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"

NLEC0033S03



*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"

NLEC0033S04

Driving Pattern B

NLEC0033S0401

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-78)

Driving Pattern C

NLEC0033S0402

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:

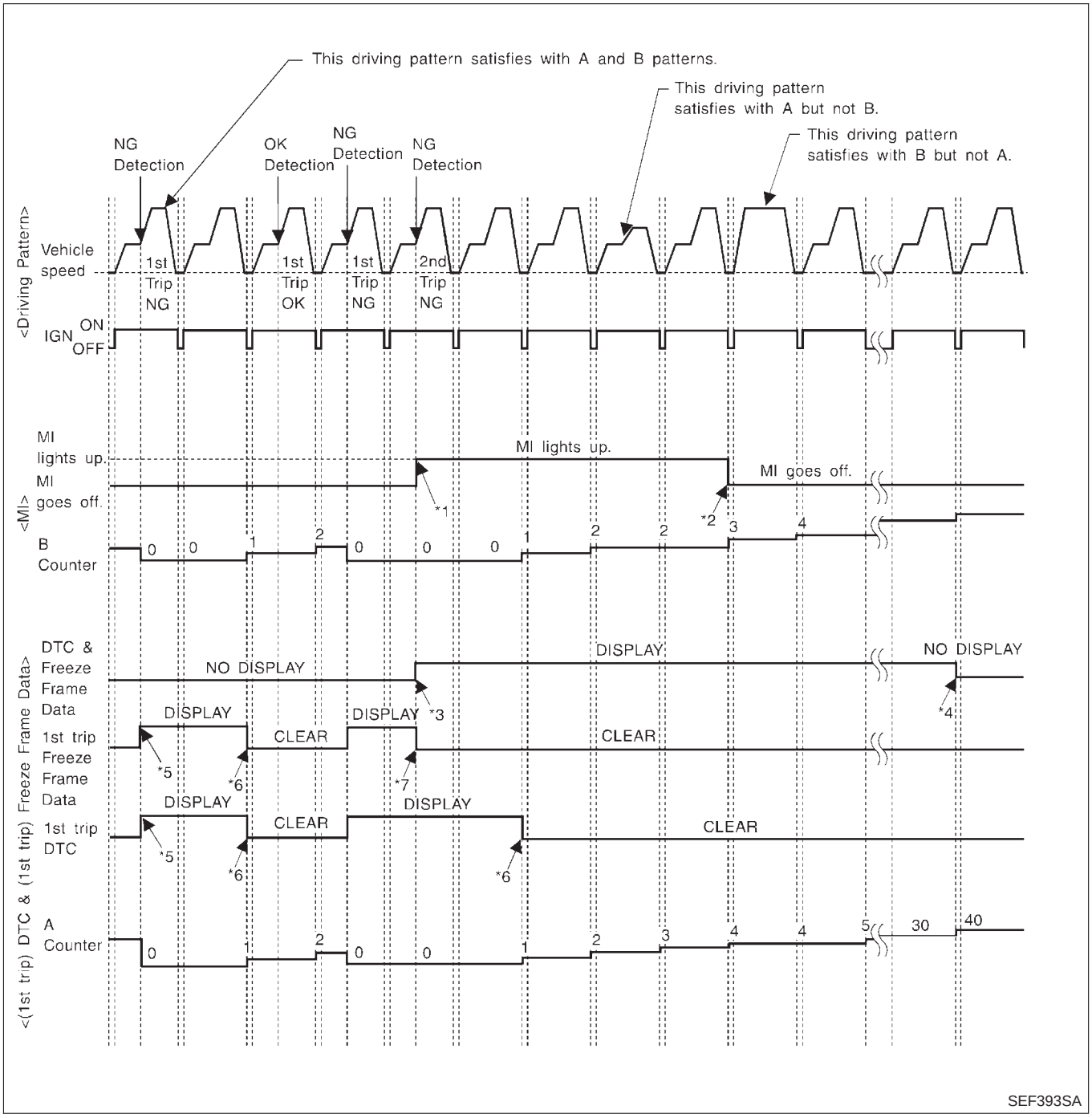
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

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.

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

NLEC0033S05



*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.

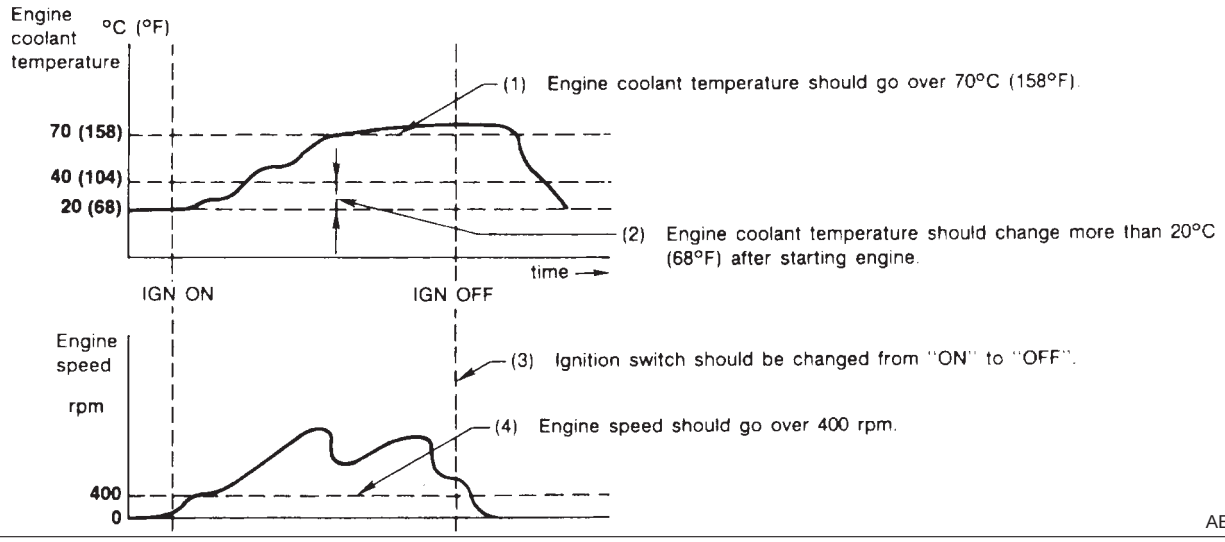
*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

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

NLEC0033S06

Driving Pattern A

NLEC0033S0601



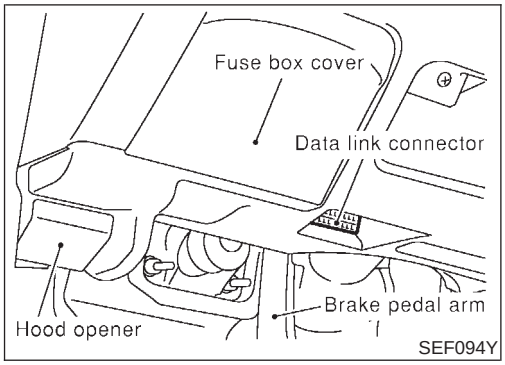
- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

Driving Pattern B

NLEC0033S0602

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-80).



SEF094Y

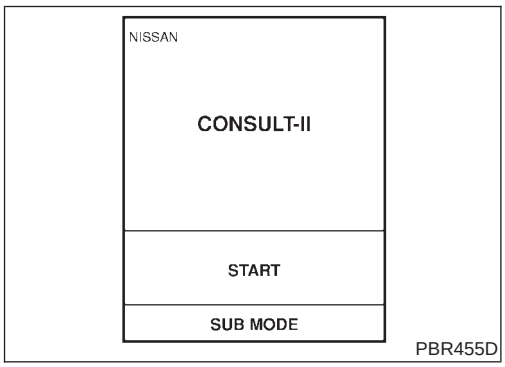
CONSULT-II

=NLEC0034

CONSULT-II INSPECTION PROCEDURE

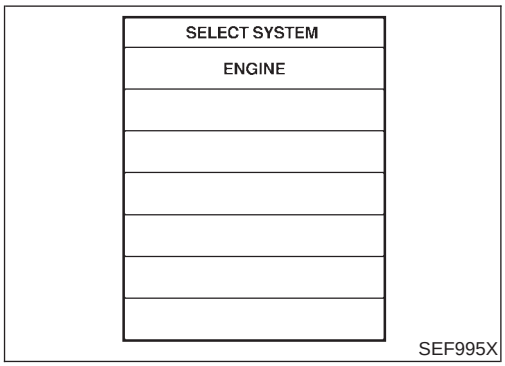
NLEC0034S01

1. Turn ignition switch OFF.
2. Connect “CONSULT-II” to data link connector. (Data link connector is located under lower dash panel near the fuse box cover.)



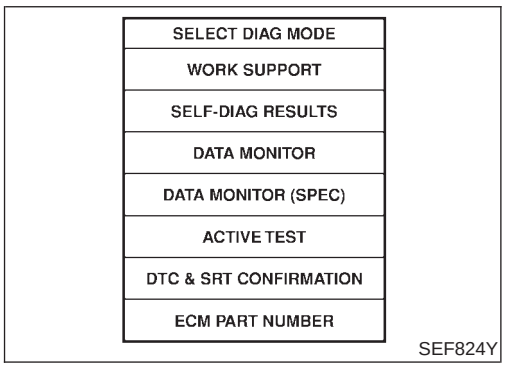
PBR455D

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

NLEC0034S02

Item			DIAGNOSTIC TEST MODE							
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Camshaft position sensor (PHASE)		X	Engine speed X	Engine speed X	Engine speed X			
		Crankshaft position sensor (POS)		X*3						
		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*3	X*3
		Heated oxygen sensor 2 (rear)		X*3		X	X		X*3	X*3
		Vehicle speed sensor		X	X	X	X			
		Throttle position sensor		X		X	X			
		EGR temperature sensor (where fitted)		X*3		X	X			
		Intake air temperature sensor		X*3	X	X	X			
		Knock sensor		X						
		Ignition switch (start signal)				X	X			
		Closed throttle position switch (where fitted)		X*3		X	X			
		Closed throttle position switch (throttle position sensor signal)				X	X			
		Air conditioner switch				X	X			
		Park/Neutral position (PNP) switch		X*3		X	X			
		Power steering oil pressure switch				X	X			
		Electrical load				X	X			
		Heater fan switch				X	X			
		Battery voltage				X	X			

CONSULT-II (Cont'd)

Item			DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOS-TIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STA-TUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	OUT-PUT	Injectors				X	X	X		
		Power transistor (Ignition timing)		X*3 (misfire)		X	X	X		
		IACV-AAC valve	X	X*3		X	X	X		
		Intake valve timing control solenoid valve				X	X	X		
		EVAP canister purge volume control solenoid valve		X*3		X	X	X		
		Air conditioner relay				X	X			
		Fuel pump relay	X			X	X	X		
		EGR volume control valve (where fitted)		X*3		X	X	X		X*3
		Heated oxygen sensor 1 heater (front)		X*3		X	X		X*3	
		Heated oxygen sensor 2 heater (rear)		X*3		X	X		X*3	
		Cooling fan				X	X	X		
		Swirl control valve control solenoid valve (where fitted)		X*3		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-61, EC-71.

*3: Not applicable for models without Euro-OBD system

FUNCTION

NLEC0034S03

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 and SRT 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

NLEC0034S04

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. ● If once the "TARGET IDLE RPM ADJ" has been done, the Idle Air Volume Learning procedure will not be completed.

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

SELF DIAGNOSTIC MODE

NLEC0034S05

DTC and 1st Trip DTC

NLEC0034S0501

Regarding items of "DTC and 1st trip DTC", refer to "TROUBLE DIAGNOSIS — INDEX", EC-16.

Freeze Frame Data and 1st Trip Freeze Frame Data

NLEC0034S0502

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	● Engine Control component part/control system has a trouble code, it is displayed as "PXXXX". (Refer to "Alphabetical & P No. Index for DTC", EC-16.)
FUEL SYS-B1	● "Fuel injection system status" at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. "MODE 2": Open loop due to detected system malfunction "MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control "MODE 5": Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● "Long-term fuel trim" at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.

CONSULT-II (Cont'd)

Freeze frame data item*	Description
S-FUEL TRIM-B1 [%]	● "Short-term fuel trim" at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH·P/S [%]	● The throttle valve opening angle at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

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

DATA MONITOR MODE

NLEC0034S06

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	○	○	● Indicates the engine speed computed from the POS signal of the crankshaft position sensor.	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	○	○	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]			● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		○	● Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	○	○	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	○	○	● The signal voltage of the heated oxygen sensor 1 (front) is displayed.	
HO2S2 (B1) [V]	○		● The signal voltage of the heated oxygen sensor 2 (rear) is displayed.	
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.

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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.
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.	
INT/A TEMP SE [°C] or [°F]	○		● The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated.	
EGR TEMP SEN [V] (where fitted)	○	○	● The signal voltage of the EGR temperature sensor is displayed.	
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 POS [ON/OFF]	○	○	● Indicates idle position [ON/OFF] computed by ECM according to the throttle position sensor signal.	
CLSD THL/P SW [ON/OFF] (where fitted)	○		● Indicates mechanical contact [ON/OFF] condition of the closed throttle position switch.	
AIR COND SIG [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioning signal.	
P/N POSI SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the PNP switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure switch signal.	
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.	
IGNITION SW [ON/OFF]	○		● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	○		● Indicates [ON/OFF] condition from the heater fan switch.	
INJ PULSE-B1 [msec]		○	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		○	● Indicates the ignition timing computed by ECM according to the input signals.	

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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 [gm/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	
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 computed by the ECM according to the inpuct signals. ● The opening becomes larger as the value increases.	
EGR VOL CON/V [step] (where fitted)		○	● Indicates the EGR volume control valve computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
SWRL CONT S/V [ON/OFF] (where fitted)			● 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.	
INT/V SOL-B1 [ON/OFF]			● The control condition of the valve timing solenoid valve (determined by ECM according to the input signal) is indicated. ON ... Intake valve timing control operating OFF ... Intake valve timing control not operating	
AIR COND RLY [ON/OFF]		○	● Indicates the air conditioner relay control condition determined by ECM according to the input signals.	
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 [ON/OFF] control condition of the cooling fan determined by ECM according to the input signals.	
HO2S1 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater (front) determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater (rear) determined by ECM according to the input signals.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
IDL A/V LEARN			● 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.	
TRVL AFTER MIL [km] or [Mile]			● Distance traveled while MI is activated	
VOLTAGE [V]			● Voltage measured by the voltage probe.	
PULSE [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.

DATA MONITOR (SPEC) MODE

NLEC0034S11

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.

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

ACTIVE TEST MODE

NLEC0034S07

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)
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.	● "Idle Air Volume Leaning" (Refer to EC-57.) ● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Engine component parts and installing conditions

CONSULT-II (Cont'd)

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
IACV-AAC/V OPENING	● Engine: After warming up, idle the engine. ● Change the IACV-AAC valve opening steps using CONSULT-II.	Engine speed changes according to the opening steps.	● Harness and connector ● IACV-AAC valve
POWER BALANCE	● Engine: After warming up, idle the engine. ● Air conditioner 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
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature indication using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay "ON" and "OFF" using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connector ● Fuel pump relay
EGR VOL CONT/V (where fitted)	● Engine: After warming up, idle the engine. ● Change the EGR volume control valve opening step using CONSULT-II.	Engine speed changes according to the opening step.	● Harness and connector ● EGR volume control valve
VALVE TIMING SOL	● Ignition switch: ON ● Turn intake valve timing control solenoid valve "ON" and "OFF" using CONSULT-II and listen for operating sound.	Intake valve timing control solenoid valve makes an operating sound.	● Harness and connector ● Intake valve timing control solenoid valve
SWIRL CONT SOL VALVE (where fitted)	● 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
PURG VOL CONT/V	● Engine: After warming up, idle the engine. ● 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 ● EVAP canister purge volume control solenoid valve

DTC AND SRT CONFIRMATION MODE

NLEC0034S08

This mode is not available for models without Euro-OBD system.

SRT STATUS Mode

NLEC0034S0801

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-62.

SRT Work Support Mode

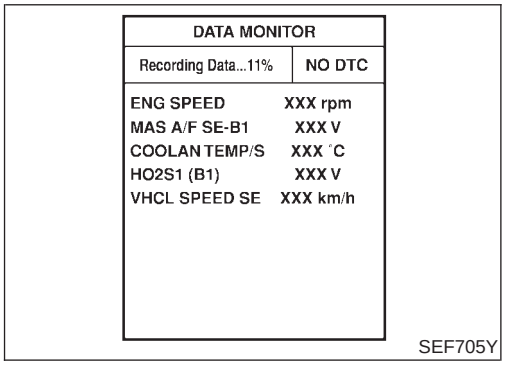
NLEC0034S0803

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

DTC Work Support Mode

NLEC0034S0802

TEST MODE	TEST ITEM	CONDITION	REFERENCE PAGE
HEATED OXYGEN SENSOR 1 (FRONT)	HO2S1 (B1) P0130	Refer to corresponding trouble diagnosis for DTC.	EC-184
	HO2S1 (B1) P0131		EC-192
	HO2S1 (B1) P0132		EC-198
	HO2S1 (B1) P0133		EC-204
HEATED OXYGEN SENSOR 2 (REAR)	HO2S2 (B1) P0137		EC-227
	HO2S2 (B1) P0138		EC-237
	HO2S2 (B1) P0139		EC-246
EGR SYSTEM (where fitted)	EGR SYSTEM P0400		EC-310
	EGR SYSTEM P1402		EC-393



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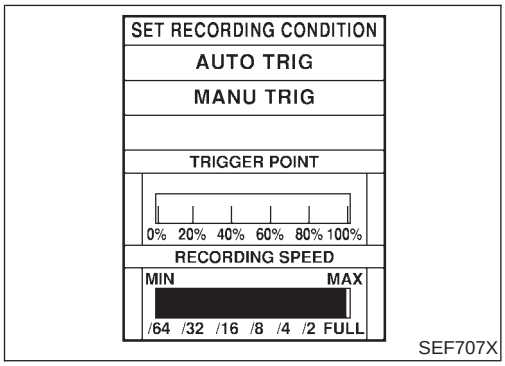


SEF707X

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

NLEC0034S10

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:

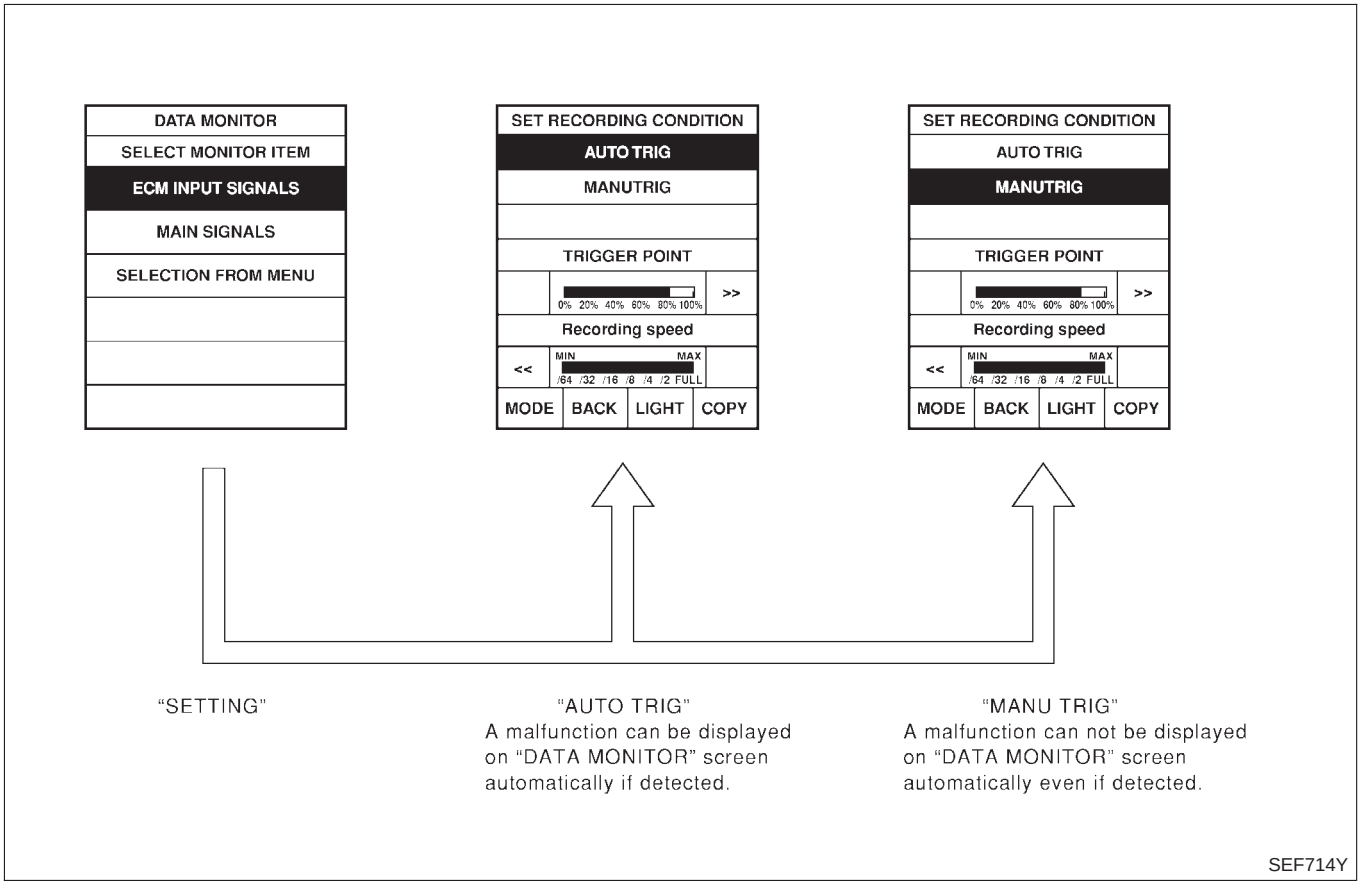
1) "AUTO TRIG"

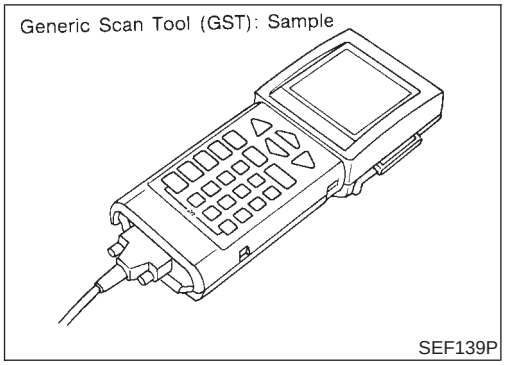
- While trying to detect the DTC/1st trip DTC by performing the "DTC Confirmation Procedure", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO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





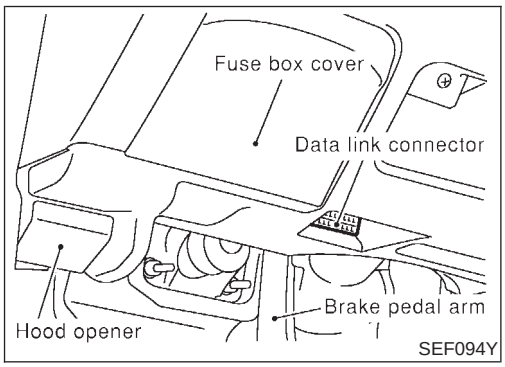
Generic Scan Tool (GST)

=NLEC0035

DESCRIPTION

NLEC0035S01

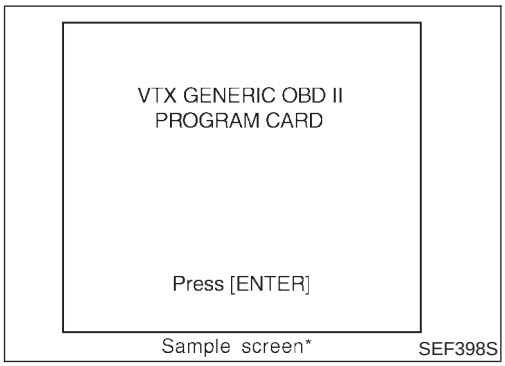
Generic Scan Tool (OBDII scan tool) complying with ISO15031-4 has 9 different functions explained on the next page.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



GST INSPECTION PROCEDURE

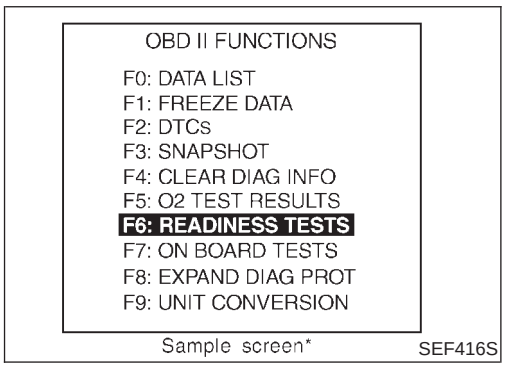
NLEC0035S02

1. Turn ignition switch OFF.
2. Connect “GST” to data link connector. (Data link connector is located under lower dash panel near the fuse box cover.)



3. Turn ignition switch ON.
4. Enter the program according to instruction on the screen or in the operation manual.

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



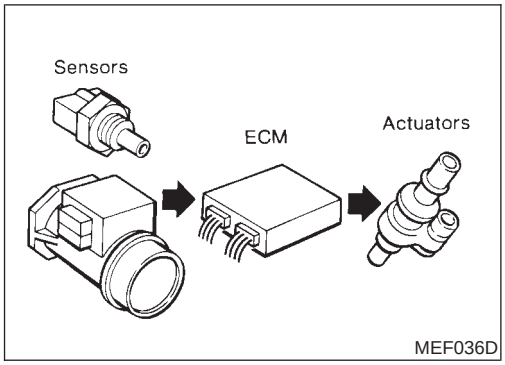
5. Perform each diagnostic mode according to each service procedure.

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

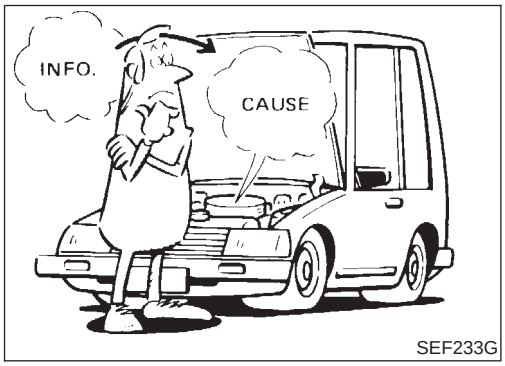
FUNCTION

NLEC0035S03

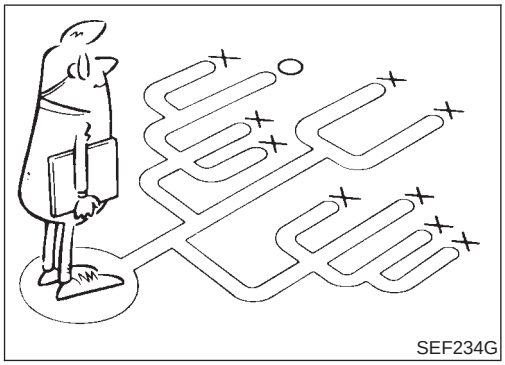
Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, distance traveled while MI is activated and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. (For details, refer to "Freeze Frame Data", EC-85.)
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

NLEC0036

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 GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-97.

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

NLEC0036S01

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.

Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected.

Example:

Vehicle ran out of fuel, which caused the engine to misfire.

Worksheet Sample

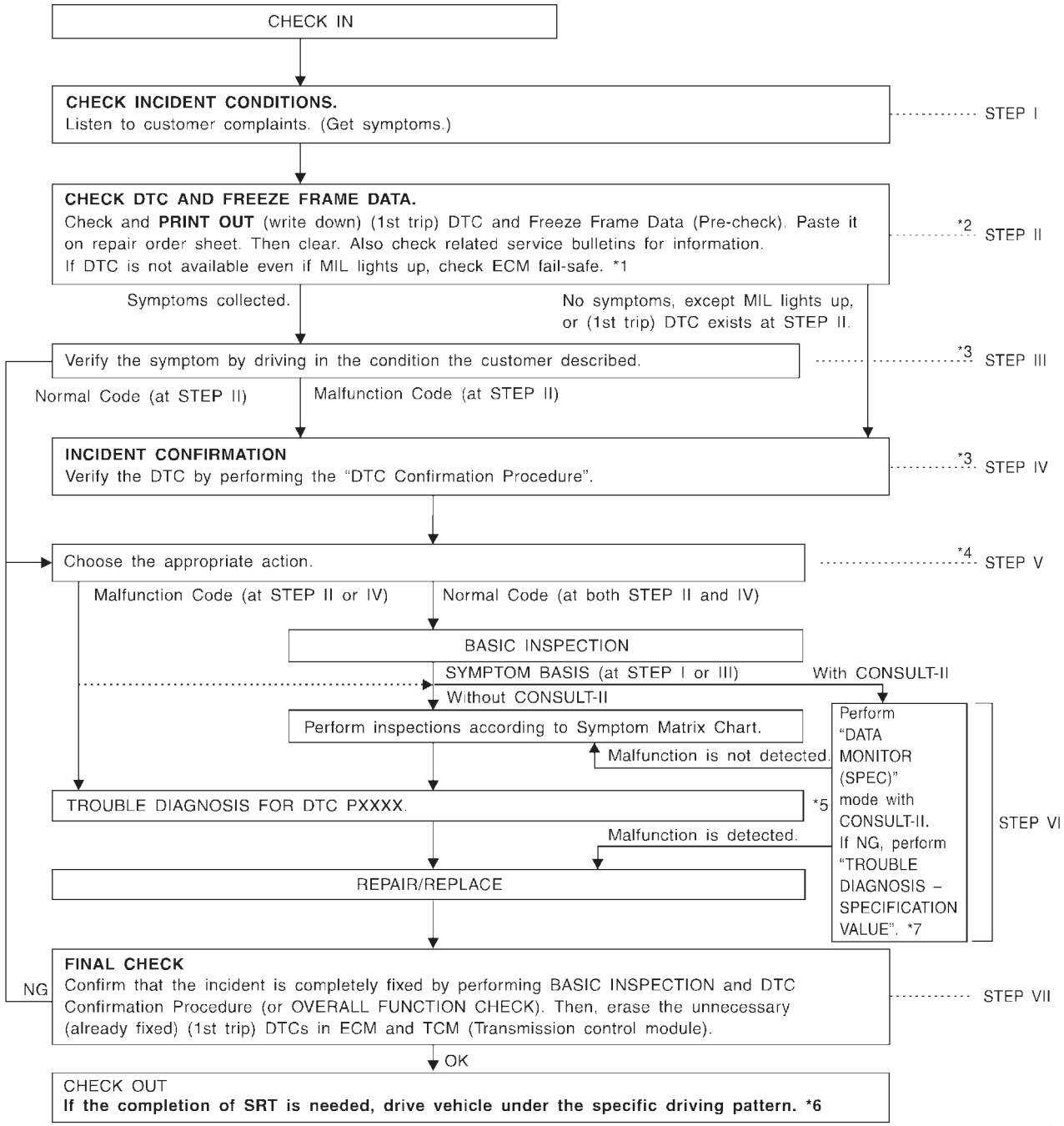
NLEC0036S0101

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 lamp		☐ Turned on ☐ Not turned on	

MTBL0311

Work Flow

NLEC0563



SEF510ZA

*1 EC-123

*2 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

*3 If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

*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-146.

*5 If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

*6 EC-66

*7 EC-141

Work Flow (Cont'd)

DESCRIPTION FOR WORK FLOW

NLEC0563S01

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-96.
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-69, EC-71.) 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-145. 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-124.) 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-145. 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-145. 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-99. If CONSULT-II is available, perform "DATA MONITOR (SPEC)" mode with CONSULT-II and proceed to the "TROUBLE DIAGNOSIS-SPECIFICATION VALUE", EC-141. (If a malfunction is detected, proceed to "REPAIR/REPLACE".) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-124.)
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-133. 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 section ("HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT", "Circuit Inspection"). Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.
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. (Refer to EC-69, EC-71.)

Basic Inspection

NLEC0564

MODELS WITH THROTTLE POSITION SWITCH AND THROTTLE OPENER

NLEC0564S01

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

- Headlamp switch is OFF,

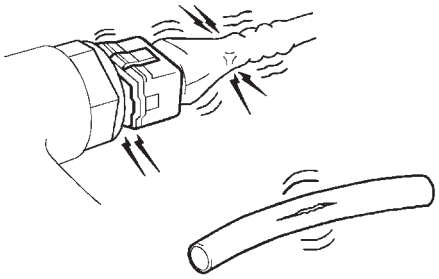
On vehicle equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.

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

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

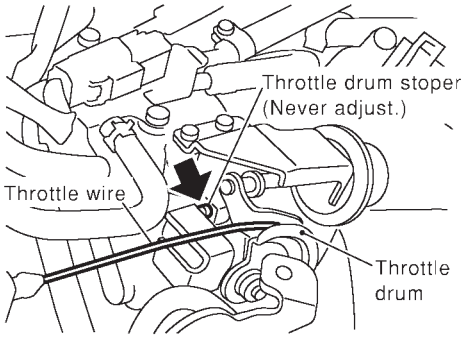


SEF983U

	▶	GO TO 2.

2	CHECK THROTTLE OPENER OPERATION-I

Confirm that there is a clearance between throttle drum and stopper.

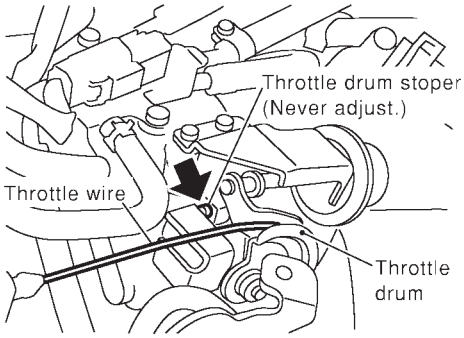


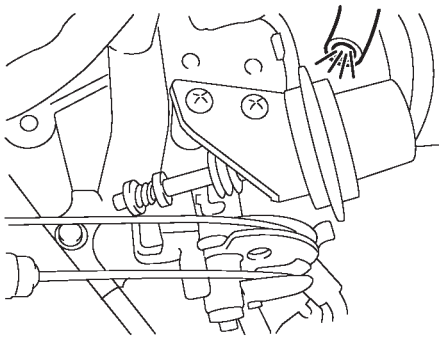
SEF850Y

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

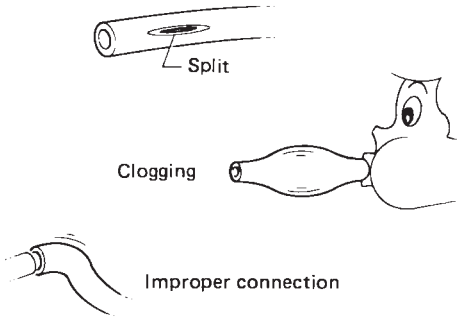
3	CHECK THROTTLE OPENER FIXING BOLTS
Check throttle opener fixing bolts for loosening.	
OK or NG	
OK ▶	Repair or replace throttle body assembly.
NG ▶	Retighten the fixing bolts.

4	CHECK THROTTLE OPENER OPERATION-II
1. Start engine and let it idle. 2. Confirm that throttle opener rod moves backward and there is a clearance between throttle drum and throttle opener rod.	
 SEF850Y	
OK or NG	
OK ▶	GO TO 7.
NG ▶	GO TO 5.

5	CHECK VACUUM SOURCE FOR THROTTLE OPENER
1. Disconnect vacuum hose connected to throttle opener. 2. Check vacuum existance with engine running.	
 **Vacuum should exist.** SEF155Y	
OK or NG	
OK ▶	Repair or replace throttle body assembly.
NG ▶	GO TO 6.

6	CHECK VACUUM HOSE

1. Stop engine.
2. Remove the vacuum hose.
3. Check the vacuum hose for splits, kinks and clogging.



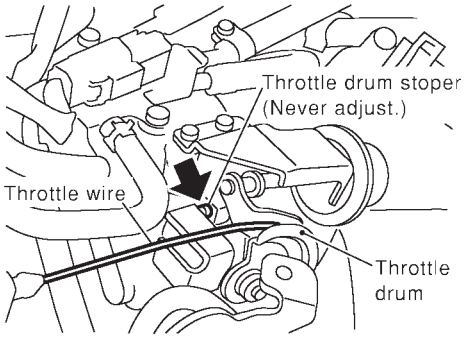
SEF109L

OK or NG

OK	▶	Clean vacuum port by blowing air.
NG	▶	Replace vacuum hose.

7	CHECK THROTTLE DRUM OPERATION

Confirm that throttle drum moves to contact the stopper.



SEF850Y

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 8.

8	CHECK ACCELERATOR WIRE INSTALLATION

1. Stop engine.
2. Check accelerator wire for slack.

OK or NG

OK	▶	GO TO 9.
NG	▶	Adjust accelerator wire. Refer to FE-3, "Adjusting Accelerator Wire".

9	CHECK THROTTLE VALVE OPERATION

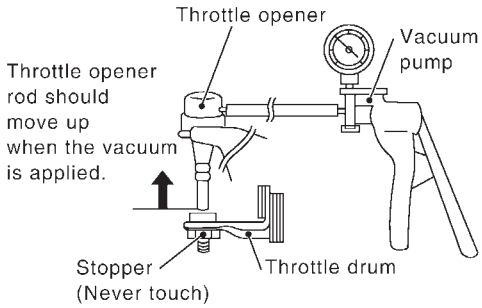
1. Remove intake air ducts.
2. Check throttle valve operation when moving throttle drum by hand.

OK or NG

OK	▶	Retighten the throttle drum fixing nuts.
NG	▶	Clean the throttle body and throttle valve.

10	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-I

NOTE:
Always check ignition timing before performing the following.
1. Warm up engine to normal operating temperature.
2. Stop engine.
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to vacuum pump as shown below.



SEF793WA

5. Apply vacuum [more than −40.0 kPa (–400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum is free from the throttle opener rod.

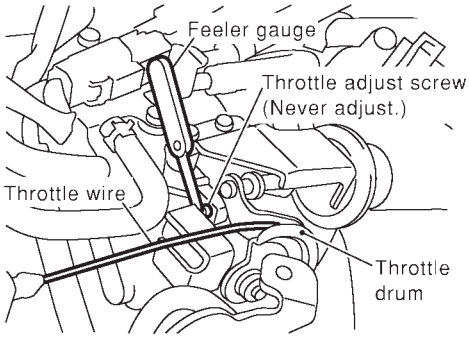
Models with CONSULT-II ▶	GO TO 11.
Models without CONSULT-II ▶	GO TO 15.

11	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-II

With CONSULT-II

1. Connect "CONSULT-II" to the data link connector and select "ENGINE" from the menu. Refer to EC-82.
2. Turn ignition switch "ON".
3. Select "TP SW/TP SEN IDLE POSI ADJ" in "WORK SUPPORT" mode with CONSULT-II.
4. 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.



SEF073X

TP SW/TP SEN IDLE POSI ADJ	
MONITOR	
COOLAN TEMP/S	91°C
CLSD THL POS	ON
CLSD THL/P SW	ON

SEF715Y

"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.

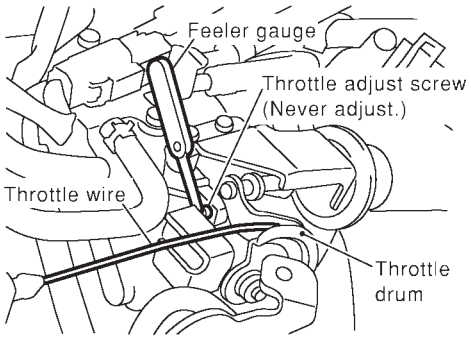
OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 12.

12	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

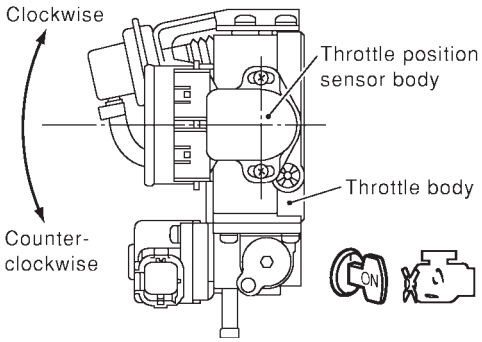
With CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Confirm that proper vacuum is applied. Refer to test No. 10. During adjustment, vacuum should be applied.
3. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.



SEF073X

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



TP SW/TP SEN IDLE POSI ADJ	
MONITOR	
COOLAN TEMP/S	91°C
CLSD THL POS	ON
CLSD THL/P SW	OFF

SEF863Y

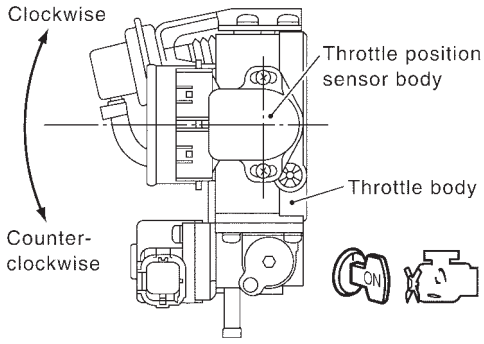
▶	GO TO 13.

13	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.**



SEF964W

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.

TP SW/TP SEN IDLE POSI ADJ	
MONITOR	
COOLAN TEMP/S	91°C
CLSD THL POS	ON
CLSD THL/P SW	OFF

SEF716Y

The signal remains "OFF" while closing throttle valve.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 12.

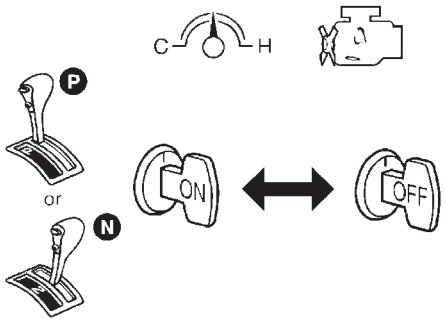
14	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

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. Confirm that proper vacuum is applied. Refer to Test No. 10.
2. Attach blind cap to vacuum port from which vacuum hose to throttle opener was disconnected.
3. Start engine.
4. Warm up engine to normal operating temperature.
5. Select "TP SW/TP SEN IDLE POSI ADJ" in "WORK SUPPORT" mode.
6. Stop engine. (Turn ignition switch "OFF".)
7. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

8. Turn ignition switch "OFF" and wait at least 9 seconds.
9. Repeat steps 7 and 8 until "CLSD THL POS" signal changes to "ON".

TP SW/TP SEN IDLE POSI ADJ	
MONITOR	
COOLAN TEMP/S	91°C
CLSD THL POS	ON
CLSD THL/P SW	ON

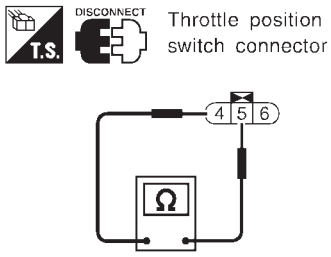
SEF715Y

▶	GO TO 19.

15	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-II

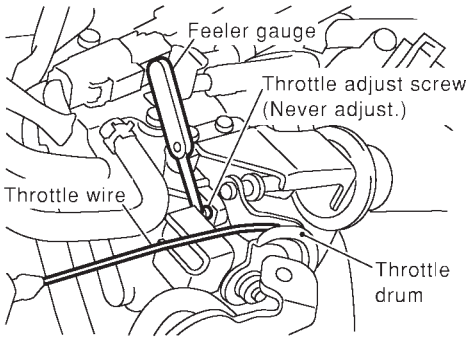
Without CONSULT-II

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.



SEF073X

"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.

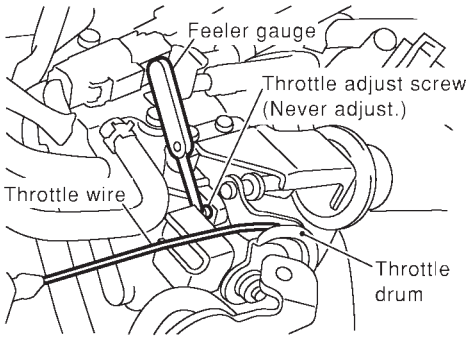
OK or NG

OK	▶	GO TO 18.
NG	▶	GO TO 16.

16	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

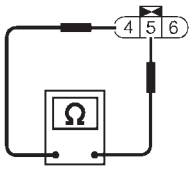
Without CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Confirm that proper vacuum is applied. Refer to Test No. 10. During adjustment, vacuum should be applied.
3. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.



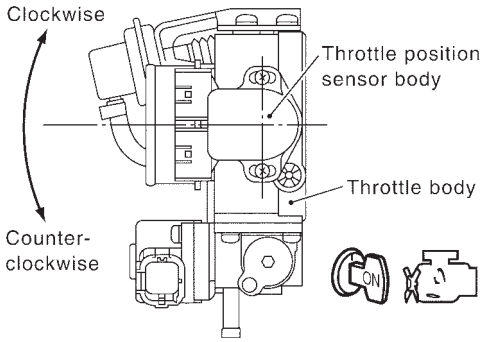
SEF073X

Throttle position
switch connector



SEF711X

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



SEF964W

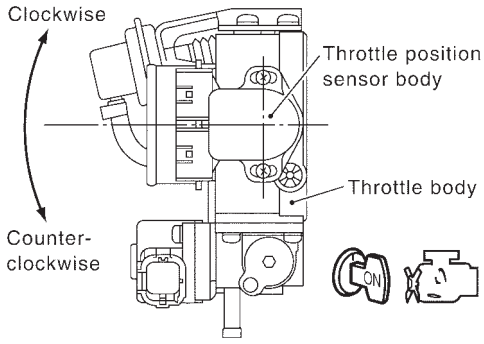
▶	GO TO 17.

17	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.**



SEF964W

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 18.
NG	▶	GO TO 16.

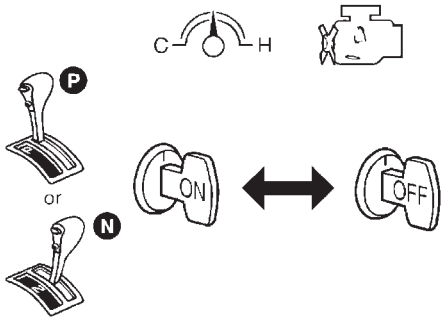
18	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

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. Confirm that proper vacuum is applied. Refer to Test No. 10.
2. Attach blind cap to vacuum port from which vacuum hose to throttle opener was disconnected.
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.



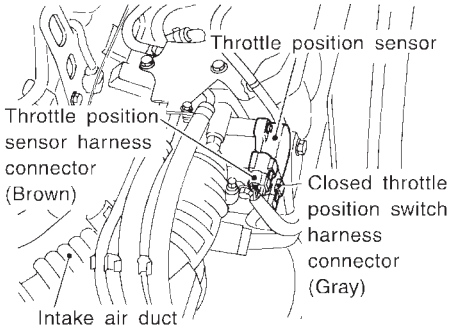
SEF864V

7. Turn ignition switch "OFF" and wait at least 9 seconds.
8. Repeat steps 6 and 7, 20 times.

	▶	GO TO 19.

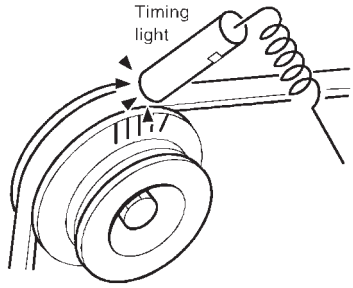
19	CHECK IGNITION TIMING-I

1. Turn ignition switch "OFF".
2. Release vacuum from throttle opener.
3. Remove vacuum pump and vacuum hose from throttle opener.
4. Reinstall original vacuum hose to throttle opener securely.
5. Start engine and warm it up to normal operating temperature.
6. Stop engine and disconnect throttle position sensor harness connector.



JEF091Y

7. Start engine.
8. Check ignition timing at idle using a timing light.



SEF984U

Ignition timing:
8±2° BTDC

OK or NG

OK	▶	GO TO 24.
NG	▶	GO TO 20.

20	DETECT MALFUNCTIONING PART

Check the following.
- Crankshaft position sensor (POS) circuit and function. Refer to EC-295.
- Camshaft position sensor (PHASE) circuit and function. Refer to EC-302.

OK or NG

OK	▶	GO TO 22.
NG	▶	GO TO 21.

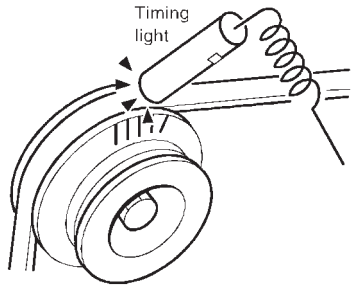
21	REPAIR MALFUNCTION

Repair or replace malfunctioning part following the "Diagnostic Procedure" corresponding the detected malfunction.

	▶	GO TO 23.

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 NATS system and registration of all NATS ignition key IDs. Refer to "NATS (Nissan Anti-Theft System)", EC-72.	
▶	GO TO 23.

23	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-57. **Which is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	GO TO 19.
INCMP ▶	Follow the construction of "Idle Air Volume Leaning".

24	CHECK IGNITION TIMING-II
1. Stop engine. 2. Reconnect throttle position sensor harness connector. 3. Start engine and let it idle. 4. Check ignition timing at idle using a timing light.	
 SEF984U	
Ignition timing: **8±2° BTDC**	
OK or NG	
OK (With CONSULT-II) ▶	GO TO 32.
OK (Without CONSULT-II) ▶	GO TO 35.
NG ▶	GO TO 25.

25	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-57. **Which is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	GO TO 26.
INCMP ▶	Follow the construction of "Idle Air Volume Learning".

26	CHECK IGNITION TIMING AGAIN
Check ignition timing again. Refer to Test No. 24.	
OK or NG	
OK (With CONSULT-II) ▶	GO TO 32.
OK (Without CONSULT-II) ▶	GO TO 35.
NG ▶	GO TO 27.

27	CHECK FOR INTAKE AIR LEAK
1. Start engine and let it idle. 2. Listen for an air leak from PCV hose and after IACV-AAC valve.	
OK or NG	
OK ▶	GO TO 29.
NG ▶	GO TO 28.

28	REPAIR MALFUNCTION
1. Stop engine. 2. Repair or replace malfunctioning part.	
▶	GO TO 25.

29	DETECT MALFUNCTIONING PART
Check the IACV-AAC valve circuit and function. Refer to EC-343.	
OK or NG	
OK ▶	GO TO 31.
NG ▶	GO TO 30.

30	REPAIR MALFUNCTION
Repair or replace malfunction part following the "Diagnostic Procedure" corresponding the detected malfunction.	
▶	GO TO 25.

31	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 NATS system and registration of NATS ignition key IDs. Refer to "NATS (Nissan Anti-Theft System)", EC-72.	
▶	GO TO 25.

32	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. 3. Check idle speed. **700±50 rpm**	
OK or NG	
OK ▶	GO TO 38.
NG ▶	GO TO 33.

33	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-57. **Which is the result CMPLT or INCMP?**		
	CMPLT or INCMP	
CMPLT	▶	GO TO 34.
INCMP	▶	Follow the construction of "Idle Air Volume Learning".

34	CHECK TARGET IDLE SPEED AGAIN	
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. **700±50 rpm**		
	OK or NG	
OK	▶	GO TO 38.
NG	▶	GO TO 27.

35	CHECK TARGET IDLE SPEED	
Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **700±50 rpm**		
	OK or NG	
OK	▶	GO TO 38.
NG	▶	GO TO 36.

36	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-57. **Which is the result CMPLT or INCMP?**		
	CMPLT or INCMP	
CMPLT	▶	GO TO 37.
INCMP	▶	Follow the construction of "Idle Air Volume Learning".

37	CHECK TARGET IDLE SPEED AGAIN	
1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **700±50 rpm**		
	OK or NG	
OK	▶	GO TO 38.
NG	▶	GO TO 27.

38	ERASE UNNECESSARY DTC	
After this inspection, unnecessary DTC No. might be displayed. Erase the stored memory in ECM. Refer to "How to Erase Emission-related Diagnostic Information", EC-69.		
	▶	**INSPECTION END**

MODELS WITHOUT THROTTLE POSITION SWITCH AND THROTTLE OPENER

NLEC0564S02

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

- Headlamp switch is OFF,

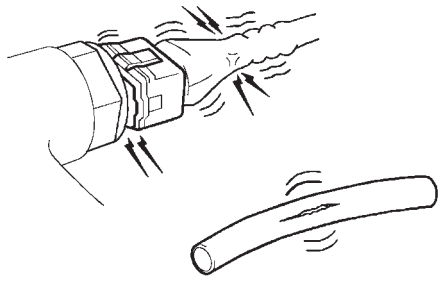
On vehicle equipped with daytime light system, set lighting switch to the 1st position to light only small lamps.

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

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-I

Confirm that throttle drum is in contact with the stopper.

OK or NG

OK (with CONSULT-II) ▶	GO TO 5.
OK (without CONSULT-II) ▶	GO TO 8.
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 section, "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 CLOSED THROTTLE POSITION SWITCH IDLE POSITION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Turn ignition switch "ON".
4. Select "THRTL POS SEN" and "CLSD THL POS" in "DATA MONITOR" mode with CONSULT-II.
5. Make sure that "THRTL POS SEN" indicates 0.35 to 0.65V, and "CLSD THL POS" indicates "ON". (Accelerator pedal is fully released).

DATA MONITOR	
MONITOR	NO DTC
THRTL POS SEN	XXX V
CLSD THL POS	ON

NEF238A

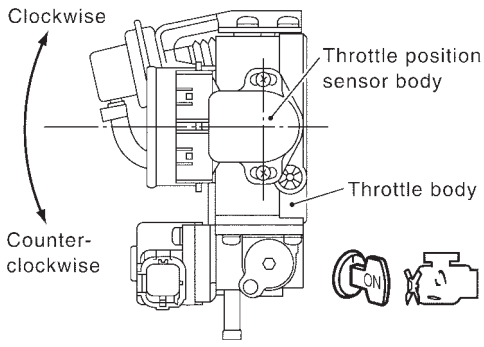
OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 6.

6	ADJUST THROTTLE POSITION SENSOR IDLE POSITION

With CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Turn throttle position sensor body clockwise or counterclockwise until "THRTL POS SEN" indication becomes 0.35 to 0.65V.



SEF964W

3. Tighten the throttle position sensor fixing bolts.

	▶	GO TO 7.

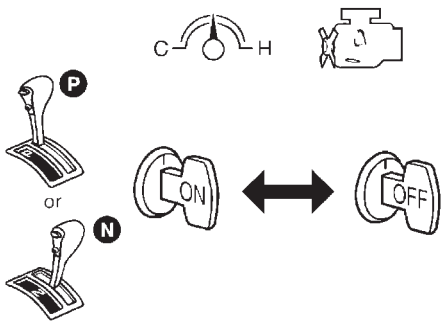
7	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

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. Start engine and warm it up to normal operating temperature.
2. Select "CLSD THL POS" in "DATA MONITOR" mode with CONSULT-II.
3. Stop engine. (Turn ignition switch "OFF".)
4. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

5. Turn ignition switch "OFF" and wait at least 9 seconds.
6. Repeat steps 4 and 6 until "CLSD THL POS" indication changes to "ON".

DATA MONITOR	
MONITOR	NO DTC
CLSD THL POS	ON

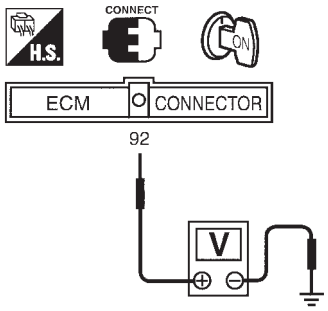
SEF061Y

▶	GO TO 11.

8	CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Turn ignition switch "ON".
4. Check voltage between ECM terminal 92 and ground with accelerator pedal fully released.



NEF315A

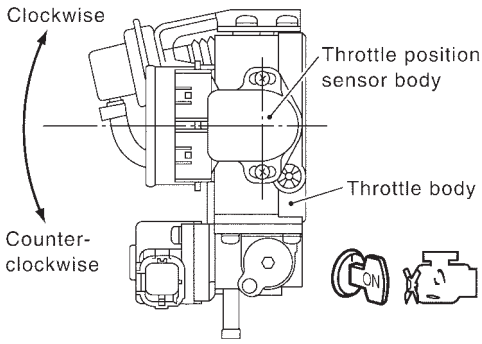
Voltage: 0.35 to 0.65V

OK	▶	GO TO 6.
NG	▶	GO TO 9.

9	CHECK THROTTLE VALVE OPERATION

Without CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Turn throttle position sensor body clockwise or counterclockwise until the voltage between ECM terminal 92 and ground becomes 0.35 to 0.65V.



SEF964W

3. Tighten the throttle position sensor fixing bolts.

	▶	GO TO 10.

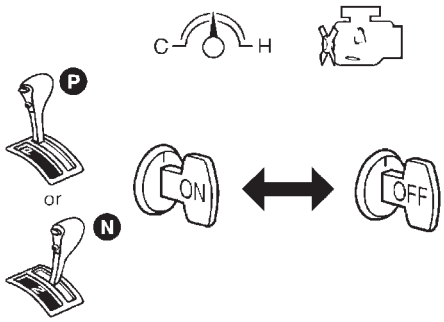
10	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

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. Start engine and warm it up to normal operating temperature.
2. Stop engine. (Turn ignition switch "OFF").
3. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

4. Turn ignition switch "OFF" and wait at least 9 seconds.
5. Repeat steps 4 and 6, 20 times.

	▶	GO TO 11.

11	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 GST or Diagnostic Test Mode II (Self-diagnostic Results).

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	REPAIR MALFUNCTION

Repair or replace components as necessary

	▶	GO TO 11.

13	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.

700±50 rpm

Without CONSULT-II

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

700±50 rpm

OK or NG

OK	▶	GO TO 22.
NG	▶	GO TO 14.

14	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-57 Which is the result CMPLT or INCMP?		
	CMPLT or INCMP	
CMPLT	▶	GO TO 15.
INCMP	▶	1. Follow the instruction of "Idle Air Volume Learning". 2. GO TO 14.

15	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. **700±50 rpm**		
Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **700±50 rpm**		
	OK or NG	
OK	▶	GO TO 20.
NG	▶	GO TO 16.

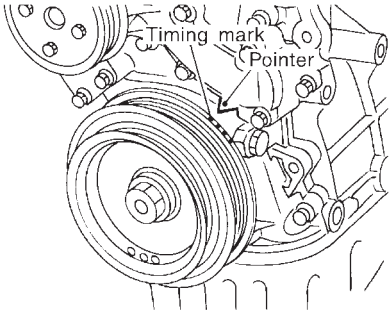
16	REPLACE IACV-AAC VALVE	
Replace IACV-AAC valve.		
	▶	GO TO 17.

17	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-57 Which is the result CMPLT or INCMP?		
	CMPLT or INCMP	
CMPLT	▶	GO TO 18.
INCMP	▶	1. Follow the instruction of "Idle Air Volume Learning". 2. GO TO 14.

18	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. **700±50 rpm**		
Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **700±50 rpm**		
	OK or NG	
OK	▶	GO TO 20.
NG	▶	GO TO 19.

19	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 NATS system and registration of NATS ignition key IDs. Refer to "NATS (Nissan Anti-Theft system)", EC-72	
▶	GO TO 14.

20	CHECK IGNITION TIMING
1. Start engine and warm it up to normal operating temperature. 2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to "NATS (Nissan Anti-Theft System)", EC-72.	



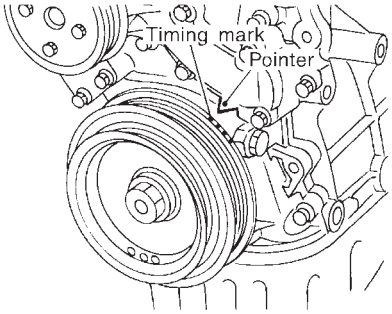
SEM872F

Ignition timing: 8°±5° BTDC

OK	▶	GO TO 28.
NG	▶	GO TO 21.

21	CHECK TIMING CHAIN INSTALLATION
Check timing chain installation. Refer to EM section. **OK or NG**	
OK ▶	GO TO 19.
NG ▶	1. Repair the timing chain installation. 2. GO TO 14..

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



SEM872F

Ignition timing: 8°±5° BTDC

OK	▶	GO TO 28.
NG	▶	GO TO 23.

23	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-57. Which is the result CMPLT or INCMP?	
CMPLT or INCMP	
CMPLT ▶	GO TO 24.
INCMP ▶	1. Follow the construction of "Idle Air Volume Leaning". 2. GO TO 23.

24	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. **700±50 rpm**	
Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **700±50 rpm**	
OK or NG	
OK ▶	GO TO 26.
NG ▶	GO TO 25.

25	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 NATS system and registration of NATS ignition key IDs. Refer to "NATS (Nissan Anti-Theft System)", EC-72.	
▶	GO TO 23.

26	CHECK IGNITION TIMING AGAIN
Check ignition timing again. Refer to Test No. 22.	
OK ▶	GO TO 28.
NG ▶	GO TO 27.

27	CHECK TIMING CHAIN INSTALLATION
Check timing chain installation. Refer to EM section.	
OK or NG	
OK ▶	GO TO 25.
NG ▶	1. Repair the timing chain installation. 2. GO TO 23.

28	ERASE UNNECESSARY DTC
After this inspection, unnecessary DTC No. might be displayed. Erase the stored memory in ECM. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-71	
▶	**INSPECTION END**

DTC Inspection Priority Chart

NLEC0039

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 ● P0325 Knock sensor ● P0340 Camshaft position sensor (PHASE) circuit ● P0403 EGR volume control valve (where fitted) ● P0500 Vehicle speed sensor ● P0605 ECM ● P0335 Crankshaft position sensor (POS) ● P1706 Park/Neutral position switch
2	● P0130 - P0134 Heated oxygen sensor 1 (front) ● P0135 Heated oxygen sensor 1 heater (front) ● P0137 - P0140 Heated oxygen sensor 2 (rear) ● P0141 Heated oxygen sensor 2 heater (rear) ● P0443 EVAP canister purge volume control solenoid valve ● P0510 Closed throttle position switch (where fitted) ● P1217 Overheat (Cooling system) ● P1401 EGR temperature sensor (where fitted)
3	● P0171, P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0400, P1402 EGR function ● P0420 Three way catalyst function ● P0505 IACV-AAC valve ● P1111 Intake valve timing control ● P1131 Swirl control valve control solenoid (where fitted)

Fail-safe Chart

=NLEC0040

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, the MI illuminates.

DTC No.		Detected items	Engine operating condition in fail-safe mode
CONSULT-II GST	ECM*1		
P0100	0100	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.
P0115	0115	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. The radiator fan operates.
			Condition: Just as ignition switch is turned ON or Start — Engine coolant temperature decided (CONSULT-II display): 40°C (104°F)
			Condition: More than approx. 4 minutes after ignition ON or Start — Engine coolant temperature decided (CONSULT-II display): 80°C (176°F)
			Condition: Except as shown above — Engine coolant temperature decided (CONSULT-II display): 40 - 80°C (104 - 176°F) (Depends on the time)
P0120	0120	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: When engine is idling — Driving condition: Normal
			Condition: When accelerating — Driving condition: Poor acceleration
Unable to access ECM	Unable to access Diagnostic Test Mode II	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 and IACV-AAC valve 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 value
			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.

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

Symptom Matrix Chart

SYSTEM — ENGINE CONTROL SYSTEM

NLEC0041

NLEC0041S01

		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-516
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-44
	Injector circuit	1	1	2	3	2		2	2			2			EC-495
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-39
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-42
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-46
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-343
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-46
	Ignition circuit	1	1	2	2	2		2	2			2			EC-500
EGR (where fitted)	EGR volume control valve circuit		2	2	3	3						3			EC-319
	EGR system	2	1	2	3	3	3	2	2	3		3			EC-310, 319, 393
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3		2	EC-146
Air conditioner circuit		2	2	3	3	3	3	3	3	3		3		2	HA section

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

(continued on next page)

	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	
Crankshaft position sensor (POS) circuit	2	2												EC-295
Camshaft position sensor (PHASE) circuit	3	2									3			EC-302
Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-154
Heated oxygen sensor 1 (front) circuit		1	2	3	2		2	2			2			EC-184, 192
Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-169, 171
Throttle position sensor circuit		1	2		2	2	2	2	2		2			EC-175
Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-99
Vehicle speed sensor circuit		2	3		3						3			EC-338
Knock sensor circuit			2								3			EC-291
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-358, 123
Start signal circuit	2													EC-512
PNP switch circuit			3		3		3	3			3			EC-402
Power steering oil pressure switch circuit		2					3	3						EC-524
Electrical load signal circuit							3	3						EC-535

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

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE MECHANICAL & OTHER

NLEC0041S03

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

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

(continued on next page)

		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	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			EM section
	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 and LC sections
	Oil level (Low)/Filthy oil														
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			LC section
	Thermostat									5					
	Water pump														
	Water gallery														
	Cooling fan									5					EC-373
	Coolant level (low)/Contaminated coolant														MA section

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

CONSULT-II Reference Value in Data Monitor Mode

NLEC0042

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. Specification data might be displayed even when ignition timing is not adjusted to specification. This IGN TIMING monitors the data calculated by the ECM according to the input signals from the crankshaft 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	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.1V
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	75 - 125%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
HO2S1 MNTR (B1)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH
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: Idle	Throttle valve fully closed	0.15 - 0.85V
	● Ignition switch: ON (Engine stopped)	Throttle valve fully opened	3.5 - 4.7V
EGR TEMP SEN (where fitted)	● Engine: After warming up		Less than 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Engine: Idle	Throttle valve: Idle position	ON
CLSD THL/P SW (where fitted)	● Ignition switch: ON (Engine stopped)	Throttle valve: Slightly open	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch “OFF”	OFF
		A/C switch “ON” (Compressor operates)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever “P” or “N”	ON
		Except above	OFF

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 turned	ON
LOAD SIGNAL	● Engine: running	Rear window defogger or headlamp "ON"	ON
		Except the above	OFF
IGNITION SW	● Ignition switch: ON → OFF		ON → OFF
HEATER FAN SW	● Heater fan switch is "ON"		ON
	● Heater fan switch is "OFF"		OFF
INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	8° BTDC
		2,000 rpm	Approx. 30° BTDC
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	Not used
		2,500 rpm	Not used
ABSOL TH·P/S	● Engine: Idle	Throttle valve fully closed	0.0°
	● 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	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	5 - 25 steps
		2,000 rpm	—
PURG VOL C/V	● Engine: After warming up ● No-load	Idle	0%
		Revving engine	—
EGR VOL CON/V (where fitted)	● Engine: After warming up ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	1 - 10 steps
SWRL CONT S/V (where fitted)	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 40°C (104°F)	ON
		Engine coolant temperature is above 40°C (104°F)	OFF
INT/V SOL-B1	● Engine: After warming up ● Lift up drive wheels	Idle	OFF
		Suitable gear position except "N" and revving engine	ON (Momentarily)
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 1 second) ● Engine running and cranking ● When engine is stopped (stops in 1.5 seconds)		ON
	● Except as shown above		OFF
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON
HO2S1 HTR (B1)	● Engine speed: Below 3,200 rpm		ON
	● Engine speed: Above 3,200 rpm		OFF
HO2S2 HTR (B1)	● Engine speed	Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
		Above 3,600 rpm	OFF
	● Ignition switch ON (Engine stopped)		OFF
TRVL AFTER MI	● Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,535 km (0 - 40,723 mile)

Major Sensor Reference Graph in Data Monitor Mode

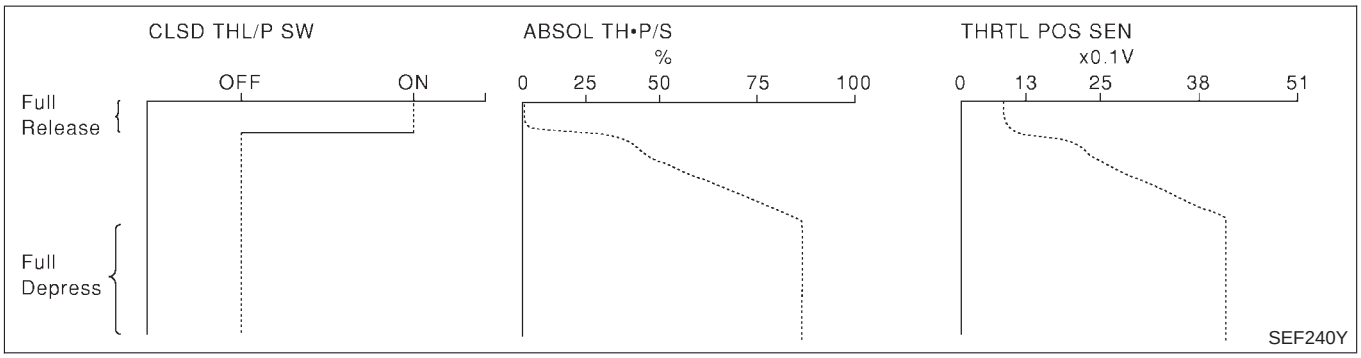
NLEC0043

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

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

NLEC0043S01

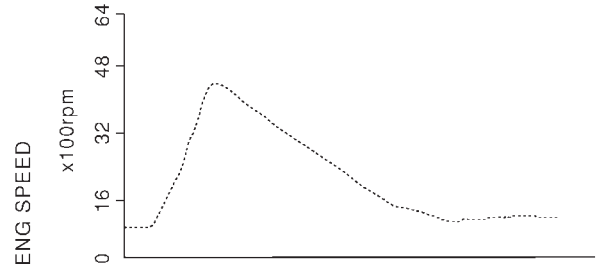
Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL/P SW" when depressing the accelerator pedal with the ignition switch "ON".
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL/P SW" is changed from "ON" to "OFF".



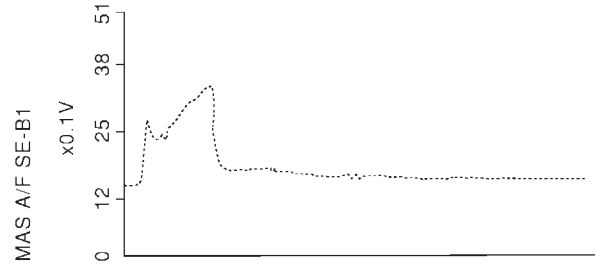
ENG SPEED, MAS A/F SE-B1, THRTL POS SEN, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

NLEC0043S02

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 to normal operating temperature.
Each value is for reference, the exact value may vary.

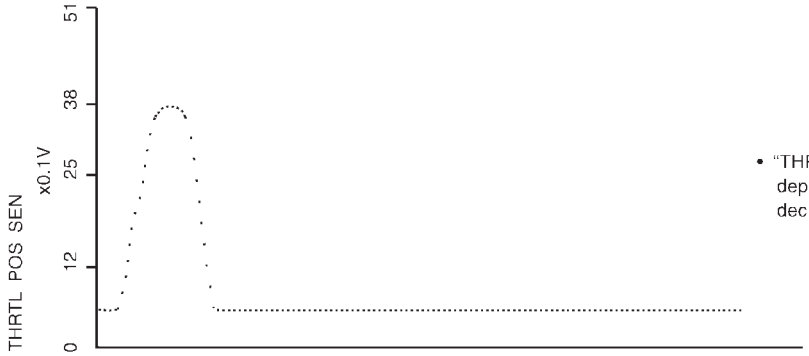


• "ENG SPEED" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intemittent drop or rise.

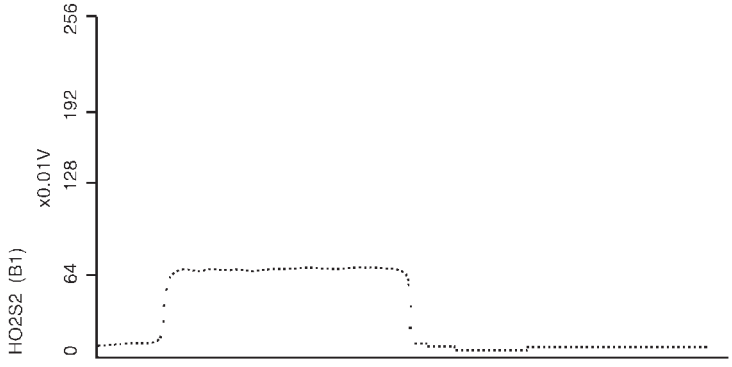


• "MAS A/F SE-B1" should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).

SEF241Y

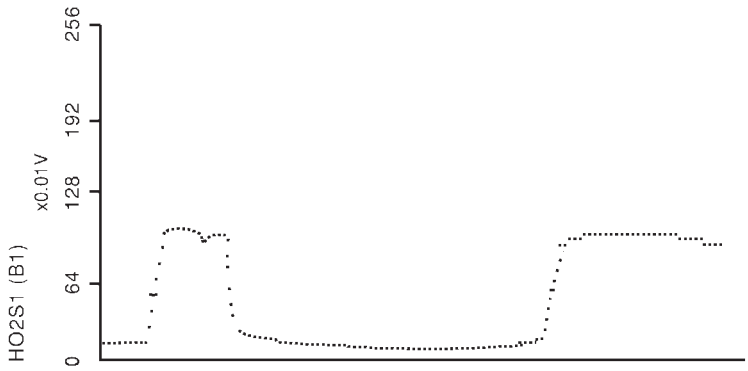


• "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.

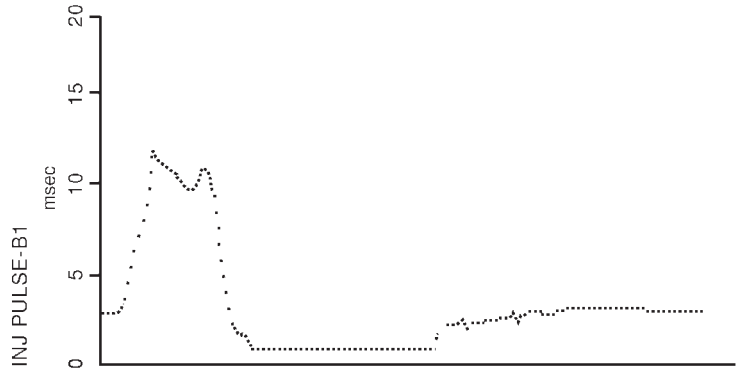


• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.

SEF601Y

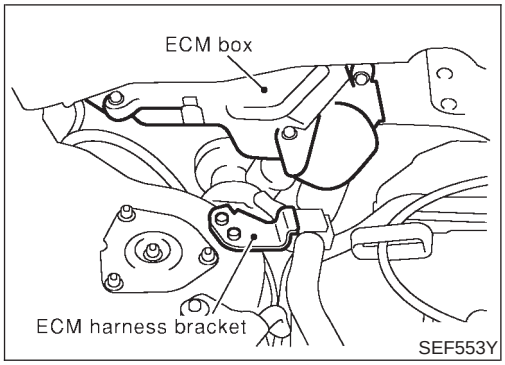


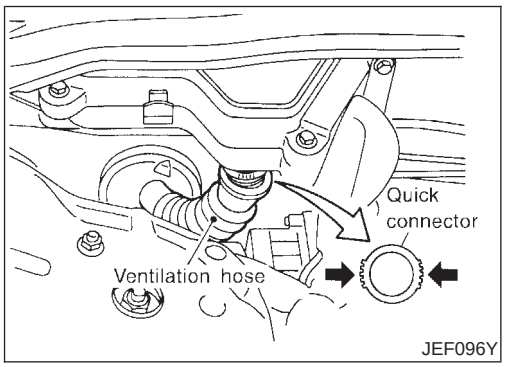
"HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.

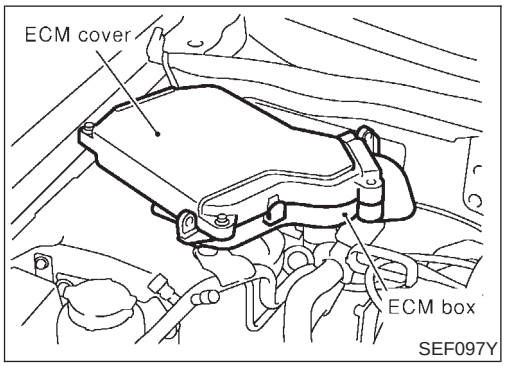


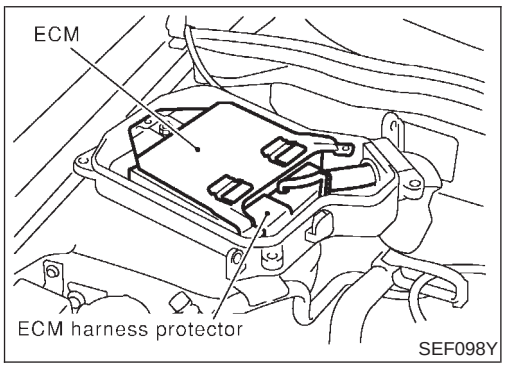
"INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

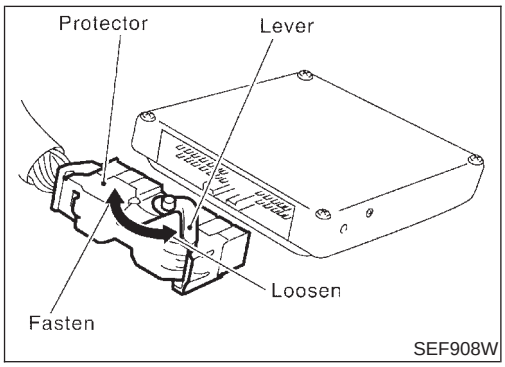
SEF170YA











ECM Terminals and Reference Value

NLEC0044

PREPARATION

NLEC0044S01

Models with ECM in engine compartment

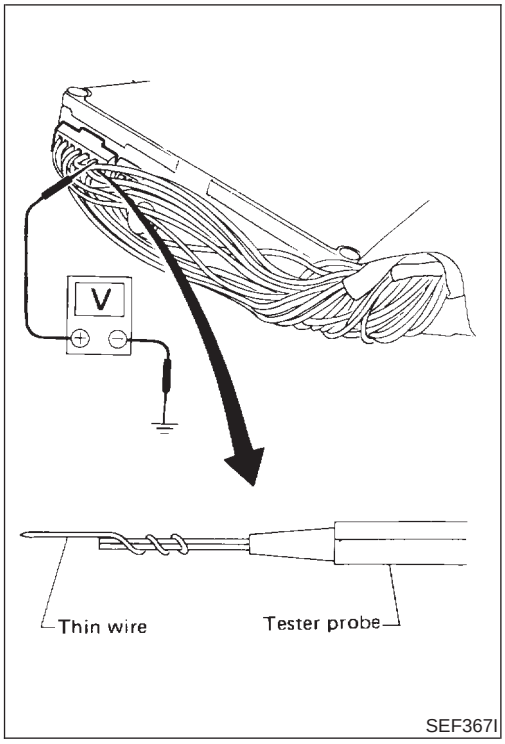
NLEC0044S0101

1. The ECM is located under the cowl panel on the passenger side (behind the strut tower). Remove it from the engine room side.

- Remove the bracket fixing ECM harness.
- Remove the quick connector of the ventilation hose in the ECM compartment room by pressing in the direction of the arrow.
- Pull the ECM box out from under the cowl panel by removing the two ECM box attaching bolts.
- Remove the five bolts on ECM box installation cover.
  : 3.9 - 6.9 N·m (0.39 - 0.71 kg-m, 34 - 61 in-lb)
- Remove the three ECM installation bolts.
  : 4.1 - 6.8 N·m (0.41 - 0.70 kg-m, 36 - 60 in-lb)

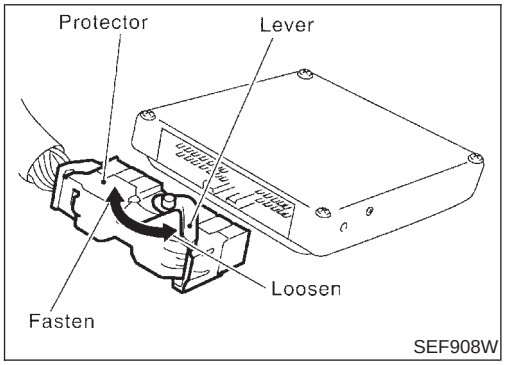
2. Remove ECM harness protector.

- **When connecting or disconnecting ECM harness connector, use lever as shown.**
  When connecting, fasten connector securely with lever moved until it stops.



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.

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.

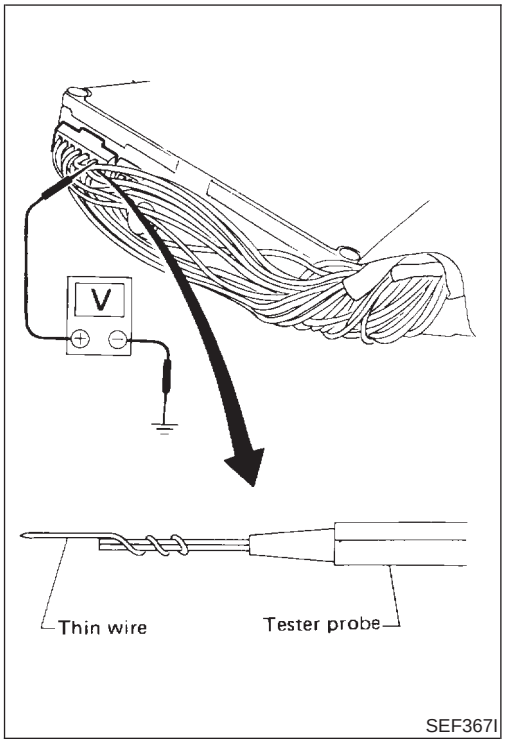


Models with ECM in cabin

NLEC0044S0102

ECM is locating beside of blower unit.

1. Remove the ECM bracket fixing.
2. Remove ECM harness protector.
- **When connecting or disconnecting ECM harness connector, use lever as shown.**
  When connecting, fasten connector securely with lever moved until it stops.

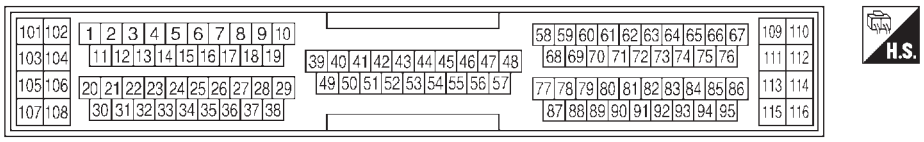


3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
- Open harness securing clip to make testing easier.
- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.

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.

ECM HARNESS CONNECTOR TERMINAL LAYOUT

NLEC0044S02



SEF970W

ECM INSPECTION TABLE

NLEC0044S03

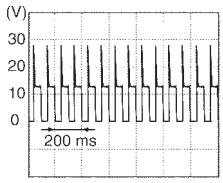
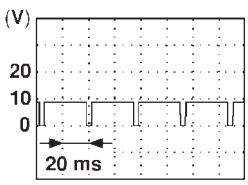
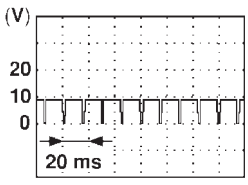
Specification data are reference values and are measured between each terminal and ground.

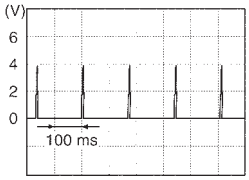
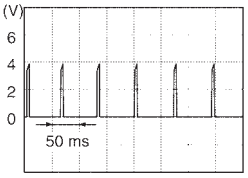
CAUTION:

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.

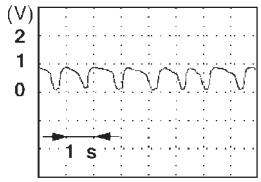
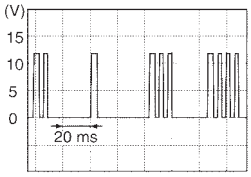
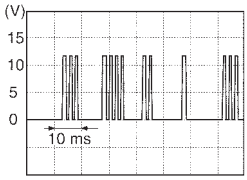
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Lift up drive wheels and suitable gear position ● Rev engine from 2,000 to 3,000 rpm	Approximately 0V
3	W/R	Heated oxygen sensor 2 heater (rear)	**[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	Approximately 0.7V
			[Ignition switch "ON"] ● Engine stopped ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
4	R/B	Heated oxygen sensor 1 heater (front)	**[Engine is running]** ● Engine speed is below 3,200 rpm	Approximately 0V
			[Engine is running] ● Engine speed is above 3,200 rpm	BATTERY VOLTAGE (11 - 14V)
6 7 15 16	BR L/G P OR	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V
8 9 17 18	SB W/B R/Y BR/R	EGR volume control valve (where fitted)	**[Engine is running]** ● **Warm-up condition** ● Rev engine from 2,000 to 4,000 rpm	0 - 14V
13	LG/R	Cooling fan relay	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	Approximately 0V

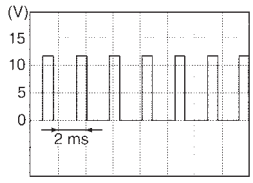
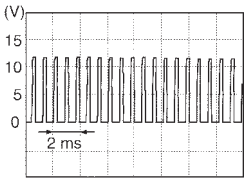
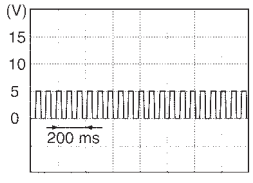
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	GY/L	EVAP canister purge volume control valve (ON/OFF duty)	**[Engine is running]** ● **Warm-up condition** ● Accelerator pedal depressed	5 - 12V  SEF975W
21	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
22	OR/L	Malfunction indicator	**[Ignition switch "ON"]**	0 - 1V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
23	L	Air conditioner relay	**[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)
31	W/G	ECM relay (Self shut-off)	**[Ignition switch "OFF"]** ● For 9 seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] ● 9 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
32	L/OR	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	7 - 8V  SEF928X
			[Engine is running] ● Engine speed is 2,000 rpm	7 - 8V  SEF929X

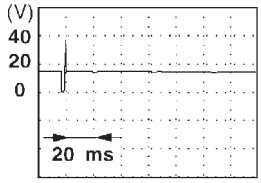
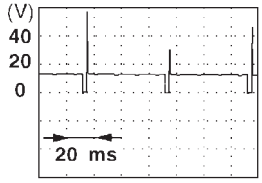
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35 36 37 38	L/W PU L/R GY/R	Ignition signal (No. 1) Ignition signal (No. 2) Ignition signal (No. 3) Ignition signal (No. 4)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.2V  SEF971W
			[Engine is running] ● Engine speed is 2,000 rpm	0.2 - 0.4V  SEF972W
40	Y/PU	Throttle position switch (Closed position) (where fitted)	**[Engine is running]** ● Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Accelerator pedal depressed	Approximately 0V
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V
42	G/OR	PNP switch	**[Ignition switch "ON"]** ● Gear position is "Neutral position"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	Approximately 5V
43	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
44	L/R	Air conditioner switch	**[Engine is running]** ● Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			[Engine is running] ● Air conditioner switch is "OFF"	Approximately 5V
46	PU/W	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is fully turned	Approximately 0V
			[Engine is running] ● Steering wheel is not turned	Approximately 5V
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
50	L/B	Electrical load signal (Headlamp and Rear defogger)	**[Engine is running]** ● Headlamp switch or rear defogger switch is "ON"	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Headlamp switch and rear defogger switch are "OFF"	Approximately 0V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
51	LG/B	Blower fan SW	**[Ignition switch "ON"]** ● Blower fan switch is "ON"	Approximately 0V
			[Ignition switch "ON"] ● Blower fan switch is "OFF"	Approximately 5V
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
61	G	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.5 - 2.1V
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - Approximately 0.7V  SEF008W
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 3,000 rpm	0 - Approximately 1.0V
64	Y/B	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature
66 75	R R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	2.0 - 3.0V  SEF977W
			[Engine is running] ● Engine speed is 2,000 rpm	2.0 - 3.0V  SEF978W
67	W/L	Power supply for ECM (Back-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
70	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
72	P/B	EGR temperature sensor (where fitted)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Less than 4.5V
			[Engine is running] ● **Warm-up condition** ● EGR system is operating	0 - 1.0V
73	B	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	R/L	Refrigerant pressure sensor	**[Engine is running]** ● Air conditioner switch is "ON" (Compressor operates)	1.0 - 4.0V
			[Engine is running] ● Warm-up condition ● Idle speed ● Air conditioner switch is turned from "ON" to "OFF"	Voltage is gradually decreasing.
81	W	Knock sensor	**[Engine is running]** ● Idle speed	1.0 - 4.0V
85	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	3.0 - 4.0V  SEF979W
			[Engine is running] ● Engine speed is 2,000 rpm	3.0 - 4.0V  SEF980W
86	PU/R	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● Vehicle speed is 40 km/h (25 MPH)	2.5 - 3V  SEF976W
92	Y	Throttle position sensor	**[Engine is running]** ● Accelerator pedal released	0.15 - 0.85V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.5 - 4.7V
93	G/R	Data link connector	**[Engine is running]** ● Idle speed (CONSULT-II or GST is disconnected)	Approximately 0V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101 103 105 107	R/B YB GB L/B	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF011W
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  SEF012W
104	SB	Swirl control valve control solenoid valve (where fitted)	**[Engine is running]** ● Engine coolant temperature is between 15°C (59°F) to 40°C (104°F) ● Idle speed	0 - 1V
			[Engine is running] ● Engine coolant temperature is above 40°C (104°F) ● Idle speed	BATTERY VOLTAGE (11 - 14V)
106 108	B/Y	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
111	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
114	GY/R	Adjust switch	**[Engine is running]** ● Idle speed	0V
115	LG	Data link connector	**[Engine is running]** ● Idle speed (CONSULT-II or GST is disconnected)	0 - 10V

Description

NLEC1271

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)

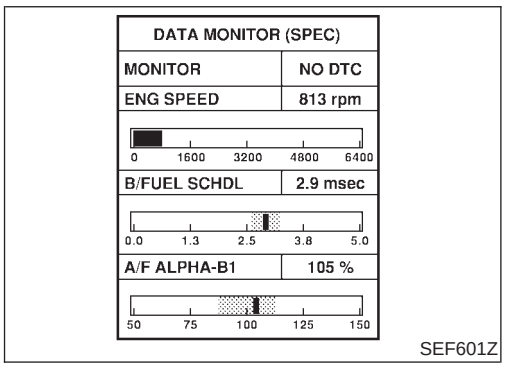
Testing Condition

NLEC1272

- Vehicle driven distance: More than 5,000 km (3,100 miles)
- Barometric pressure: 101.3 kPa (760.0 mmHg, 29.92 inHg) ±3 kPa (22.5 mmHg, 0.89 inHg)
- 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 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

NLEC1273

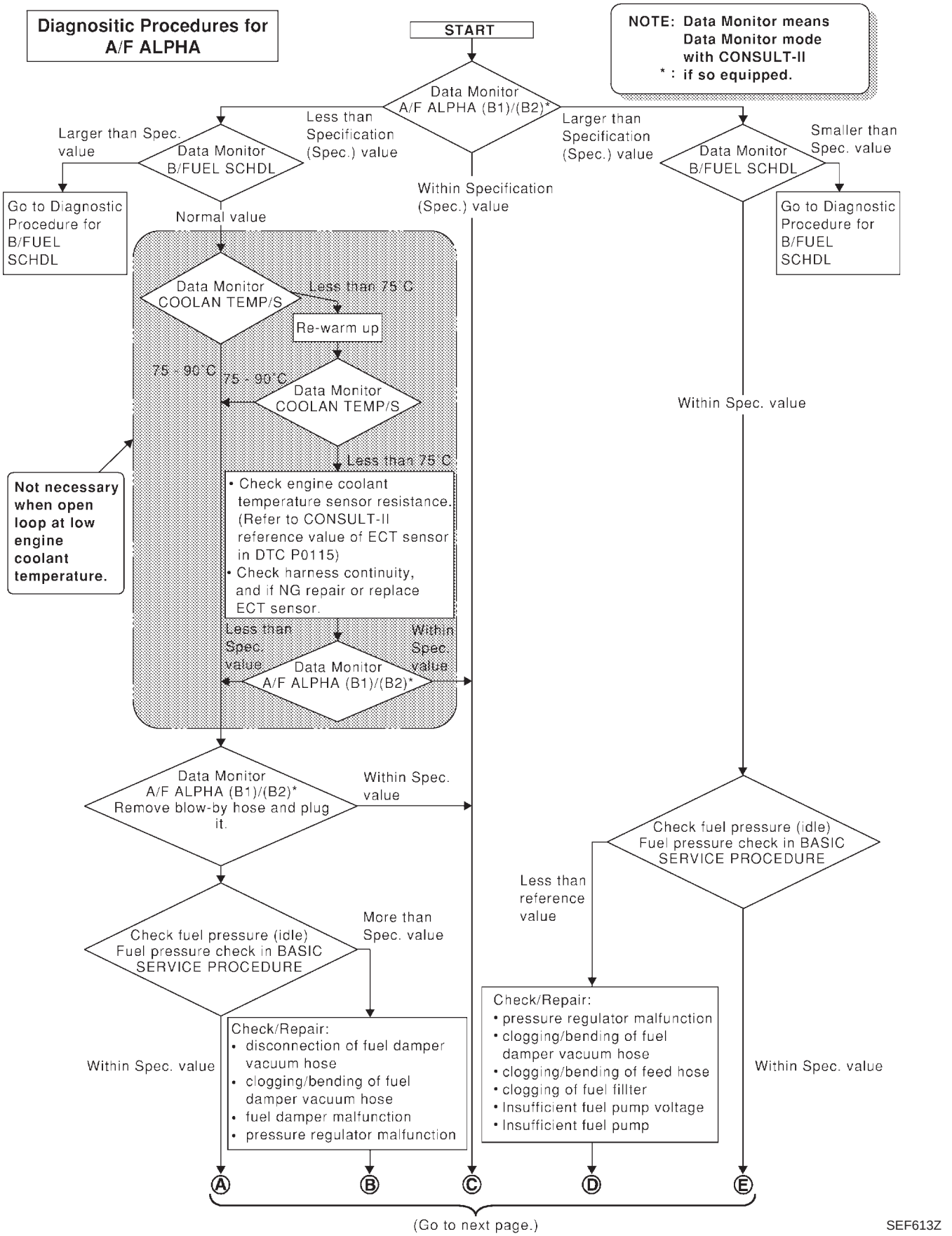
NOTE:

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

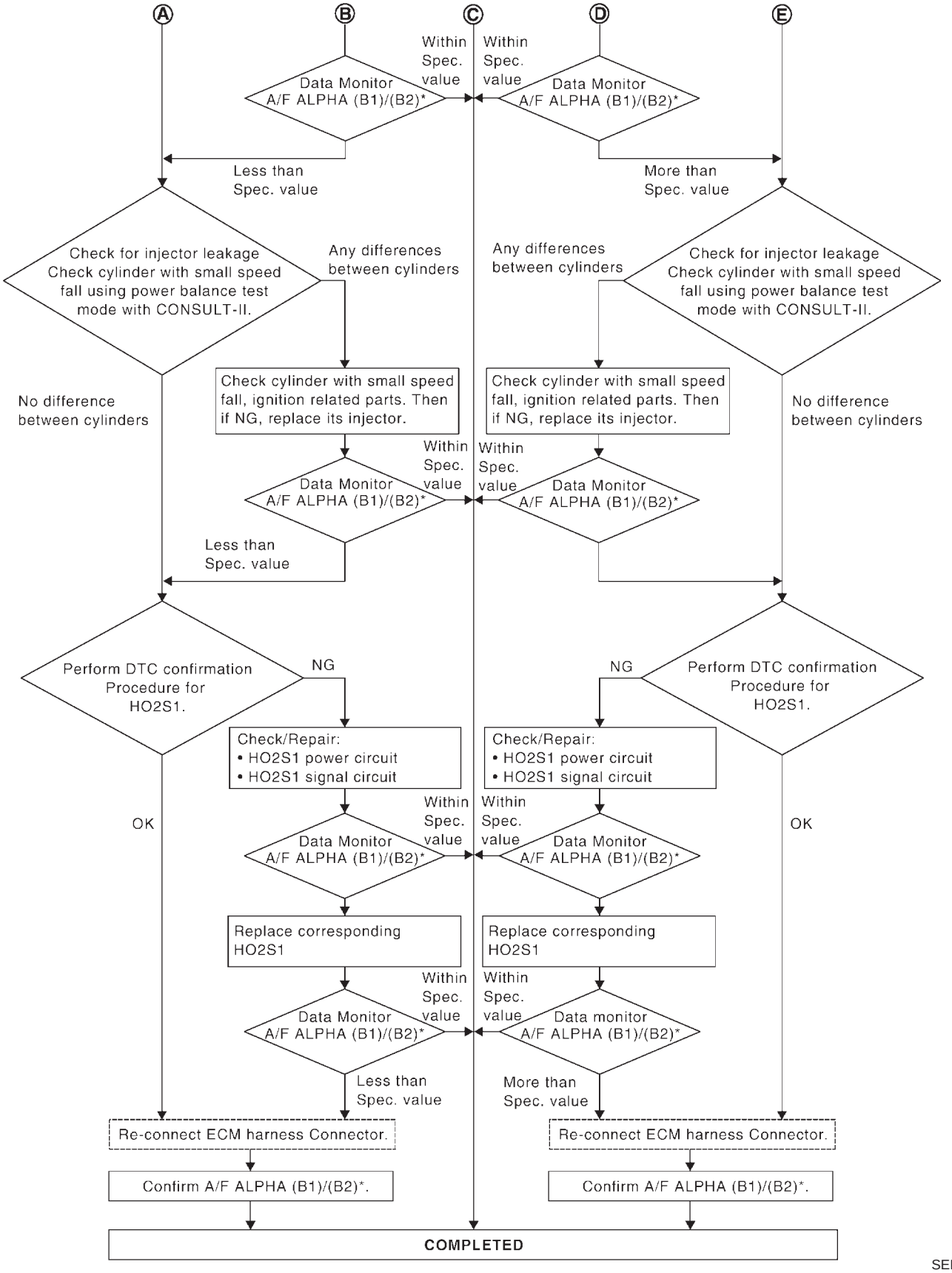
1. Perform “Basic Inspection”, EC-99.
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1”, “A/F ALPHA-B2” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to “Diagnostic Procedure”, EC-142.

Diagnostic Procedure

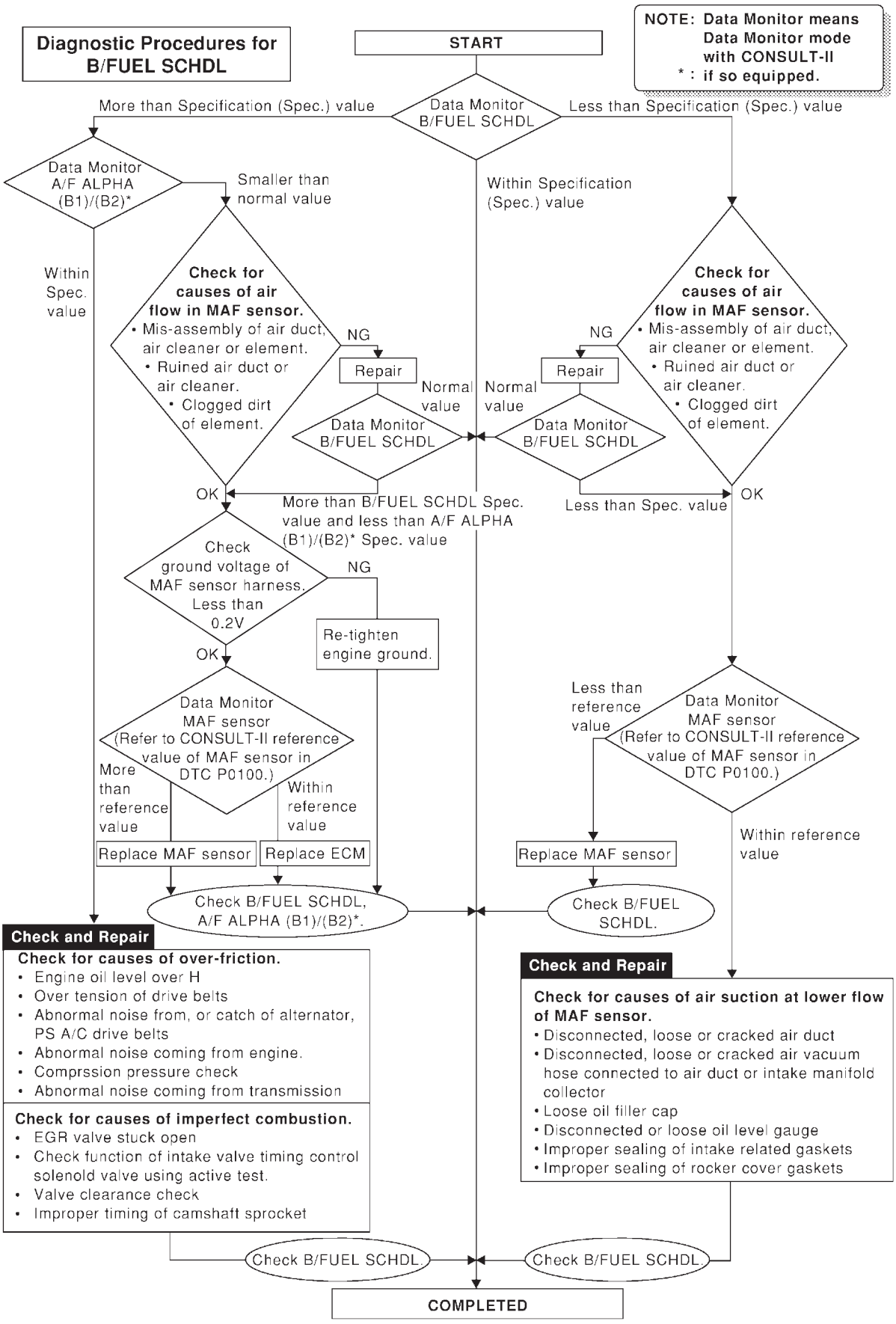
NLEC1274



SEF613Z


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

SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
Re-tighten engine ground.
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor 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

Description

NLEC0045

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 DTC (1st trip) 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

NLEC0045S01

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 data does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the problem area.

Diagnostic Procedure

NLEC0046

1	INSPECTION START	
Erase (1st trip) DTCs. Refer to "How to Erase Emission-related Diagnostic Information", EC-69, EC-71.		
	▶	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

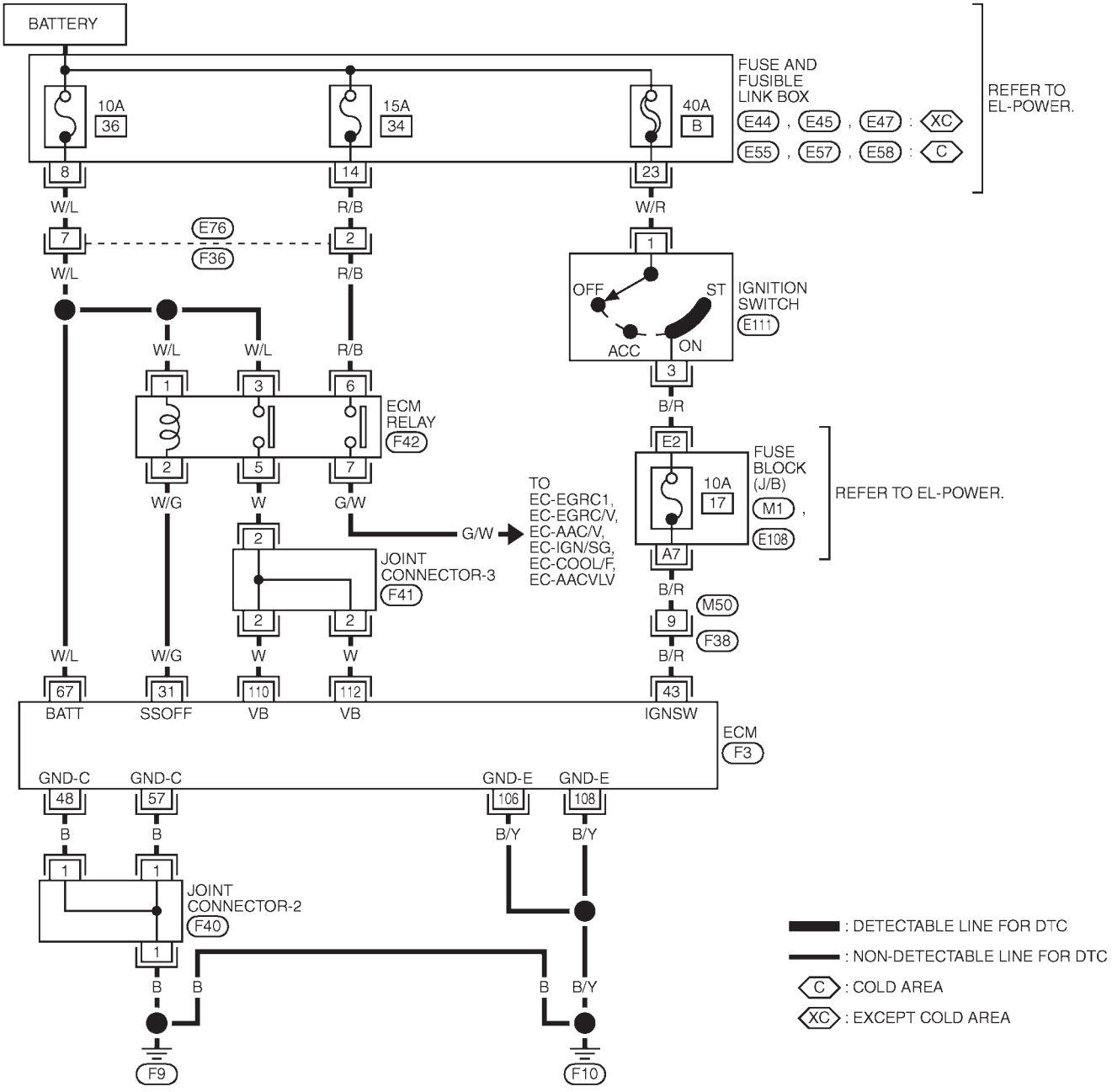
WIRING DIAGRAM

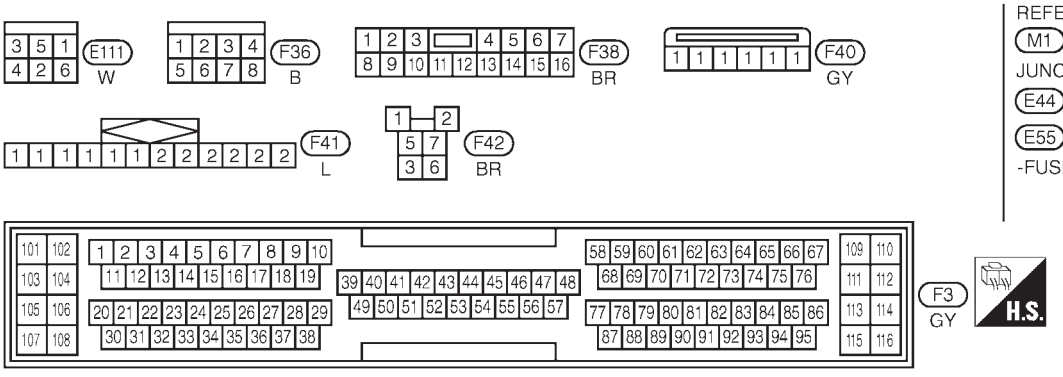
NLEC0047

Models with ECM in engine compartment

NLEC0047S01

EC-MAIN-01





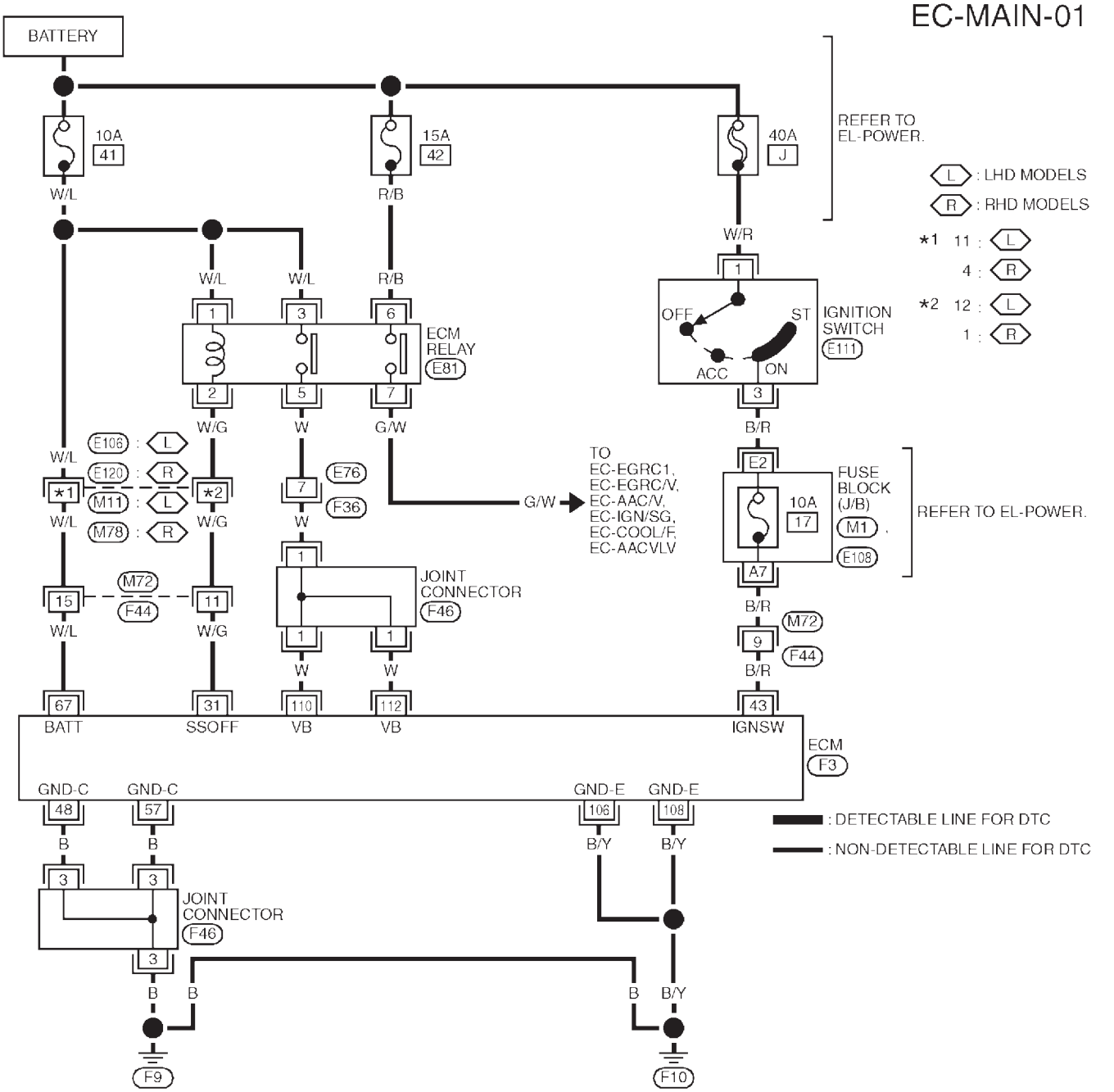
REFER TO THE FOLLOWING.
M1 , E108 -FUSE BLOCK-JUNCTION BOX (J/B)
E44 , E45 , E47
E55 , E57 , E58
-FUSE AND FUSIBLE LINK BOX

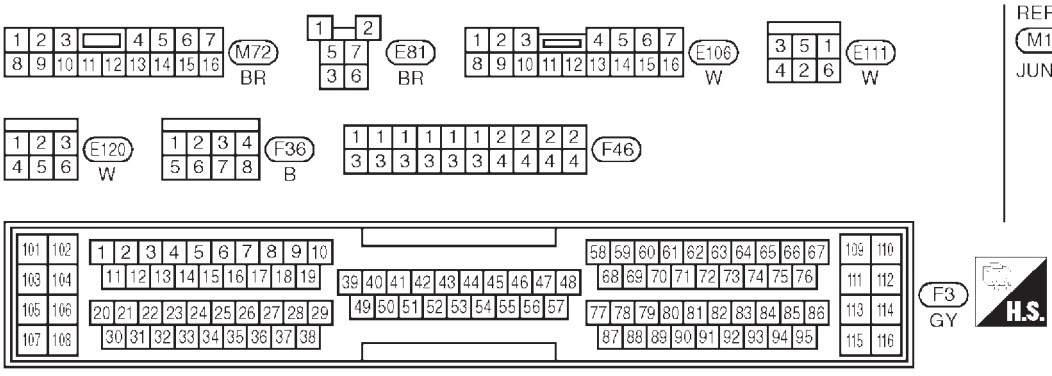
YEC650

Models with ECM in cabin

NLEC0047S02

EC-MAIN-01





REFER TO THE FOLLOWING.
M1, E108 -FUSE BLOCK-JUNCTION BOX (J/B)

YEC872

ECM TERMINALS AND REFERENCE VALUE

NLEC0048

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)
31	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 9 seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] ● 9 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
43	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
57	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
67	W/L	Power supply for ECM (Back-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
106 108	B/Y B/Y	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

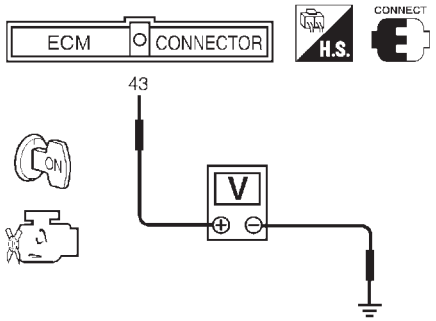
DIAGNOSTIC PROCEDURE

NLEC0565

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 M50, F44 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Fuse block (J/B) connector M1, E108
- 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

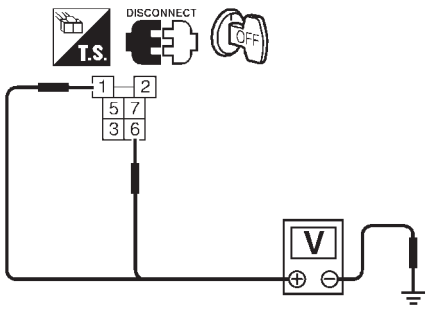
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 48, 57, 106, 108 and engine ground.
   Refer to WIRING DIAGRAM.
   Continuity should exist.
4. Also check harness for short to power.

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. (For ECM relay location, refer to "Engine Control Compartment Parts Location".)
2. Check voltage between ECM relay terminals 1, 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF101Y

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuses
- Harness connectors E76, F36
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- 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 31 and ECM relay terminal 2.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	Go to "IGNITION SIGNAL", EC-500.
NG	▶	GO TO 8.

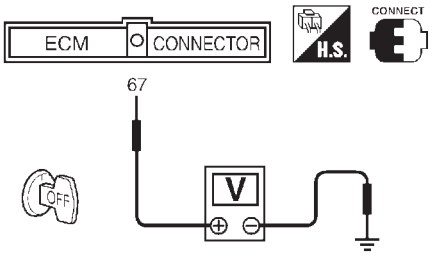
8	DETECT MALFUNCTIONING PART

Check the 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.

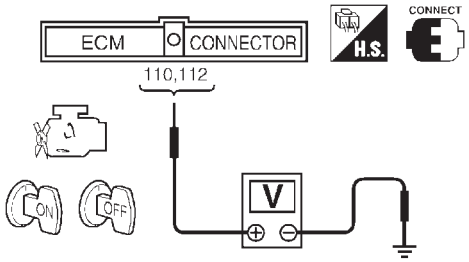
10	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F36
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- 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.

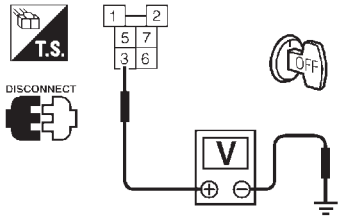
SEF294X

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. (For ECM relay location, refer to "Engine Control Compartment Parts Location".)
2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF295X

Or, ECM relay is locating on relay box in engine compartment.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F36
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between ECM relay and 10A 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.

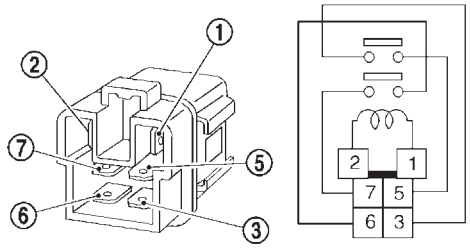
15	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3
- Harness connector E76, F36 (where fitted)
- Joint connector F46 (where fitted)
- 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.

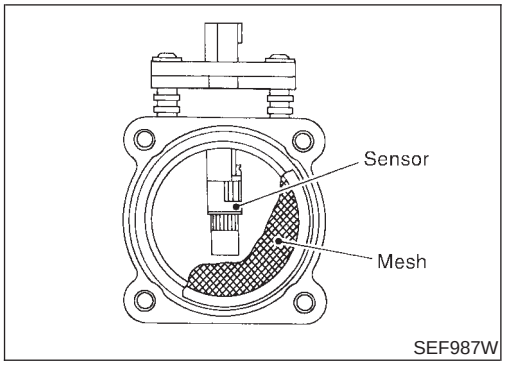
17	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

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-145.	
▶	**INSPECTION END**



Component Description

NLEC0050

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

NLEC0051

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	1.0 - 1.7V
		2,500 rpm	1.5 - 2.1V
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

ECM Terminals and Reference Value

NLEC0052

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)
61	G	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.5 - 2.1V
73	B	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NLEC0053

DTC No.	Malfunction is detected when ...		Check Items (Possible Cause)
P0100 0100	A)	An excessively high voltage from the sensor is sent to ECM when engine is not running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor
	B)	An excessively low voltage from the sensor is sent to ECM* when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor

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

Fail-safe Mode

NLEC0589

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

DTC Confirmation Procedure

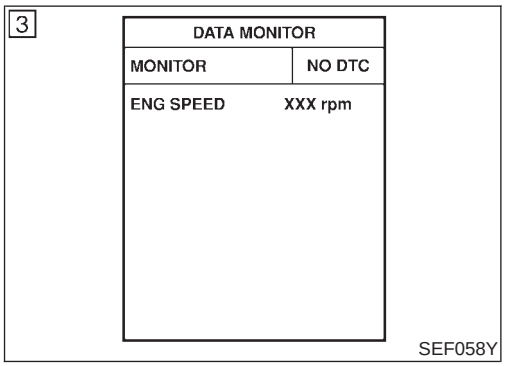
NLEC0054

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 9 seconds before conducting the next test.



PROCEDURE FOR MALFUNCTION A

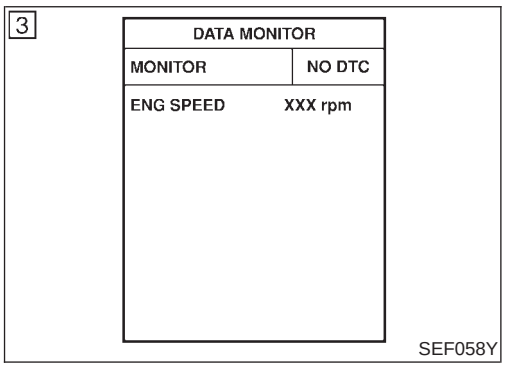
NLEC0054S01

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 2 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-158.

With GST

Follow the procedure “With CONSULT-II” above.



PROCEDURE FOR MALFUNCTION B

NLEC0054S02

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait 2 seconds at most.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-158.

With GST

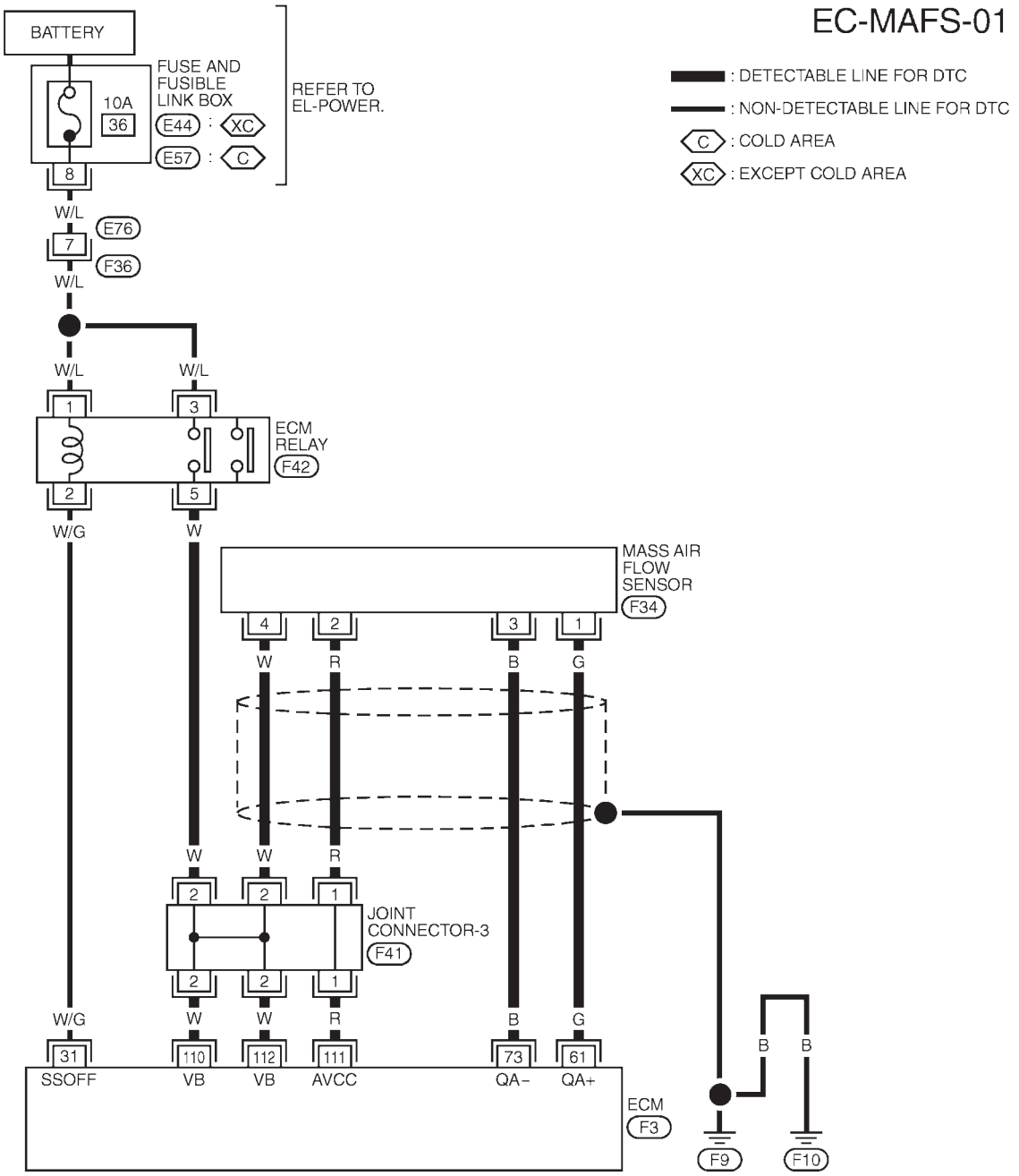
Follow the procedure “With CONSULT-II” above.

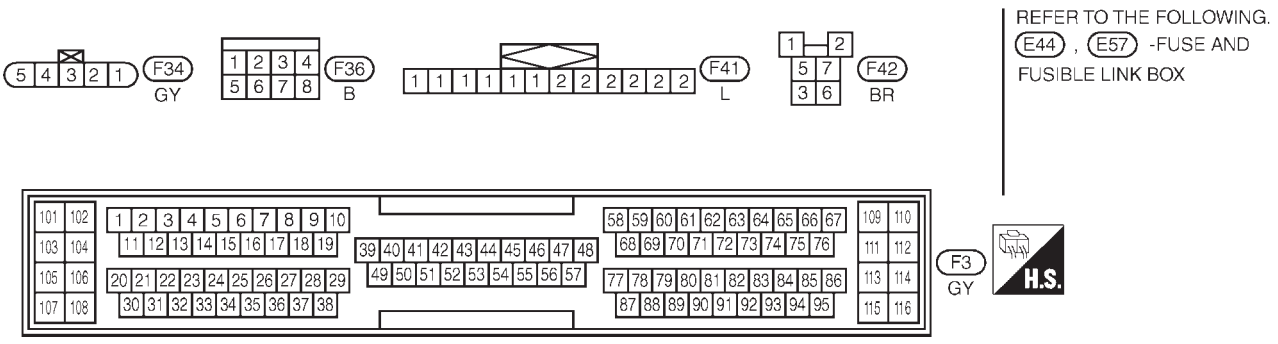
Wiring Diagram

NLEC0056

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0056S01



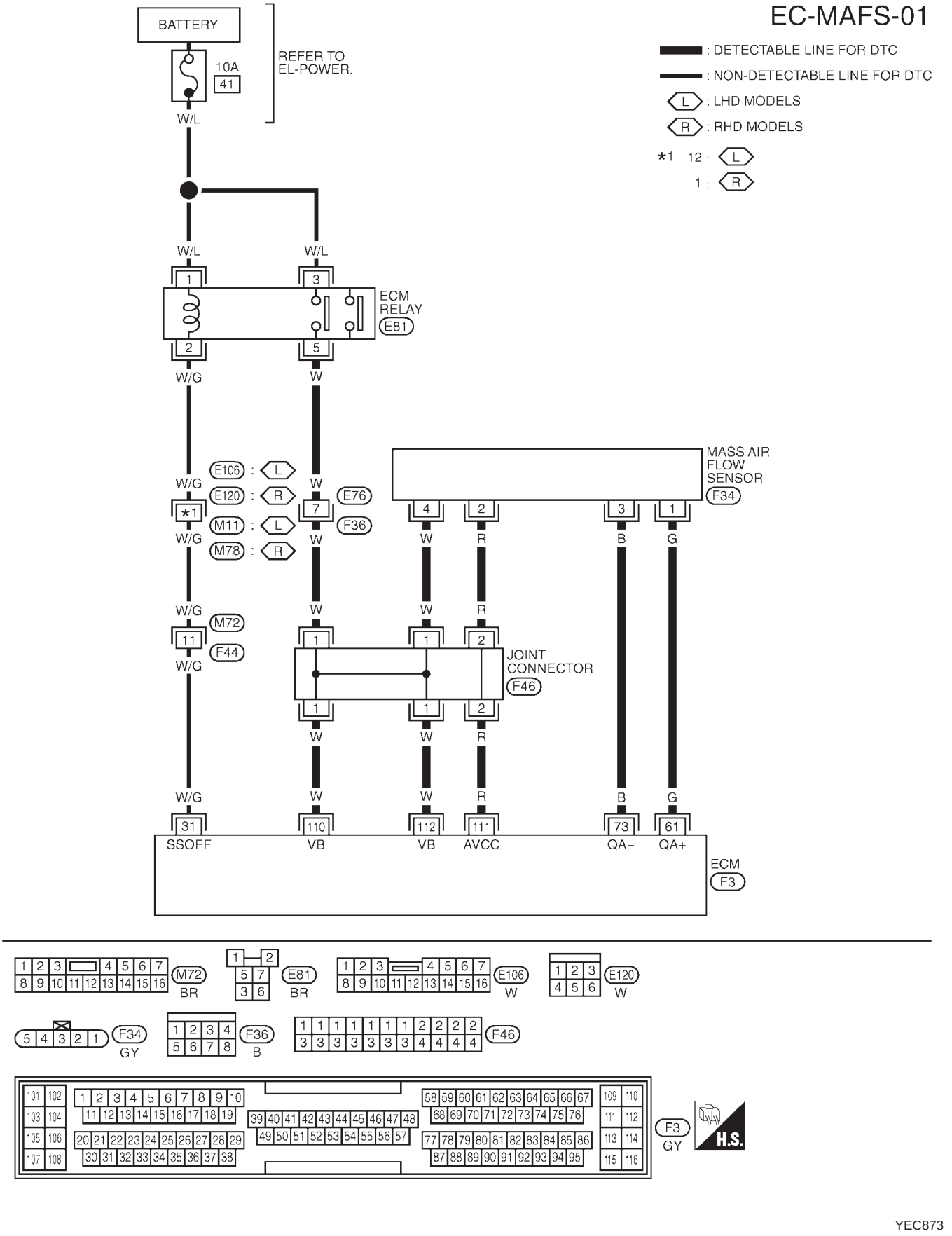


YEC651

MODELS WITH ECM IN CABIN

NLEC0056S02

EC-MAFS-01



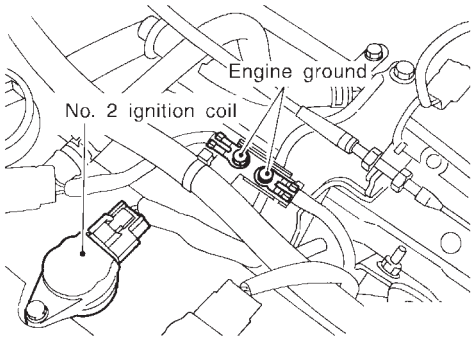
YEC873

Diagnostic Procedure

NLEC0057

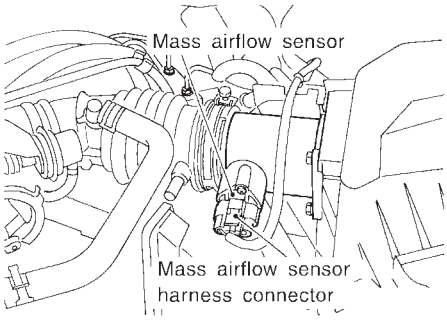
1	INSPECTION START	
Which malfunction (A, or B) is duplicated? **Malfunction A or B**		
A	▶	GO TO 3.
B	▶	GO TO 2.

2	CHECK INTAKE SYSTEM	
Check the following for connection. ● Air duct ● Vacuum hoses ● Intake air passage between air duct to 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.  JEF104Y		
	▶	GO TO 4.

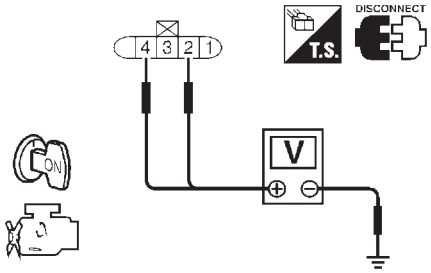
4	CHECK POWER SUPPLY

1. Disconnect mass air flow sensor harness connector.



JEF105Y

2. Turn ignition switch "ON".
3. Check voltage between terminal 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.
- Joint connector-3 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- 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 GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between mass air flow sensor harness connector terminal 3 and ECM terminal 73. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

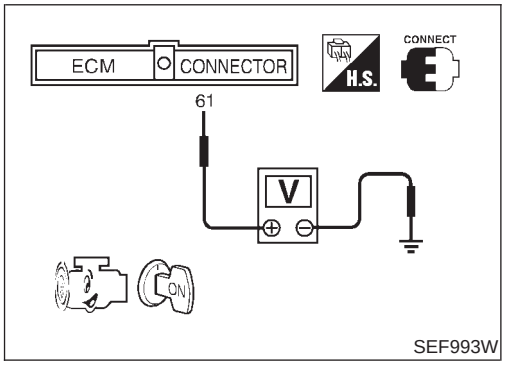
OK	▶	GO TO 7.
NG	▶	Repair open circuit or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

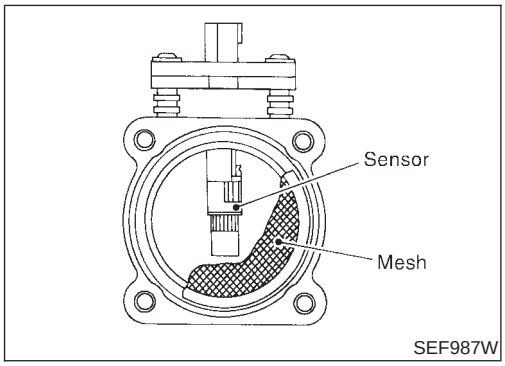
7	CHECK INPUT SIGNAL CIRCUIT	
1. Check harness continuity between mass air flow sensor harness connector terminal 1 and ECM terminal 61. Refer to wiring diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK MASS AIR FLOW SENSOR	
Refer to "Component Inspection", EC-160.		
OK or NG		
OK	▶	GO TO 9.
NG	▶	Replace mass air flow sensor.

9	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**



SEF993W



SEF987W

Component Inspection

NLEC0058

MASS AIR FLOW SENSOR

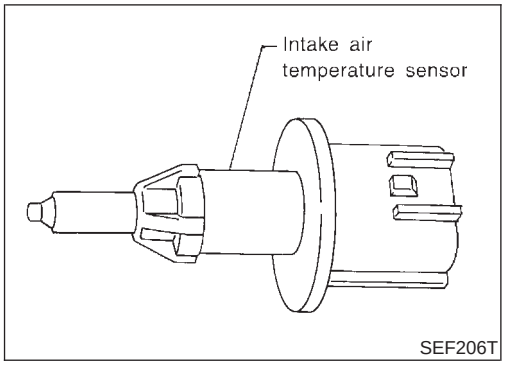
NLEC0058S01

1. Turn ignition switch "ON".
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.

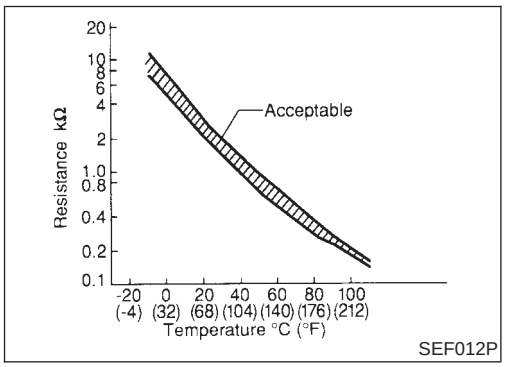
Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.2
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.7 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

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

4. If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Repeat above check.
5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.



SEF206T



SEF012P

Component Description

NLEC0066

MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT

NLEC0066S01

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.

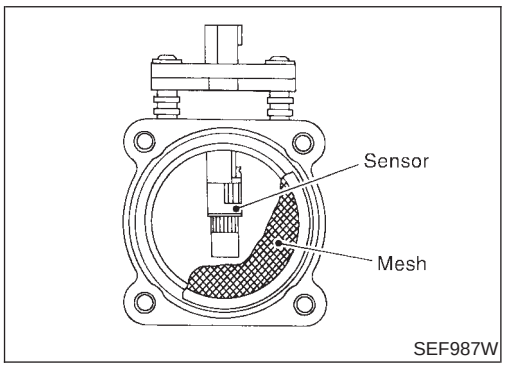
<Reference data>

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

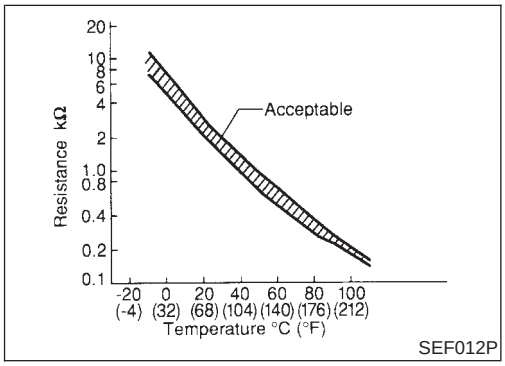
*: These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) and ground.

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.



SEF987W



SEF012P

MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR

NLEC0066S02

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

<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
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

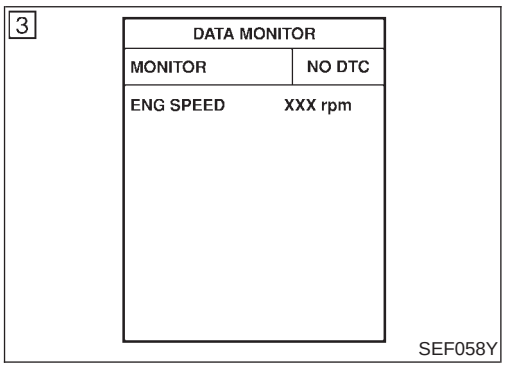
NLEC0067

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0110 0110	An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor

DTC Confirmation Procedure

NLEC0068

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.



With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-165.

With GST

Follow the procedure "With CONSULT-II" above.

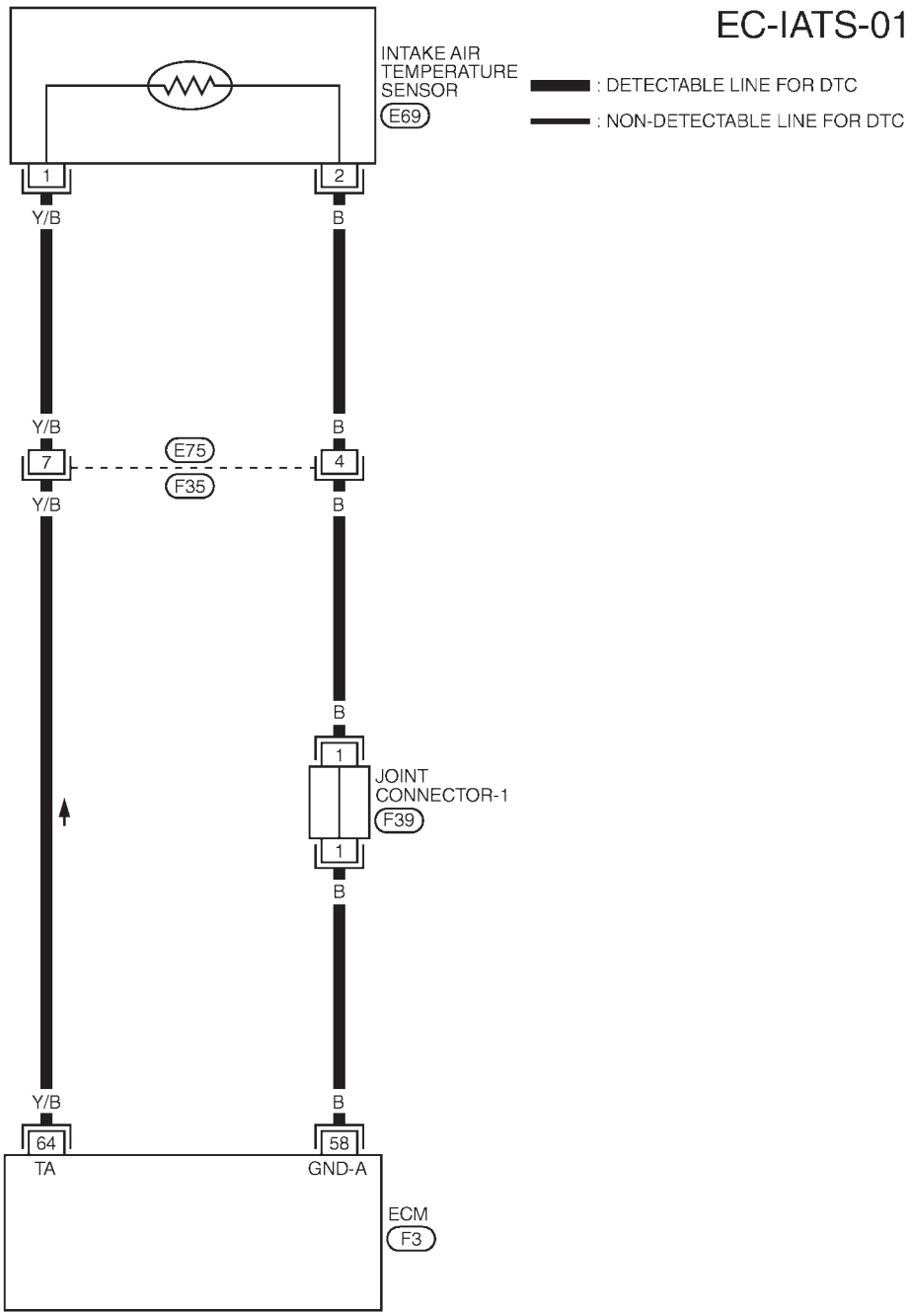
Wiring Diagram

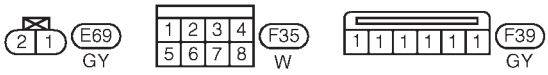
NLEC0069

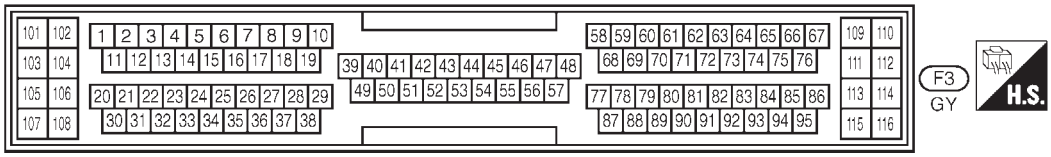
MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT

NLEC0069S01

EC-IATS-01





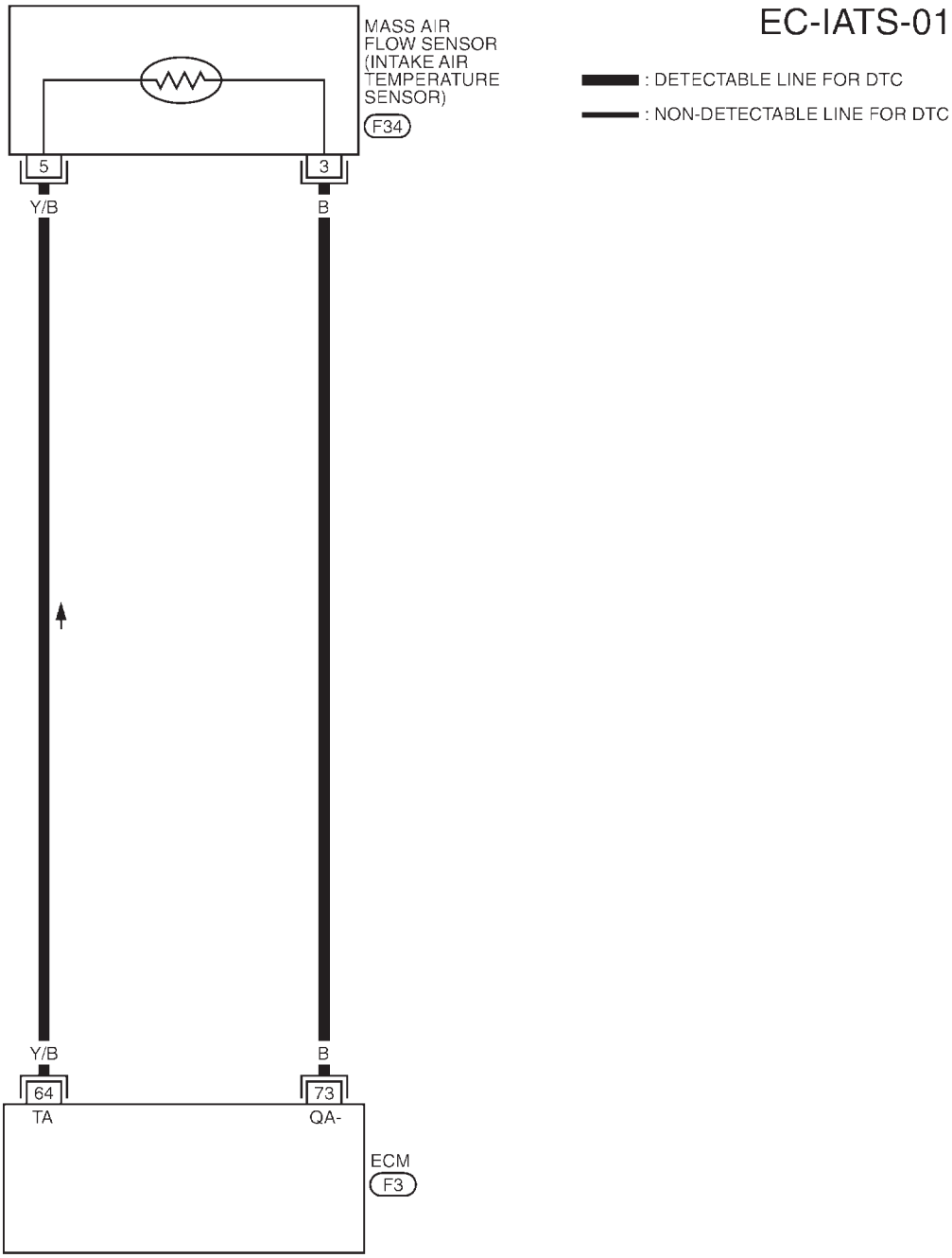


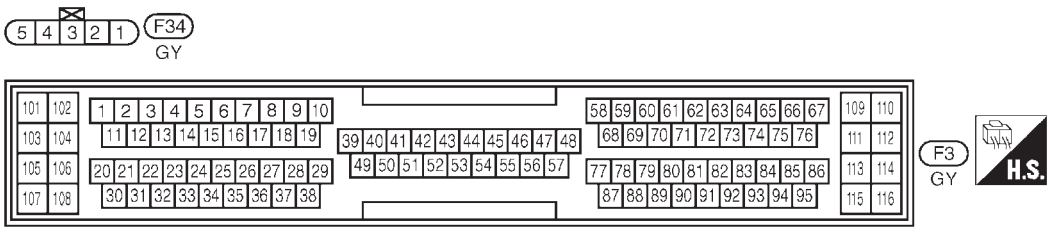
YEC652

MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR

NLEC0069S02

EC-IATS-01





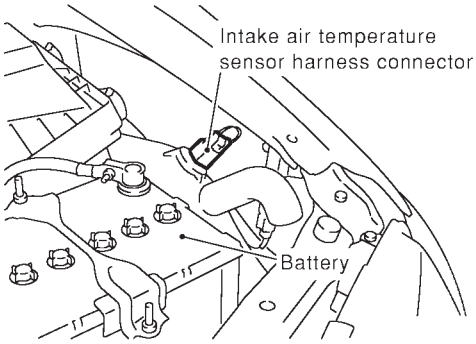
YEC874

Diagnostic Procedure

NLEC0070

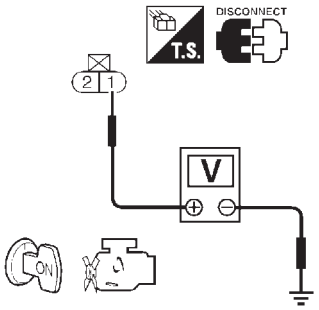
1	CHECK POWER SUPPLY (Models with intake air temperature sensor on intake air duct)

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



SEF602Y

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



Voltage: Approximately 5V

SEF301X

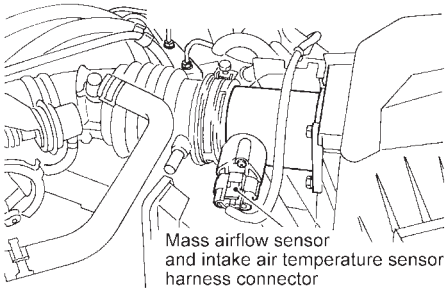
OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

Diagnostic Procedure (Cont'd)

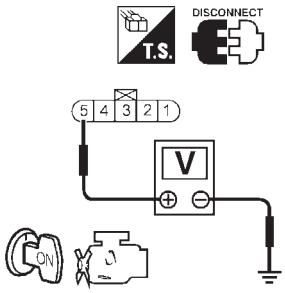
1	CHECK POWER SUPPLY (Models with intake air temperature sensor in mass air flow sensor)

1. Turn ignition switch "OFF".
2. Disconnect intake air temperature sensor (mass air flow sensor) harness connector.



NEF306A

3. Turn ignition switch "ON".
4. Check voltage between terminal 5 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

NEF307A

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E75, F35 (where fitted)
- Harness for open or short between ECM and intake air temperature sensor

	▶	Repair harness or connectors.

3	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between intake air temperature sensor harness connector and engine ground.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to power.

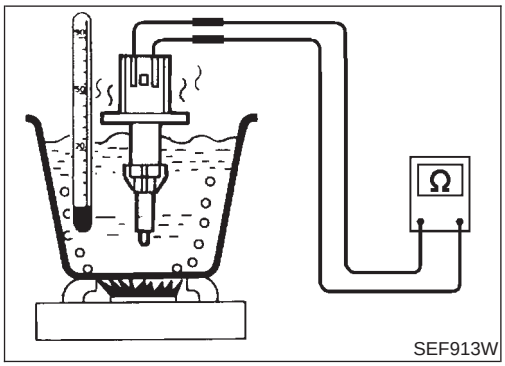
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

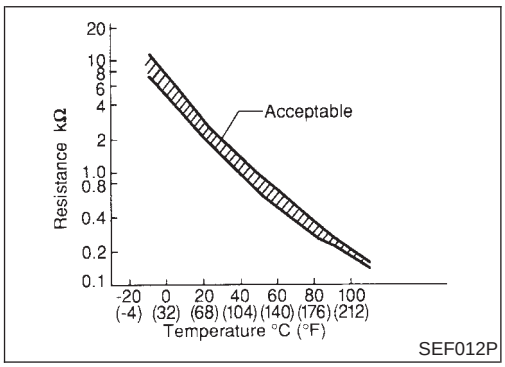
4	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-1 (where fitted) ● Harness connectors E75, F35 (where fitted) ● Harness for open or short between ECM and intake air temperature sensor	
▶	Repair open circuit or short to power in harness or connectors.

5	CHECK INTAKE AIR TEMPERATURE SENSOR
Refer to "Component Inspection", EC-169.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace intake air temperature sensor.

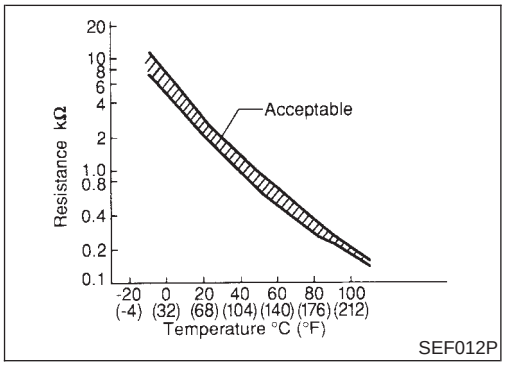
6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF913W



SEF012P



SEF012P

Component Inspection

NLEC0071

INTAKE AIR TEMPERATURE SENSOR

NLEC0071S01

Models with intake air temperature sensor on intake air duct

NLEC0071S0101

Check resistance as shown in the figure.

<Reference data>

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

If NG, replace intake air temperature sensor.

Models with intake air temperature sensor in mass air flow sensor

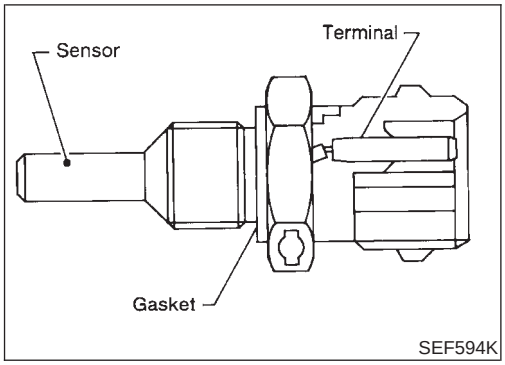
NLEC0071S0102

Check resistance between intake air temperature sensor (mass air flow sensor) terminal 3 and 5.

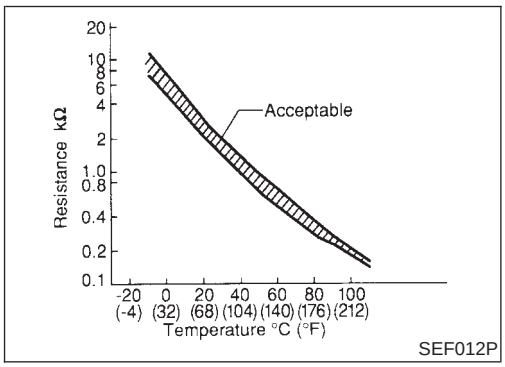
<Reference data>

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

If NG, replace intake air temperature sensor.



SEF594K



SEF012P

Component Description

NLEC0072

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) 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.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0073

MONITOR ITEM	CONDITION	SPECIFICATION
COOLAN TEMP/S	● Engine: After warming up	More than 70°C (158°F)

On Board Diagnosis Logic

NLEC0074

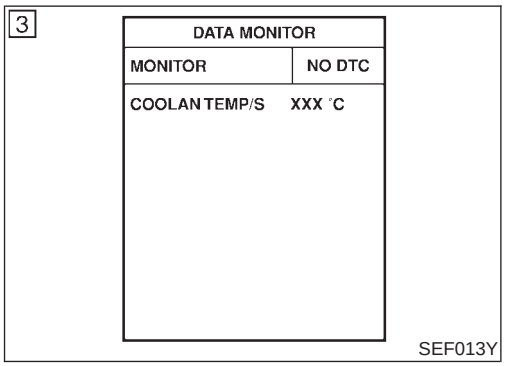
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0115 0115	● An excessively high or low voltage from the sensor is sent to ECM.*	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor

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

Fail-safe Mode

NLEC0566

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



DTC Confirmation Procedure

NLEC0075

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-173 .

With GST

Follow the procedure “With CONSULT-II” above.

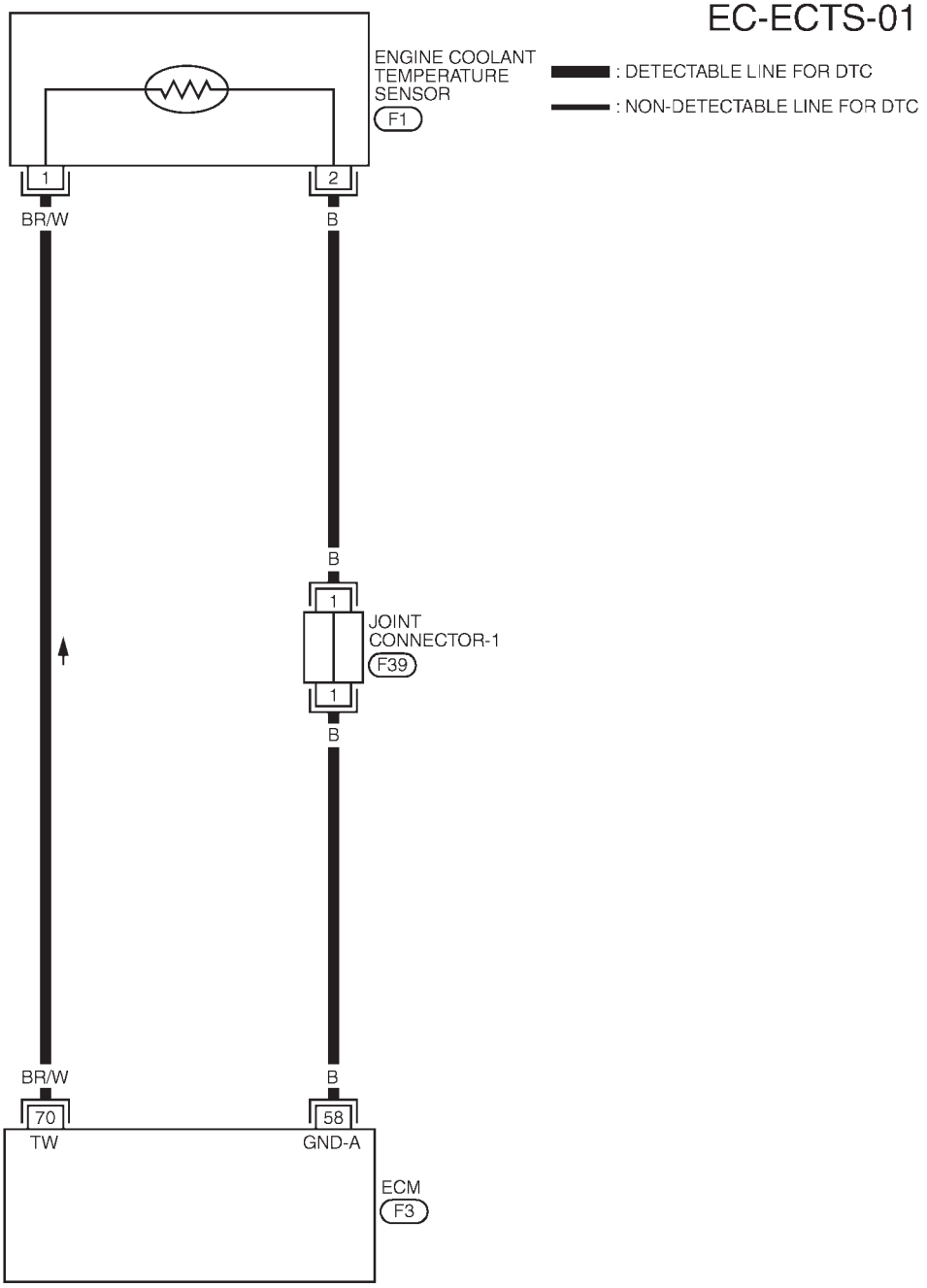
Wiring Diagram

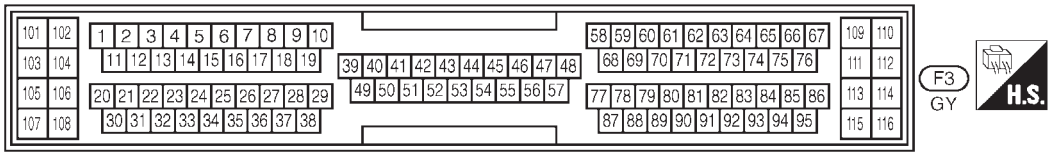
NLEC0076

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0076S01

EC-ECTS-01





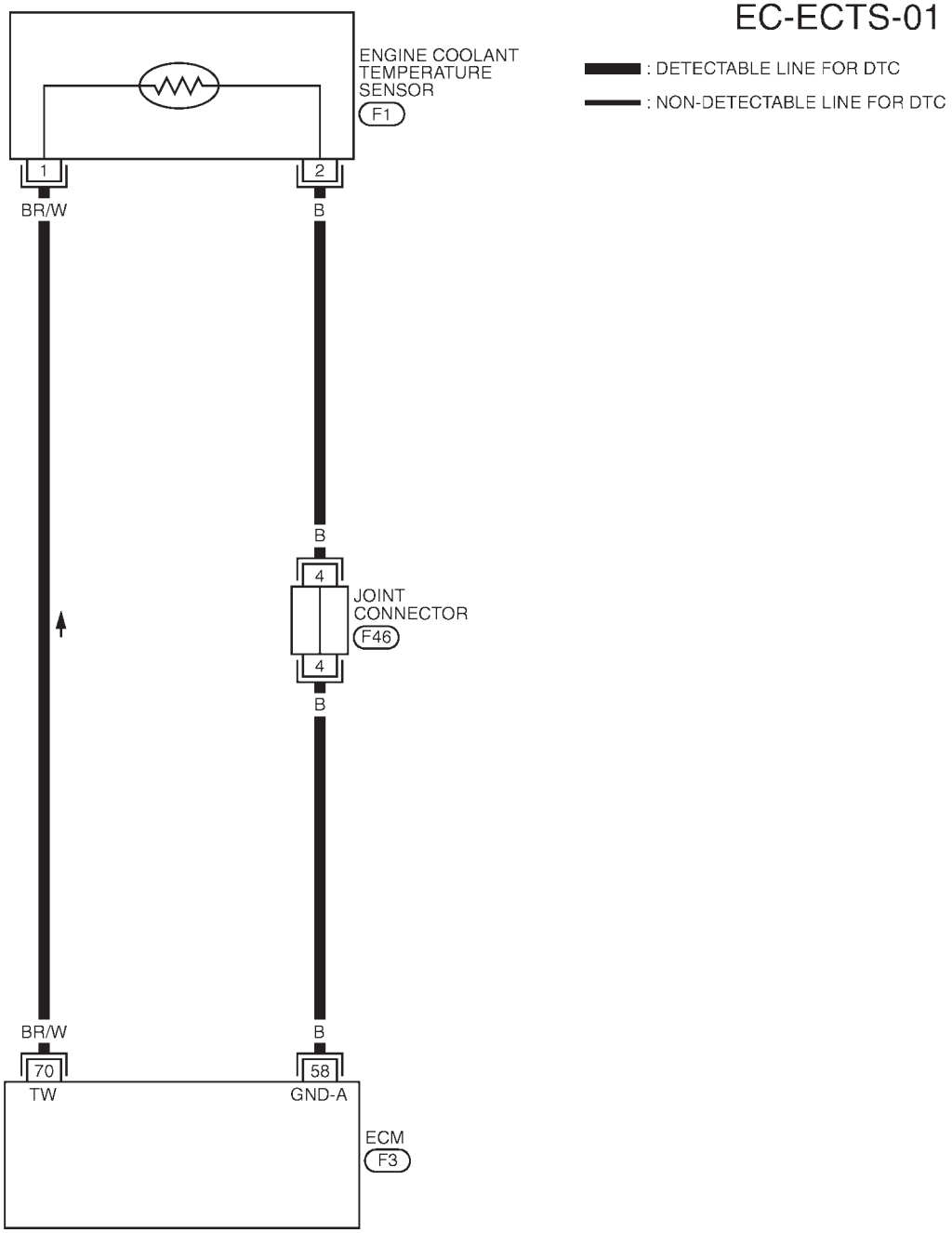
YEC653

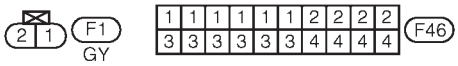
Wiring Diagram (Cont'd)

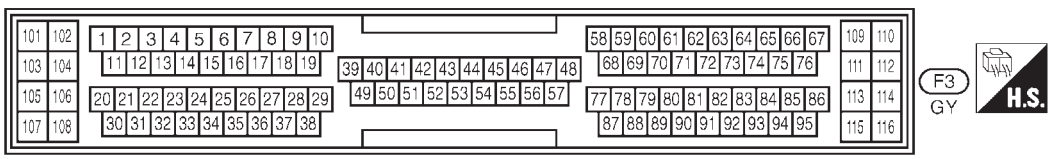
MODELS WITH ECM IN CABIN

NLEC0076S02

EC-ECTS-01







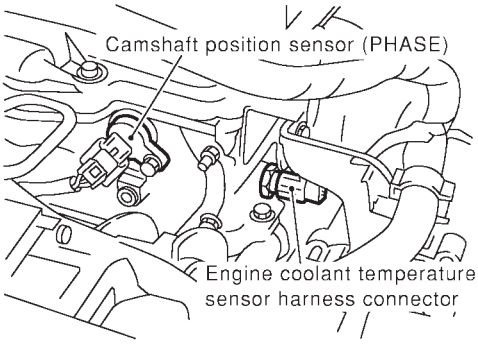
YEC875

Diagnostic Procedure

NLEC0077

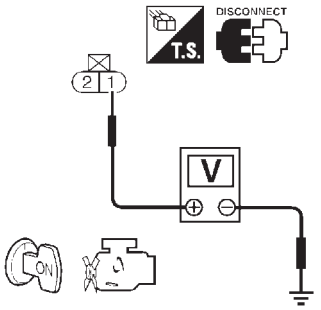
1	CHECK POWER SUPPLY

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



SEF999W

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



Voltage: Approximately 5V

SEF301X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM and engine coolant temperature sensor.

	▶	Repair harness or connectors.

3	CHECK GROUND CIRCUIT

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

OK or NG

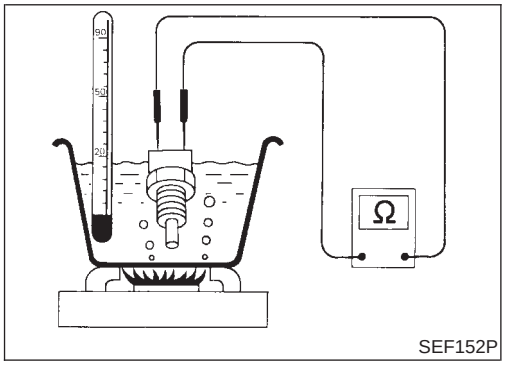
OK	▶	GO TO 5.
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

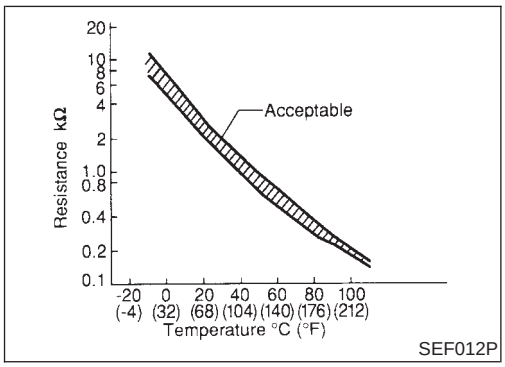
4	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-1 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between ECM and engine coolant temperature sensor	
▶	Repair open circuit or short to power in harness or connectors.

5	CHECK ENGINE COOLANT TEMPERATURE SENSOR
Refer to "Component Inspection", EC-174.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace engine coolant temperature sensor.

6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF152P



SEF012P

Component Inspection

NLEC0078

ENGINE COOLANT TEMPERATURE SENSOR

NLEC0078S01

Check resistance 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

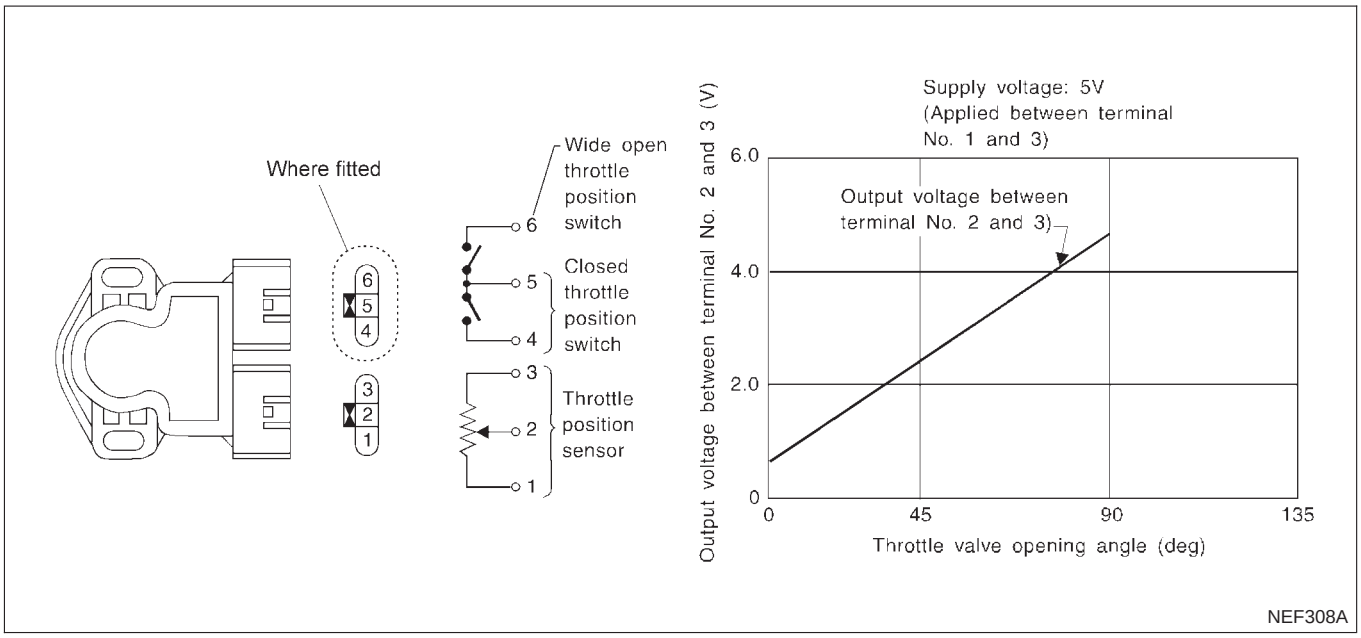
If NG, replace engine coolant temperature sensor.

Component Description

NLEC0079

NOTE:
If DTC P0120 (0120) is displayed with DTC P0510 (0510), first perform trouble diagnosis for DTC P0510, EC-352.

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

NLEC0080

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Engine: Idle	Throttle valve: fully closed	0.15 - 0.85V
	● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	3.5 - 4.7V
ABSOL TH·P/S	● Engine: Idle	Throttle valve: fully closed	0.0°
	● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	Approx. 80°

ECM Terminals and Reference Value

=NLEC0081

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)
58	B	Sensors' ground	**[Engine is running]** ● Warm up condition ● Idle speed	Approximately 0V
92	Y	Throttle position sensor	**[Engine is running]** ● Accelerator pedal fully released	0.15 - 0.85V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.5 - 4.7V
111	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V

On Board Diagnosis Logic

NLEC0082

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0120	An excessively low or high voltage from the sensor is sent to ECM* while driving.	● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor

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

Fail-safe Mode

NLEC0567

Detected items	Engine operating condition in fail-safe mode	
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

DTC Confirmation Procedure

NLEC0083

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

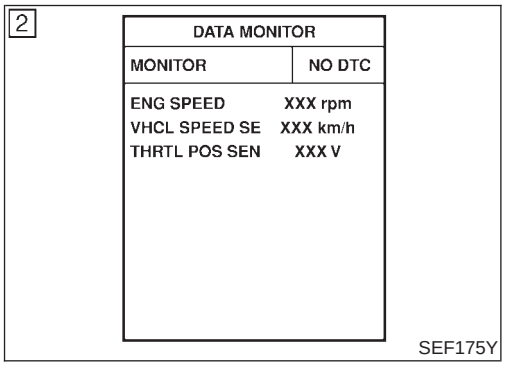
CAUTION:

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.



With CONSULT-II

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.

VHCL SPEED SE	More than 4 km/h (2 MPH)
Selector lever	Suitable position except "N" position

3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-180.

With GST

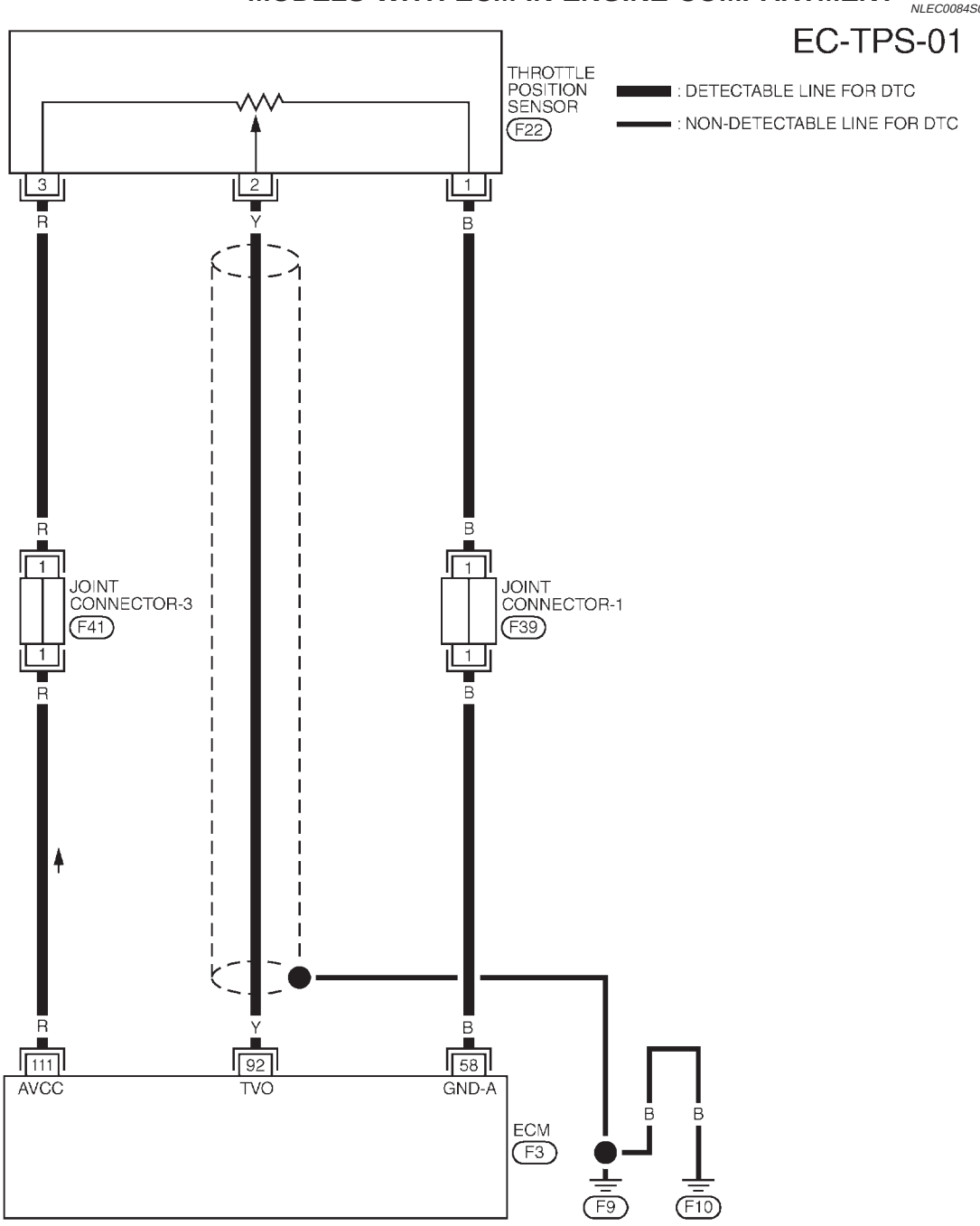
Follow the procedure "With CONSULT-II" above.

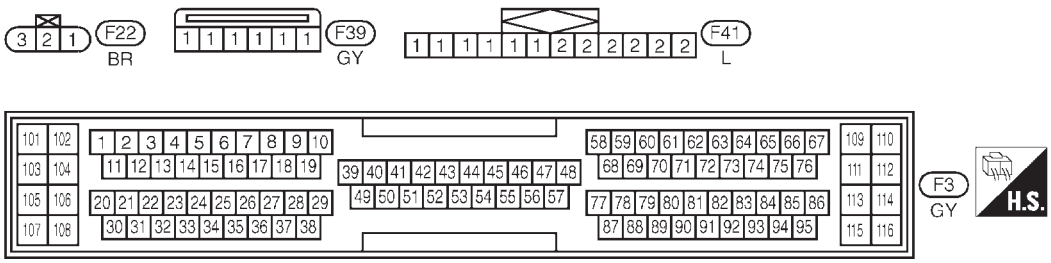
Wiring Diagram

NLEC0084

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0084S01



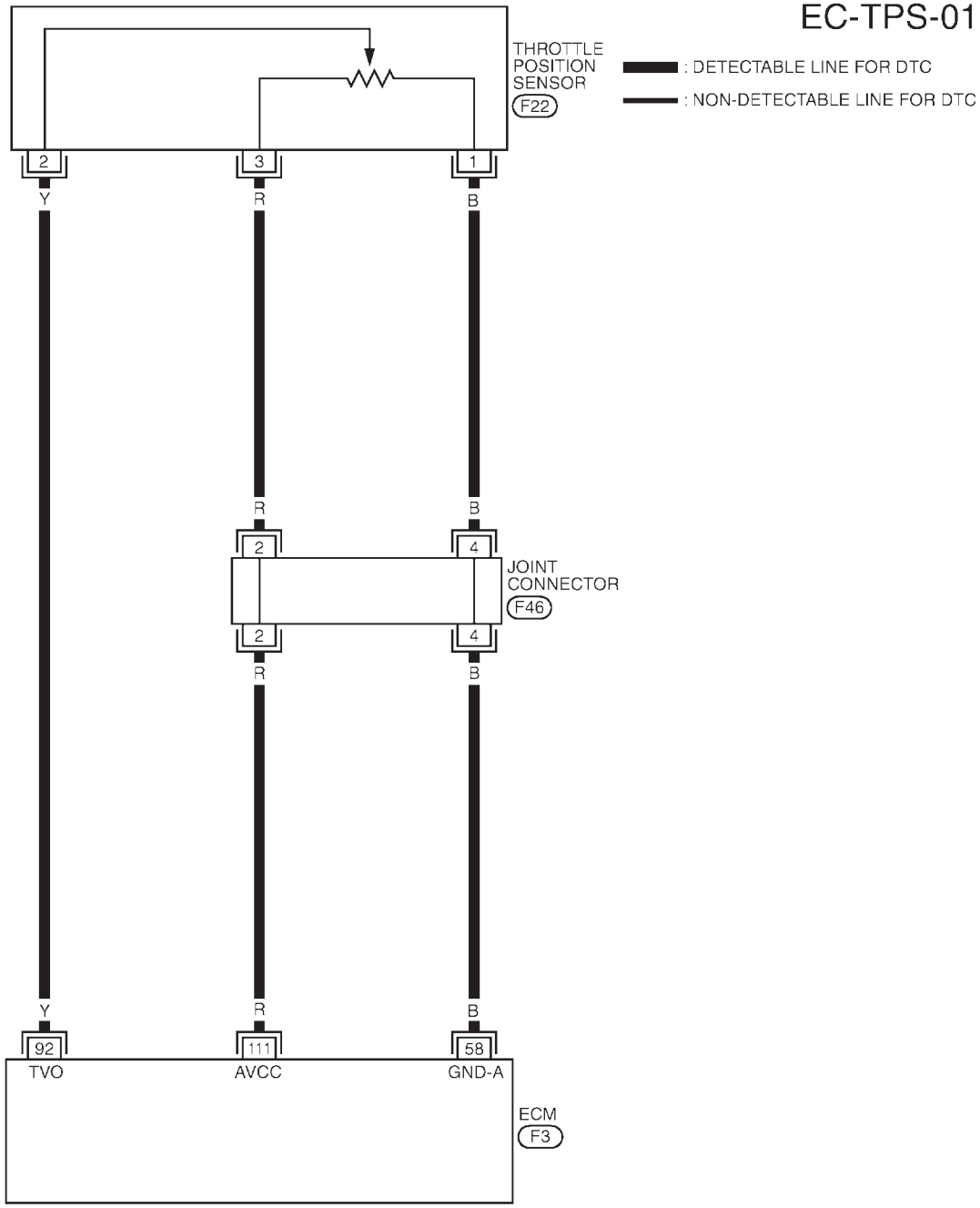


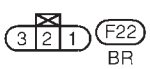
YEC654

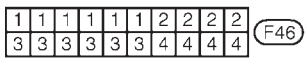
MODELS WITH ECM IN CABIN

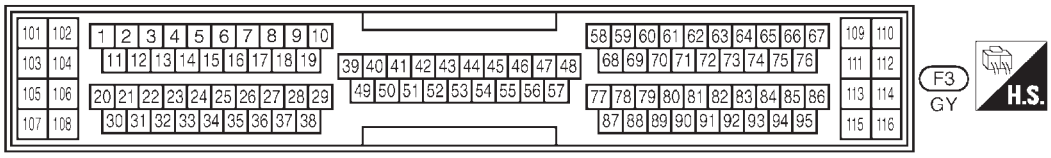
NLEC0084S02

EC-TPS-01









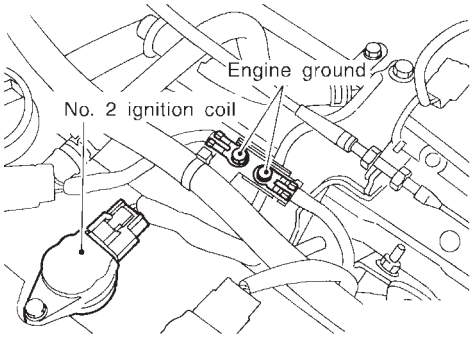
YEC876

Diagnostic Procedure

NLEC0085

1	RETIGHTEN GROUND SCREWS

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

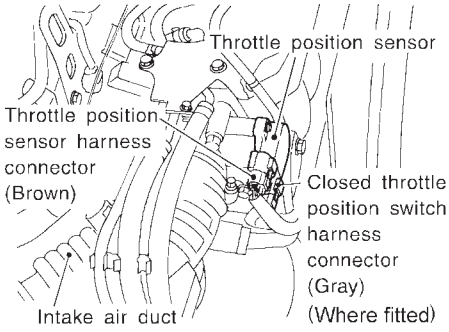


JEF104Y

▶	GO TO 2.

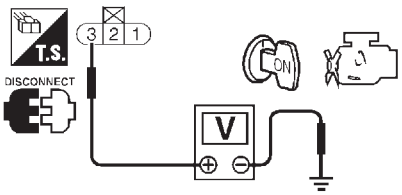
2	CHECK POWER SUPPLY

1. Disconnect throttle position sensor harness connector.



NEF309A

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



Voltage: Approximately 5V

SEF306X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3
- Harness for open or short between throttle position sensor terminal 3 and ECM terminal 111

▶	Repair harness or connectors.

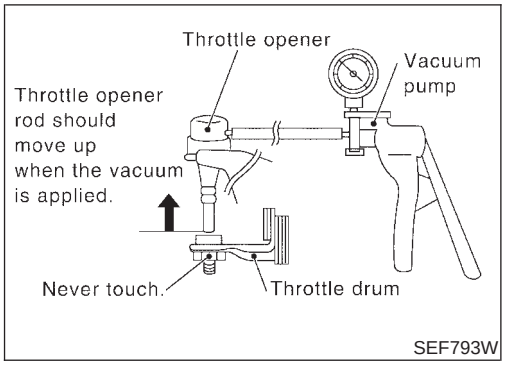
4	CHECK GROUND CIRCUIT	
1. Turn ignition switch "OFF". 2. Check harness continuity between throttle position sensor harness connector terminal 1 and engine ground. Refer to wiring diagram. **Continuity should exist.** 3. Also check harness for short to power. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART	
Check the following. ● Joint connector-1 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between ECM terminal 58 and throttle position sensor		
	▶	Repair open circuit or short to power in harness or connectors.

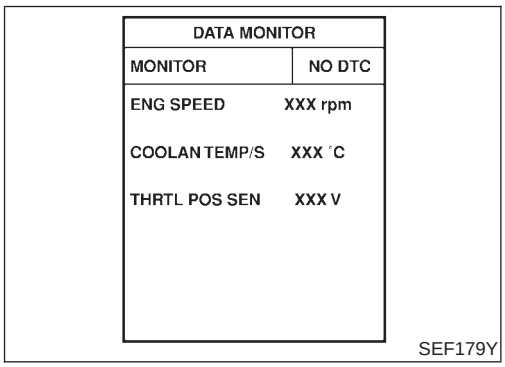
6	CHECK INPUT SIGNAL CIRCUIT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 92 and throttle position sensor harness connector terminal 2. Refer to wiring diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power. **OK or NG**		
OK	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK THROTTLE POSITION SENSOR	
Refer to "Component Inspection", EC-182. **OK or NG**		
OK	▶	GO TO 8.
NG	▶	Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-99.

8	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**



SEF793W



SEF179Y

Component Inspection

NLEC0086

THROTTLE POSITION SENSOR

NLEC0086S01

Models with throttle opener

NLEC0086S0101

With CONSULT-II

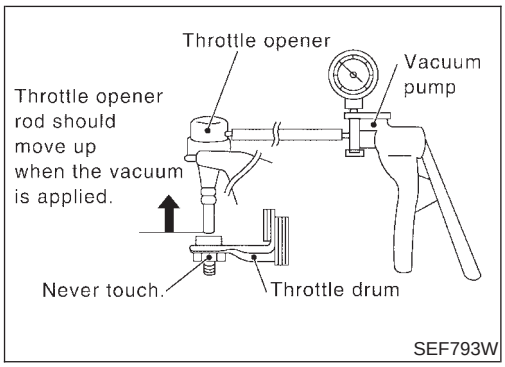
1) Start engine and warm it up to normal operating temperature.
2) Stop engine (ignition switch OFF).
3) Remove the vacuum hose connected to the throttle opener.
4) Connect suitable vacuum hose to the vacuum pump and the opener.
5) Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6) Turn ignition switch ON.
7) Select “DATA MONITOR” mode with CONSULT-II.
8) Check voltage of “THRTL POS SEN” under the following conditions.

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.

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

If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-99.

9) If it is impossible to adjust closed throttle position switch in “Basic Inspection”, replace throttle position sensor.



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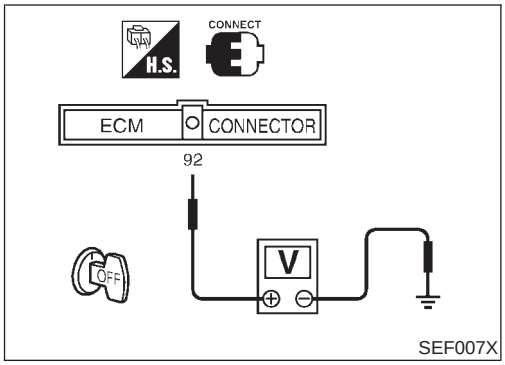


SEF007X

Without CONSULT-II

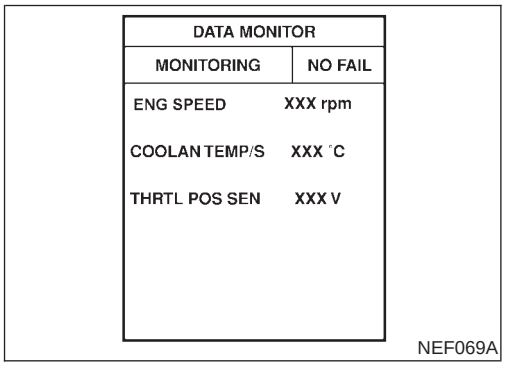
1) Start engine and warm it up to normal operating temperature.
2) Stop engine (ignition switch OFF).
3) Remove the vacuum hose connected to the throttle opener.
4) Connect suitable vacuum hose to the vacuum pump and the opener.
5) Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6) Turn ignition switch ON.
7) Check voltage between ECM terminal 92 (Throttle position sensor signal) and ground under the following conditions.

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.

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

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-99.

8) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace throttle position sensor.



NEF069A

Models without throttle opener

NLEC0086S0102

With CONSULT-II

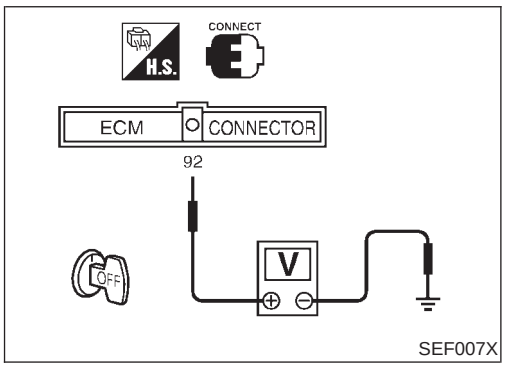
1) Stop engine (ignition switch OFF).
2) Turn ignition switch ON.
3) Select "DATA MONITOR" mode with CONSULT-II.
4) Check voltage of "THRTL POS SEN" under the following conditions.

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.

Throttle valve conditions	Voltage (V)
Completely closed	0.35 - 0.65 (a)
Partially open	Between (a) and (b)
Completely open	3.7 - 4.5 (b)

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-99.

5) If it is impossible to adjust closed throttle position sensor idle position in "Basic Inspection", replace throttle position sensor.



SEF007X

Without CONSULT-II

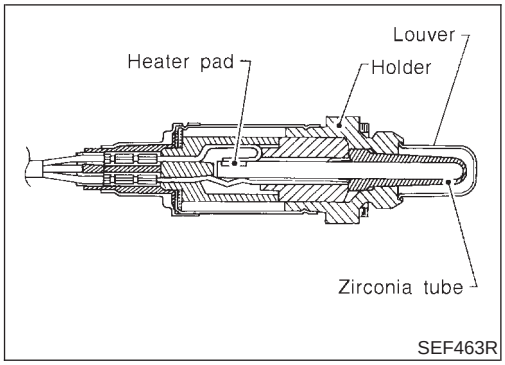
1) Stop engine (ignition switch OFF).
2) Turn ignition switch ON.
3) Check voltage between ECM terminal 92 (Throttle position sensor signal) and ground under the following conditions.

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.

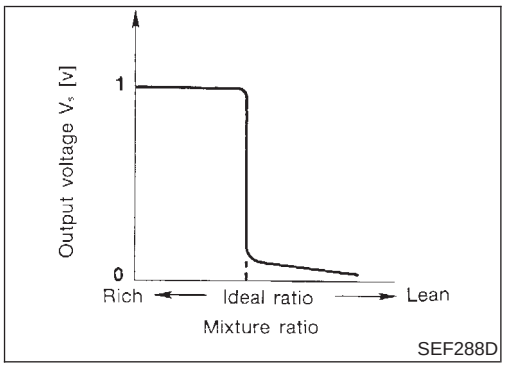
Throttle valve conditions	Voltage (V)
Completely closed	0.35 - 0.65 (a)
Partially open	Between (a) and (b)
Completely open	3.7 - 4.5 (b)

If NG, adjust throttle position sensor idle position. Refer to "Basic Inspection", EC-114.

4) If it is impossible to adjust throttle position sensor idle position in "Basic Inspection", replace throttle position sensor.



SEF463R



SEF288D

Component Description

NLEC0094

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

NLEC0095

Specification data are reference values.

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

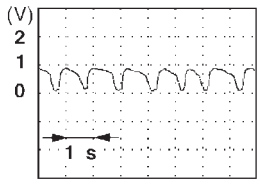
ECM Terminals and Reference Value

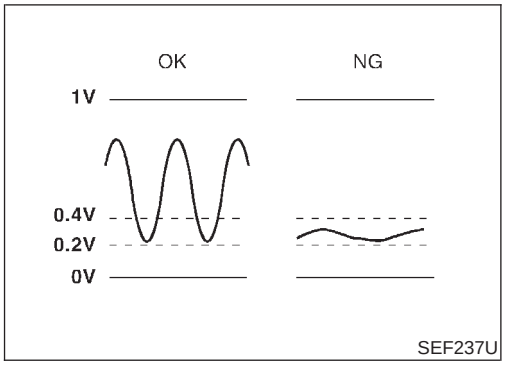
NLEC0096

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W



SEF237U

On Board Diagnosis Logic

NLEC0097

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.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0130	● The voltage from the sensor is constantly approx. 0.3V.	● 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

NLEC0098

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 9 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Select “HO2S1 (B1) P0130” of “HO2S1 (B1)” 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 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 4.

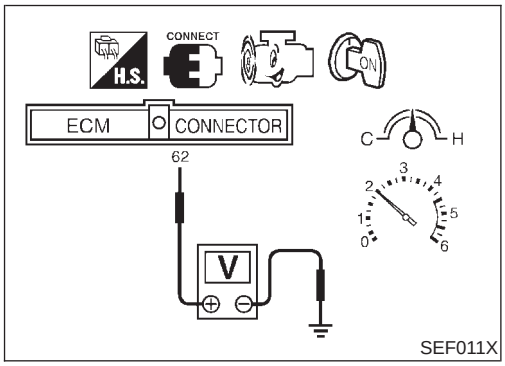
5) When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,700 - 2,600 rpm
Vehicle speed	64 - 100 km/h (40 - 62 MPH)
B/FUEL SCHDL	3.0 - 5.2 msec
Selector lever	Suitable position

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

6) Make sure that “OK” is displayed after touching “SELF-DIAG

RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-189.



Overall Function Check

NLEC0099

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

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

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

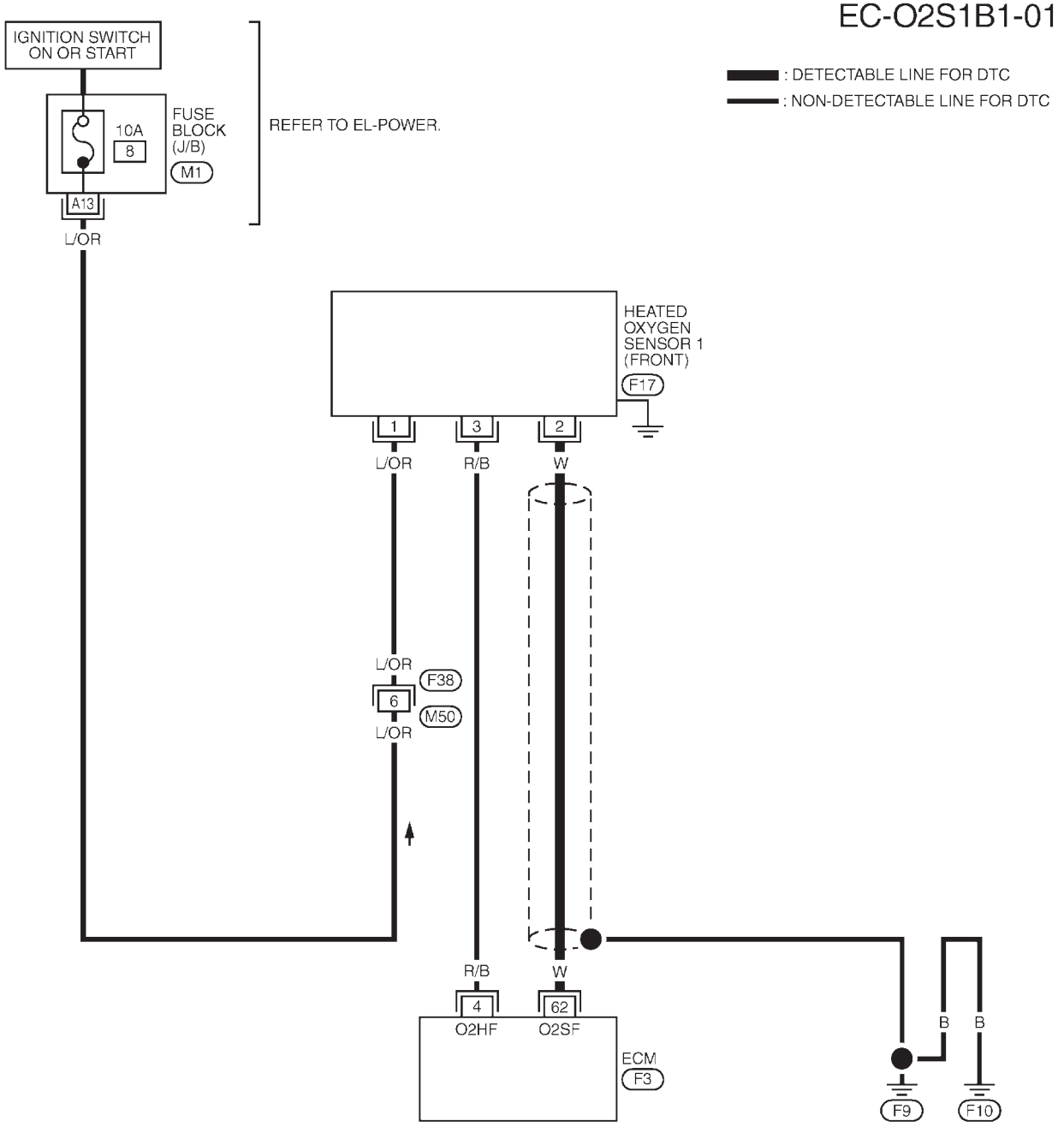
Wiring Diagram

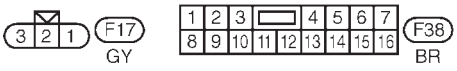
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0100

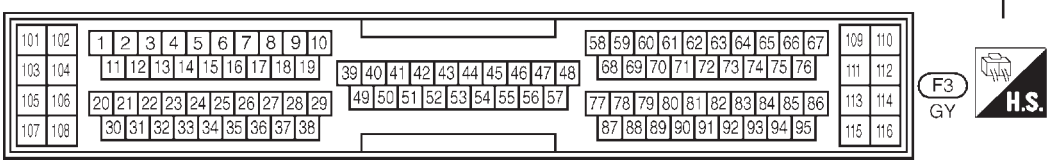
NLEC0100S03

EC-O2S1B1-01





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

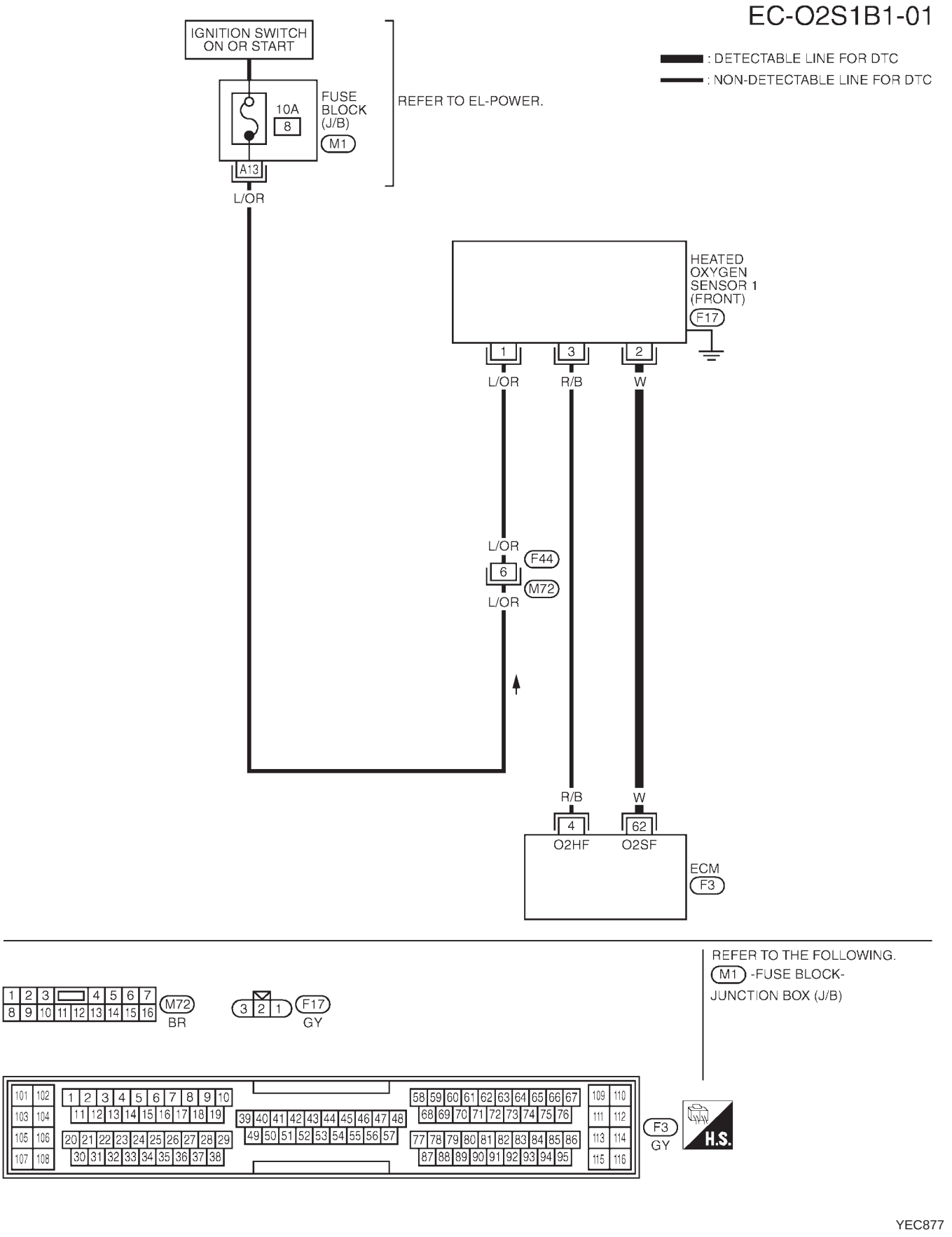


YEC655

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0100S04



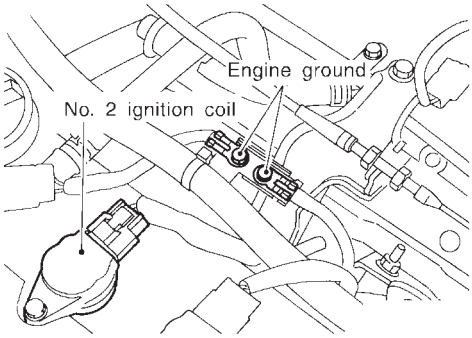
YEC877

Diagnostic Procedure

NLEC0101

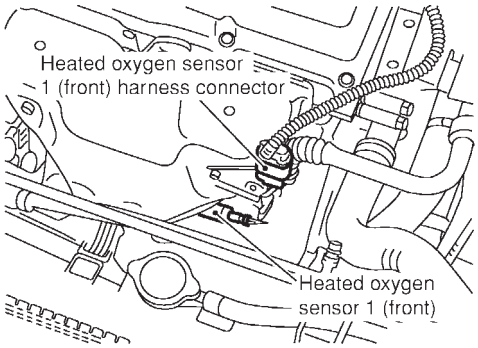
1	INSPECTION START

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



JEF104Y

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



SEF012XA

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 62 and heated oxygen sensor 1 (front) harness connector terminal 2. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 62 (or terminal 2) and ground.
   Continuity should not exist.
4. 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 1 (FRONT)

Refer to “Component Inspection”, EC-190.

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace heated oxygen sensor 1 (front).

4	CHECK INTERMITTENT INCIDENT

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-145.

	▶	**INSPECTION END**

4

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 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

SEF647Y

Component Inspection

NLEC0102

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC0102S01

With CONSULT-II

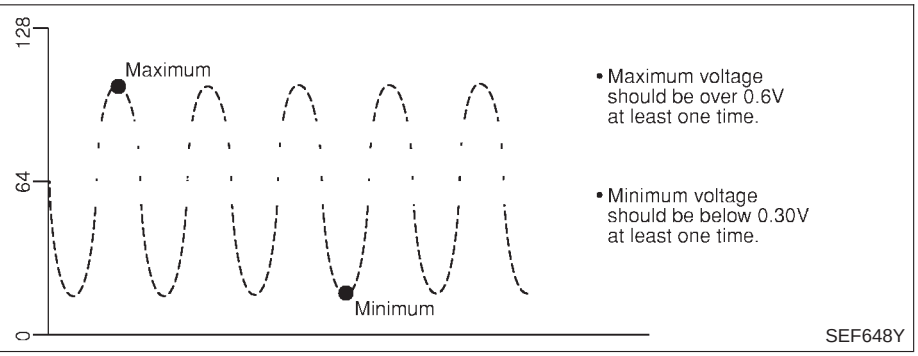
1) Start engine and warm it up to normal operating temperature.
2) Select “MANU TRIG” in “DATA MONITOR” mode, and select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch “RECORD” on CONSULT-II screen.
5) Check the following.

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

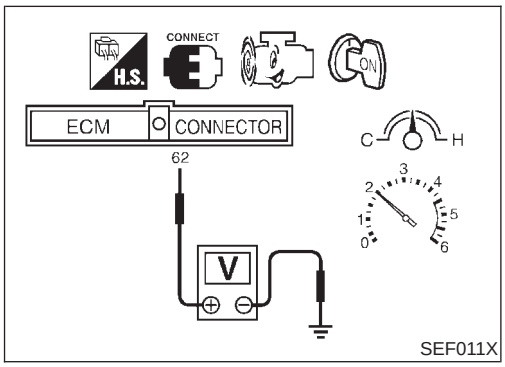
CAUTION:

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

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



SEF011X

Without CONSULT-II

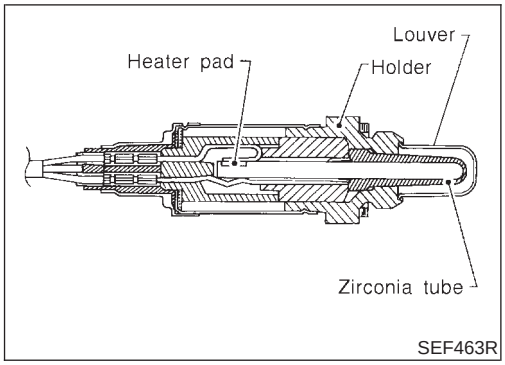
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.

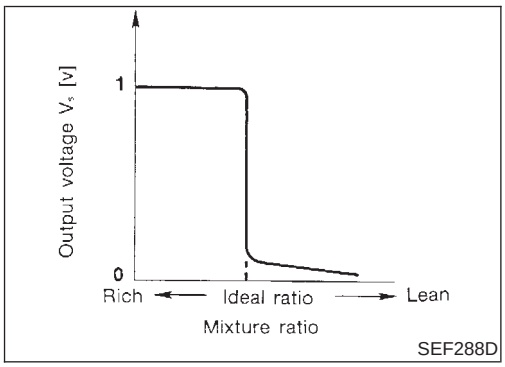
- The voltage never exceeds 1.0V.

CAUTION:

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



SEF463R



SEF288D

Component Description

NLEC0103

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

NLEC0104

Specification data are reference values.

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

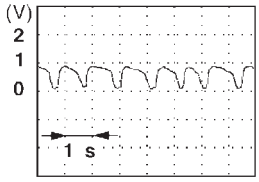
ECM Terminals and Reference Value

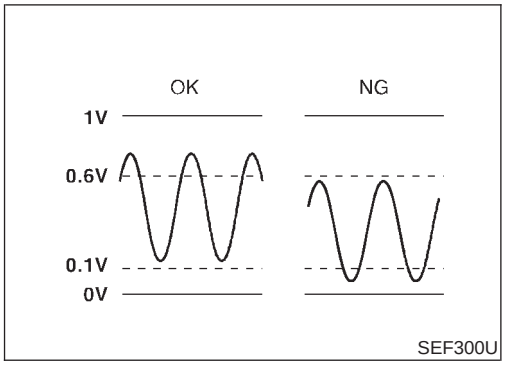
NLEC0105

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W



SEF300U

On Board Diagnosis Logic

NLEC0106

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.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0131 0131	● The maximum and minimum voltages from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 (front) ● Heated oxygen sensor 1 heater (front) ● Fuel pressure ● Injectors ● Intake air leaks

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

DTC Confirmation Procedure

NLEC0107

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 9 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 9 seconds.
3) Turn ignition switch “ON” and select “HO2S1 (B1) P0131” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3 minutes.

NOTE:

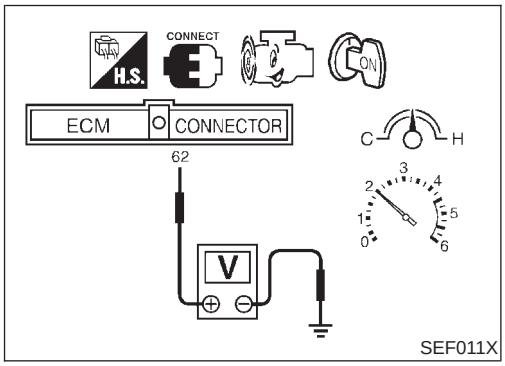
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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	1,700 - 2,600 rpm
Vehicle speed	64 - 100 km/h (40 - 62 MPH)
B/FUEL SCHDL	3.0 - 5.2 msec
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-194.



Overall Function Check

NLEC0108

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check 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-194.

Diagnostic Procedure

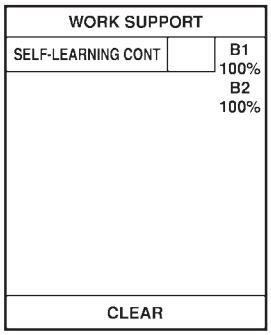
NLEC0109

1	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
1. Turn ignition switch "OFF". 2. Loosen and retighten heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**	
▶	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-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "START".



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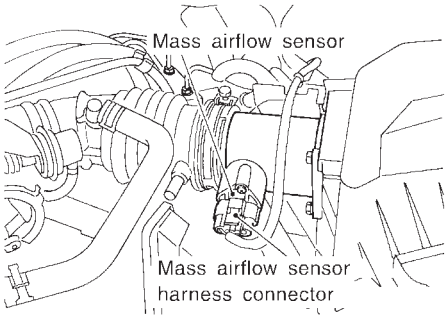
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



JEF105Y

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to "How to Erase Emission-related Diagnostic InformatioN", EC-69.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0171 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171. Refer to EC-269.
No	▶	GO TO 3.

3	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Refer to "Component Inspection", EC-226.

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace heated oxygen sensor 1 (front).

Diagnostic Procedure (Cont'd)

4	CHECK HEATED OXYGEN SENSOR 1 (FRONT)	
Refer to "Component Inspection", EC-196.		
	OK or NG	
OK	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1 (front).

5	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145. Refer to "Wiring Diagram", EC-187, for circuit.	
▶	**INSPECTION END**

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

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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

SEF647Y

Component Inspection

NLEC0110

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC0110S02

With CONSULT-II

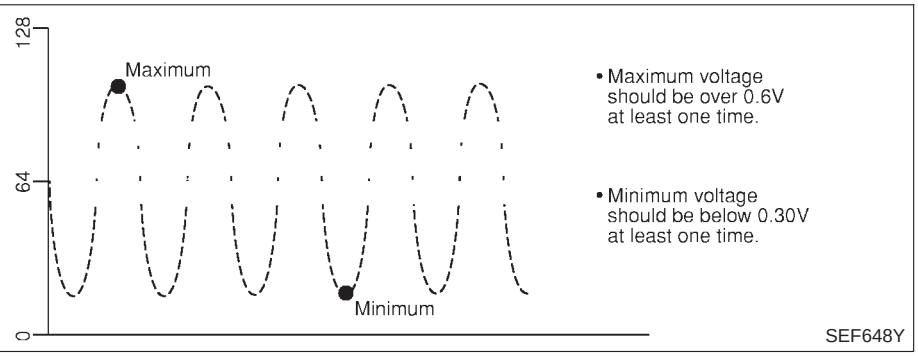
1) Start engine and warm it up to normal operating temperature.
2) Select "MANU TRIG" in "DATA MONITOR" mode, and select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT-II screen.
5) Check the following.

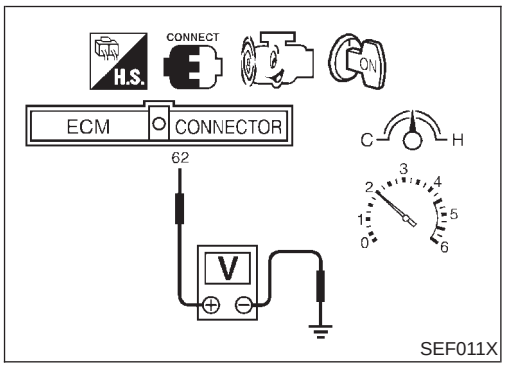
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "HO2S1 MNTR (B1)", "RICH"
  L = "HO2S1 MNTR (B1)", "LEAN"
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

CAUTION:

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

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





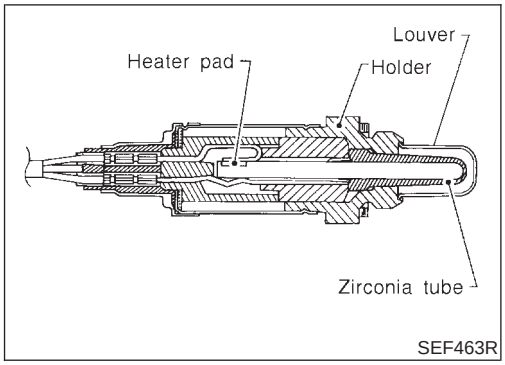
Without CONSULT-II

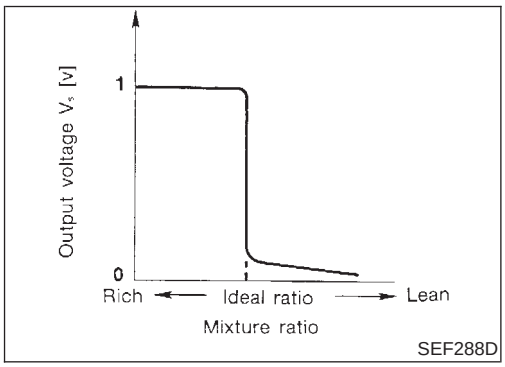
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator lamp goes on more than five times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]
- 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.

CAUTION:

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





Component Description

NLEC0111

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

NLEC0112

Specification data are reference values.

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

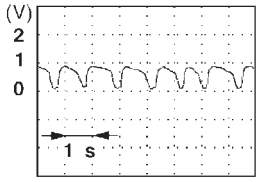
ECM Terminals and Reference Value

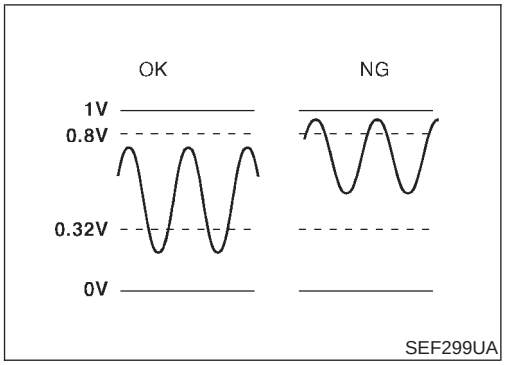
NLEC0113

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

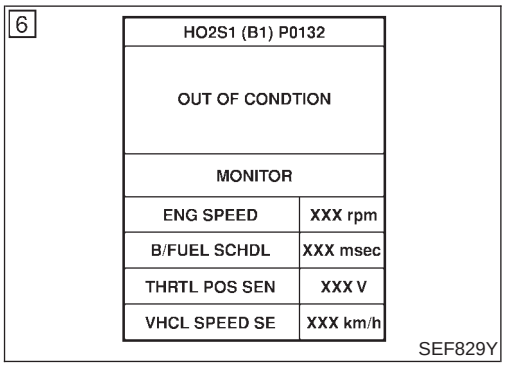


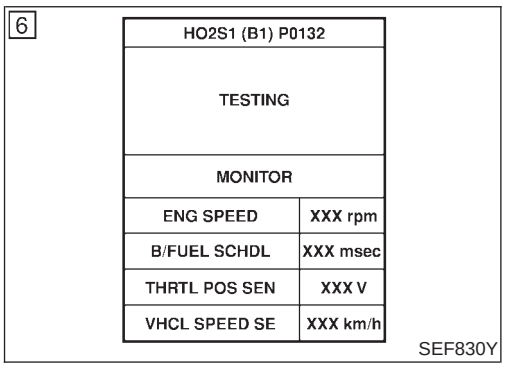
On Board Diagnosis Logic

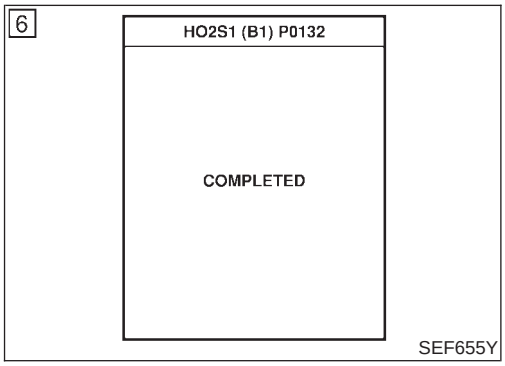
NLEC0114

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.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0132 0132	● The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 (front) ● Heated oxygen sensor 1 heater (front) ● Fuel pressure ● Injectors







DTC Confirmation Procedure

NLEC0115

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 9 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 9 seconds.
3) Turn ignition switch “ON” and select “HO2S1 (B1) P0132” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3 minutes.

NOTE:

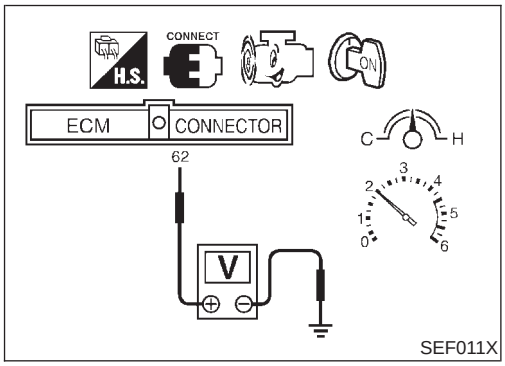
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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	1,700 - 2,600 rpm
Vehicle speed	64 - 100 km/h (40 - 62 MPH)
B/FUEL SCHDL	3.0 - 5.2 msec
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-200.



Overall Function Check

NLEC0116

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check 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 0.3V at least one time.

4) If NG, go to "Diagnostic Procedure", EC-200.

Diagnostic Procedure

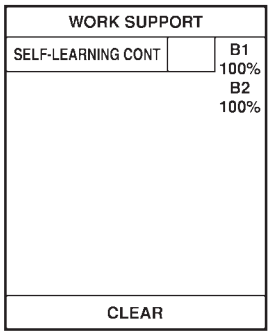
NLEC0117

1	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
1. Turn ignition switch "OFF". 2. Loosen and retighten heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**	
▶	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-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "START".



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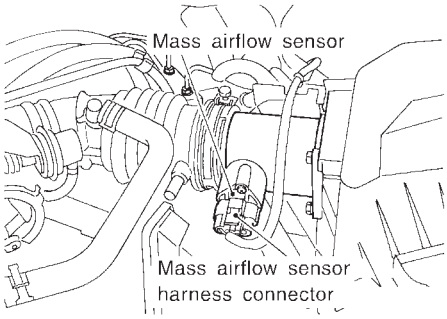
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected? Is it difficult to start engine?

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



JEF105Y

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-69.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-277.
No	▶	GO TO 3.

3	CHECK HARNESS CONNECTOR

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 1 (front) harness connector.
3. Check harness connector for water.
   Water should not exit.

OK or NG

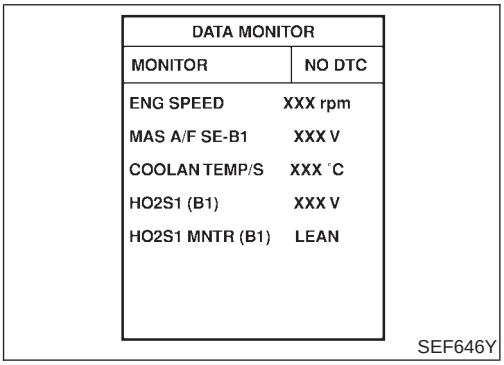
OK	▶	GO TO 4.
NG	▶	Repair or replace harness connector.

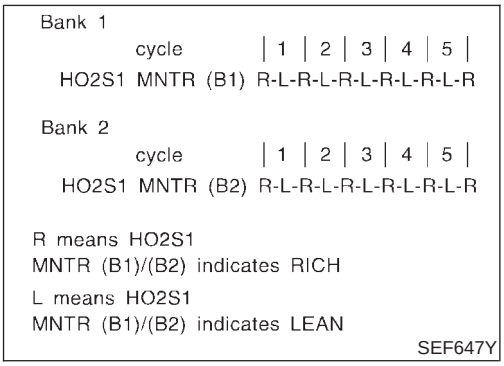
Diagnostic Procedure (Cont'd)

4	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)	
Refer to "Component Inspection", EC-226.		
	OK or NG	
OK	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1 (front).

5	CHECK HEATED OXYGEN SENSOR 1 (FRONT)	
Refer to "Component Inspection", EC-202.		
	OK or NG	
OK	▶	GO TO 6.
NG	▶	Replace heated oxygen sensor 1 (front).

6	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145. Refer to "Wiring Diagram", EC-187, for circuit.		
	▶	**INSPECTION END**





Component Inspection

NLEC0118

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC0118S02

With CONSULT-II

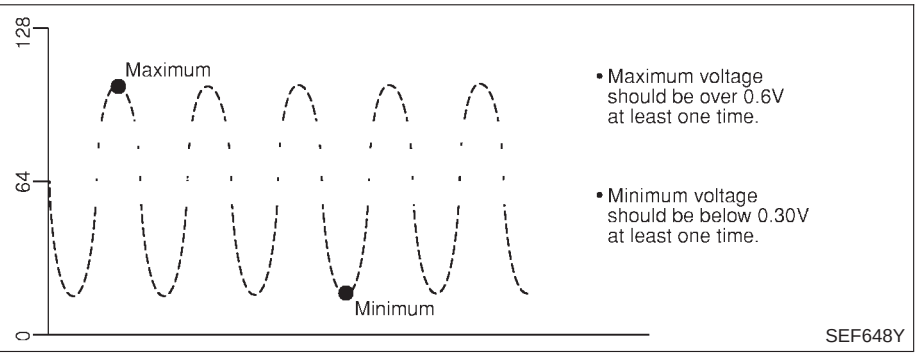
1) Start engine and warm it up to normal operating temperature.
2) Select "MANU TRIG" in "DATA MONITOR" mode, and select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT-II screen.
5) Check the following.

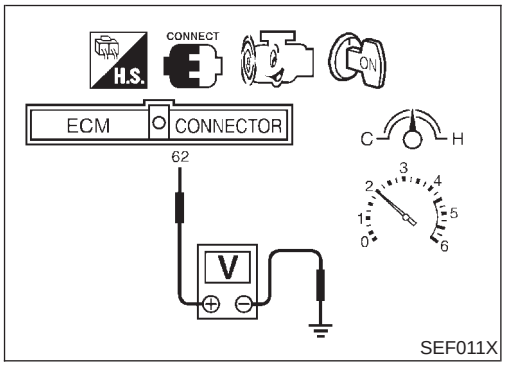
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "HO2S1 MNTR (B1)", "RICH"
  L = "HO2S1 MNTR (B1)", "LEAN"
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

CAUTION:

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

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





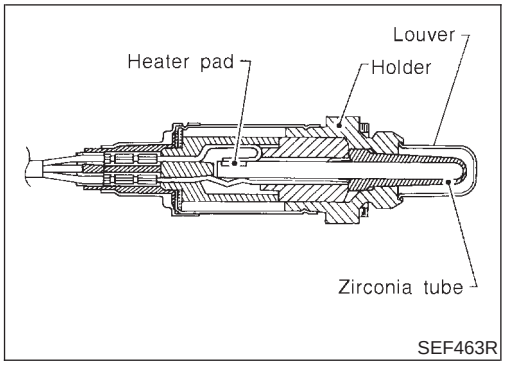
Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]
- 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.

CAUTION:

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



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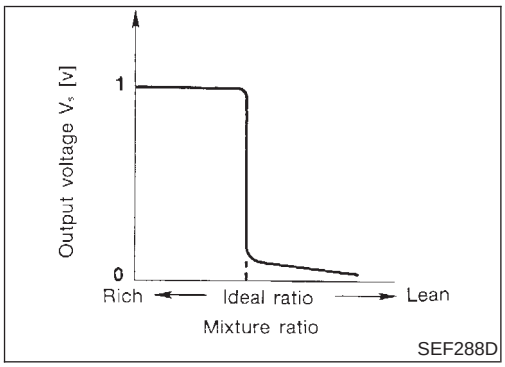


SEF288D

Component Description

NLEC0119

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

NLEC0120

Specification data are reference values.

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

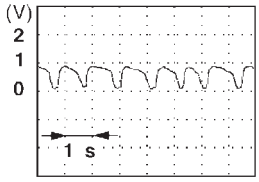
ECM Terminals and Reference Value

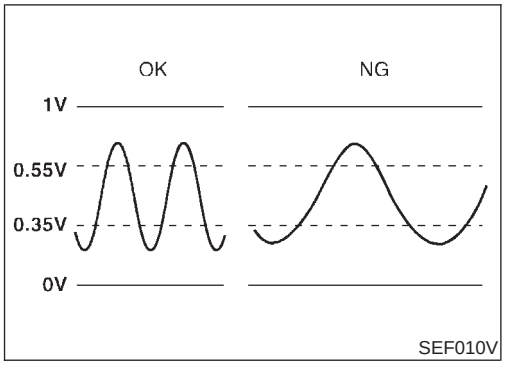
NLEC0121

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

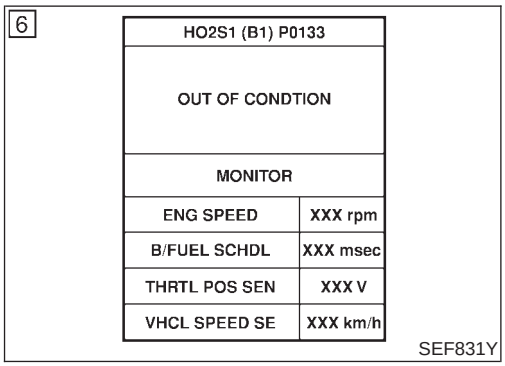


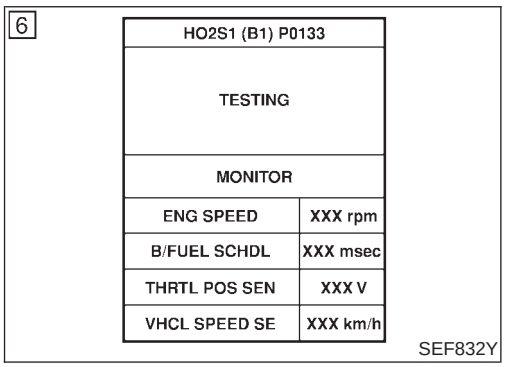
On Board Diagnosis Logic

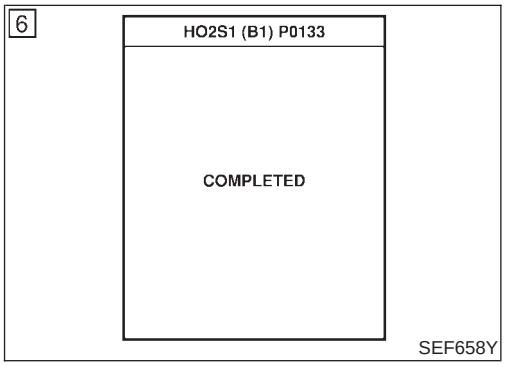
NLEC0122

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.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0133 0133	● The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1 (front) ● Heated oxygen sensor 1 heater (front) ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV ● Mass air flow sensor







DTC Confirmation Procedure

NLEC0123

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 9 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 9 seconds.
3) Turn ignition switch “ON” and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3 minutes.

NOTE:

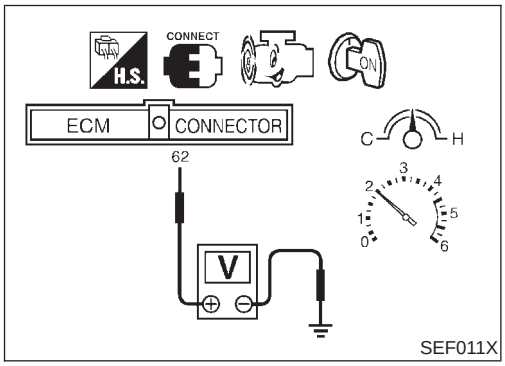
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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.)

ENG SPEED	2,100 - 3,100 rpm
Vehicle speed	80 - 120 km/h (50 - 75 MPH)
B/FUEL SCHDL	3.8 - 7.6 msec
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-209.



Overall Function Check

NLEC0124

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]

4) If NG, go to "Diagnostic Procedure", EC-209.

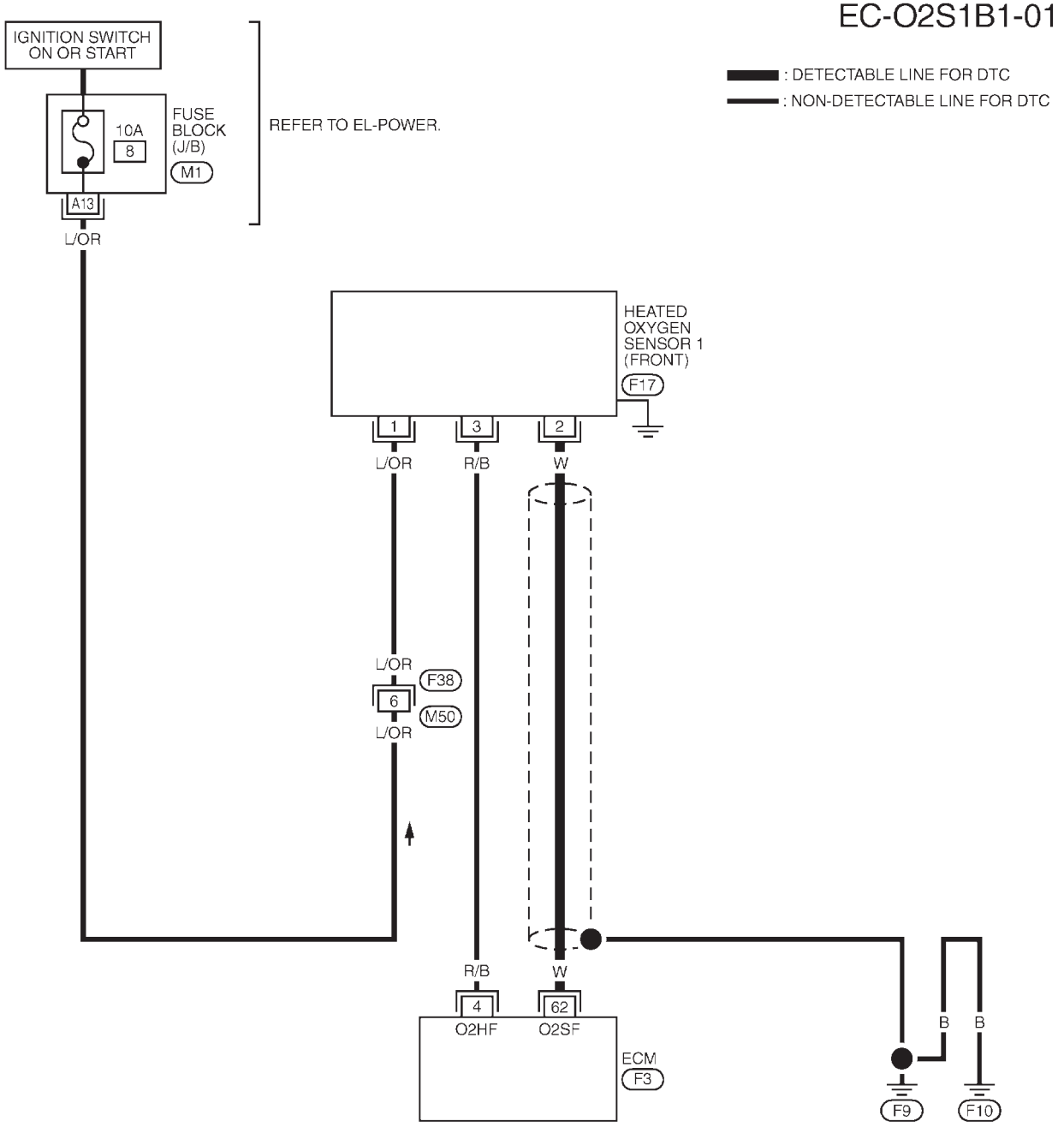
Wiring Diagram

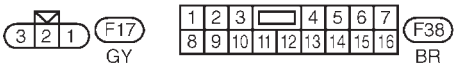
NLEC0125

MODELS WITH ECM IN ENGINE COMPARTMENT

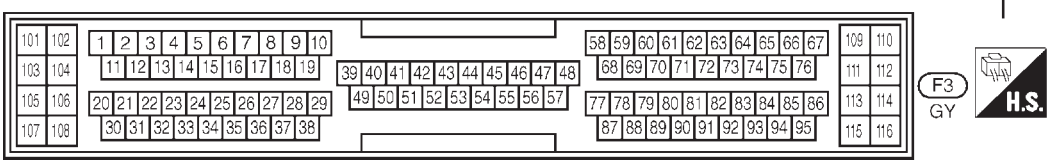
NLEC0125S03

EC-O2S1B1-01





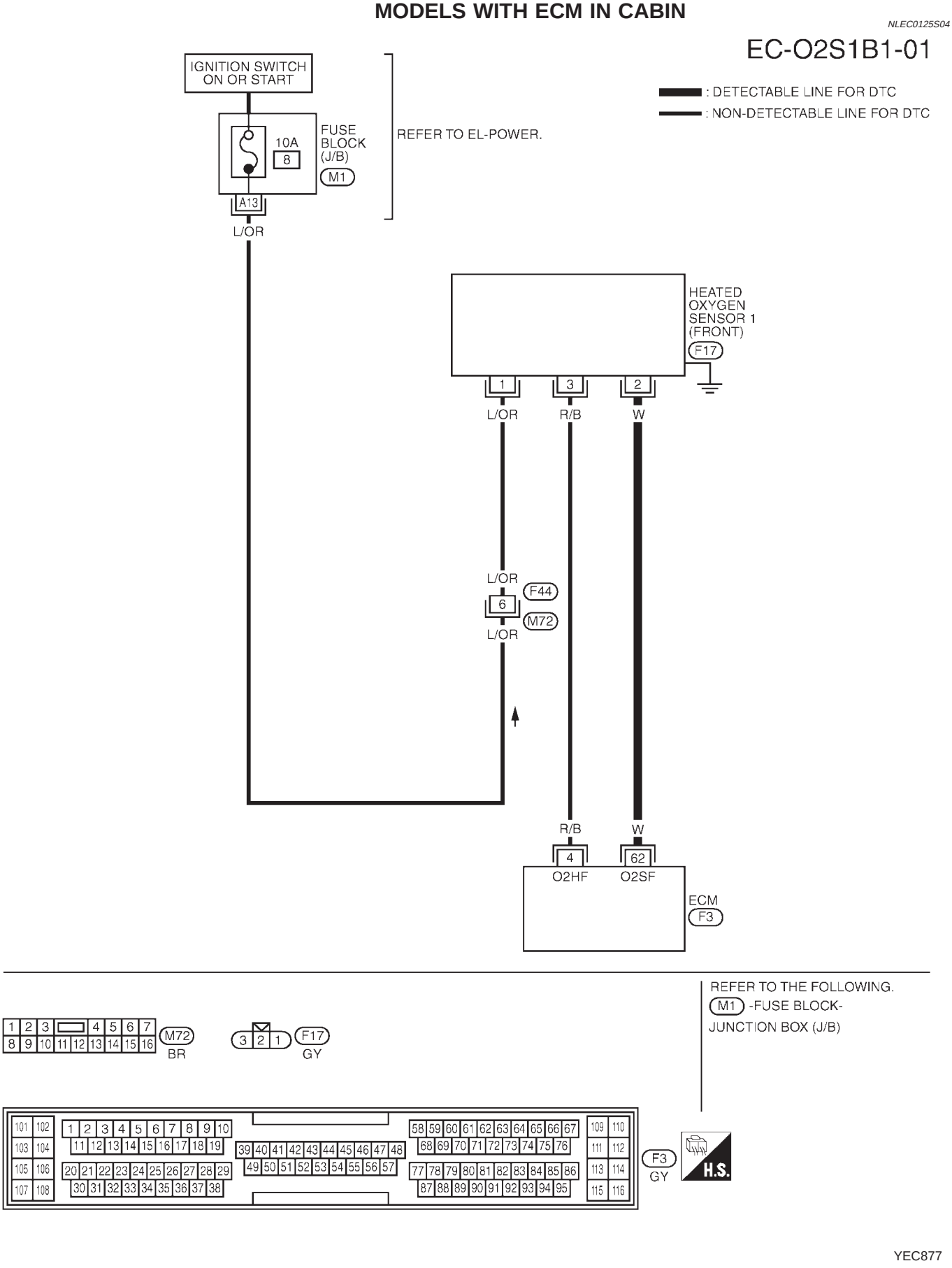
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)



YEC655

MODELS WITH ECM IN CABIN

NLEC0125S04



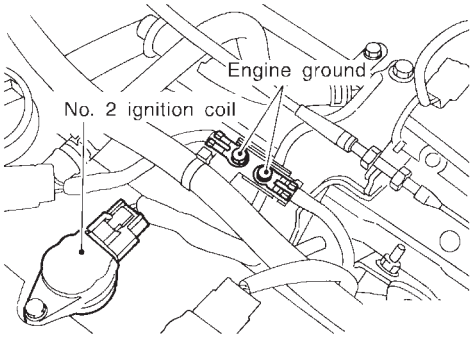
YEC877

Diagnostic Procedure

NLEC0126

1	RETIGHTEN GROUND SCREWS

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



JEF104Y

▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)

Loosen and retighten heated oxygen sensor 1 (front).

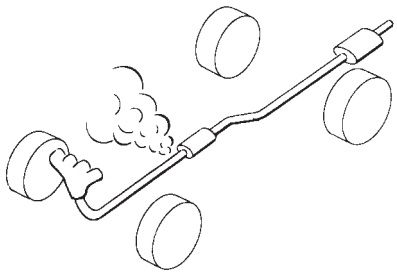
Tightening torque:

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

▶	GO TO 3.

3	CHECK EXHAUST AIR LEAK

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



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.

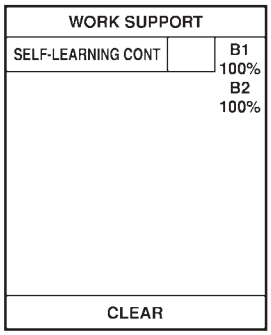
OK or NG

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-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "START".

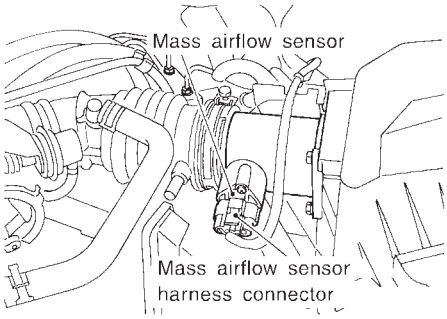


SEF652Y

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



JEF105Y

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-69.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0171 or 0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171, P0172. Refer to EC-269, 277.
No	▶	GO TO 6.

6	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 1 (front) harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal 62 and heated oxygen sensor 1 (front) harness connector terminal 2. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 62 (or terminal 2) and ground.
   Continuity should not exist.
4. Also check harness for 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 HEATED OXYGEN SENSOR 1 HEATER (FRONT)	
Refer to "Component Inspection", EC-226.		
	OK or NG	
OK	▶	GO TO 8.
NG	▶	Replace heated oxygen sensor 1 (front).

8	CHECK HEATED OXYGEN SENSOR 1 (FRONT)	
Refer to "Component Inspection", EC-212.		
	OK or NG	
OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 1 (front).

9	CHECK MASS AIR FLOW SENSOR	
Refer to "Component Inspection", EC-160.		
	OK or NG	
OK	▶	GO TO 10.
NG	▶	Replace mass air flow sensor.

10	CHECK PCV VALVE	
Refer to "Positive Crankcase Ventilation", EC-42.		
	OK or NG	
OK	▶	GO TO 11.
NG	▶	Repair or replace PCV valve.

11	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**

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

Bank 1

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

Bank 2

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

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

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

SEF647Y

Component Inspection

NLEC0127

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC0127S02

With CONSULT-II

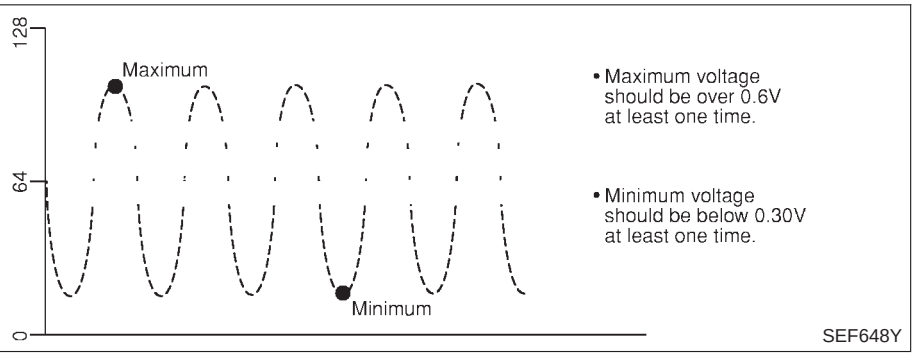
1) Start engine and warm it up to normal operating temperature.
2) Select “MANU TRIG” in “DATA MONITOR” mode, and select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch “RECORD” on CONSULT-II screen.
5) Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” five times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = “HO2S1 MNTR (B1)”, “RICH”
  L = “HO2S1 MNTR (B1)”, “LEAN”
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

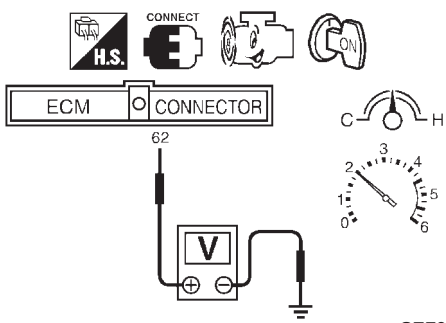
CAUTION:

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

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



SEF011X

Without CONSULT-II

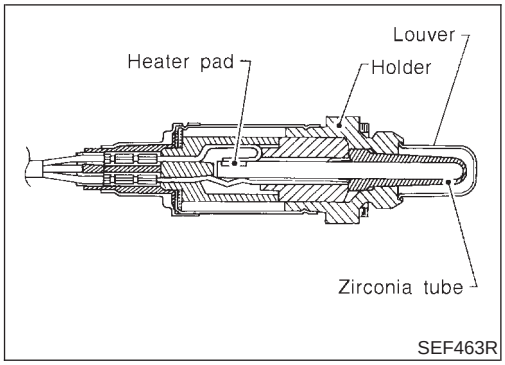
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator lamp goes on more than five times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.

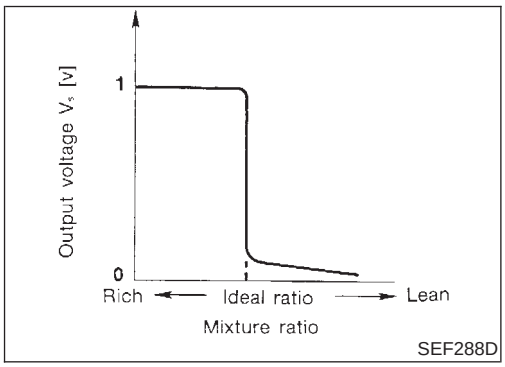
- The voltage never exceeds 1.0V.

CAUTION:

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



SEF463R



SEF288D

Component Description

NLEC0128

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

NLEC0129

Specification data are reference values.

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

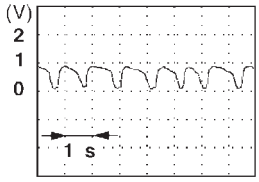
ECM Terminals and Reference Value

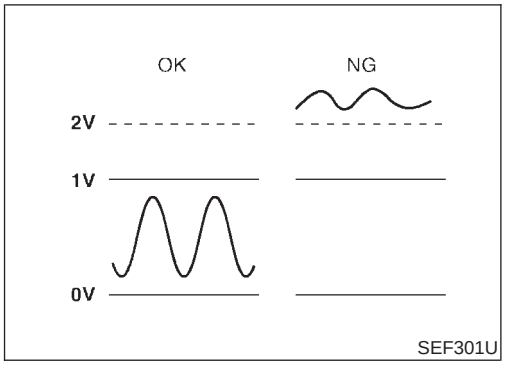
NLEC0130

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W



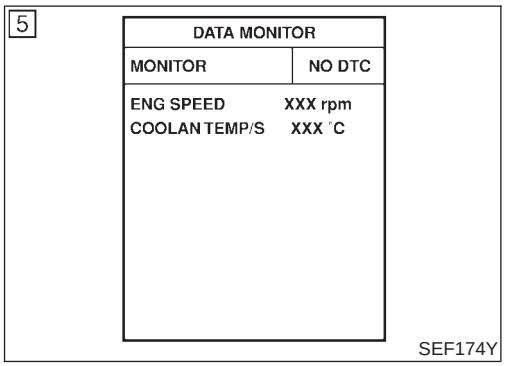
SEF301U

On Board Diagnosis Logic

NLEC0131

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

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0134 0134	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1 (front)



SEF174Y

DTC Confirmation Procedure

NLEC0132

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 9 seconds.
3) Turn ignition switch “ON”.
4) Select “DATA MONITOR” mode with CONSULT-II.
5) Restart engine and let it idle for 2 minutes.
6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-218.

With GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 9 seconds.
3) Restart engine and let it idle for 2 minutes.
4) Turn ignition switch “OFF” and wait at least 9 seconds.
5) Restart engine and let it idle for 2 minutes.
6) Select “MODE 3” with GST.
7) If DTC is detected, go to “Diagnostic Procedure”, EC-218.

- **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.**

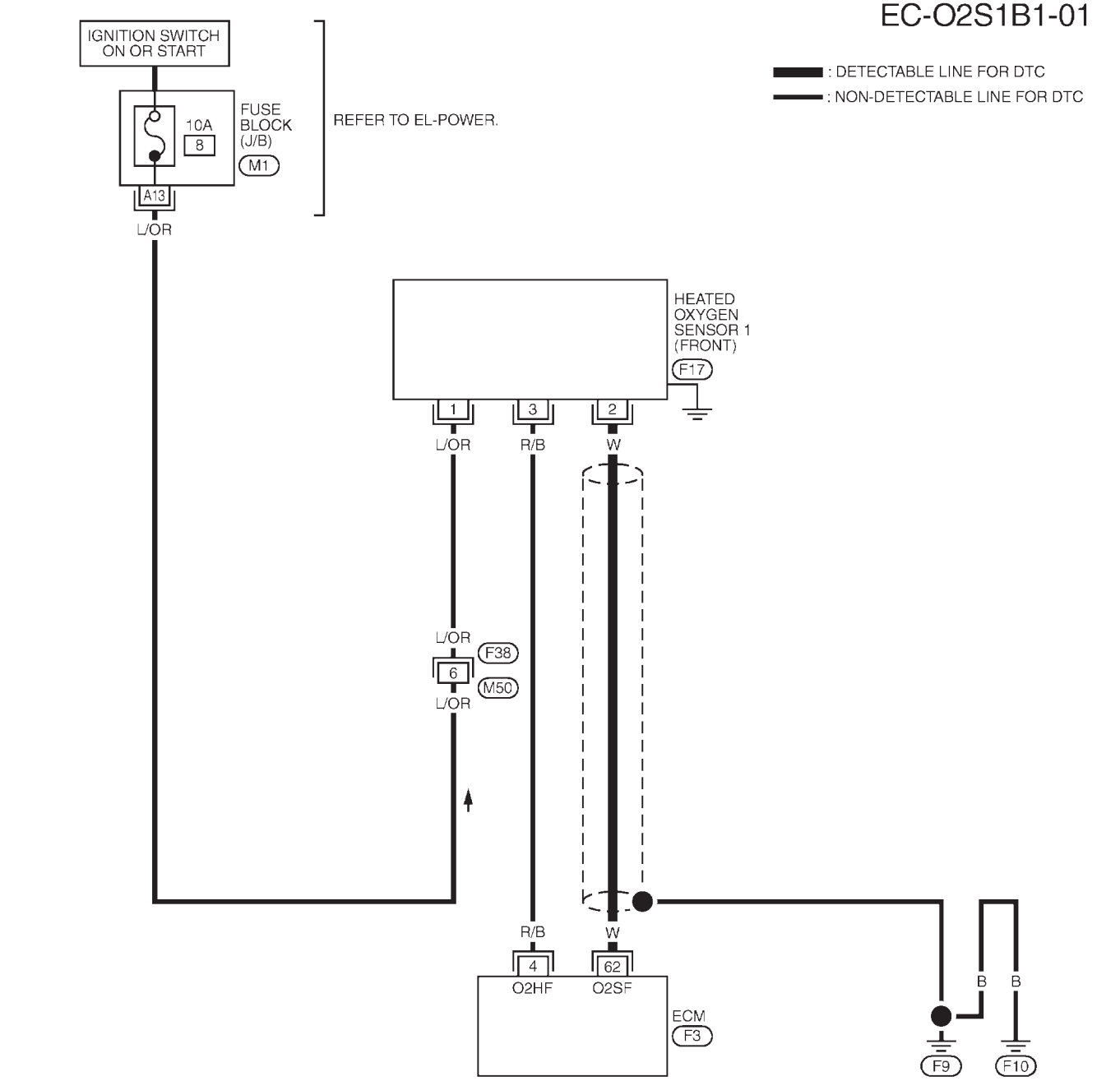
Wiring Diagram

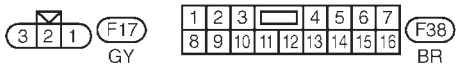
NLEC0133

MODELS WITH ECM IN ENGINE COMPARTMENT

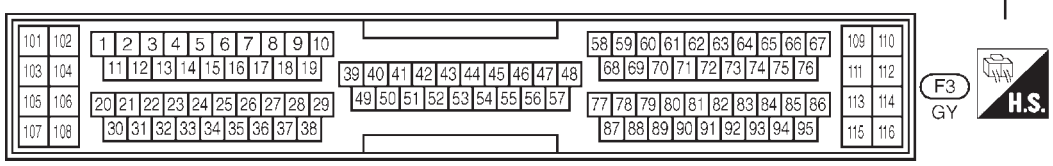
NLEC0133S03

EC-O2S1B1-01





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

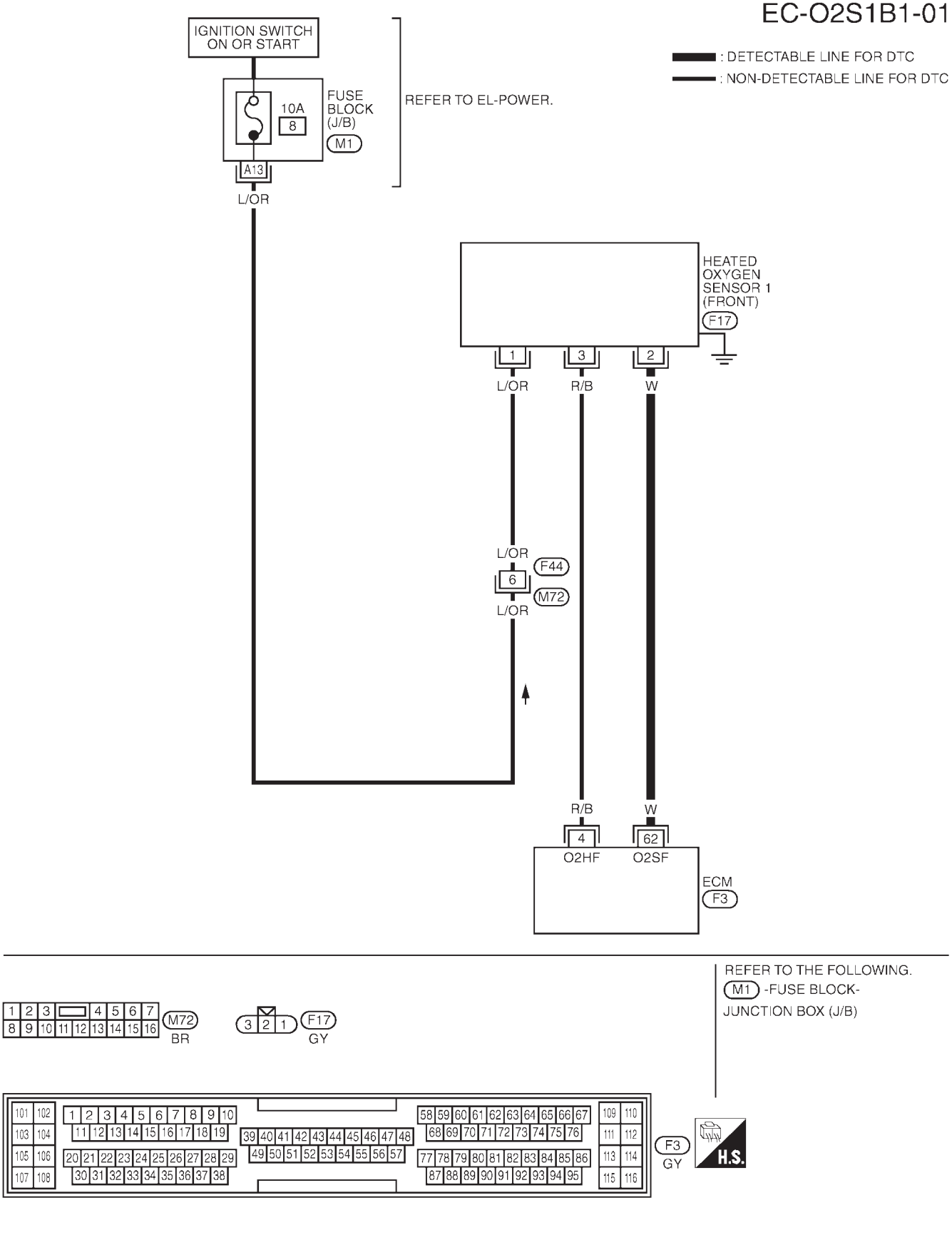


YEC655

MODELS WITH ECM IN CABIN

NLEC0133S04

EC-O2S1B1-01



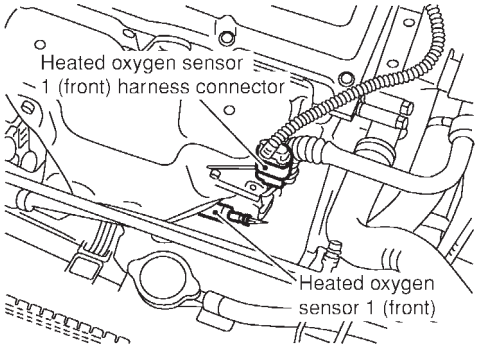
YEC877

Diagnostic Procedure

NLEC0134

1	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
Loosen and retighten heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**	
▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT
1. Disconnect heated oxygen sensor 1 (front) harness connector and ECM harness connector.	



SEF012XA

2. Check harness continuity between ECM terminal 62 and heated oxygen sensor 1 (front) harness connector terminal 2. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 62 (or terminal 2) and ground.
   Continuity should not exist.
4. 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 HARNESS CONNECTOR
Check heated oxygen sensor 1 (front) harness connector for water. **Water should not exist.**	

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair or replace harness connector.

4	CHECK HEATED OXYGEN SENSOR 1 (FRONT)
Refer to “Component Inspection”, EC-219.	

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1 (front).

5	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-145.	
▶	**INSPECTION END**

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

Bank 1

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

Bank 2

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

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

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

SEF647Y

Component Inspection

NLEC0135

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC0135S01

With CONSULT-II

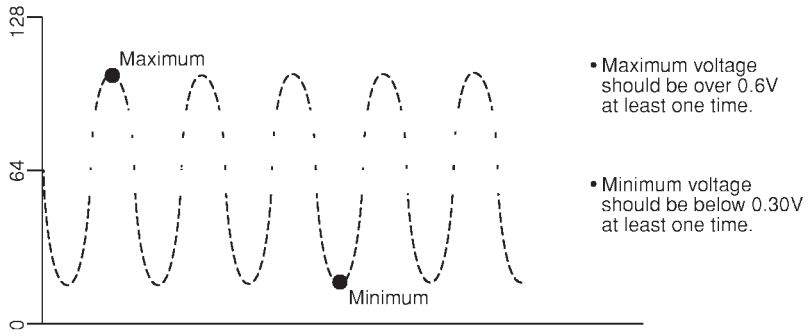
1) Start engine and warm it up to normal operating temperature.
2) Select “MANU TRIG” in “DATA MONITOR” mode, and select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch “RECORD” on CONSULT-II screen.
5) Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” five times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = “HO2S1 MNTR (B1)”, “RICH”
  L = “HO2S1 MNTR (B1)”, “LEAN”
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

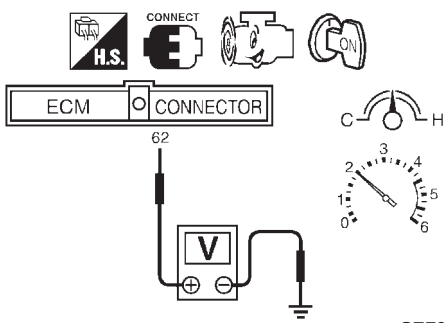
CAUTION:

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

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



SEF011X

Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator lamp goes on more than five times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]
- 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.

CAUTION:

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

Description

NLEC0136

SYSTEM DESCRIPTION

NLEC0136S01

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

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

OPERATION

NLEC0136S02

Engine speed	Heated oxygen sensor 1 heater (front)
Above 3,200 rpm	OFF
Below 3,200 rpm	ON

CONSULT-II Reference Value in Data Monitor Mode

NLEC0137

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine speed: Below 3,200 rpm	ON
	● Engine speed: Above 3,200 rpm	OFF

ECM Terminals and Reference Value

NLEC0138

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	R/B	Heated oxygen sensor 1 heater (front)	**[Engine is running]** ● Engine speed is below 3,200 rpm.	Approximately 0V
			[Engine is running] ● Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NLEC0139

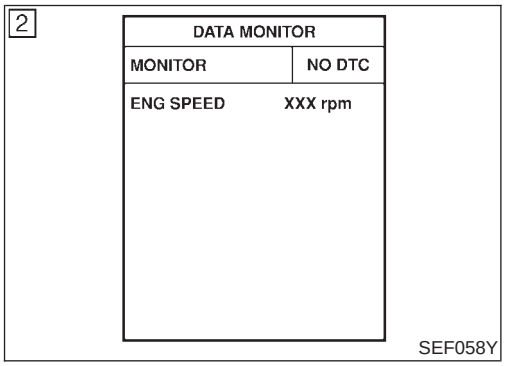
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0135 0135	● The current amperage in the heated oxygen sensor 1 heater (front) circuit is out of the normal range. [An improper voltage drop signal is sent to ECM through the heated oxygen sensor 1 heater (front).]	● Harness or connectors (The heated oxygen sensor 1 heater (front) circuit is open or shorted.) ● Heated oxygen sensor 1 heater (front)

DTC Confirmation Procedure

NLEC0140

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

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



With CONSULT-II

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 5 seconds at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-225.

With GST

1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch “OFF” and wait at least 9 seconds.
3) Start engine and run it for at least 5 seconds at idle speed.
4) Select “MODE 3” with GST.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-225.

- **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.**

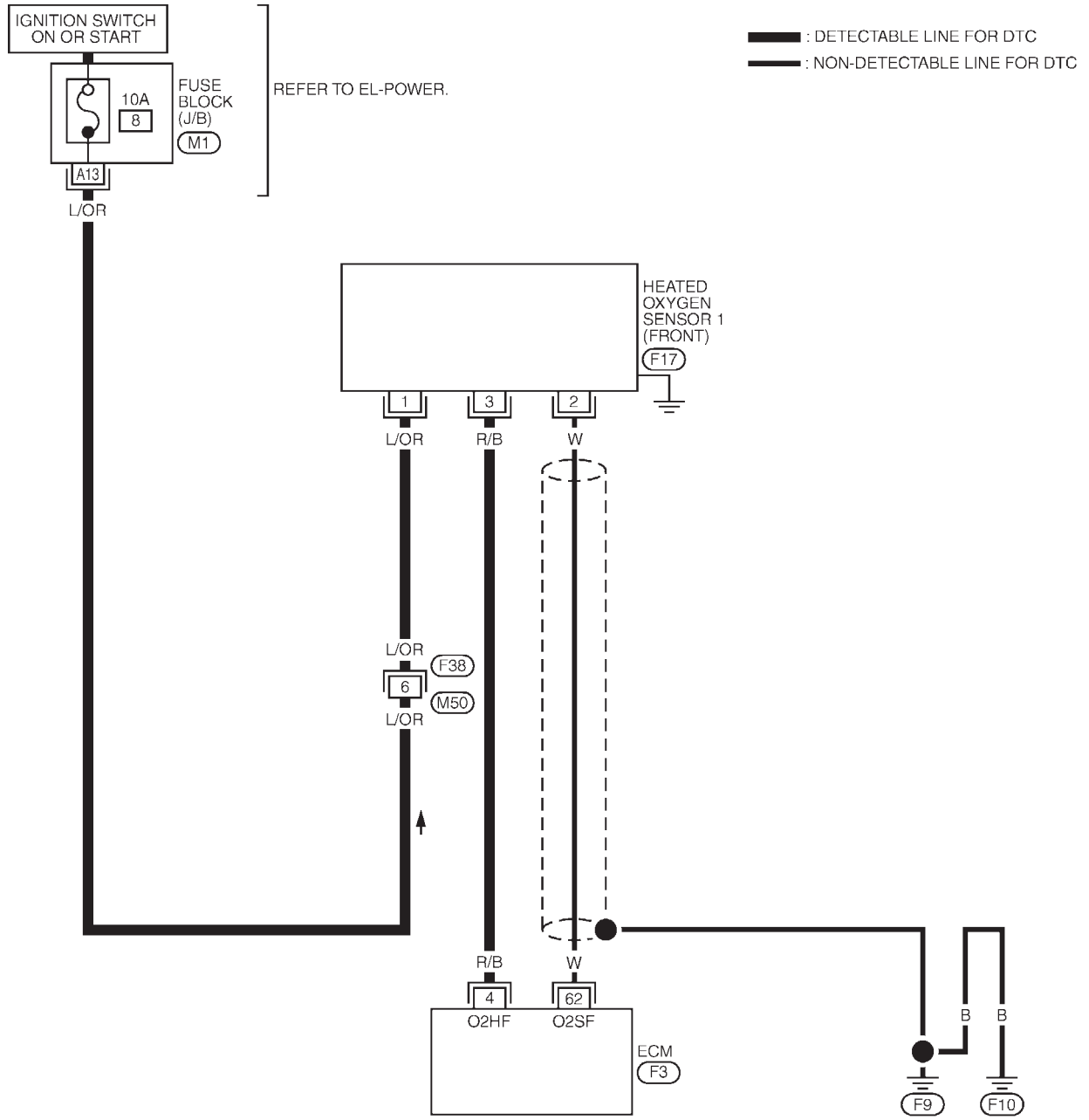
Wiring Diagram

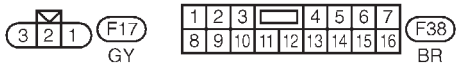
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0141

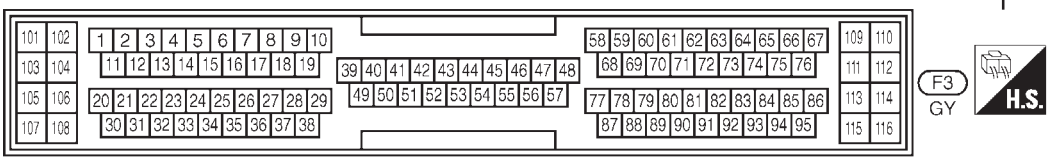
NLEC0141S03

EC-O2H1B1-01





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



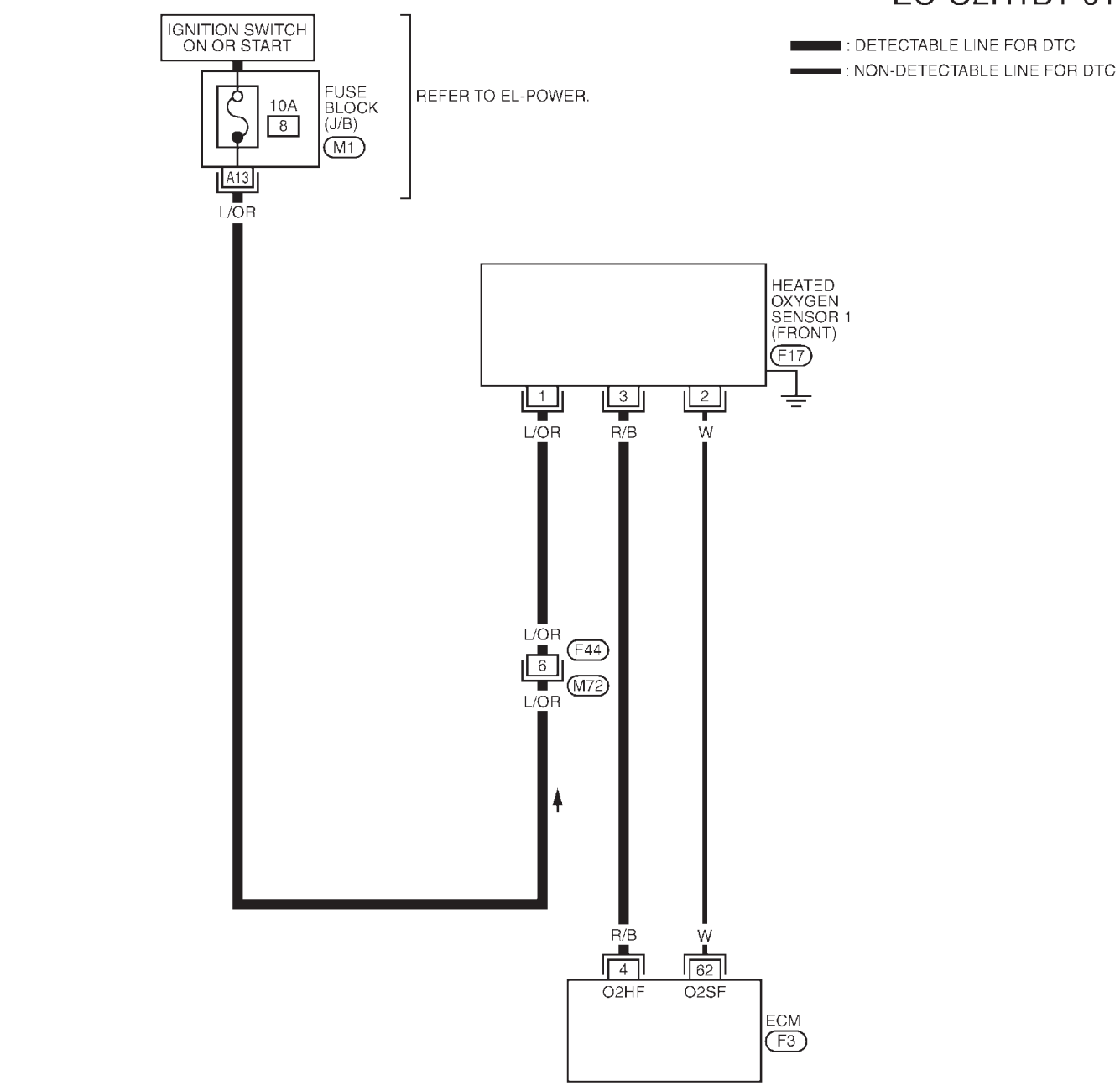
YEC656

Wiring Diagram (Cont'd)

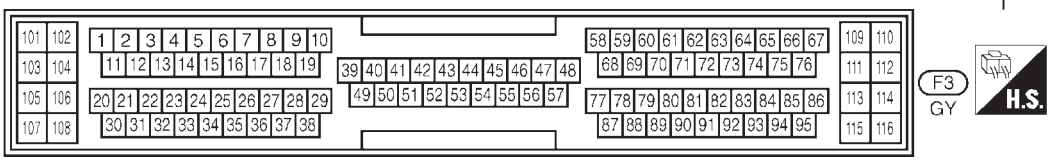
MODELS WITH ECM IN CABIN

NLEC0141S04

EC-O2H1B1-01



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



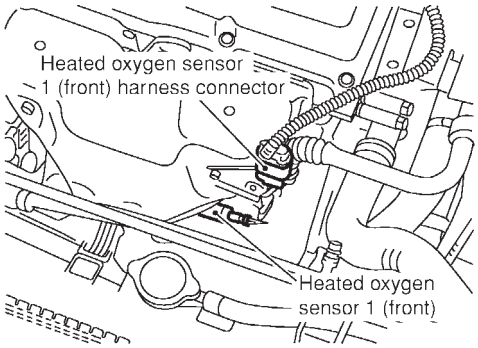
YEC878

Diagnostic Procedure

NLEC0142

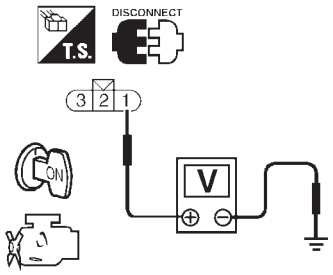
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (front) harness connector.



SEF012XA

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



Voltage: Battery voltage

SEF934X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F38, M50 (where fitted)
- Harness connectors F44, M72 (where fitted)
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 (front) and fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between heated oxygen sensor 1 (front) harness connector terminal 3 and ECM terminal 4. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

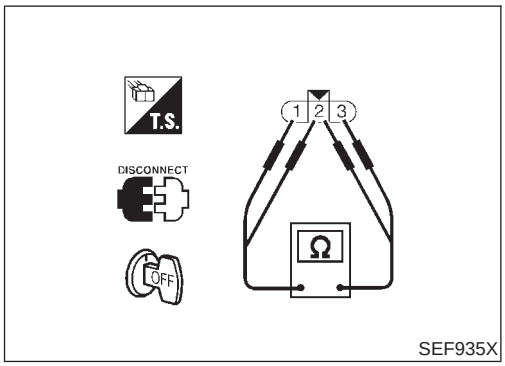
OK or NG

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 HEATED OXYGEN SENSOR 1 HEATER (FRONT)	
Refer to "Component Inspection", EC-226.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1 (front).

5	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	INSPECTION END



SEF935X

Component Inspection

NLEC0143

HEATED OXYGEN SENSOR 1 HEATER (FRONT)

NLEC0143S01

Check resistance between terminals 3 and 1.

Resistance: 2.3 - 4.3 Ω at 25°C (77°F)

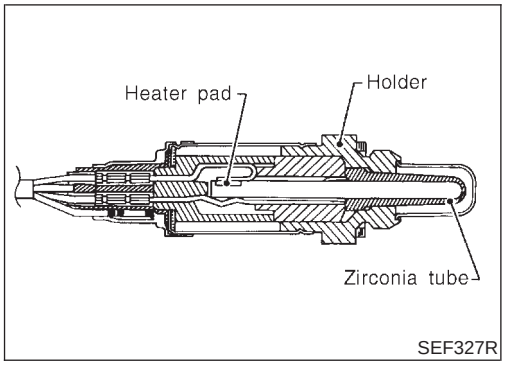
Check continuity between terminals 2 and 1, 3 and 2.

Continuity should not exist.

If NG, replace the heated oxygen sensor 1 (front).

CAUTION:

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



Component Description

NLEC0144

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

NLEC0145

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

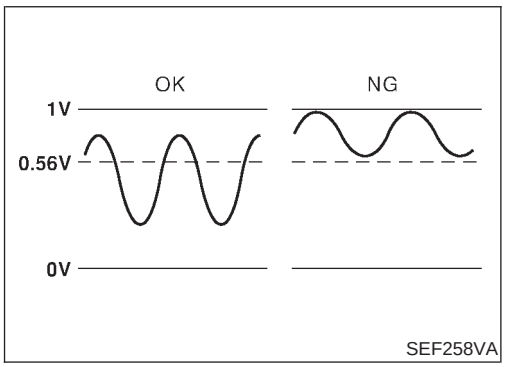
NLEC0146

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 3,000 rpm	0 - Approximately 1.0V



On Board Diagnosis Logic

NLEC0147

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 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the minimum voltage of the sensor is sufficiently low during various driving conditions such as fuel-cut.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0137 0137	● The minimum voltage from the sensor does not reach the specified voltage.	● 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

NLEC0594

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 9 seconds before conducting the next test.

TESTING CONDITION:

Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".

With CONSULT-II

Procedure for COND1

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 9 seconds.
3) Turn ignition switch "ON" and select "HO2S2 (B1) P0137" of "HO2S2" 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)
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".**

1

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

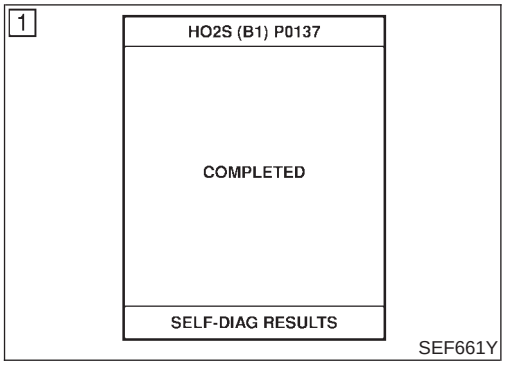
SEF836Y

Procedure for COND2

1) While driving, release accelerator pedal completely with 4th gear position 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:

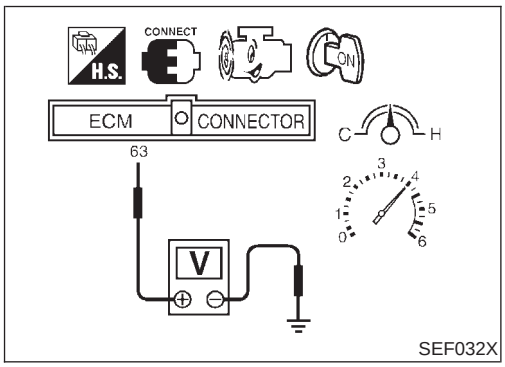
If "COMPLETED" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".



SEF661Y

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-232.



SEF032X

Overall Function Check

NLEC0595

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

Without CONSULT-II

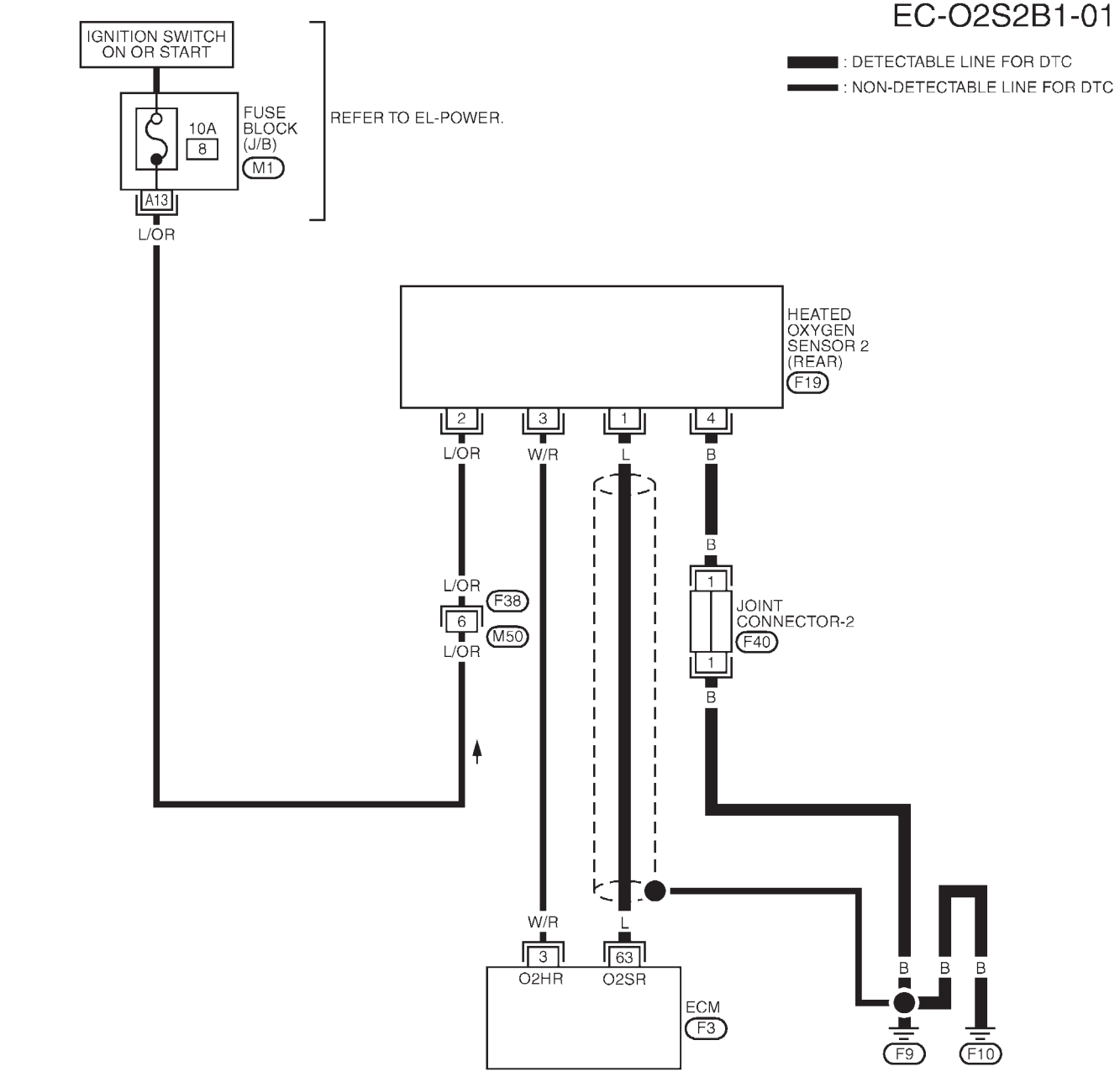
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (HO2S2 signal) and engine ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.56V at least once during this procedure.
   If the voltage can be confirmed in step 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.
   The voltage should be below 0.56V at least once during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-232.

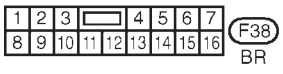
Wiring Diagram

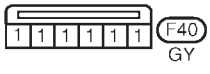
NLEC0150

MODELS WITH ECM IN ENGINE COMPARTMENT

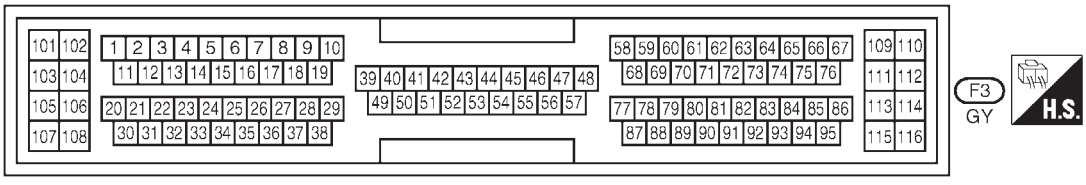
NLEC0150S03







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

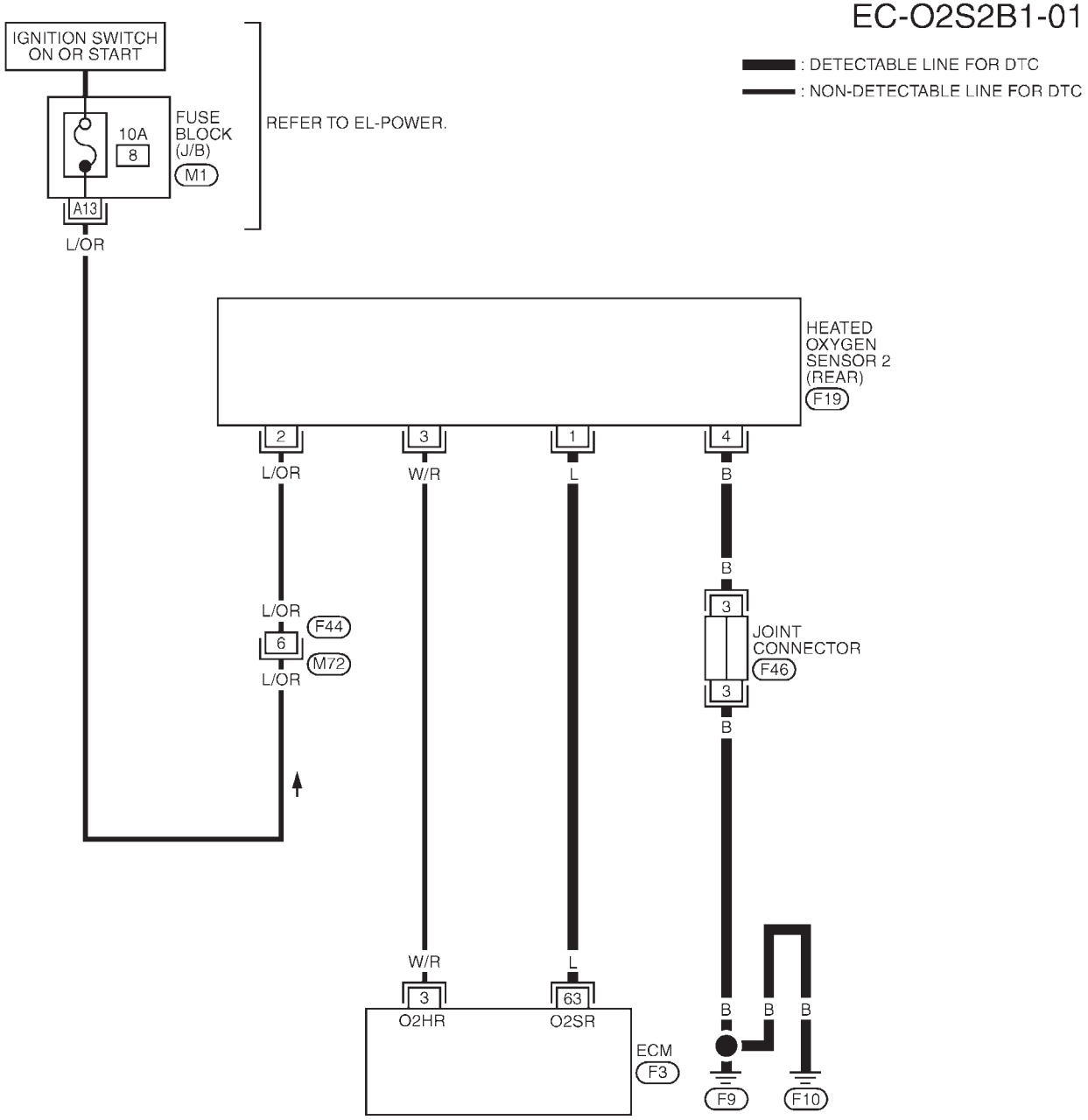


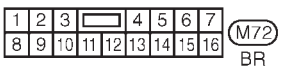
YEC693

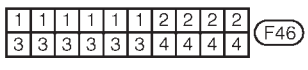
MODELS WITH ECM IN CABIN

NLEC0150S04

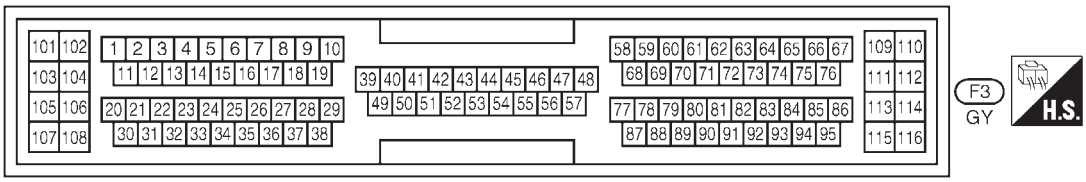
EC-O2S2B1-01







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



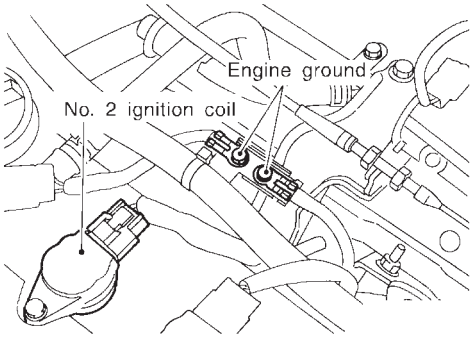
YEC879

Diagnostic Procedure

NLEC0151

1	RETIGHTEN GROUND SCREWS

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



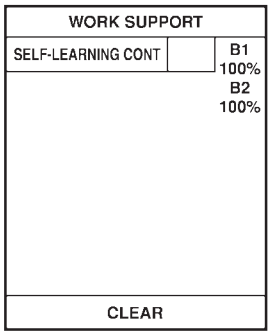
JEF104Y

▶	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-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "START".

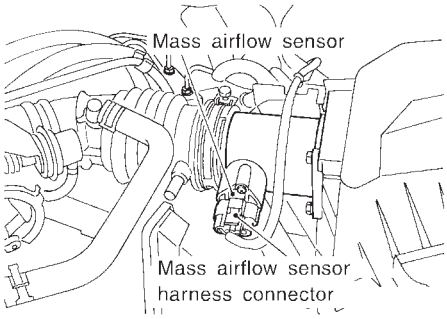


SEF652Y

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



JEF105Y

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-69.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0172 detected? Is it difficult to start engine?

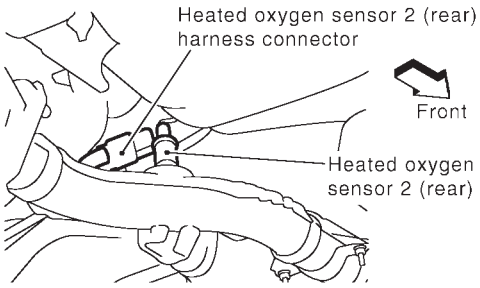
Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-277.
No	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

3. Check harness continuity between ECM terminal 63 and heated oxygen sensor 2 (rear) harness connector terminal 1. Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 63 [or heated oxygen sensor 2 (rear) harness connector terminal 1] and ground.
   Continuity should not exist.
5. 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 harness for open or short between heated oxygen sensor 2 (rear) and ECM.

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

5	CHECK GROUND CIRCUIT

1. Check harness continuity between heated oxygen sensor 2 (rear) harness connector terminal 4 and body ground. Refer to wiring diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)

Refer to "Component Inspection", EC-235.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

	▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC0152

HEATED OXYGEN SENSOR 2 (REAR)

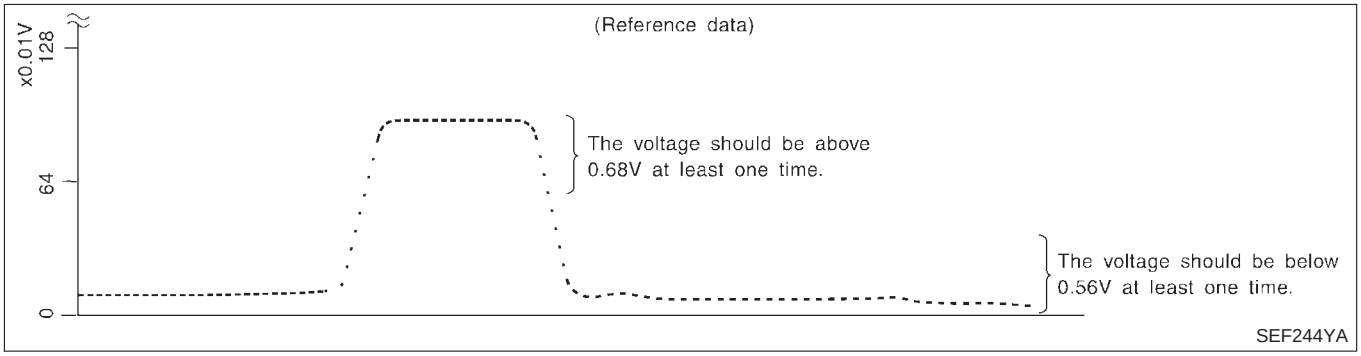
NLEC0152S01

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)” as the monitor item with CONSULT-II.
4) Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.
   “HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%. “HO2S2 (B1)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



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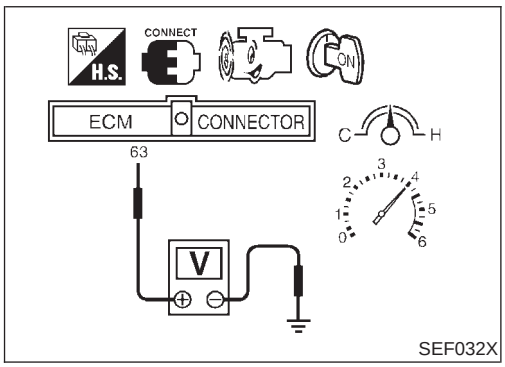


SEF032X

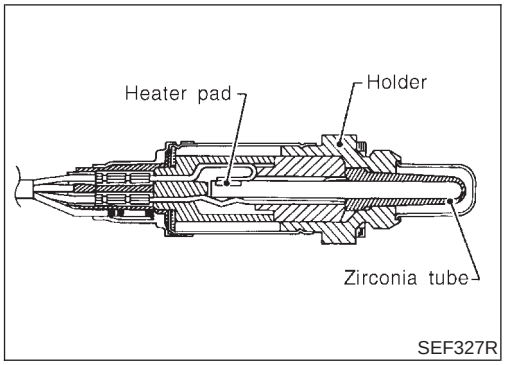
Without CONSULT-II

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 terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or 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.
   The voltage should be below 0.56V at least once.

CAUTION:

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

and approved anti-seize lubricant.



Component Description

NLEC0153

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

NLEC0154

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

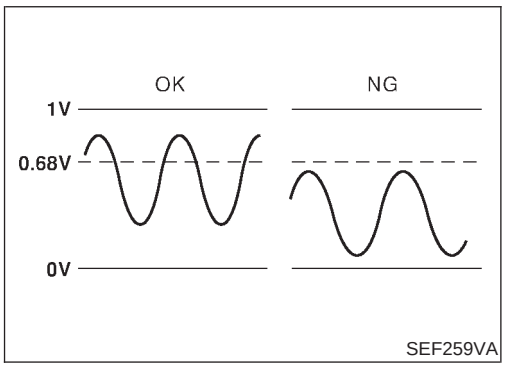
NLEC0155

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V



On Board Diagnosis Logic

NLEC0156

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 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 various driving conditions such as fuel-cut.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0138 0138	● The maximum voltage from the sensor does not reach the specified voltage.	● 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

NLEC0596

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 9 seconds before conducting the next test.

TESTING CONDITION:

Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".

With CONSULT-II

Procedure for COND1

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 9 seconds.
3) Turn ignition switch "ON" and select "HO2S2 (B1) P0138" of "HO2S2" 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)
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".**

1

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

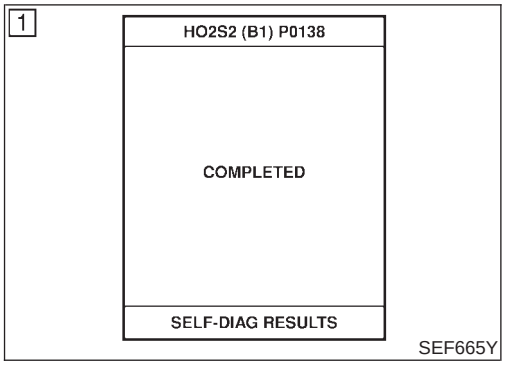
SEF840Y

Procedure for COND2

1) While driving, release accelerator pedal completely with 4th gear position 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:

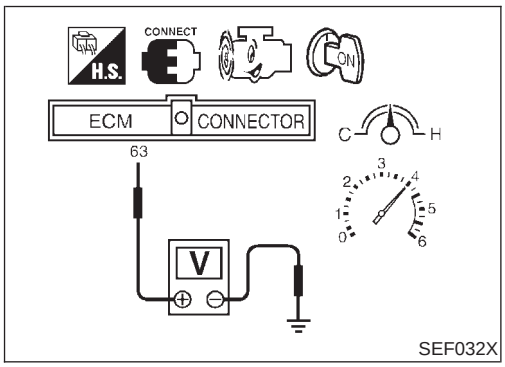
If "COMPLETED" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".



SEF665Y

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-242.



SEF032X

Overall Function Check

NLEC0597

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

Without CONSULT-II

1) Start engine and drive vehicle at a speed of 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (HO2S2 signal) and engine ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage can be confirmed in step 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.
   The voltage should be above 0.68V at least once during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-242.

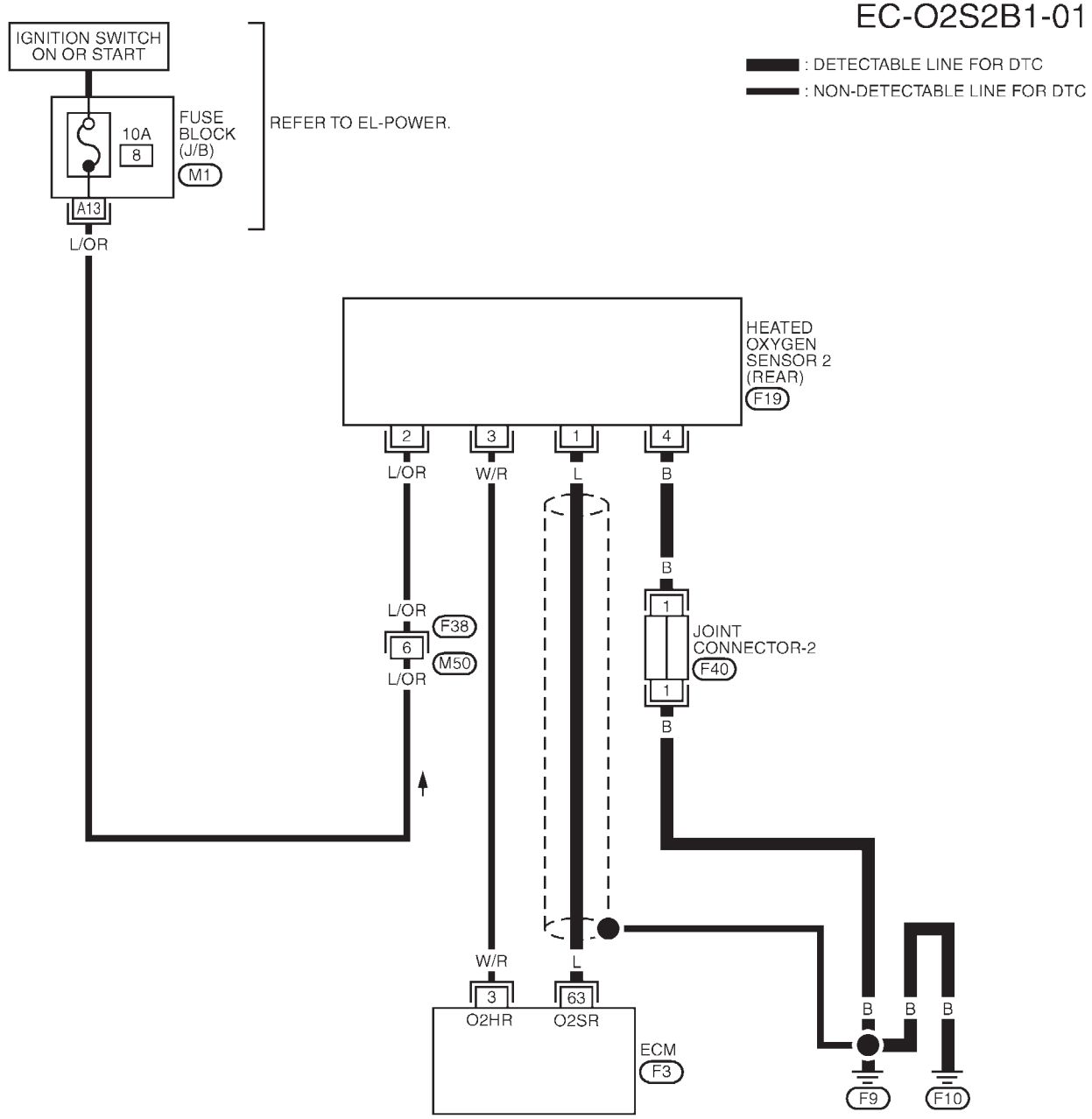
Wiring Diagram

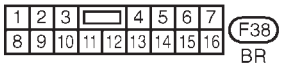
NLEC0159

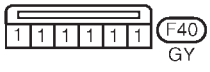
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0159S03

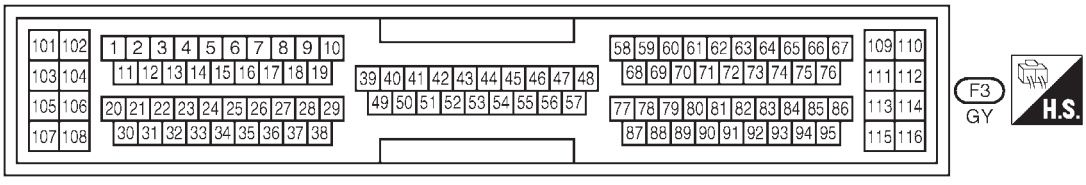
EC-O2S2B1-01







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

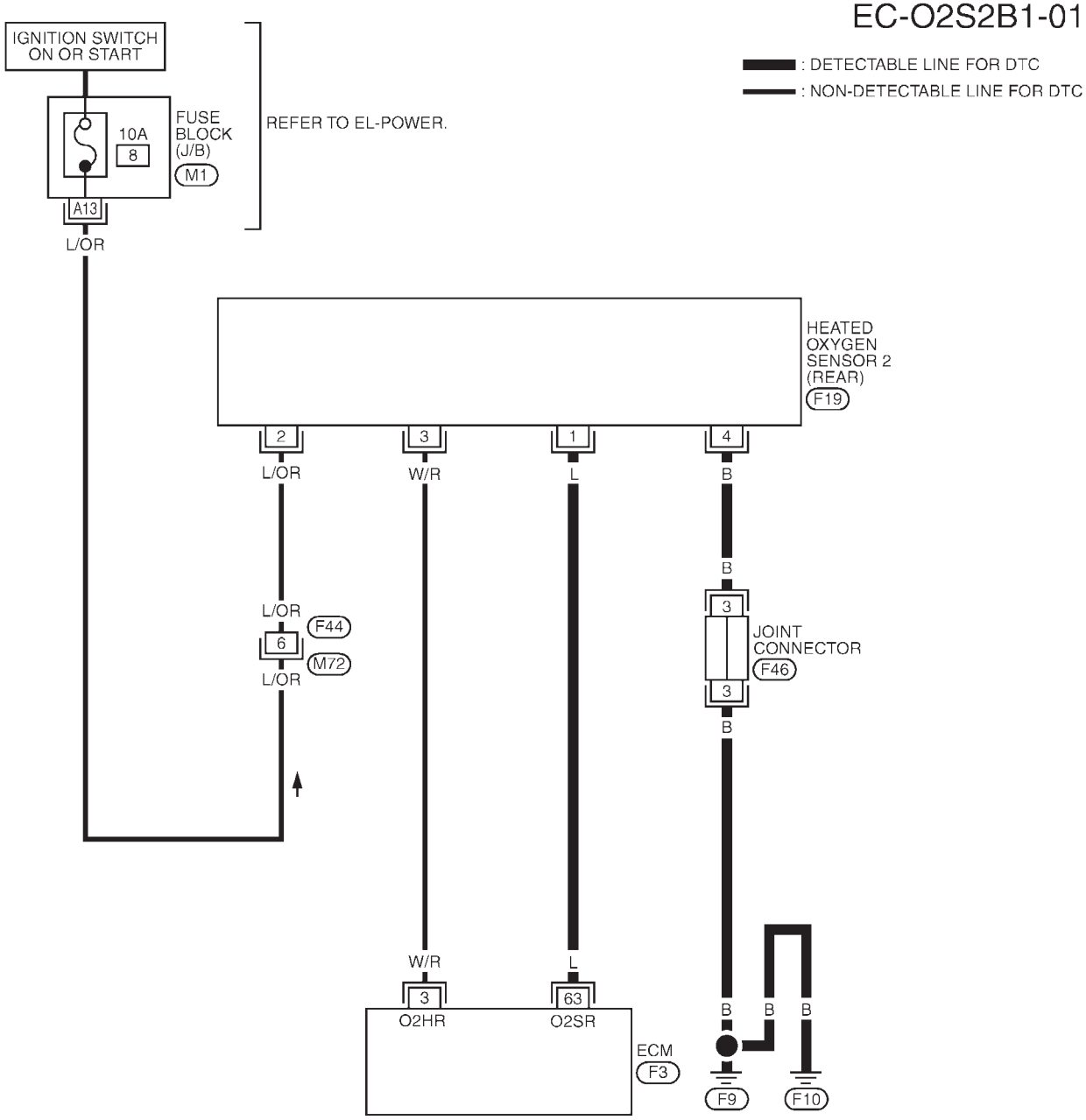


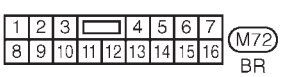
YEC693

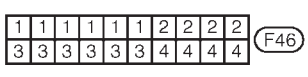
MODELS WITH ECM IN CABIN

NLEC0159S04

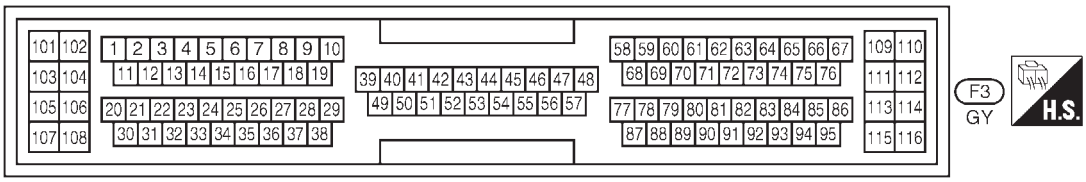
EC-O2S2B1-01







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



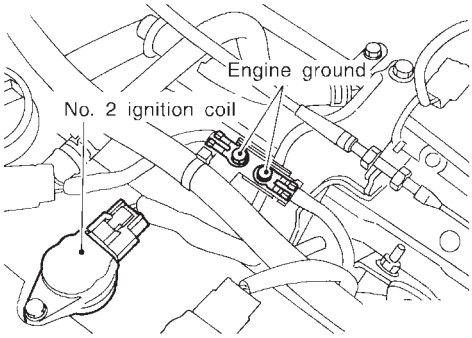
YEC879

Diagnostic Procedure

NLEC0160

1	RETIGHTEN GROUND SCREWS

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



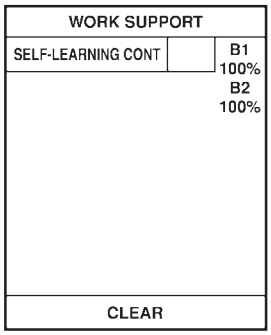
JEF104Y

▶	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-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "START".

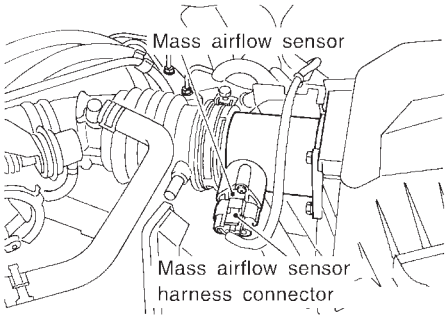


SEF652Y

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



JEF105Y

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-69.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0171 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171. Refer to EC-269.
No	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal 63 and heated oxygen sensor 2 (rear) harness connector terminal 1. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 63 [or heated oxygen sensor 2 (rear) harness connector terminal 1] and ground.
   Continuity should not exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM and heated oxygen sensor 2 (rear).

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

5	CHECK GROUND CIRCUIT

1. Check harness continuity between heated oxygen sensor 2 (rear) harness connector 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 6.
NG	▶	Repair open circuit or short to power in harness or connectors.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)

Refer to "Component Inspection", EC-244.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

	▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC0161

HEATED OXYGEN SENSOR 2 (REAR)

NLEC0161S01

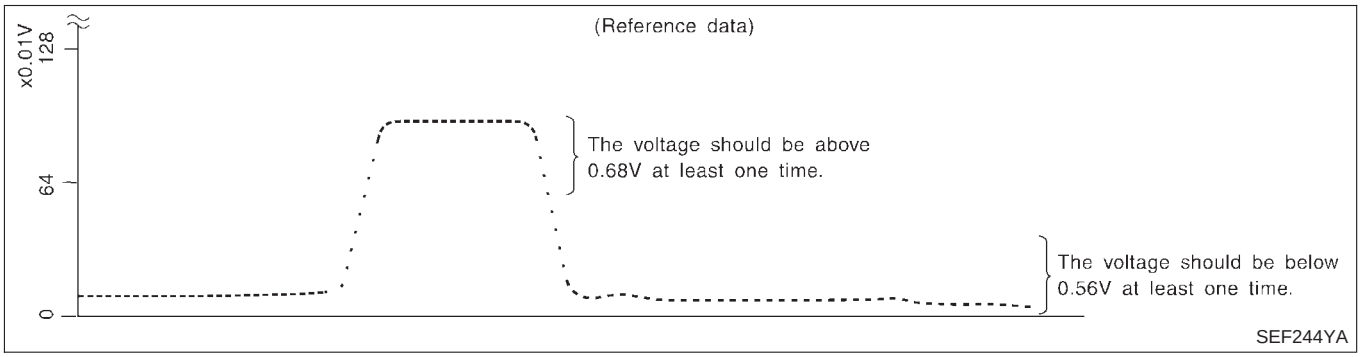
With CONSULT-II

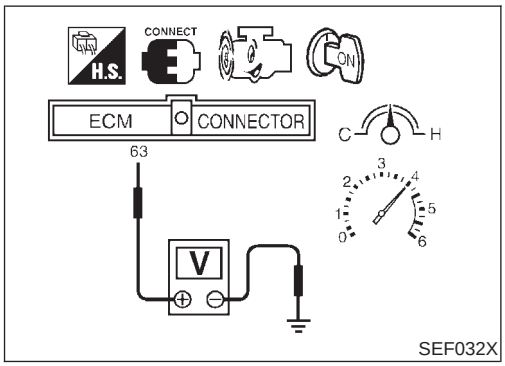
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes..
2) Stop vehicle with engine running.
3) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-II.
4) Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "HO2S2 (B1)" should be above 0.68V at least once when

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

CAUTION:

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



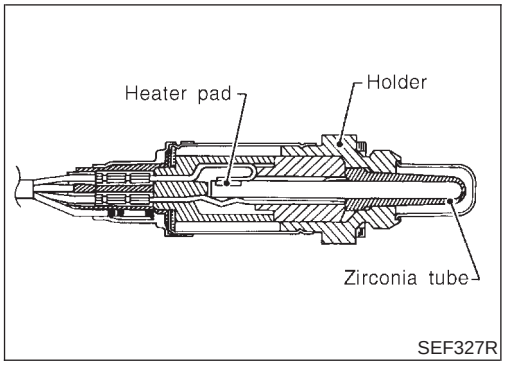


Without CONSULT-II

1) Start engine and drive vehicle at a speed of 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or 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.
   The voltage should be below 0.56V at least once.

CAUTION:

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



Component Description

NLEC0162

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

NLEC0163

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

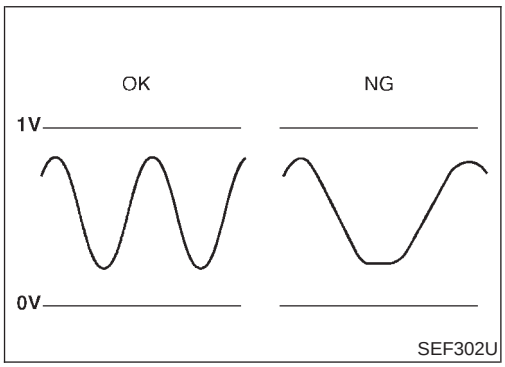
NLEC0164

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V



On Board Diagnosis Logic

NLEC0165

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 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 various driving conditions such as fuel-cut.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0139 0139	● It takes more than the specified time for the sensor to respond between rich and lean.	● 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

NLEC0598

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 9 seconds before conducting the next test.

TESTING CONDITION:

Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".

With CONSULT-II

Procedure for COND1

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 9 seconds.
3) Turn ignition switch "ON" and select "HO2S2 (B1) P0139" of "HO2S2" 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)
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".**

1

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

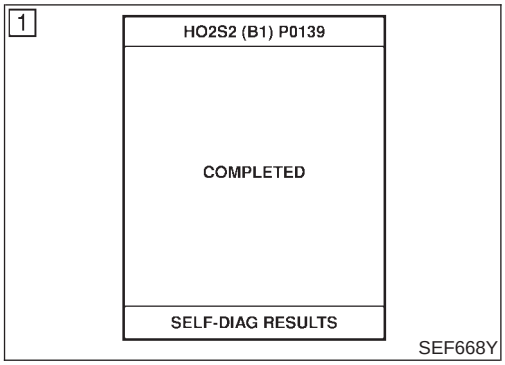
SEF844Y

Procedure for COND2

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

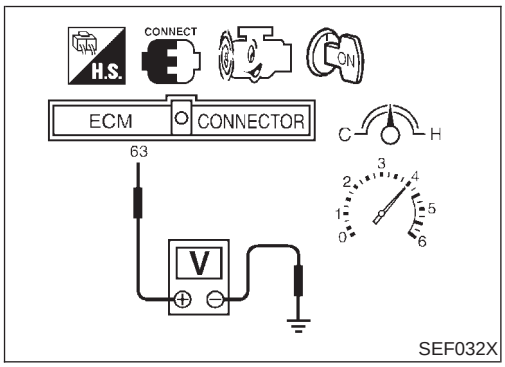
NOTE:

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-251.



Overall Function Check

NLEC0599

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

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 terminals 63 (HO2S2 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 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.
   The voltage should change at more than 0.06V for 1 second during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-251.

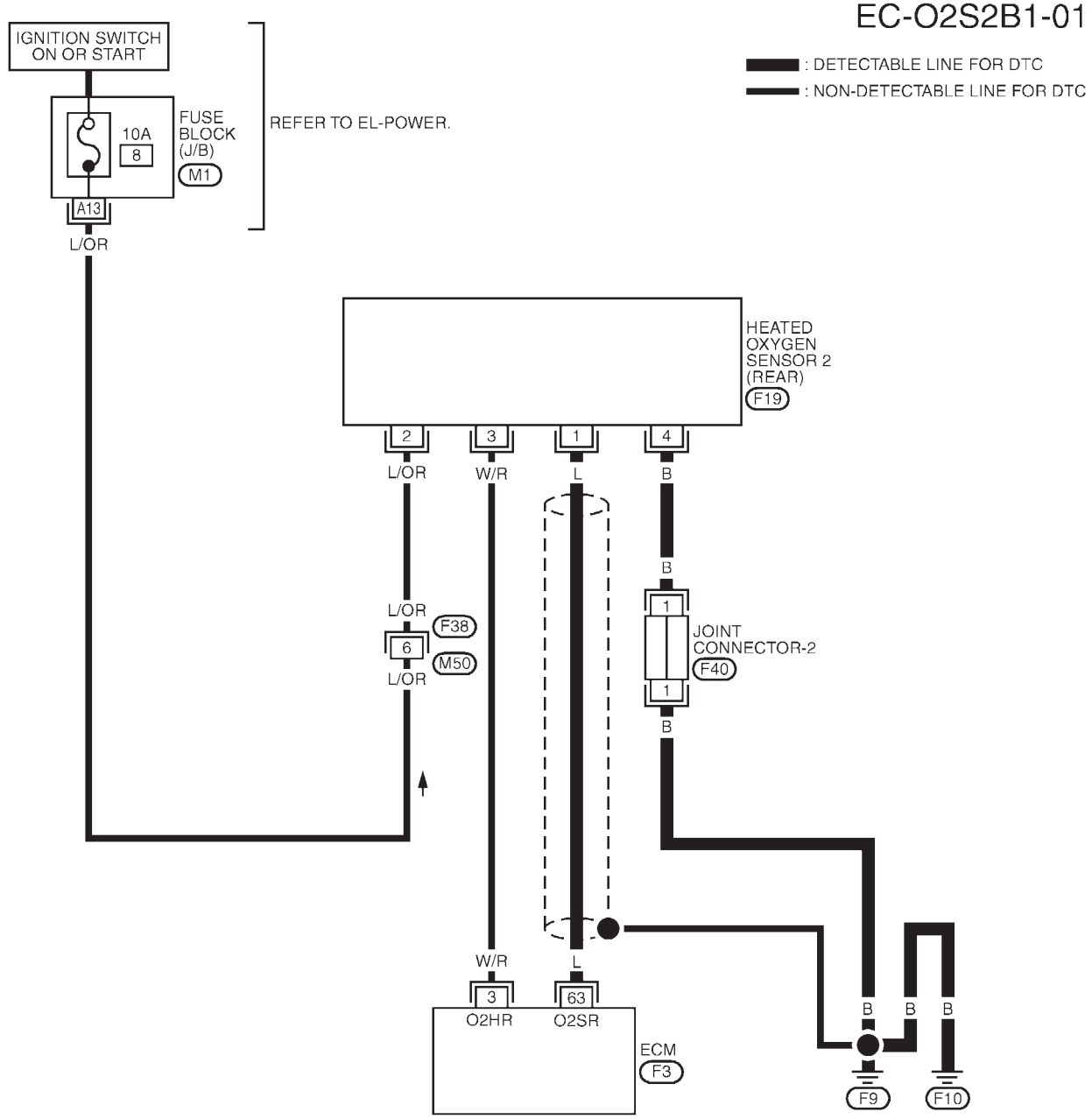
Wiring Diagram

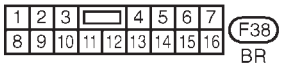
NLEC0168

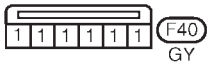
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0168S03

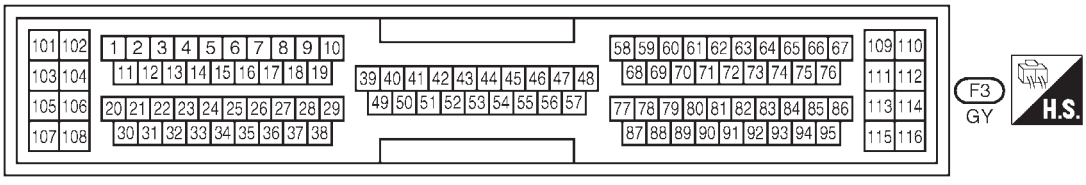
EC-O2S2B1-01







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

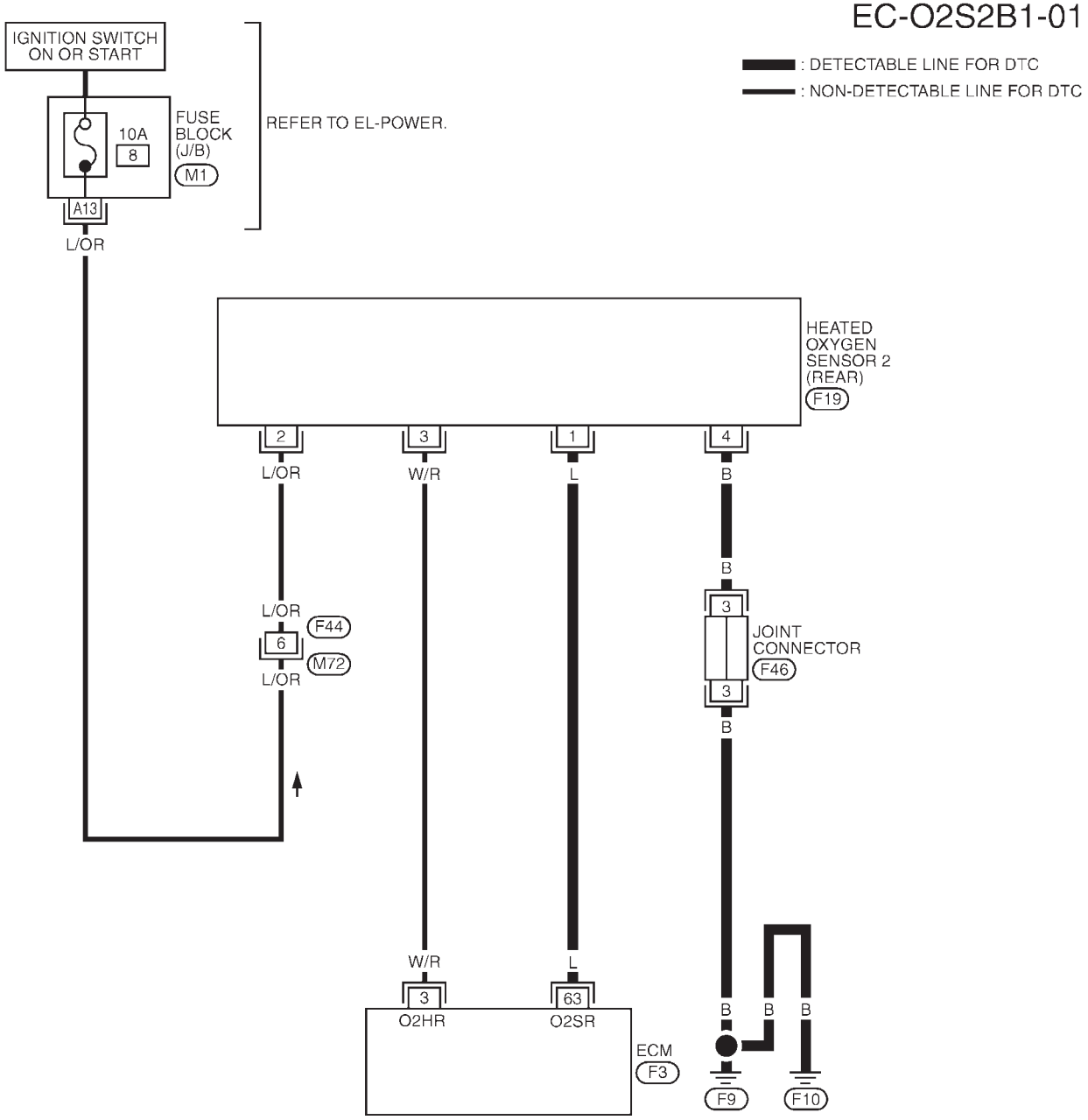


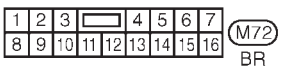
YEC693

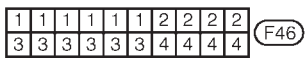
MODELS WITH ECM IN CABIN

NLEC0168S04

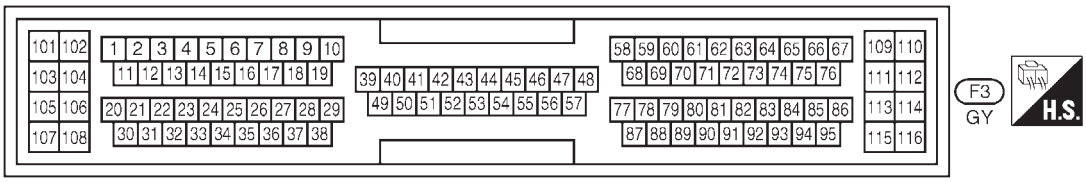
EC-O2S2B1-01







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



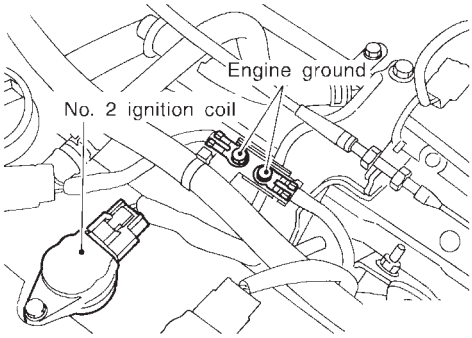
YEC879

Diagnostic Procedure

NLEC0169

1	RETIGHTEN GROUND SCREWS

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



JEF104Y

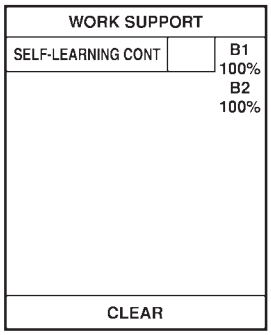
▶	GO TO 2.

Diagnostic Procedure (Cont'd)

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "START".

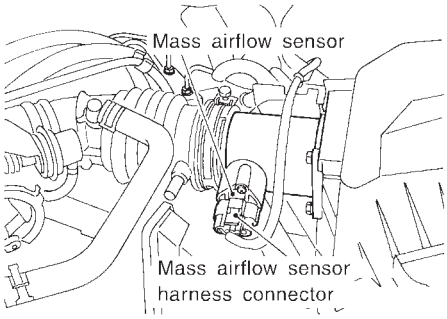


SEF652Y

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



JEF105Y

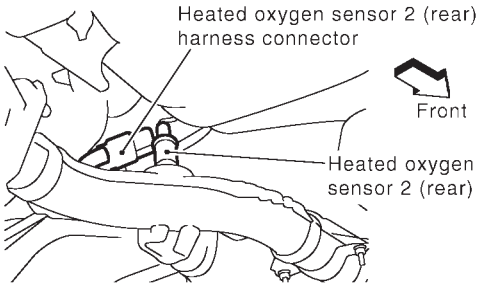
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-69.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-277.
No	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

2. Check harness continuity between ECM terminal 63 and heated oxygen sensor 2 (rear) harness connector terminal 1. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 63 [or heated oxygen sensor 2 (rear) harness connector terminal 1] and ground.
   Continuity should not exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the harness for open or short between heated oxygen sensor 2 (rear) and ECM.

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

5	CHECK GROUND CIRCUIT

1. Check harness continuity between heated oxygen sensor 2 (rear) harness connector 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 6.
NG	▶	Repair open circuit or short to power in harness or connectors.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)

Refer to "Component Inspection", EC-254.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

	▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC0170

HEATED OXYGEN SENSOR 2 (REAR)

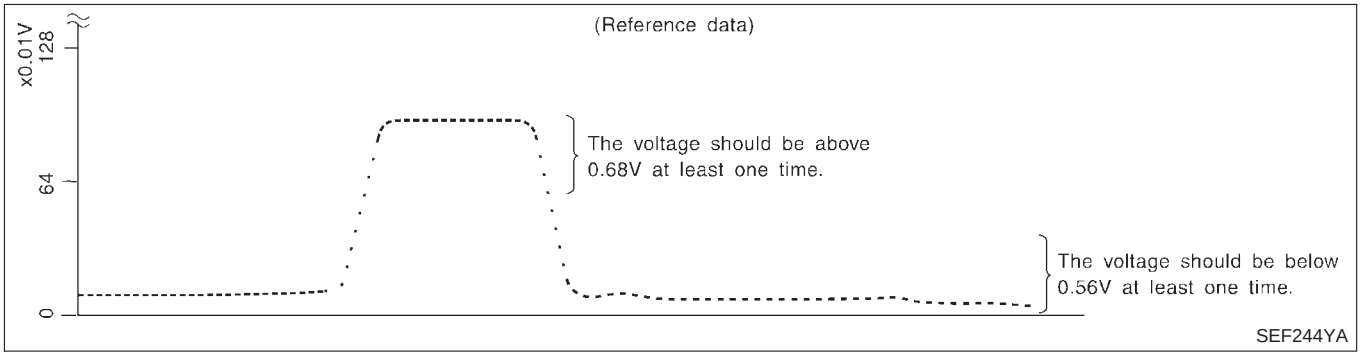
NLEC0170S01

With CONSULT-II

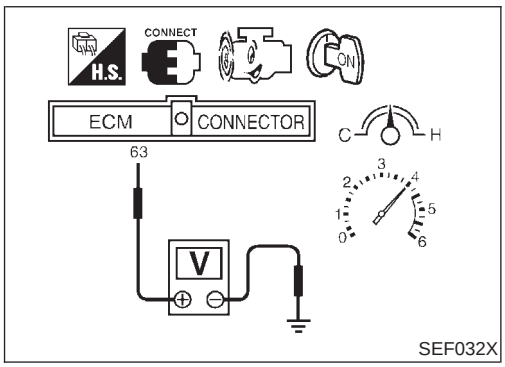
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.
4) Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.
   “HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
   “HO2S2 (B1)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



SEF244YA



SEF032X

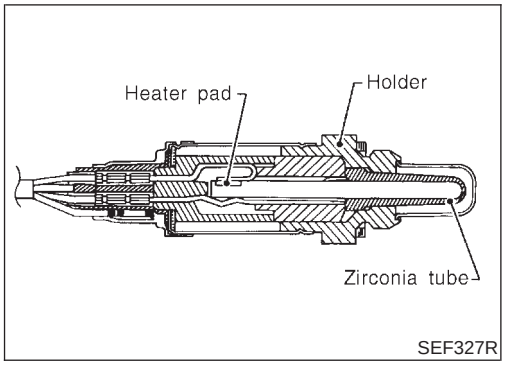
Without CONSULT-II

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 terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or 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.
   The voltage should be below 0.56V at least once.

CAUTION:

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

and approved anti-seize lubricant.



Component Description

NLEC0171

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

NLEC0172

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

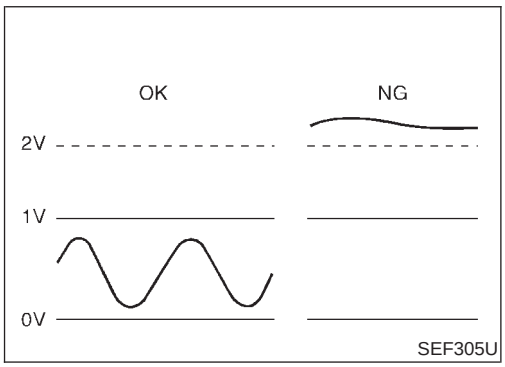
NLEC0173

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V

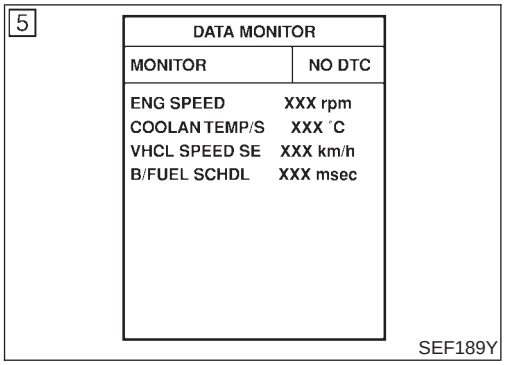


On Board Diagnosis Logic

NLEC0174

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 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether or not the voltage is too high during various driving conditions such as fuel-cut.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0140 0140	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 (rear)



DTC Confirmation Procedure

NLEC0175

NOTE:

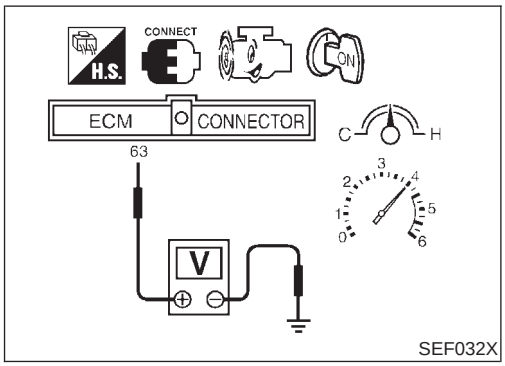
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine and 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 minutes.

ENG SPEED	Above 1,500 rpm
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-260.



Overall Function Check

NLEC0176

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.

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 terminals 63 (HO2S2 signal) and engine ground.
4) Check the voltage after revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 2V during this procedure.
5) If NG, go to "Diagnostic Procedure", EC-260.

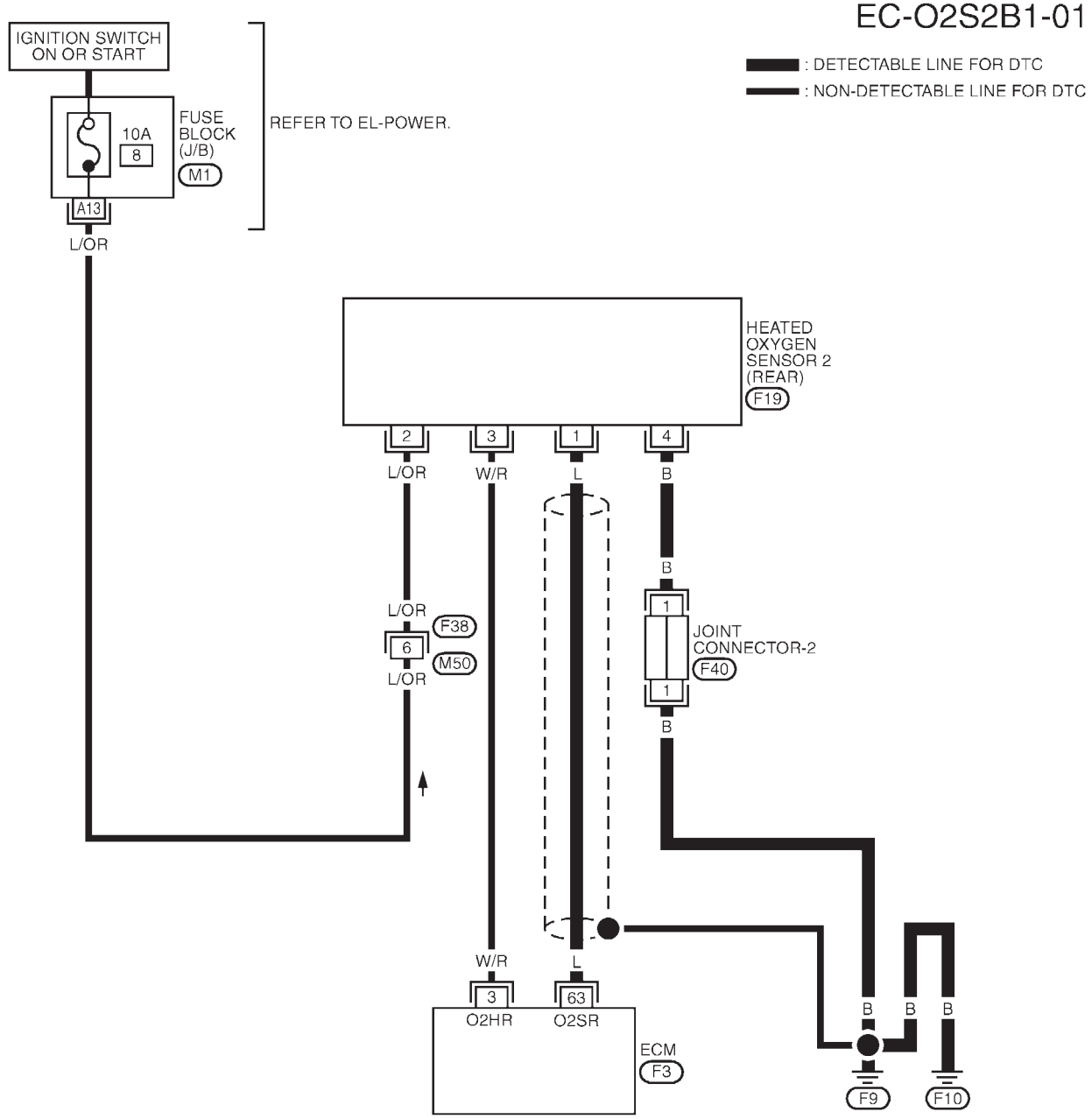
Wiring Diagram

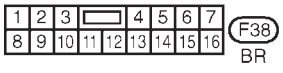
NLEC0177

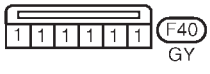
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0177S03

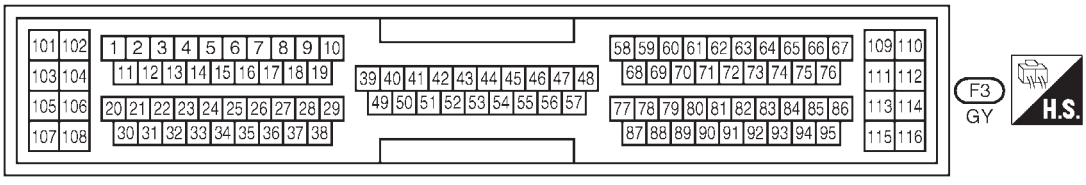
EC-O2S2B1-01







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

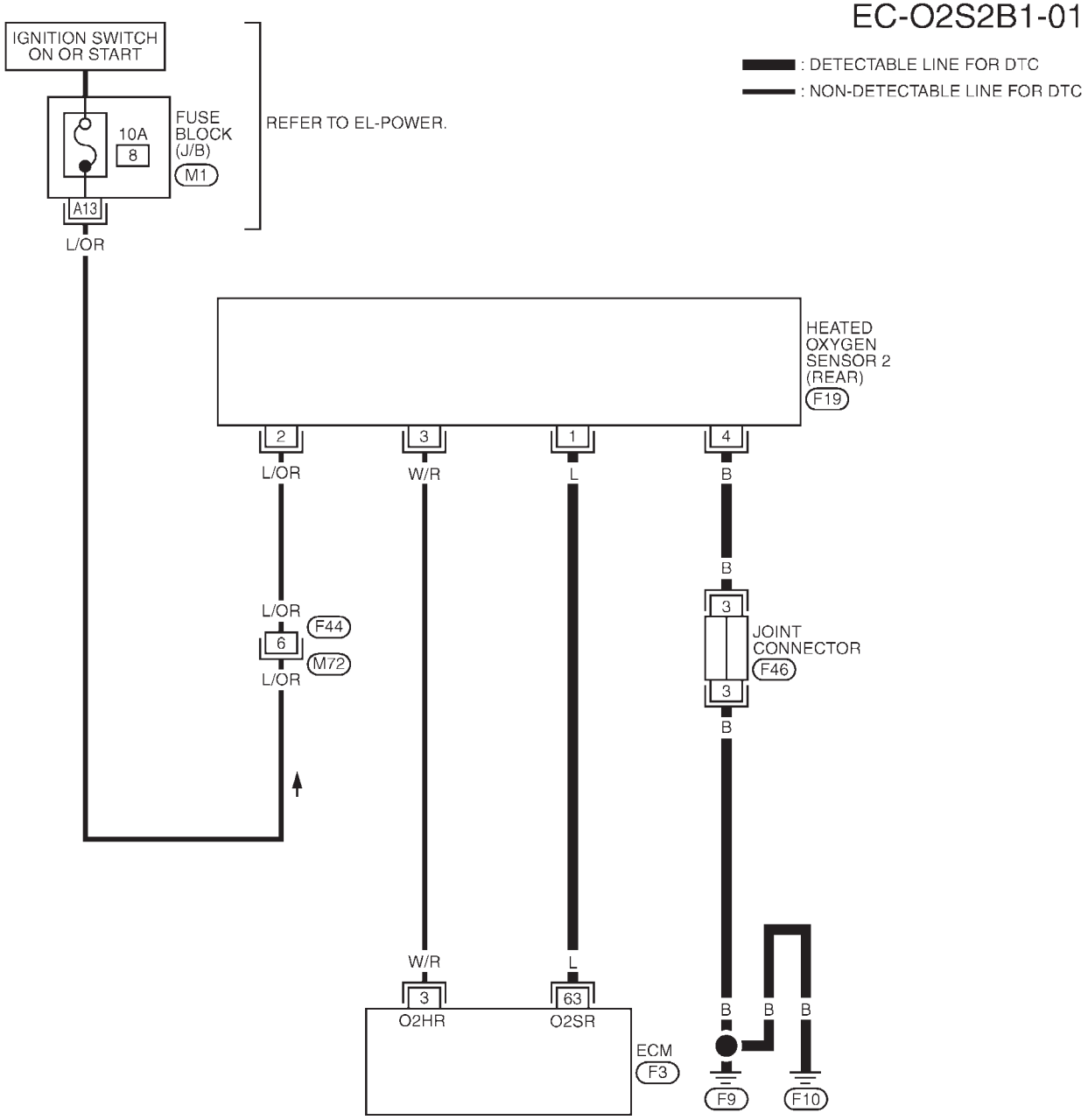


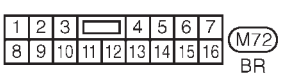
YEC693

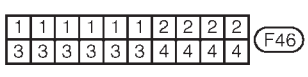
MODELS WITH ECM IN CABIN

NLEC0177S04

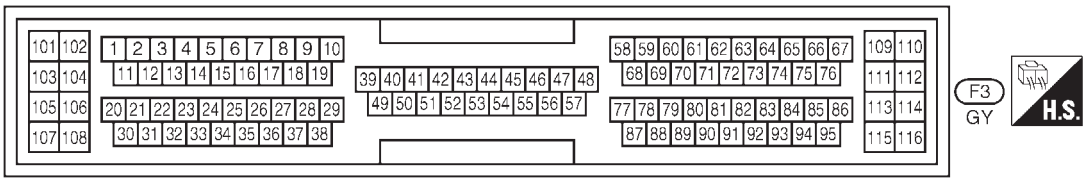
EC-O2S2B1-01







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



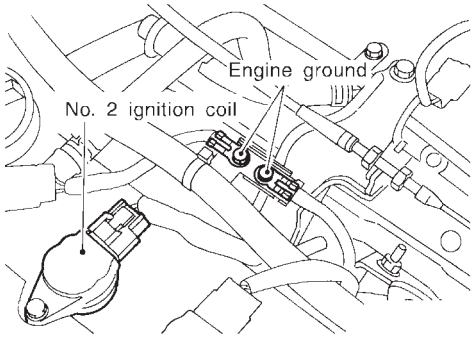
YEC879

Diagnostic Procedure

NLEC0178

1	RETIGHTEN GROUND SCREWS

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

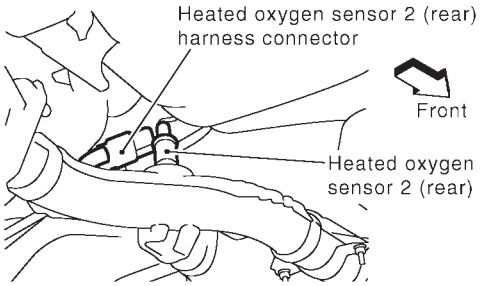


JEF104Y

▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

2. Check harness continuity between ECM terminal 63 and heated oxygen sensor 2 (rear) harness connector terminal 1. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 63 [or heated oxygen sensor 2 (rear) harness connector terminal 1] and ground.
   Continuity should not 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 harness for open or short between heated oxygen sensor 2 (rear) and ECM.

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

4	CHECK GROUND CIRCUIT	
1. Check harness continuity between heated oxygen sensor 2 (rear) harness connector 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 5.
NG	▶	Repair open circuit or short to power in harness or connectors.

5	CHECK HARNESS CONNECTOR	
Check heated oxygen sensor 2 (rear) harness connector for water. **Water should not exist.** **OK or NG**		
OK	▶	GO TO 6.
NG	▶	Repair or replace harness connector.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)	
Refer to "Component Inspection", EC-261. **OK or NG**		
OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC0179

HEATED OXYGEN SENSOR 2 (REAR)

NLEC0179S01

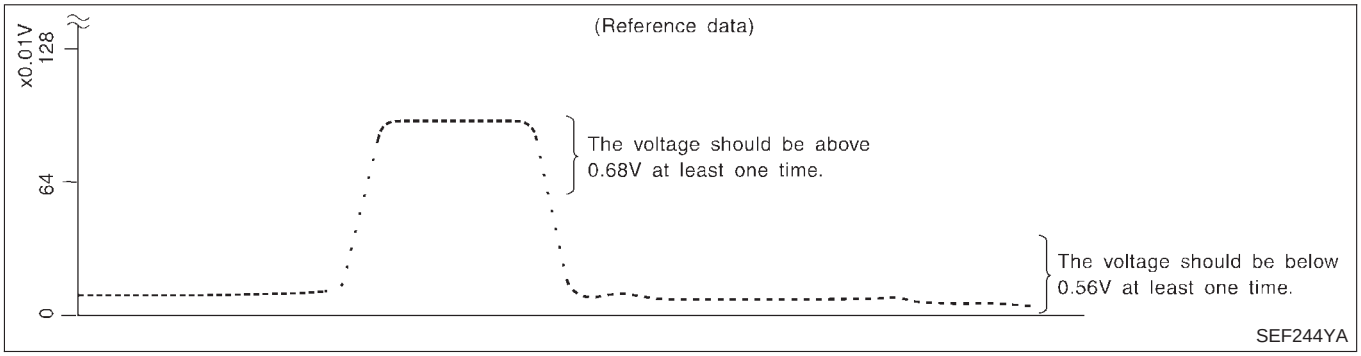
With CONSULT-II

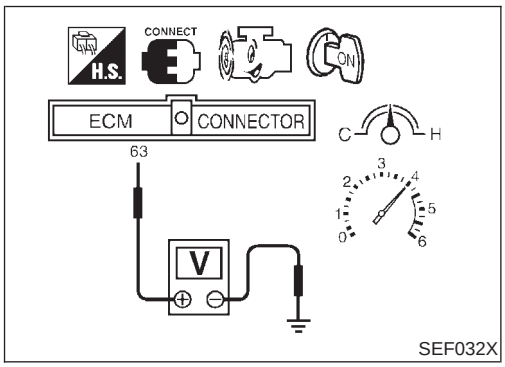
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-II.
4) Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
   "HO2S2 (B1)" should be below 0.56V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

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

Component Inspection (Cont'd)





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 terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or 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.
   The voltage should be below 0.56V at least once.

CAUTION:

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

Description

NLEC0180

SYSTEM DESCRIPTION

NLEC0180S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 2 heater (rear) control	Heated oxygen sensor 2 heater (rear)

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater (rear) corresponding to the engine speed.

OPERATION

NLEC0180S02

Engine condition		Heated oxygen sensor 2 heater (rear)
Engine stopped		OFF
Engine is running.	After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	ON
	Engine speed above 3,600 rpm	OFF

CONSULT-II Reference Value in Data Monitor Mode

NLEC0181

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 HTR (B1)	● Engine speed	Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
		Above 3,600 rpm	OFF
	● Ignition switch ON (Engine stopped)		OFF

ECM Terminals and Reference Value

NLEC0182

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	W/R	Heated oxygen sensor 2 heater (rear)	**[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]	Approximately 0.7V
			[Engine is running] ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Engine stopped	

On Board Diagnosis Logic

NLEC0183

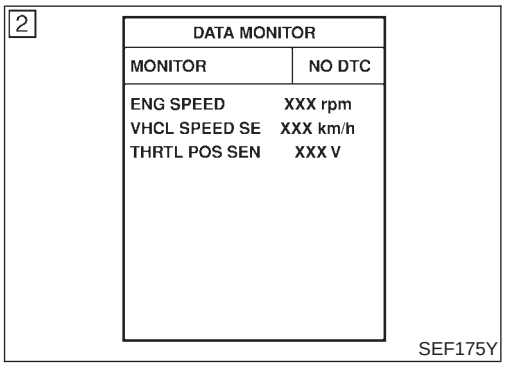
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0141 0141	● The current amperage in the heated oxygen sensor 2 heater (rear) circuit is out of the normal range. [An improper voltage drop signal is sent to ECM through the heated oxygen sensor 2 heater (rear).]	● Harness or connectors (The heated oxygen sensor 2 heater (rear) circuit is open or shorted.) ● Heated oxygen sensor 2 heater (rear)

DTC Confirmation Procedure

NLEC0184

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

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



With CONSULT-II

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes. Engine speed must be maintained at speeds of 3,600 rpm or less during vehicle operations.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-267.

With GST

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes. Engine speed must be maintained at speeds of 3,600 rpm or less during vehicle operations.
2) Turn ignition switch “OFF” and wait at least 9 seconds.
3) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
4) Select “MODE 3” with GST.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-267.

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.

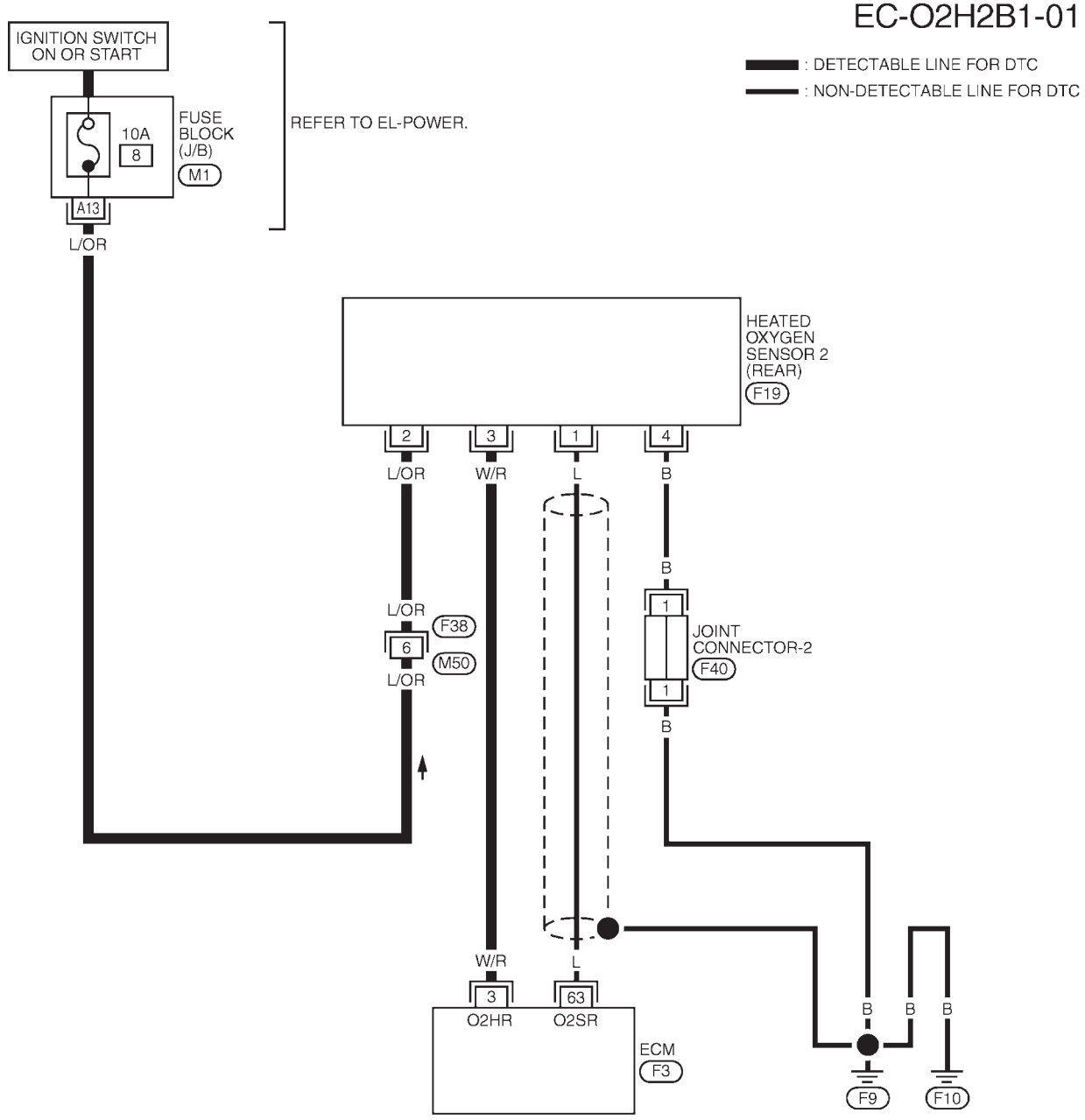
Wiring Diagram

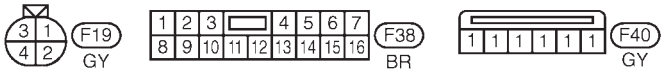
NLEC0185

MODELS WITH ECM IN ENGINE COMPARTMENT

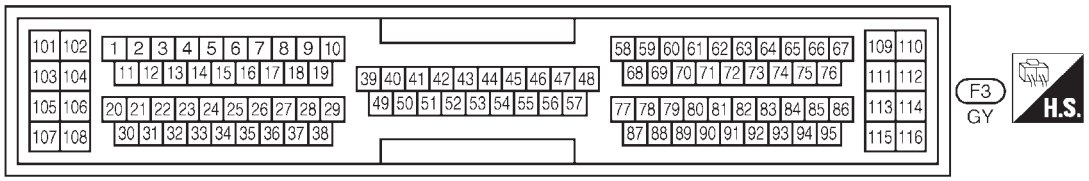
NLEC0185S03

EC-O2H2B1-01





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



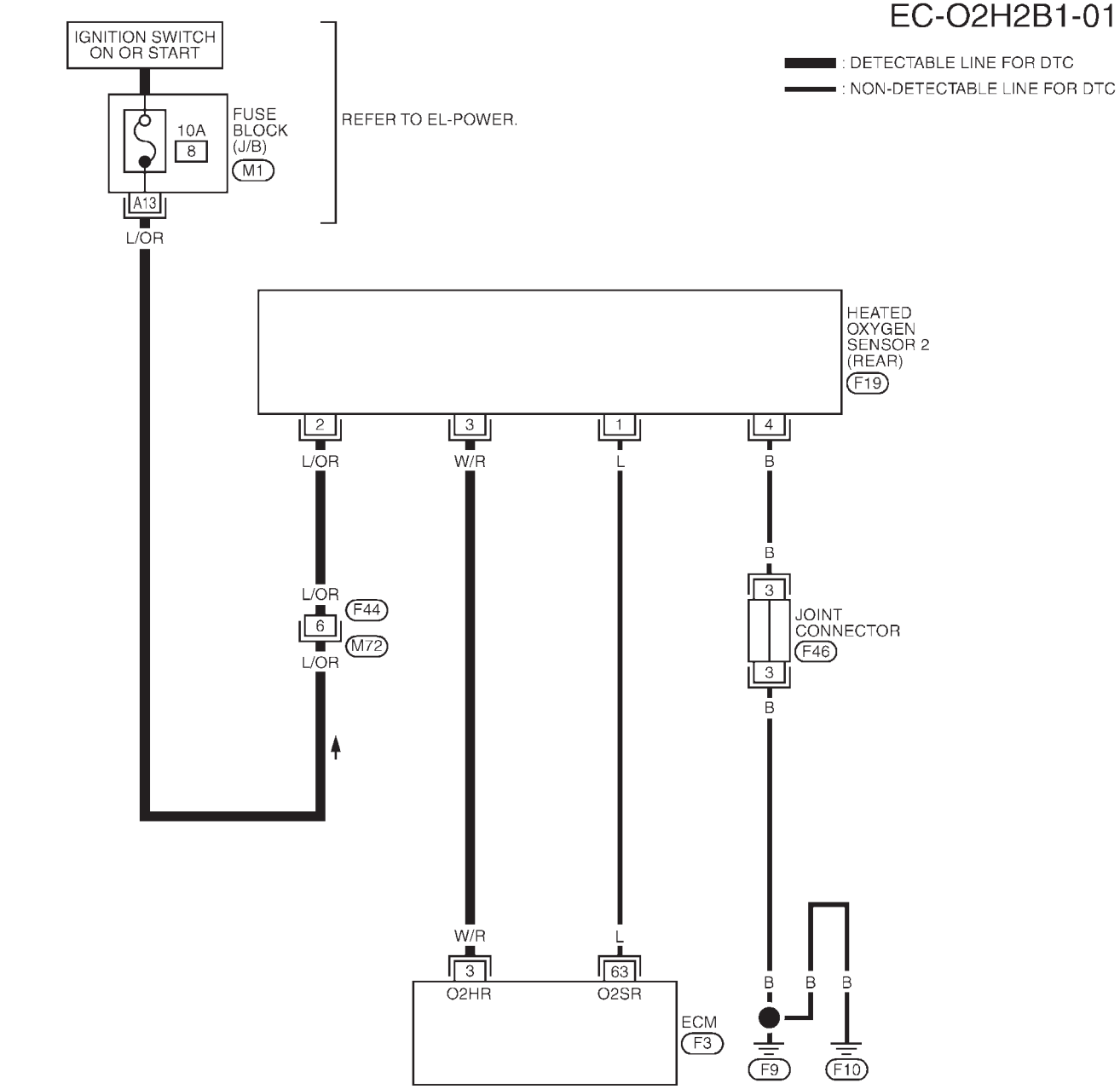
YEC694

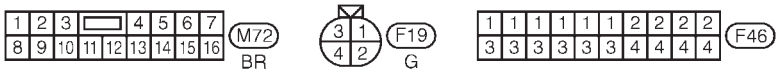
Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

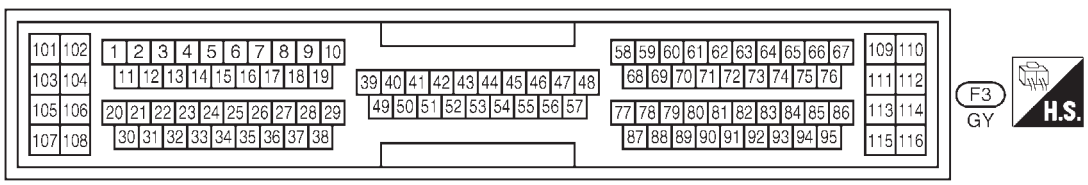
NLEC0185S04

EC-O2H2B1-01





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



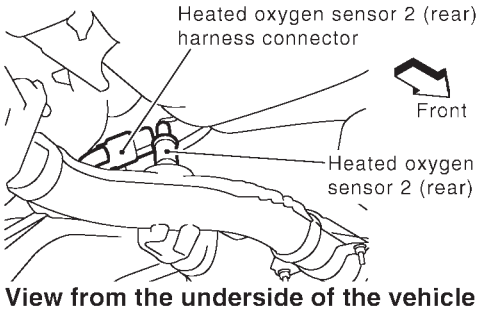
YEC880

Diagnostic Procedure

NLEC0186

1	CHECK POWER SUPPLY

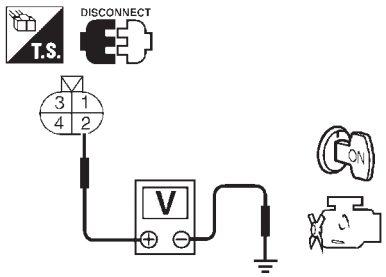
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 (rear) harness connector.



View from the underside of the vehicle

SEF639Z

3. Turn ignition switch “ON”.
4. Check voltage between terminal 2 and ground.



SEF218W

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F38, M50 (where fitted)
- Harness connectors F44, M72 (where fitted)
- Harness for open or short between heated oxygen sensor 2 (rear) and fuse
- 10A fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between heated oxygen sensor 2 (rear) harness connector terminal 3 and ECM terminal 3. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

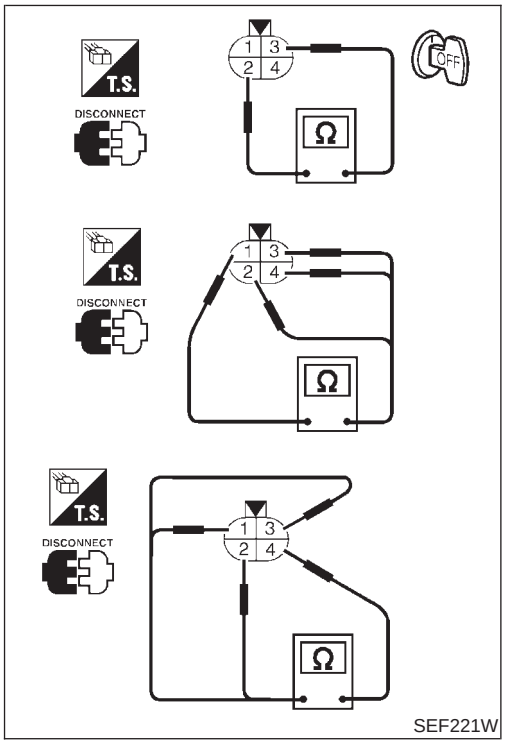
OK	▶	GO TO 5.
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the harness for open or short between heated oxygen sensor 2 heater (rear) and ECM.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK HEATED OXYGEN SENSOR 2 HEATER (REAR)
Refer to "Component Inspection", EC-268.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace heated oxygen sensor 2 (rear).

6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



Component Inspection

NLEC0187

HEATED OXYGEN SENSOR 2 HEATER (REAR)

NLEC0187S01

Check the following.

1. Check resistance between terminals 1 and 4.
   Resistance: 2.3 - 4.3Ω at 25°C (77°F)
2. Check continuity.

Terminal No.	Continuity
1 and 2, 3, 4	No
4 and 1, 2, 3	

If NG, replace the heated oxygen sensor 2 (rear).

CAUTION:

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

On Board Diagnosis Logic

NLEC0188

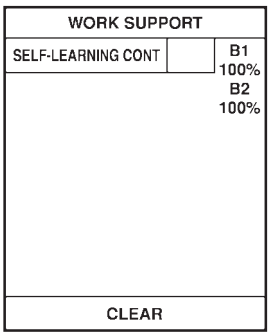
With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1 (front). The ECM calculates the necessary compensation to correct the offset between the actual 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 lights up the MIL (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 & mixture ratio control	Injectors

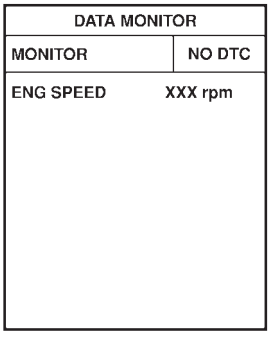
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0171 0171	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Heated oxygen sensor 1 (front) ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor

4

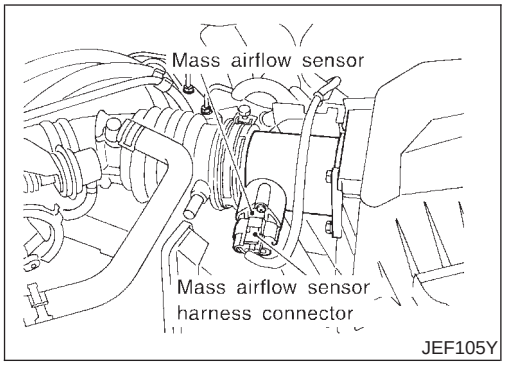


SEF652Y

6



SEF058Y



JEF105Y

DTC Confirmation Procedure

NLEC0189

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 9 seconds.
3) Turn ignition switch “ON” and select “SELF-LEARN CONTROL” in “WORK SUPPORT” mode with CONSULT-II.
4) Clear the self-learning control coefficient by touching “START”.
5) Select “DATA MONITOR” mode with CONSULT-II.
6) Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-273.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
8) Crank engine while depressing accelerator pedal. If engine starts, go to “Diagnostic Procedure”, EC-273. If engine does not start, visually check for exhaust and intake air leak.

With GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 9 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 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.

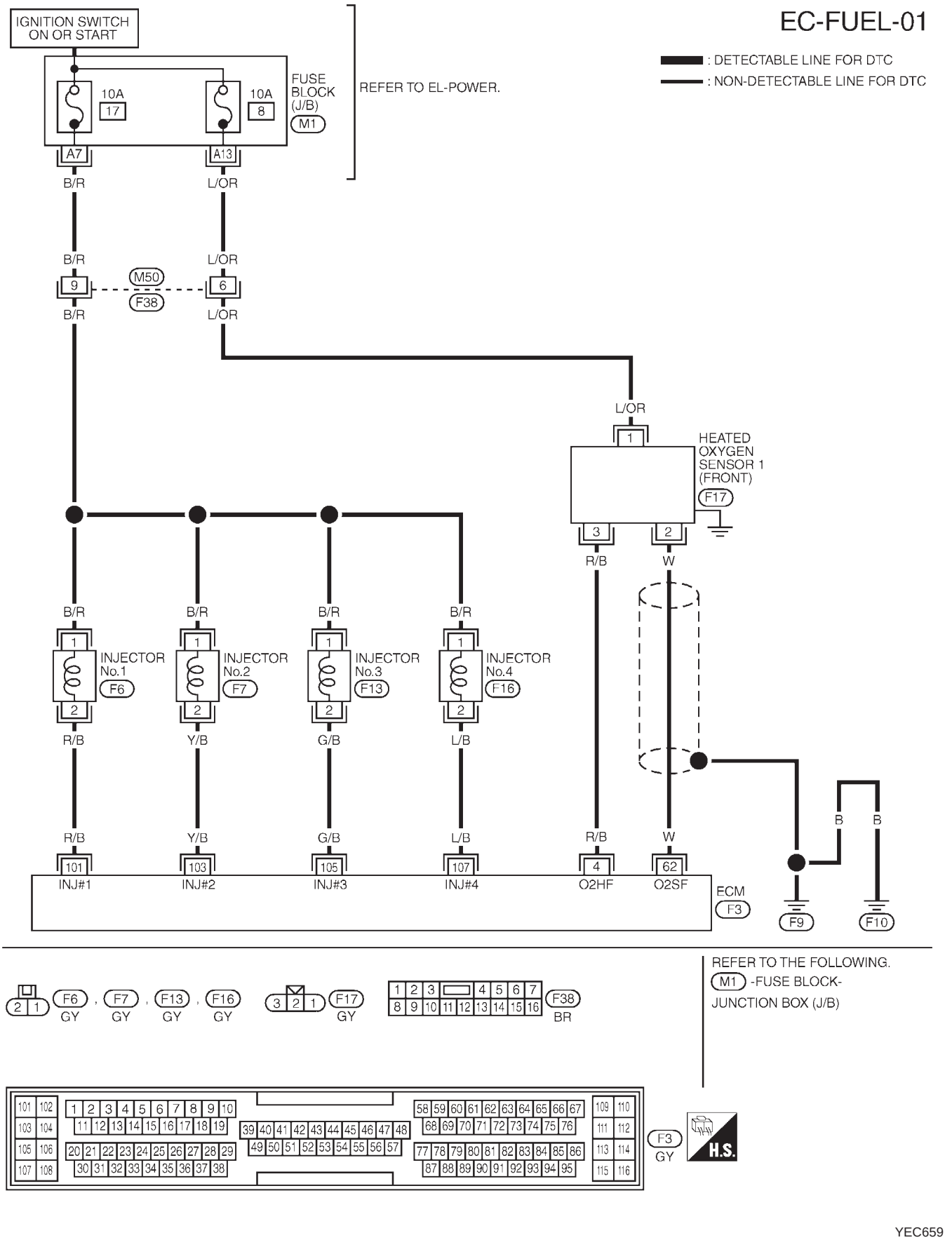
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select "MODE 7" with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-273.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
10) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-273. If engine does not start, visually check for exhaust and intake air leak.

Wiring Diagram

NLEC0190

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0190S03

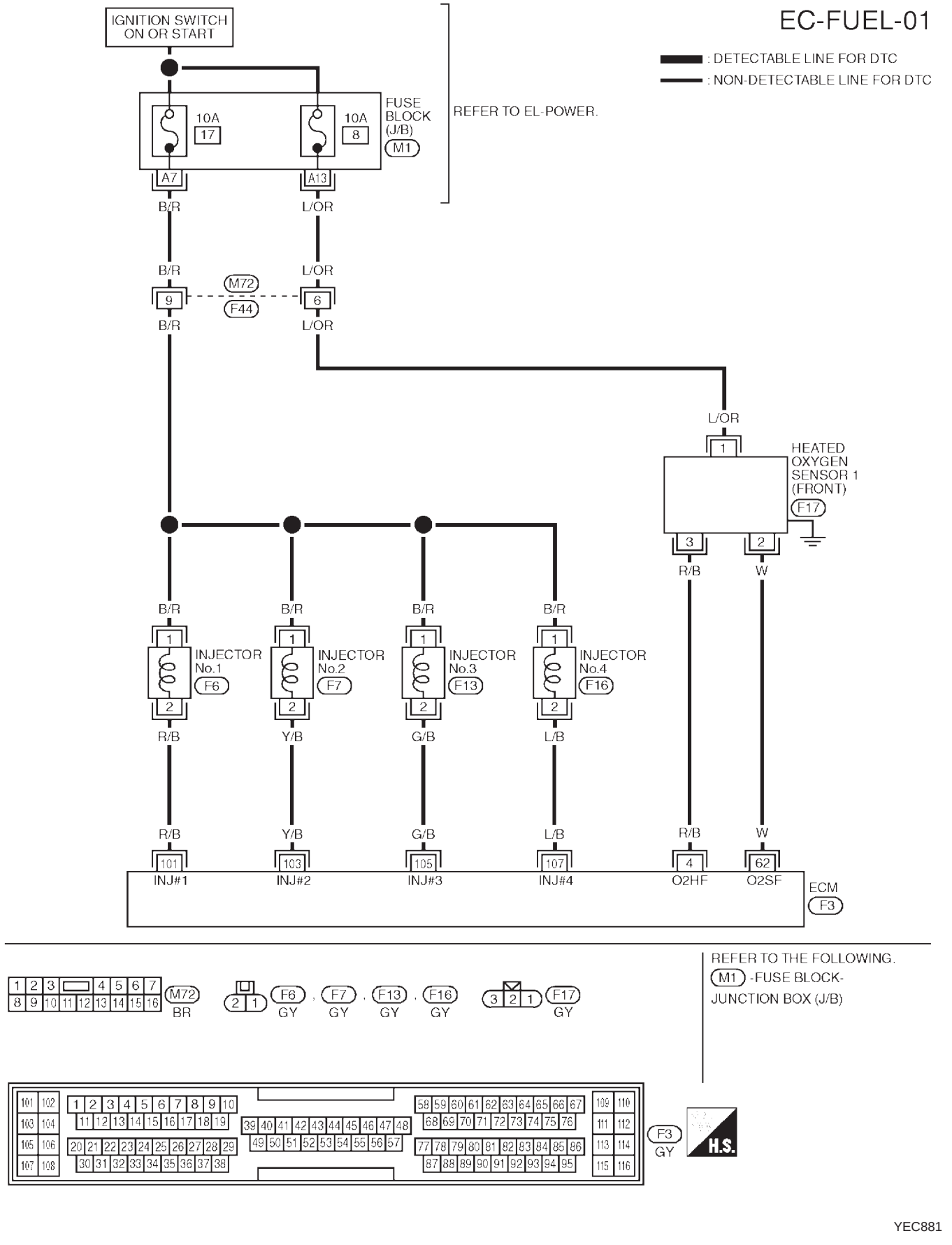


YEC659

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0190S04



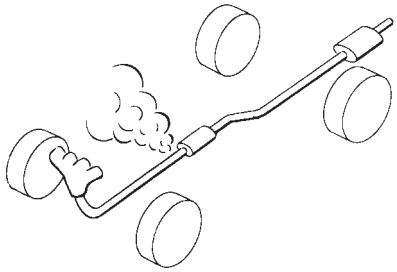
YEC881

Diagnostic Procedure

NLEC0191

1	CHECK EXHAUST AIR LEAK

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



SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK FOR INTAKE AIR LEAK

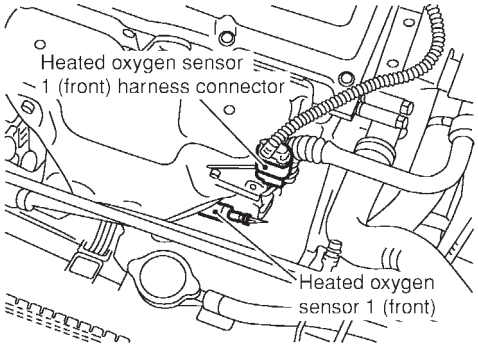
Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair or replace.

3	CHECK HEATED OXYGEN SENSOR 1 (FRONT) CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (front) harness connector and ECM harness connector.



SEF012XA

3. Check harness continuity between ECM terminal 62 and heated oxygen sensor 1 (front) harness connector terminal 2. Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 62 [or heated oxygen sensor 1 (front) harness connector terminal 2] and ground.
   Continuity should not exist.
5. Also check harness for short to ground and short to power.

OK or NG

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

Diagnostic Procedure (Cont'd)

4	CHECK FUEL PRESSURE	
1. Release fuel pressure to zero. Refer to EC-43. 2. Install fuel pressure gauge and check fuel pressure. **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-516.) ● Fuel pressure regulator (Refer to EC-44.) ● Fuel lines (Refer to "ENGINE MAINTENANCE" in MA section.) ● Fuel filter for clogging		
	▶	Repair or replace.

6	CHECK MASS AIR FLOW SENSOR	
With CONSULT-II Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II. **at idling: 1.0 - 4.0 g·m/sec** **at 2,500 rpm: 5.0 - 10.0 g·m/sec**		
With GST Check mass air flow sensor signal in MODE 1 with GST. **at idling: 1.0 - 4.0 g·m/sec** **at 2,500 rpm: 5.0 - 10.0 g·m/sec** **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-154.

7	CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Install all parts removed.
2. Start engine.
3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

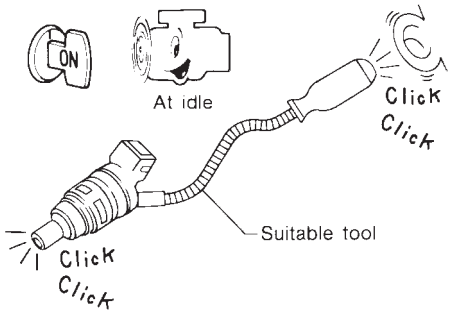
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

4. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-II

1. Install all parts removed.
2. Start engine.
3. 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-494.

8	REMOVE INJECTOR

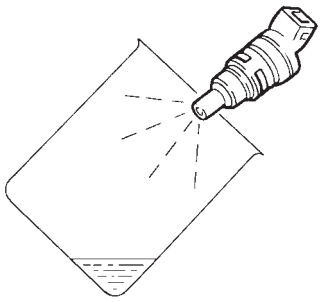
1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch "OFF".
3. Remove injector with fuel tube assembly. Refer to EC-44.
   Keep fuel hose and all injectors connected to injector gallery. The injector harness connectors should remain connected.

	▶	GO TO 9.

Diagnostic Procedure (Cont'd)

9	CHECK INJECTOR

1. Disconnect all ignition coil harness connectors.
2. Place pans or saucers under each injector.
3. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.



SEF595Q

Fuel should be sprayed evenly for each cylinder.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace injectors from which fuel does not spray out. Always replace O-ring with new one.

10	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NLEC0192

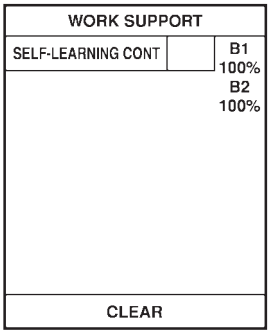
With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1 (front). The ECM calculates the necessary compensation to correct the offset between the actual 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 lights 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 & mixture ratio control	Injectors

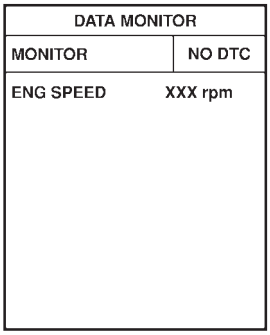
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0172 0172	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	• Heated oxygen sensor 1 (front) • Injectors • Exhaust gas leaks • Incorrect fuel pressure • Mass air flow sensor

4

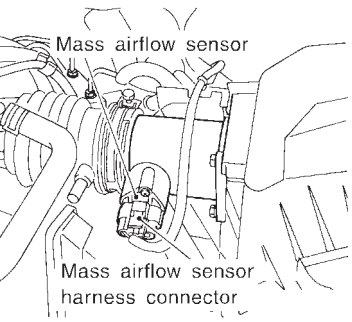


SEF652Y

6



SEF058Y



JEF105Y

DTC Confirmation Procedure

NLEC0193

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 9 seconds.
3) Turn ignition switch “ON” and select “SELF-LEARN CONTROL” in “WORK SUPPORT” mode with CONSULT-II.
4) Clear the self-learning control coefficient by touching “START”.
5) Select “DATA MONITOR” mode with CONSULT-II.
6) Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-281.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
8) Crank engine while depressing accelerator pedal. If engine starts, go to “Diagnostic Procedure”, EC-281. If engine does not start, remove ignition plugs and check for fouling, etc.

With GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 9 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 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.

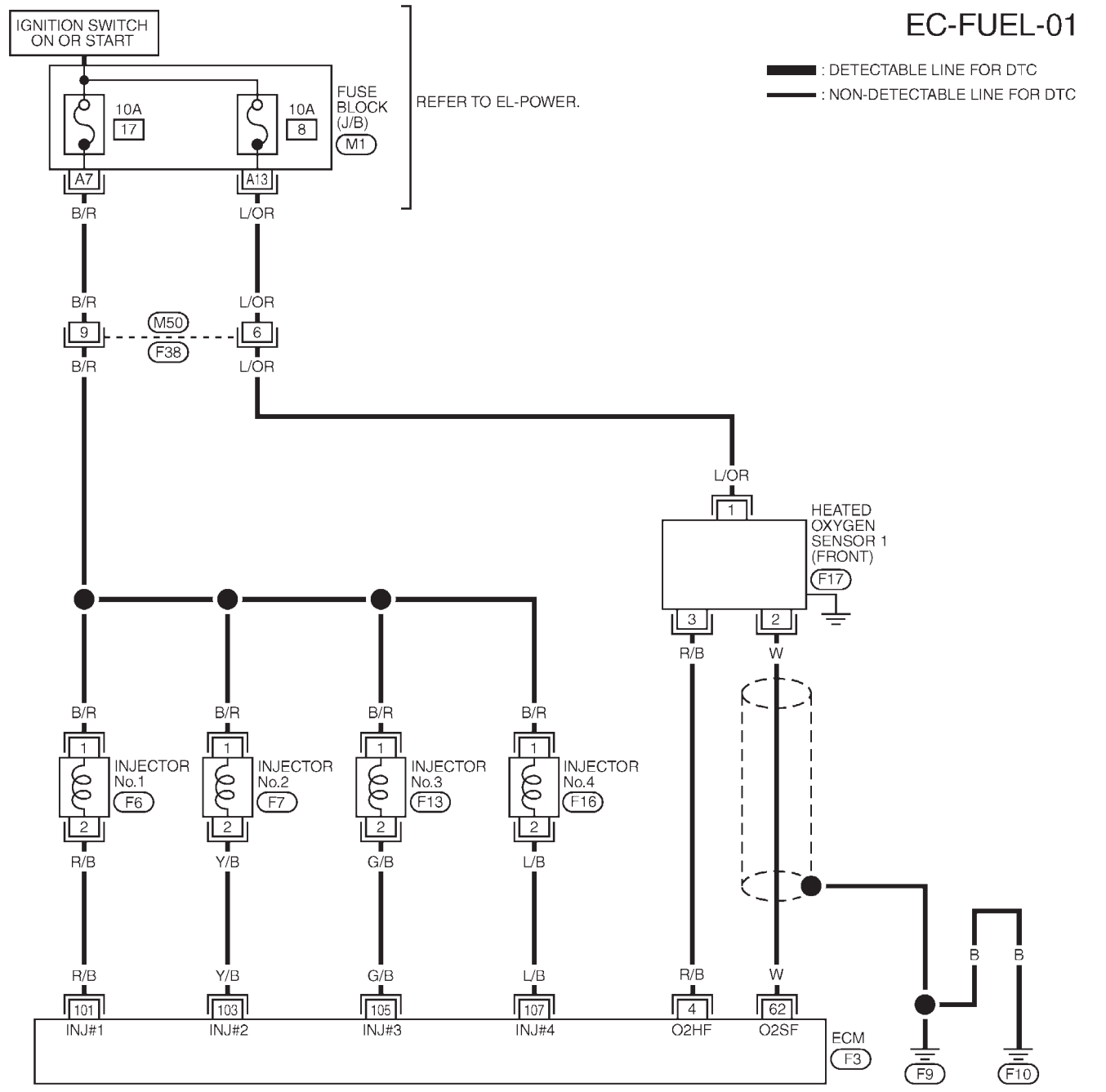
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select "MODE 7" with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-281.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
10) Crank engine while depressing accelerator pedal.
If engine starts, go to "Diagnostic Procedure", EC-281. If engine does not start, remove ignition plugs and check for fouling, etc.

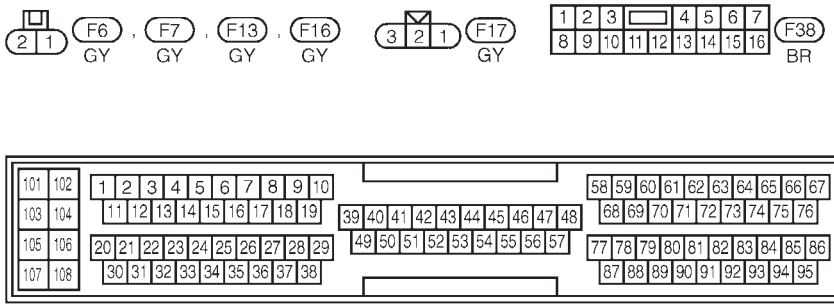
Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0194

NLEC0194S03



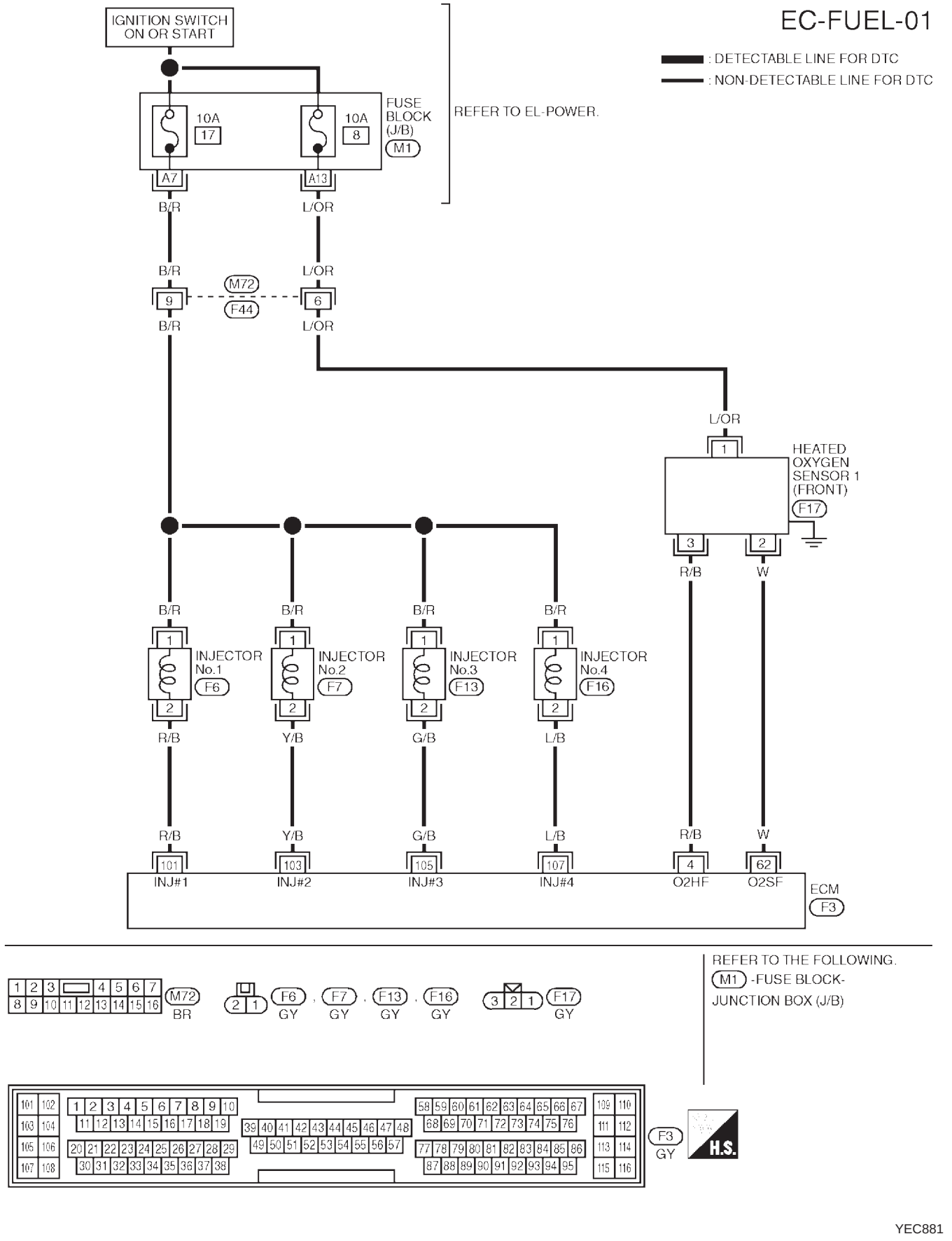


YEC659

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0194S04



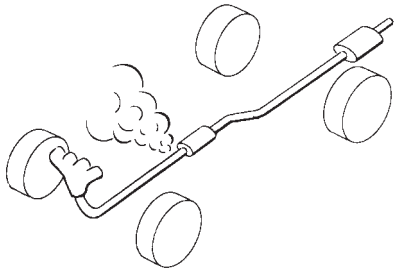
YEC881

Diagnostic Procedure

NLEC0195

1	CHECK FOR EXHAUST AIR LEAK

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



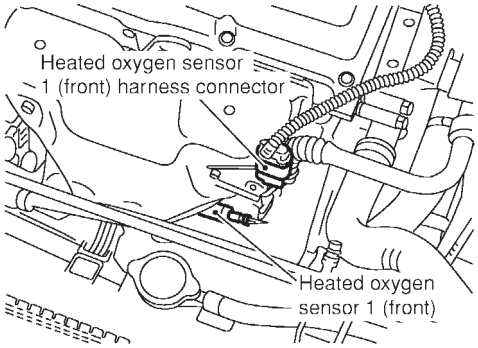
SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK HEATED OXYGEN SENSOR 1 (FRONT) CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (front) harness connector and ECM harness connector.



SEF012XA

3. Check harness continuity between ECM terminal 62 and heated oxygen sensor 1 (front) harness connector terminal 2. Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 62 [or heated oxygen sensor 1 (front) harness connector terminal 2] and ground.
   Continuity should not exist.
5. Also check harness for short to ground and short to power.

OK or NG

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

Diagnostic Procedure (Cont'd)

3	CHECK FUEL PRESSURE
1. Release fuel pressure to zero. Refer to EC-43. 2. Install fuel pressure gauge and check fuel pressure. **At idling:** **When fuel pressure regulator valve vacuum hose is connected.** **Approximately 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)** **When fuel pressure regulator valve vacuum hose is disconnected.** **Approximately 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)** **OK or NG**	
OK ▶	GO TO 5.
NG ▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the following. ● Fuel pump and circuit (Refer to EC-516.) ● Fuel pressure regulator (Refer to EC-44.)	
▶	Repair or replace.

5	CHECK MASS AIR FLOW SENSOR
With CONSULT-II Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II. **at idling: 1.0 - 4.0 g·m/sec** **at 2,500 rpm: 5.0 - 10.0 g·m/sec**	
With GST Check mass air flow sensor signal in MODE 1 with GST. **at idling: 1.0 - 4.0 g·m/sec** **at 2,500 rpm: 5.0 - 10.0 g·m/sec** **OK or NG**	
OK ▶	GO TO 6.
NG ▶	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-158.

6	CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Install all parts removed.
2. Start engine.
3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

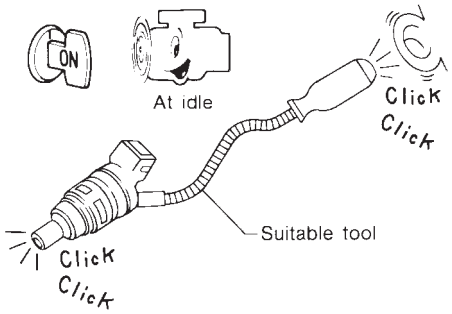
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

4. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-II

1. Install all parts removed.
2. Start engine.
3. Listen to each injector operating sound.



MEC703B

Clicking noise should be heard.

OK or NG

OK	▶	GO TO 7.
NG	▶	Perform trouble diagnosis for "INJECTORS", EC-495.

7	REMOVE INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch "OFF".
3. Remove injector assembly. Refer to EC-44.
   Keep fuel hose and all injectors connected to injector gallery.

	▶	GO TO 8.

8	CHECK INJECTOR

1. Disconnect all injector harness connectors.
2. Disconnect all ignition coil harness connectors.
3. Prepare pans or saucers under each injectors.
4. 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.

Diagnostic Procedure (Cont'd)

9	**CHECK INTERMITTENT INCIDENT**
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NLEC0202

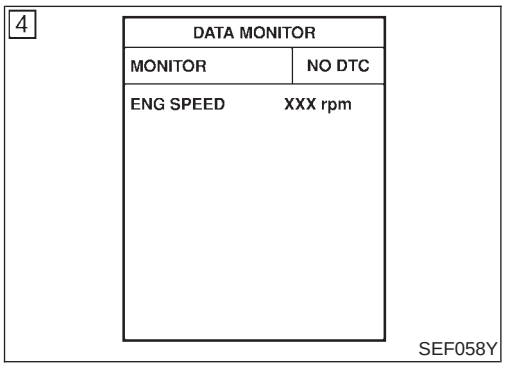
When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the CKP sensor signal to vary, the ECM can determine that a misfire is occurring.

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 signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MI will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will remain on.
   If another misfire condition occurs that can damage the TWC, the MI will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MI will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0300 0300	● Multiple cylinders misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● EGR volume control valve ● The injector circuit is open or shorted ● Injectors ● Intake air leak ● Insufficient ignition spark ● Lack of fuel ● Heated oxygen sensor 1 (front)
P0301 0301	● No. 1 cylinder misfires.	
P0302 0302	● No. 2 cylinder misfires.	
P0303 0303	● No. 3 cylinder misfires.	
P0304 0304	● No. 4 cylinder misfires.	



DTC Confirmation Procedure

NLEC0203

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 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch “ON”, and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and warm it up to normal operating temperature.

3) Turn ignition switch "OFF" and wait at least 9 seconds.
4) Start engine again and drive at 1,500 - 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-286.

With GST
Follow the procedure "With CONSULT-II" above.

Diagnostic Procedure

NLEC0204

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	
Stop engine and visually check exhaust tube, three way catalyst and muffler for dents. **OK or NG**		
OK	▶	GO TO 3.
NG	▶	Repair or replace it.

3	CHECK EGR FUNCTION	
Perform DTC Confirmation Procedure for DTC P1402 EGR FUNCTION (OPEN). Refer to EC-393. **OK or NG**		
OK	▶	GO TO 4.
NG	▶	Repair EGR system.

4	PERFORM POWER BALANCE TEST

With CONSULT-II

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.

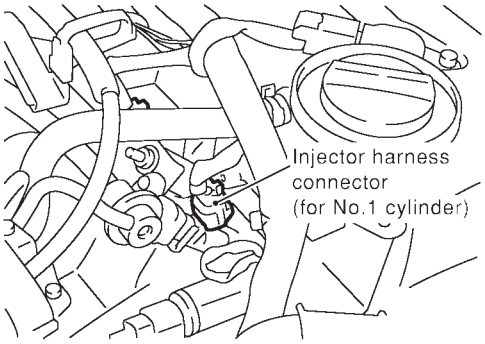
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

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?



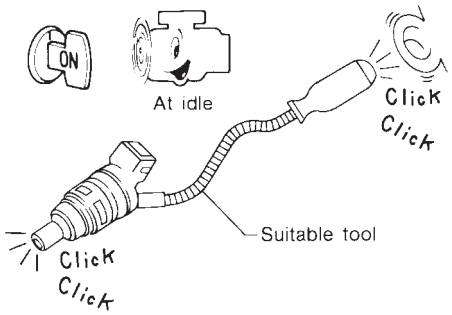
SEF604Y

Yes or No

Yes	▶	GO TO 5.
No	▶	GO TO 7.

5	CHECK INJECTOR

Does each injector make an operating sound at idle?



MEC703B

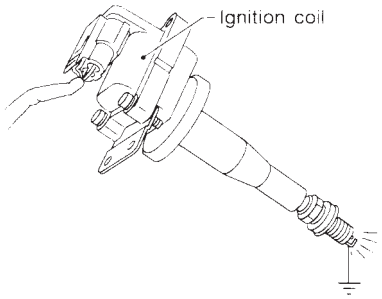
Yes or No

Yes	▶	GO TO 6.
No	▶	Check injector(s) and circuit(s). Refer to EC-495.

Diagnostic Procedure (Cont'd)

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.



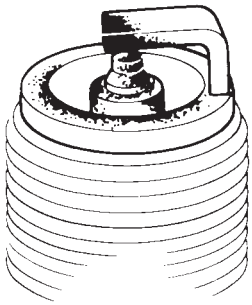
SEF575Q

OK or NG

OK	▶	GO TO 7.
NG	▶	Check ignition coil, power transistor and their circuits. Refer to EC-500.

7	CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.



SEF156I

OK or NG

OK	▶	GO TO 8.
NG	▶	Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-19, "Checking and changing".

8	CHECK COMPRESSION PRESSURE

Refer to EM section.

- Check compression pressure.

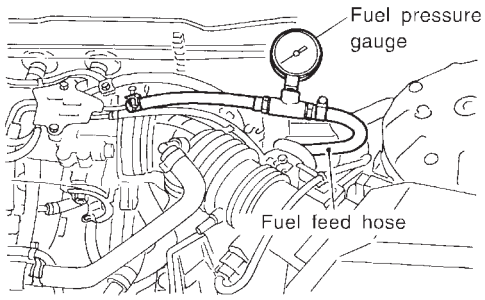
Standard:
1,324 kPa (13.24 bar, 13.5 kg/cm^2, 192 psi)/350 rpm
Minimum:
1,128 kPa (11.28 bar, 11.5 kg/cm^2, 164 psi)/350 rpm
Difference between each cylinder:
98 kPa (0.98 bar, 1.0 kg/cm^2, 14 psi)/350 rpm

OK or NG

OK	▶	GO TO 9.
NG	▶	Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

9	CHECK FUEL PRESSURE

1. Install any parts removed.
2. Release fuel pressure to zero. Refer to EC-43.
3. Install fuel pressure gauge and check fuel pressure.



JEF087Y

At idle: Approx. 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART

Check the following.
- Fuel pump and circuit (Refer to EC-516.)
- Fuel pressure regulator (Refer to EC-44.)
- Fuel lines
- Fuel filter for clogging

	▶	Repair or replace.

11	CHECK IGNITION TIMING

Perform "Basic Inspection".
Refer to EC-99.

OK or NG

OK	▶	GO TO 12.
NG	▶	1. Perform "Idle Air Volume Learning". Refer to EC-57. 2. Check camshaft position sensor (PHASE) (EC-302) and crankshaft position sensor (POS) (EC-295).

12	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Refer to "Component Inspection", EC-190.

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace heated oxygen sensor 1 (front).

Diagnostic Procedure (Cont'd)

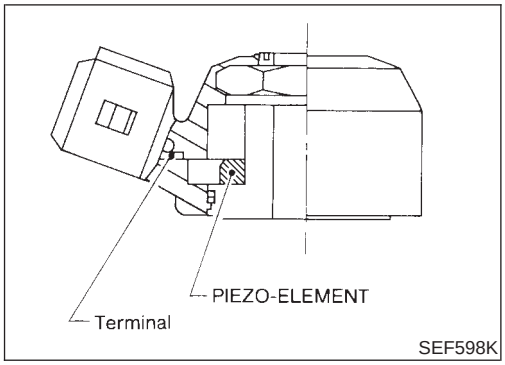
13	CHECK MASS AIR FLOW SENSOR
With CONSULT-II Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II. **at idling: 1.0 - 4.0 g·m/sec** **at 2,500 rpm: 5.0 - 10.0 g·m/sec**	
With GST Check mass air flow sensor signal in MODE 1 with GST. **at idling: 1.0 - 4.0 g·m/sec** **at 2,500 rpm: 5.0 - 10.0 g·m/sec**	
OK or NG	
OK ▶	GO TO 15.
NG ▶	GO TO 14.

14	CHECK CONNECTORS
Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-154.	
OK or NG	
NG ▶	Repair or replace it.

15	CHECK SYMPTOM MATRIX CHART
Check items on the rough idle symptom in "Symptom Matrix Chart", EC-124.	
OK or NG	
OK ▶	GO TO 16.
NG ▶	Repair or replace.

16	ERASE THE 1ST TRIP DTC
Some tests may cause a 1st trip DTC to be set. Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-69.	
▶	GO TO 17.

17	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



Component Description

NLEC0206

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.

ECM Terminals and Reference Value

NLEC0207

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

CAUTION:

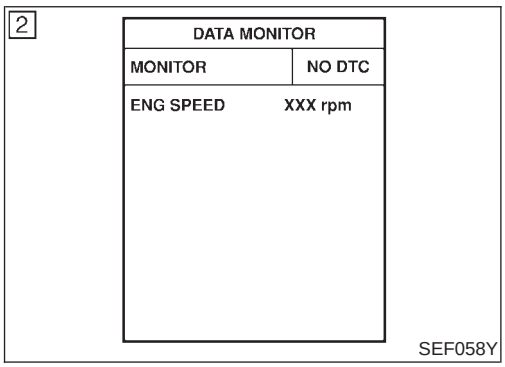
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
81	W	Knock sensor	**[Engine is running]** ● Idle speed	1.0 - 4.0V

On Board Diagnosis Logic

NLEC0208

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0325 0325	● An excessively low or high voltage from the knock sensor is sent to ECM.	● Harness or connectors (The knock sensor circuit is open or shorted.) ● Knock sensor



DTC Confirmation Procedure

NLEC0209

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine and run it for at least 5 seconds at idle speed.
3) If DTC is detected, go to "Diagnostic Procedure", EC-293.

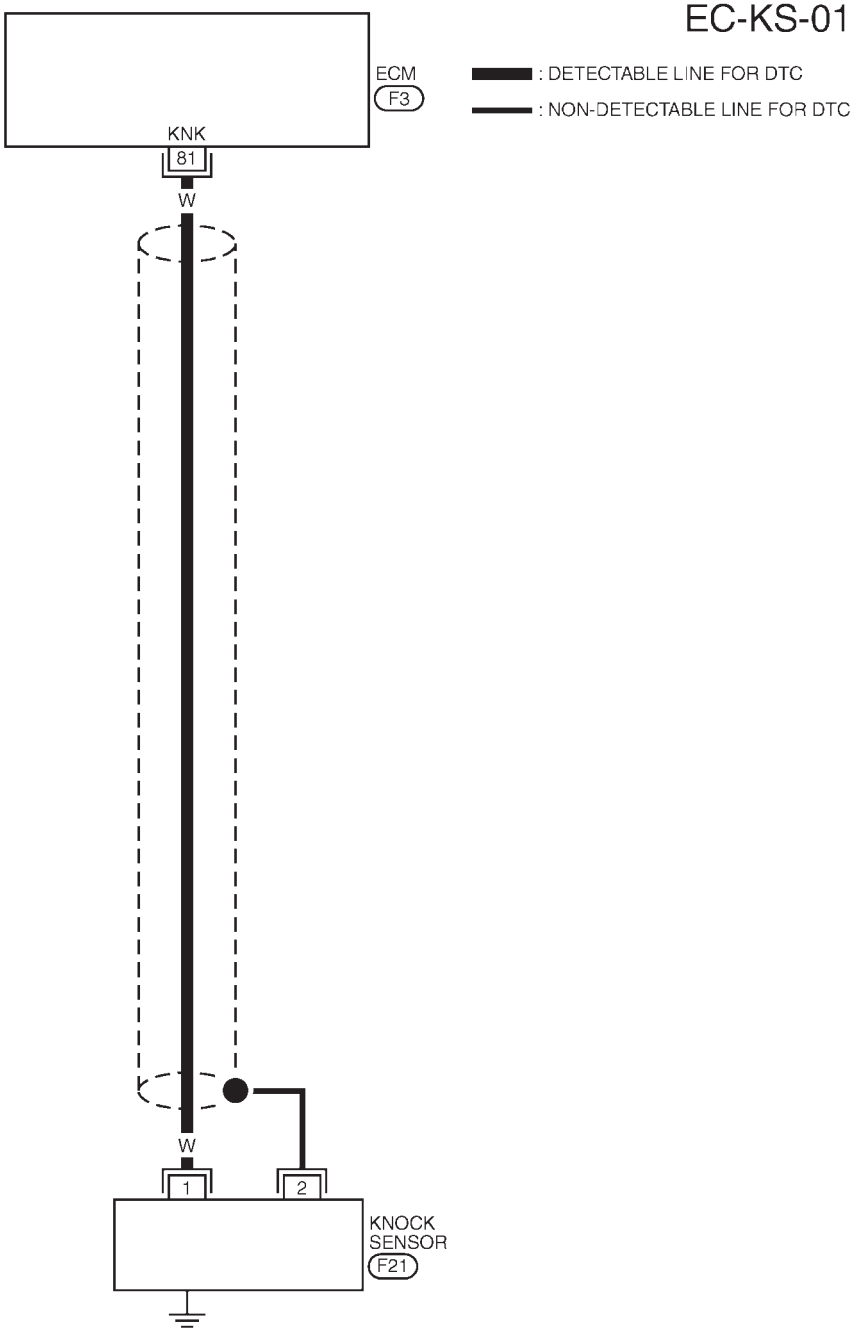
With GST

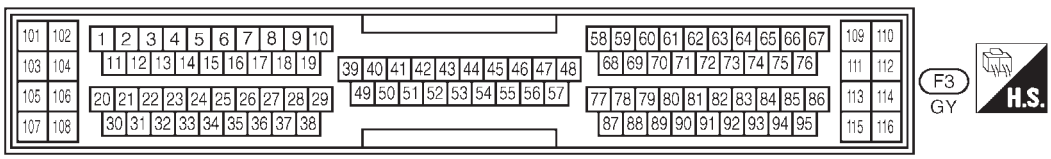
Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NLEC0210

EC-KS-01





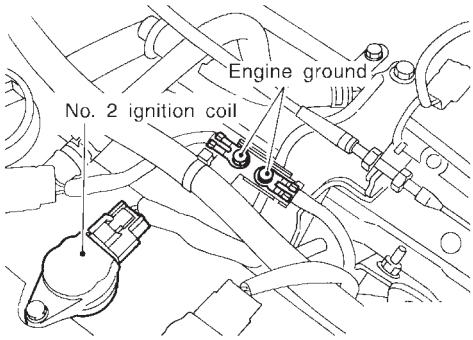
YEC657

Diagnostic Procedure

NLEC0211

1	RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.



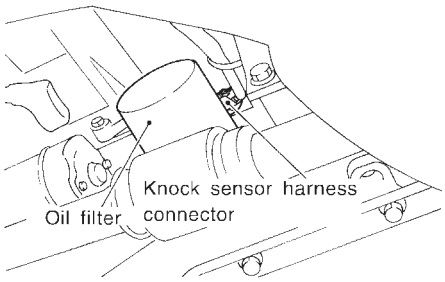
JEF104Y

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT-1

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and knock sensor harness connector.

View under the engine room



JEF110Y

3. Check harness continuity between knock sensor signal terminal 1 and ECM terminal 81. 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 harness for open or short between knock sensor and ECM.

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

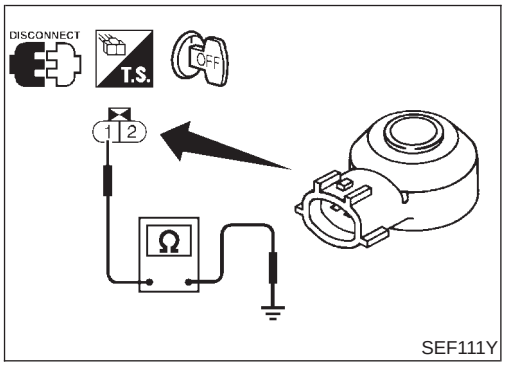
4	CHECK KNOCK SENSOR

Refer to “Component Inspection”, EC-294.

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace knock sensor.

5	**CHECK INTERMITTENT INCIDENT**
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF111Y

Component Inspection

NLEC0212

KNOCK SENSOR

NLEC0212S01

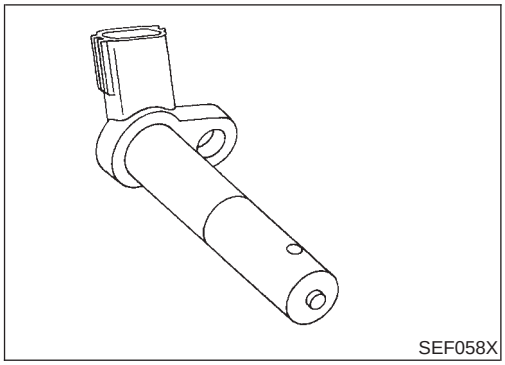
- Use an ohmmeter which can measure more than 10 MΩ.

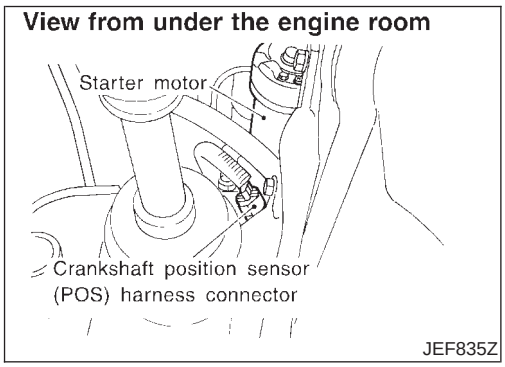
1. Disconnect knock sensor harness connector.
2. Check resistance between terminal 1 and ground.

Resistance: 500 - 620 kΩ [at 25°C (77°F)]

CAUTION:

Discard any knock sensors that have been dropped or physically damaged. Use only new ones.


SEF058X



JEF835Z

Component Description

NLEC0551

The crankshaft position sensor (POS) is located on the right-rear wall of the cylinder block in relation to the signal plate at the rear end of the crankshaft.
The sensor consists of a permanent magnet, and hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

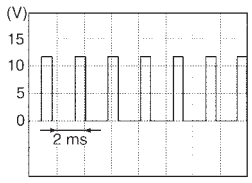
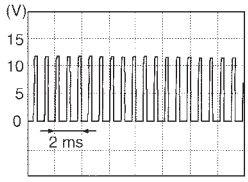
ECM Terminals and Reference Value

NLEC0552

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

CAUTION:

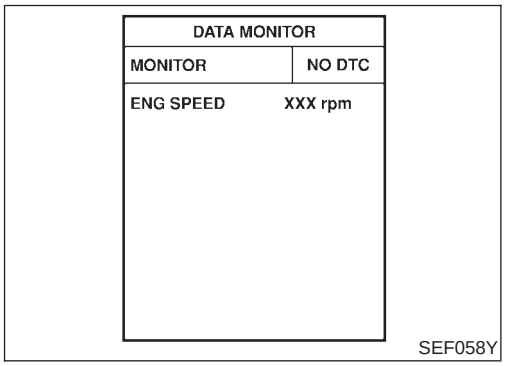
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (AC Voltage)
85	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	3 - 4V  SEF979W
			[Engine is running] ● Engine speed is 2,000 rpm	3 - 4V  SEF980W

On Board Diagnosis Logic

NLEC0553

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0335 0802	● The 10° signal is not entered to ECM for the first few seconds during engine cranking. ● The 10° signal is not entered to ECM during engine running. ● The 10° signal is not in the normal pattern at each engine revolution.	● 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

NLEC0554

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 2 seconds at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-299.

With GST

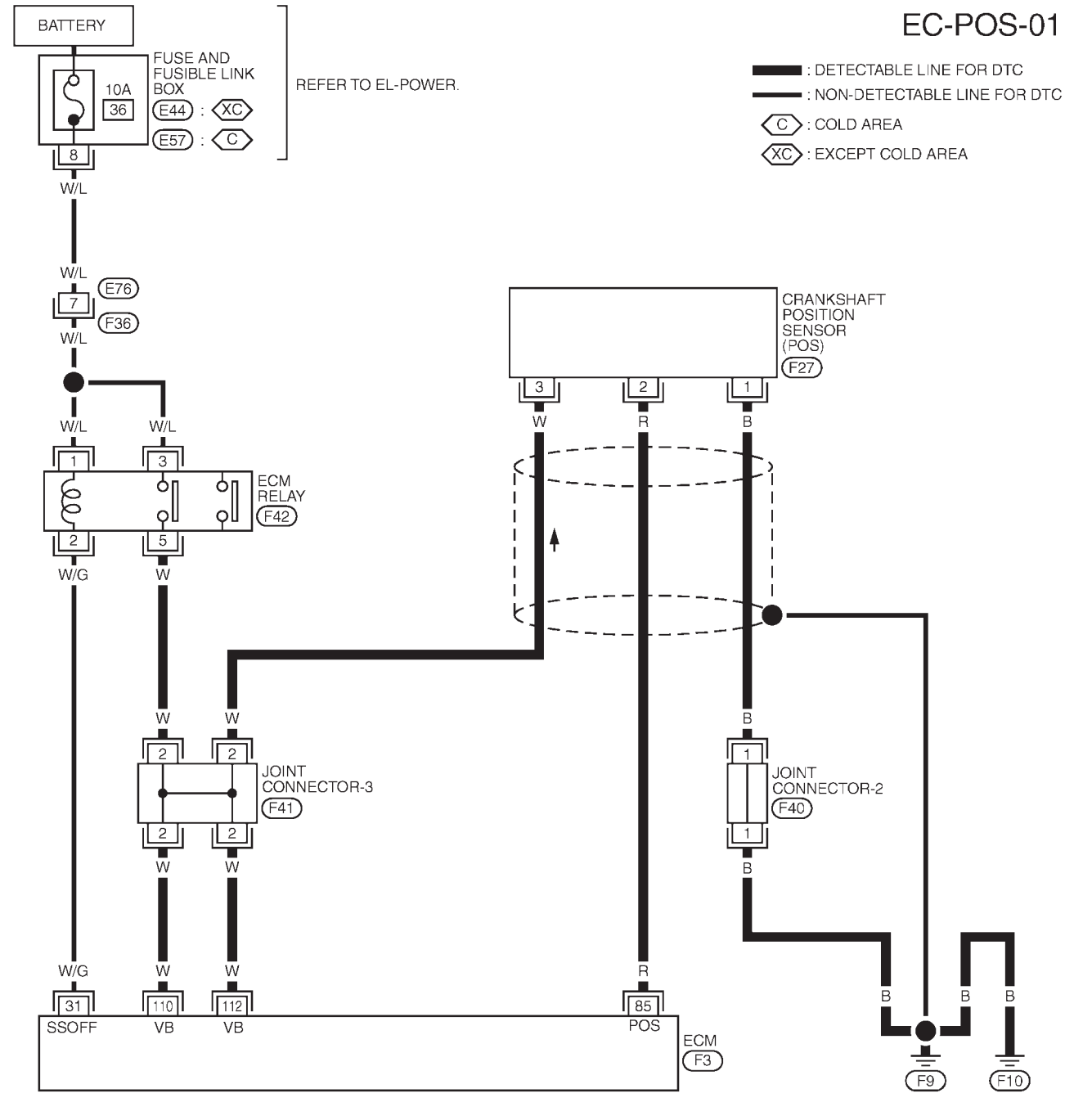
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

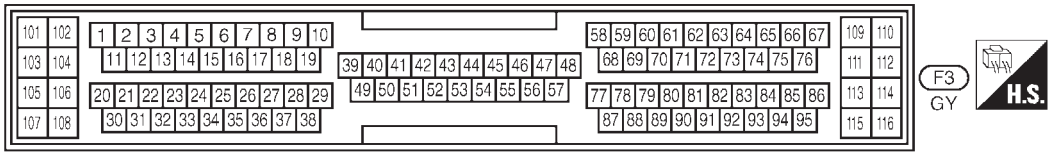
NLEC0555

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0555S01



REFER TO THE FOLLOWING.
E44 , E57 -FUSE AND FUSIBLE LINK BOX

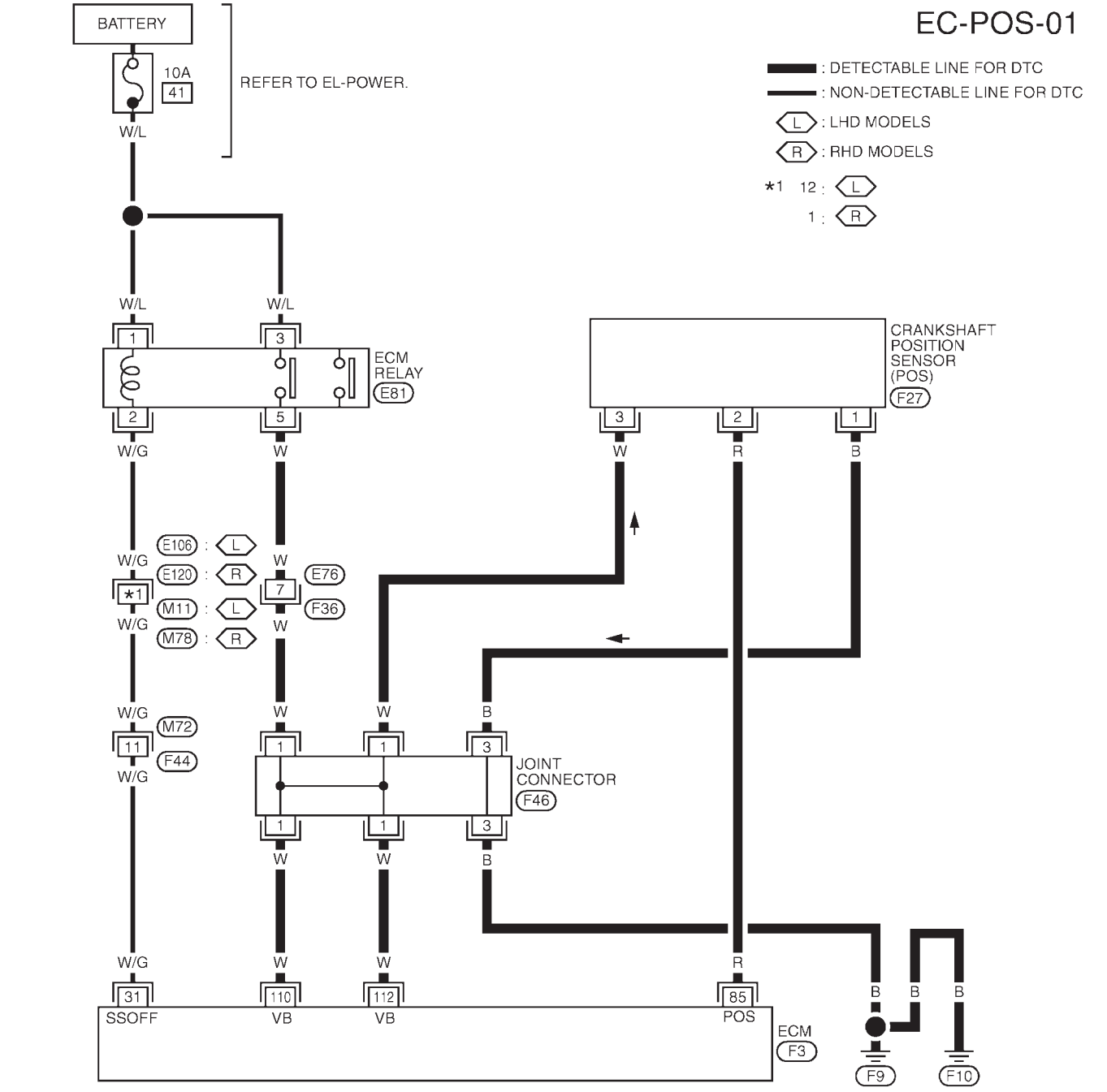


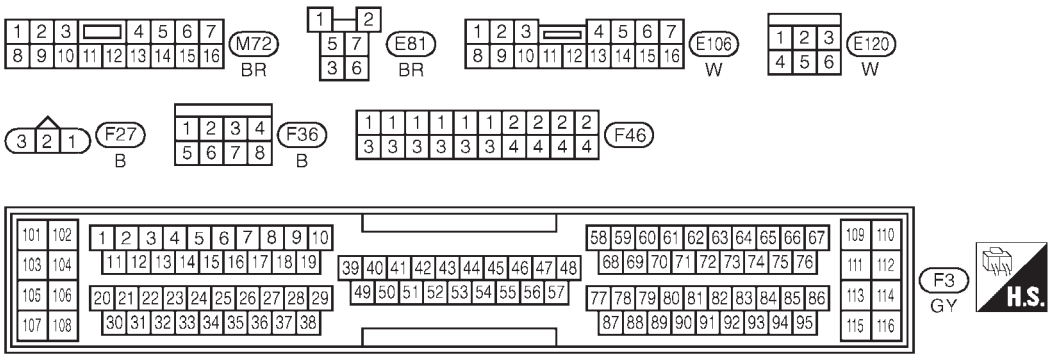
YEC662

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0555S02





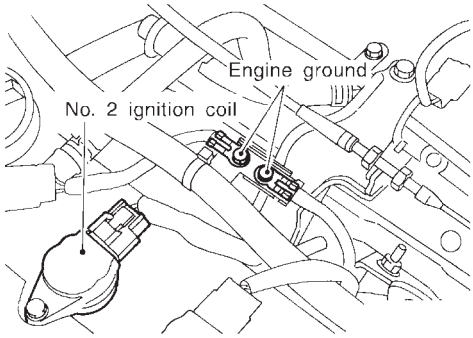
YEC882

Diagnostic Procedure

NLEC0556

1	RETIGHTEN GROUND SCREWS

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



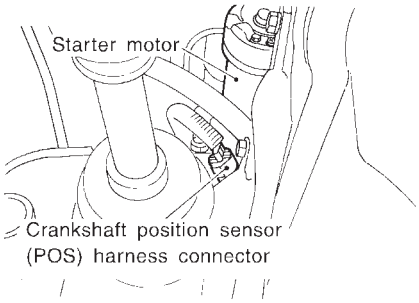
JEF104Y

▶	GO TO 2.

2	CHECK POWER SUPPLY

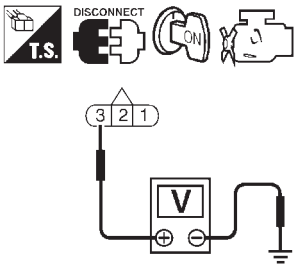
1. Disconnect crankshaft position sensor harness connector.

View from under the engine room



JEF835Z

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



Voltage: Battery voltage

SEF113Y

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	DETECT MALFUNCTIONING PART

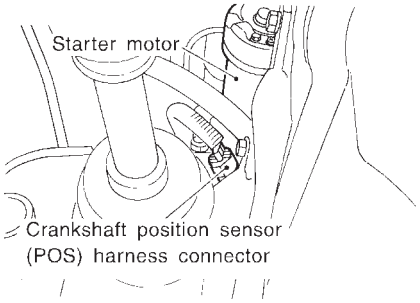
Check the following.
- Joint connector-3 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- Harness connectors E76, F36 (where fitted)
- Harness for open or short between joint connector and ECM relay
- Harness for open or short between crankshaft position sensor and joint connector
- Harness for open or short between joint connector and ECM
- ECM relay

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

4	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect crankshaft position sensor and ECM harness connectors.

View from under the engine room



JEF835Z

2. Check continuity between ECM terminal 85 and crankshaft position sensor harness connector 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 or short to ground or short to power in harness or connectors.

5	CHECK GROUND CIRCUIT

1. Reconnect ECM harness connector.
2. Check harness continuity between 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 7.
NG	▶	GO TO 6.

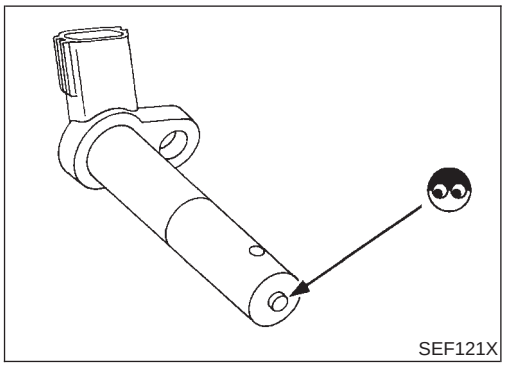
6	DETECT MALFUNCTIONING PART

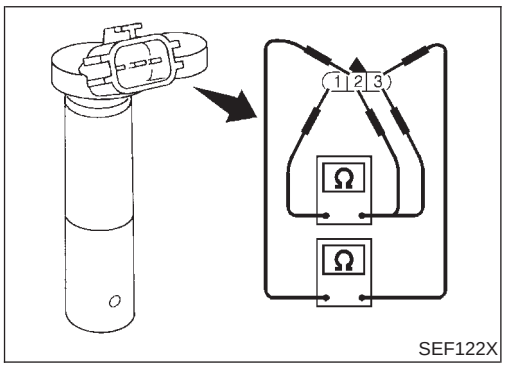
Check the following.
- Joint connector-2 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open between crankshaft position sensor harness connector terminal 1 and engine ground.

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

7	CHECK CRANKSHAFT POSITION SENSOR	
Refer to "Component Inspection", EC-301.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	Replace crankshaft position sensor.

8	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**


SEF121X



SEF122X

Component Inspection

CRANKSHAFT POSITION SENSOR (POS)

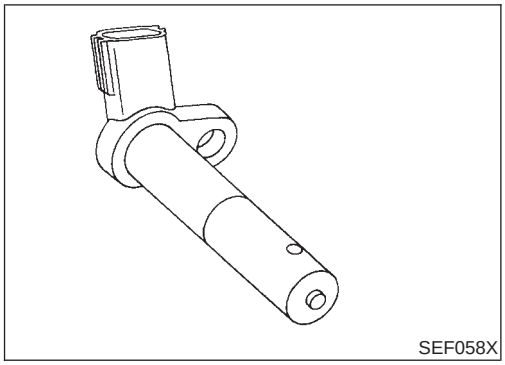
NLEC0557

NLEC0557S01

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.
5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (–)	Except 0 or ∞
2 (+) - 1 (–)	
3 (+) - 2 (–)	

If NG, replace crankshaft position sensor.


SEF058X

Component Description

NLEC0220

The camshaft position sensor (PHASE) senses the protrusion provided with exhaust valve cam sprocket to identify a particular cylinder. The crankshaft position sensor senses the piston position.
The sensor consists of a permanent magnet and hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the cylinder number signal.

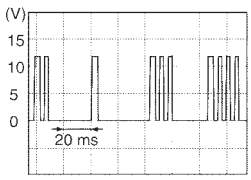
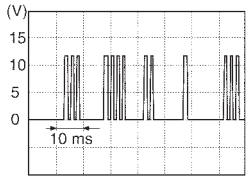
ECM Terminals and Reference Value

NLEC0221

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)
66 75	R R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	3 - 4V  SEF977W
			[Engine is running] ● Engine speed is 2,000 rpm	3 - 4V  SEF978W

On Board Diagnosis Logic

NLEC0222

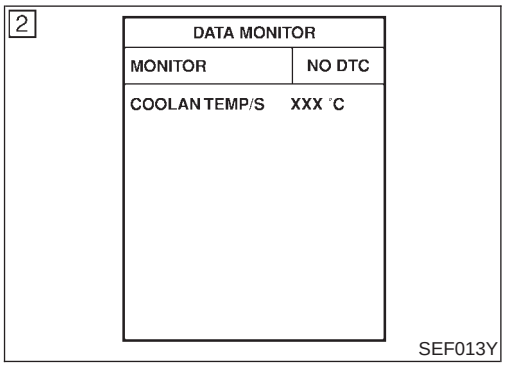
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0340 0340	● The cylinder No. signal is not entered to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not entered to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The camshaft position sensor (PHASE) circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.)

DTC Confirmation Procedure

NLEC0223

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 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

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

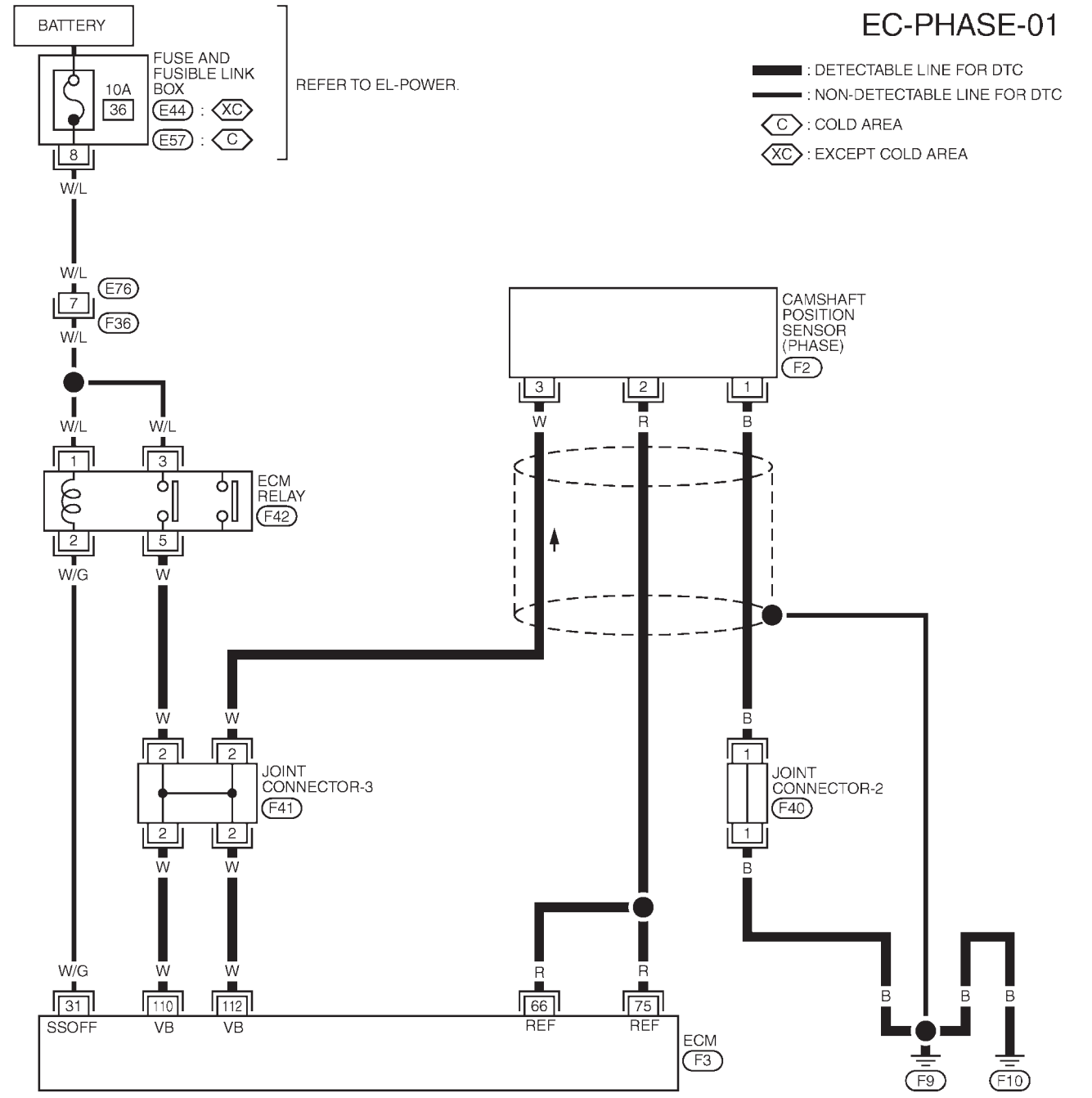
Follow the procedure “With CONSULT-II” above.

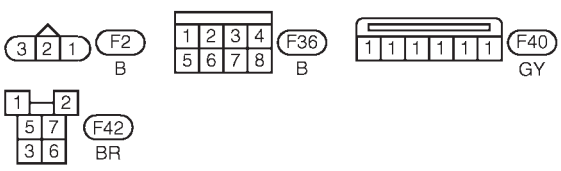
Wiring Diagram

NLEC0224

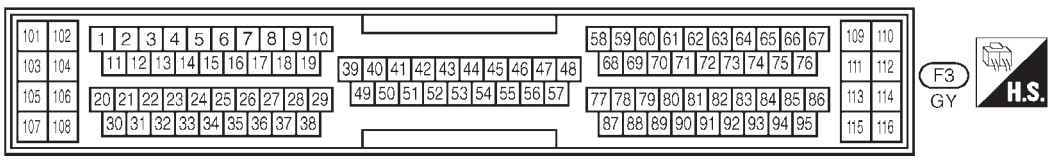
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0224S01





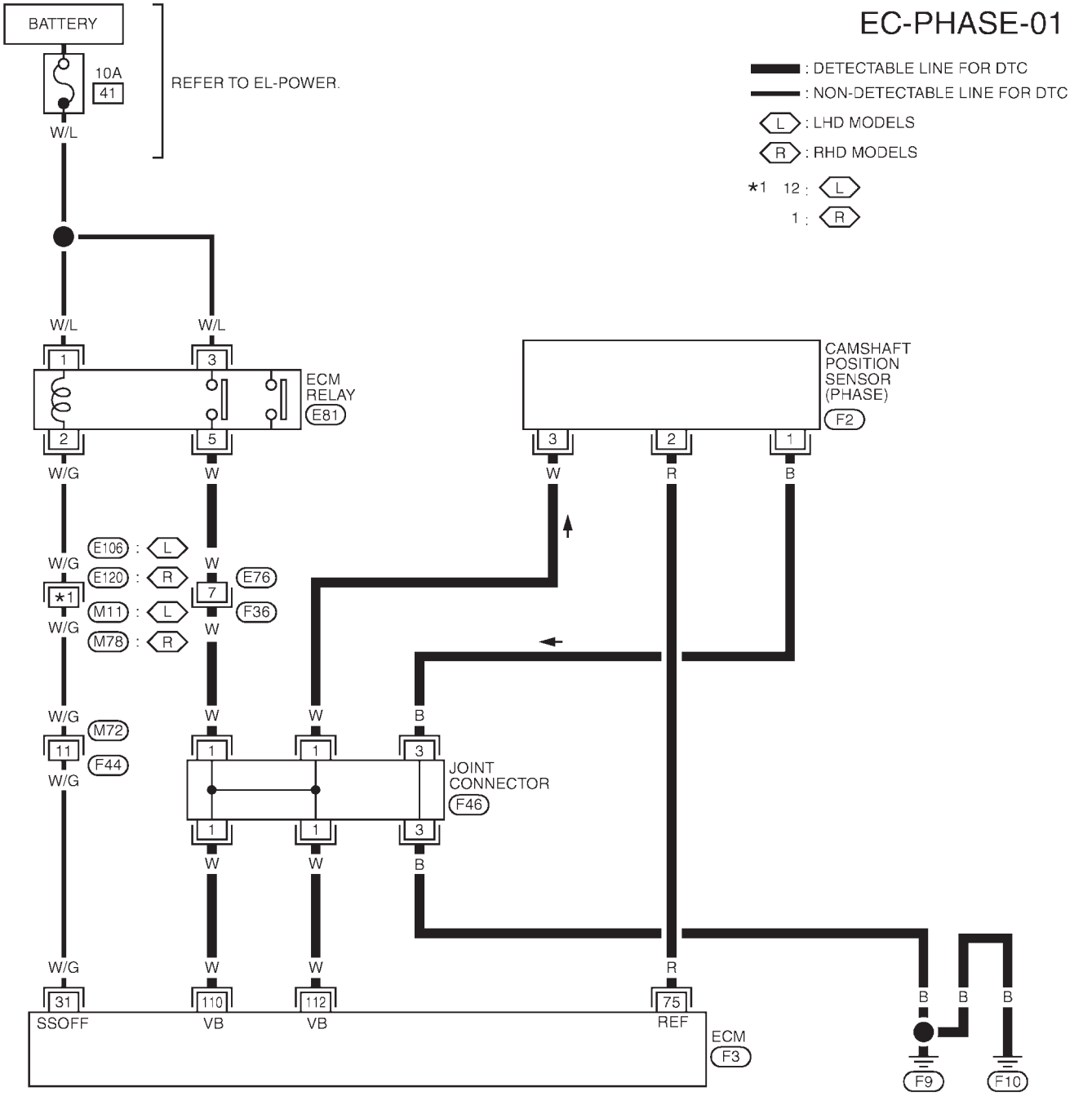
REFER TO THE FOLLOWING.
E44 , E57 -FUSE AND FUSIBLE LINK BOX

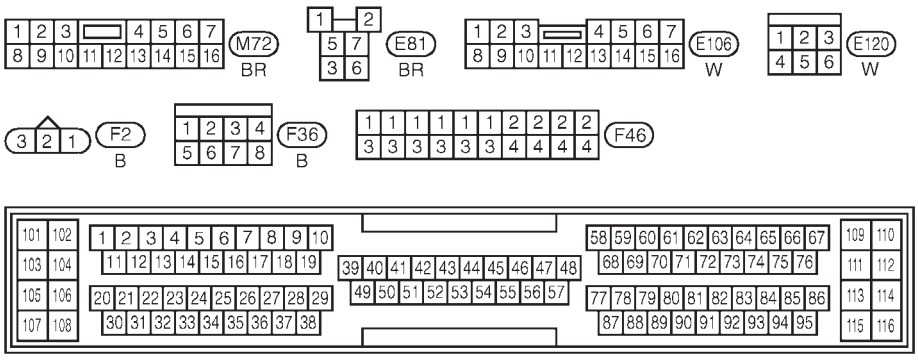


YEC663

MODELS WITH ECM IN CABIN

NLEC0224S02



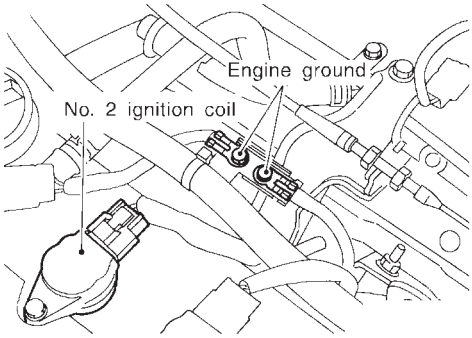


YEC883

Diagnostic Procedure

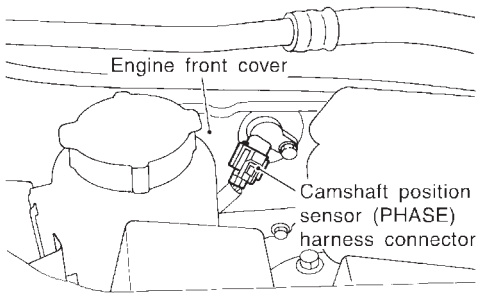
NLEC0225

1	CHECK STARTING SYSTEM	
Does the engine turn over? (Does the starter motor operate?)		
	Yes or No	
Yes	▶	GO TO 2.
No	▶	Check starting system. (Refer to EL section.)

2	RETIGHTEN GROUND SCREWS	
1. Turn ignition switch “OFF”. 2. Loosen and retighten engine ground screws.		
 JEF104Y		
	▶	GO TO 3.

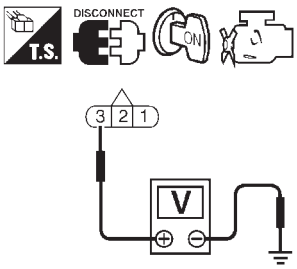
3	CHECK POWER SUPPLY

1. Disconnect camshaft position sensor harness connector.



JEF114Y

2. Turn ignition switch "ON".
3. Check voltage between terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF113Y

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- Harness connectors E76, F36 (where fitted)
- Harness for open or short between joint connector and ECM relay
- Harness for open or short between camshaft position sensor and joint connector
- Harness for open or short between joint connector and ECM

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

5	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between sensor terminal 2 and ECM terminal 75.
   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.

Diagnostic Procedure (Cont'd)

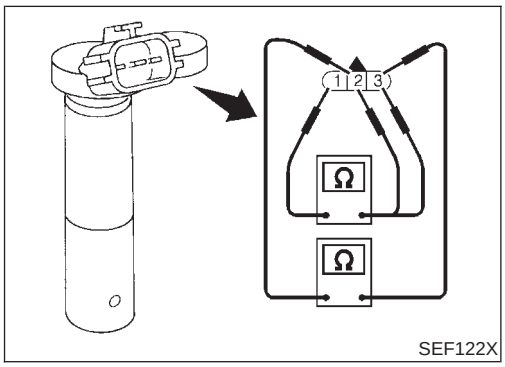
6	DETECT MALFUNCTIONING PART
Check the harness for open or short between ECM and camshaft position sensor.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK GROUND CIRCUIT
1. Turn ignition switch "OFF". 2. Check harness continuity between 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 9.
NG ▶	GO TO 8.

8	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-2 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open between camshaft position sensor (PHASE) and ground.	
▶	Repair open circuit or short to power in harness connectors.

9	CHECK CAMSHAFT POSITION SENSOR
Refer to "Component Inspection", EC-308.	
OK or NG	
OK ▶	GO TO 10.
NG ▶	Replace camshaft position sensor.

10	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF122X

Component Inspection

NLEC0226

CAMSHAFT POSITION SENSOR

NLEC0226S01

1. Disconnect camshaft position sensor (PHASE) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (–)	Except 0 or ∞
2 (+) - 1 (–)	
3 (+) - 2 (–)	

If NG, replace camshaft position sensor.

Description

NLEC0227

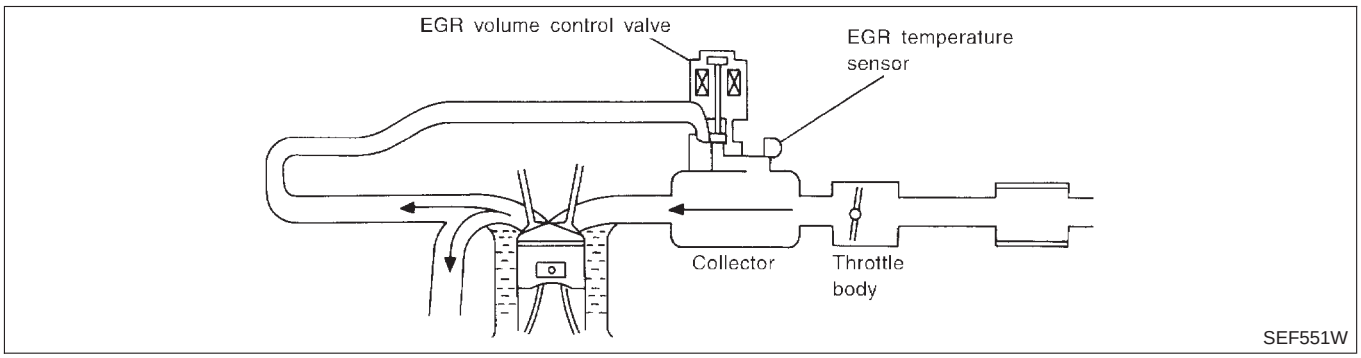
SYSTEM DESCRIPTION

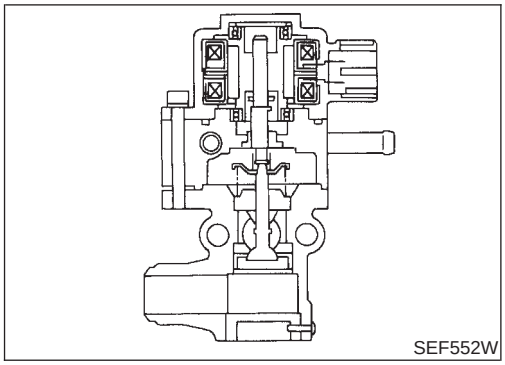
NLEC0227S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	EGR volume control	EGR volume control valve
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
PNP switch	Park/Neutral position signal		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Extremely light load engine operation
- Engine idling
- Excessively high engine coolant temperature
- Wide open throttle
- Mass air flow sensor malfunction
- Low battery voltage




SEF552W

COMPONENT DESCRIPTION

NLEC0227S02

EGR Volume Control Valve

NLEC0227S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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

NLEC0502

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

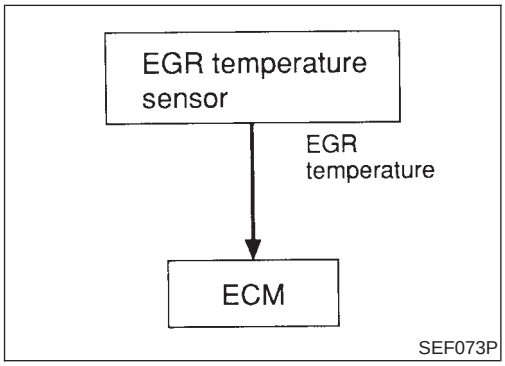
NLEC0503

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)
8 9 17 18	SB W/B R/Y BR/R	EGR volume control valve	**[Engine is running]** ● Idle speed	0 - 14V
58	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0V
72	P/B	EGR temperature sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Less than 4.5V
			[Engine is running] ● **Warm-up condition** ● EGR system is operating.	0 - 1V



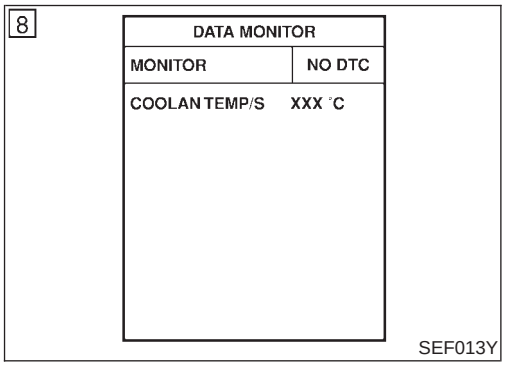
SEF073P

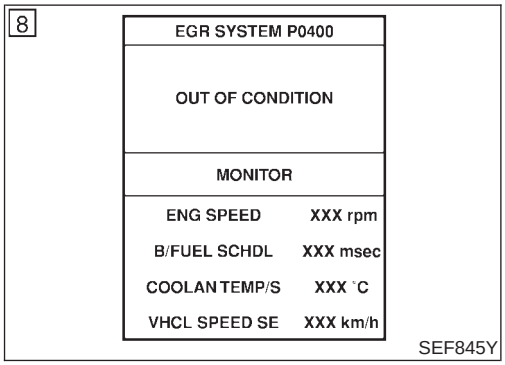
On Board Diagnosis Logic

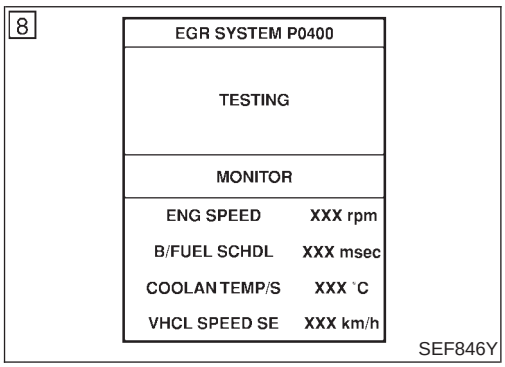
NLEC0228

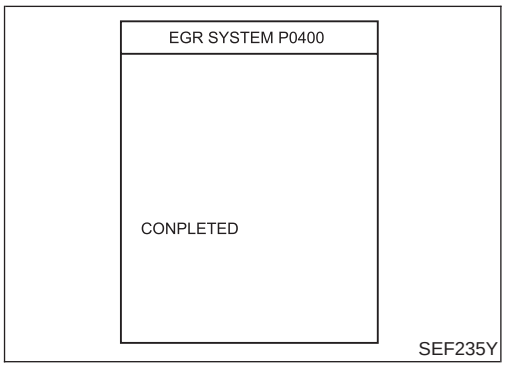
If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400 0400	● No EGR flow is detected under conditions that call for EGR.	● Harness or connectors (EGR volume control valve circuit is open or shorted.) ● EGR volume control valve stuck closed ● Dead (Weak) battery ● EGR passage clogged ● EGR temperature sensor and circuit ● Exhaust gas leaks









DTC Confirmation Procedure

NLEC0229

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 9 seconds before conducting the next test.
- P0400 will not be displayed at "SELF-DIAG RESULTS" mode with CONSULT-II even though DTC work support test result is "NG".

TESTING CONDITION:

- **Before performing the following procedure, confirm battery voltage is more than 10V at idle, then stop engine immediately.**
- **For best result, perform the test at a temperature of 0°C (32°F) or higher.**

With CONSULT-II

1) Turn ignition switch "OFF" and wait at least 9 seconds.
2) Turn ignition switch "ON".
3) Check "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-II and confirm it is within the range listed below.

   COOLAN TEMP/S: Less than 40°C (104°F)

   If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the engine coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.
4) Start engine and let it idle monitoring "COOLAN TEMP/S" value. When the "COOLAN TEMP/S" value reaches 70°C (158°F), immediately go to the next step.
5) Select "EGR SYSTEM P0400" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
6) Touch "START".
7) Accelerate vehicle to a speed of 40 km/h (25 MPH) once and then stop vehicle with engine running.
   If "COMPLETED" appears on CONSULT-II screen, go to step 9.
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
8) When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions until "TESTING" changes to "COMPLETED". (It will take approximately 45 seconds or more.)

ENG SPEED	Above 2,400 rpm
Vehicle speed	Above 90 km/h (56 MPH)
B/FUEL SCHDL	4.0 - 8.0 msec
Selector lever	4th or 5th

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

9) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-316.

With GST

1) Turn ignition switch "ON".
2) Check engine coolant temperature in MODE 1 with GST.

Engine coolant temperature: Less than 40°C (104°F)

If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the engine coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

3) Start engine and let it idle monitoring the value of "COOLAN TEMP/S". When the engine coolant temperature reaches 70°C (158°F), immediately go to the next step.
4) Maintain the following conditions for at least 1 minute.

Engine speed	Above 2,400 rpm
Vehicle speed	Above 90 km/h (56 MPH)
Selector lever	4th or 5th

5) Stop vehicle.
6) Turn ignition switch "OFF" and wait at least 9 seconds, then turn "ON".
7) Repeat step 2 to 4.
8) Select "MODE 3" with GST.
9) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-316.

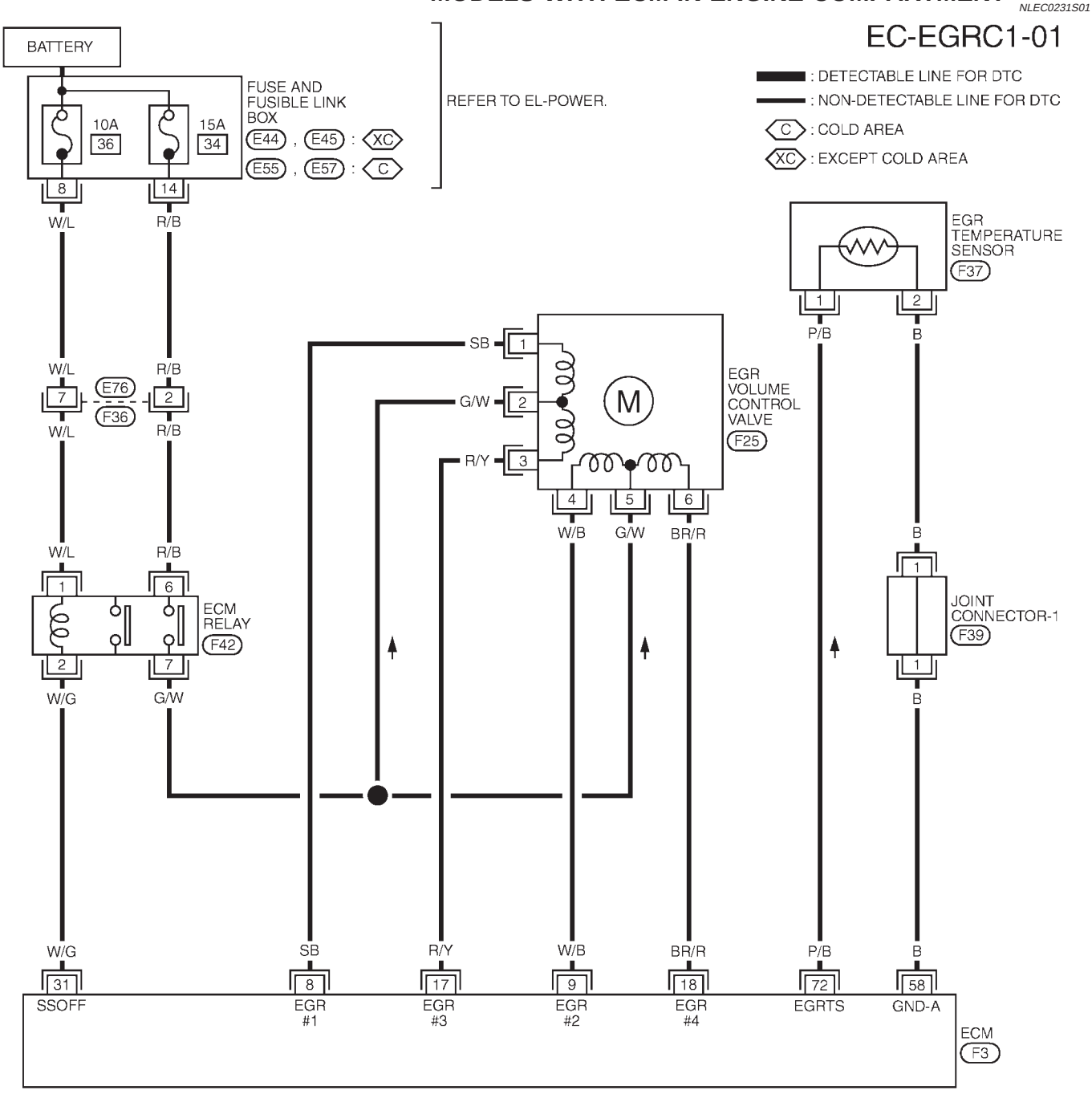
- **When using GST, "DTC CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT-II because GST cannot diaplay MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

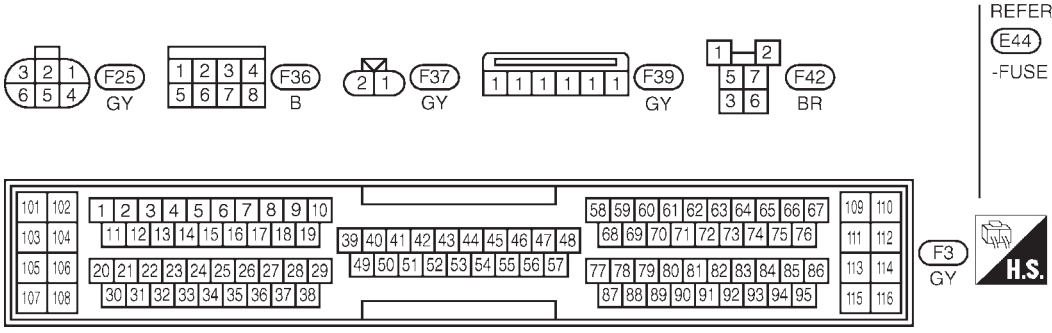
Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0231

NLEC0231S01



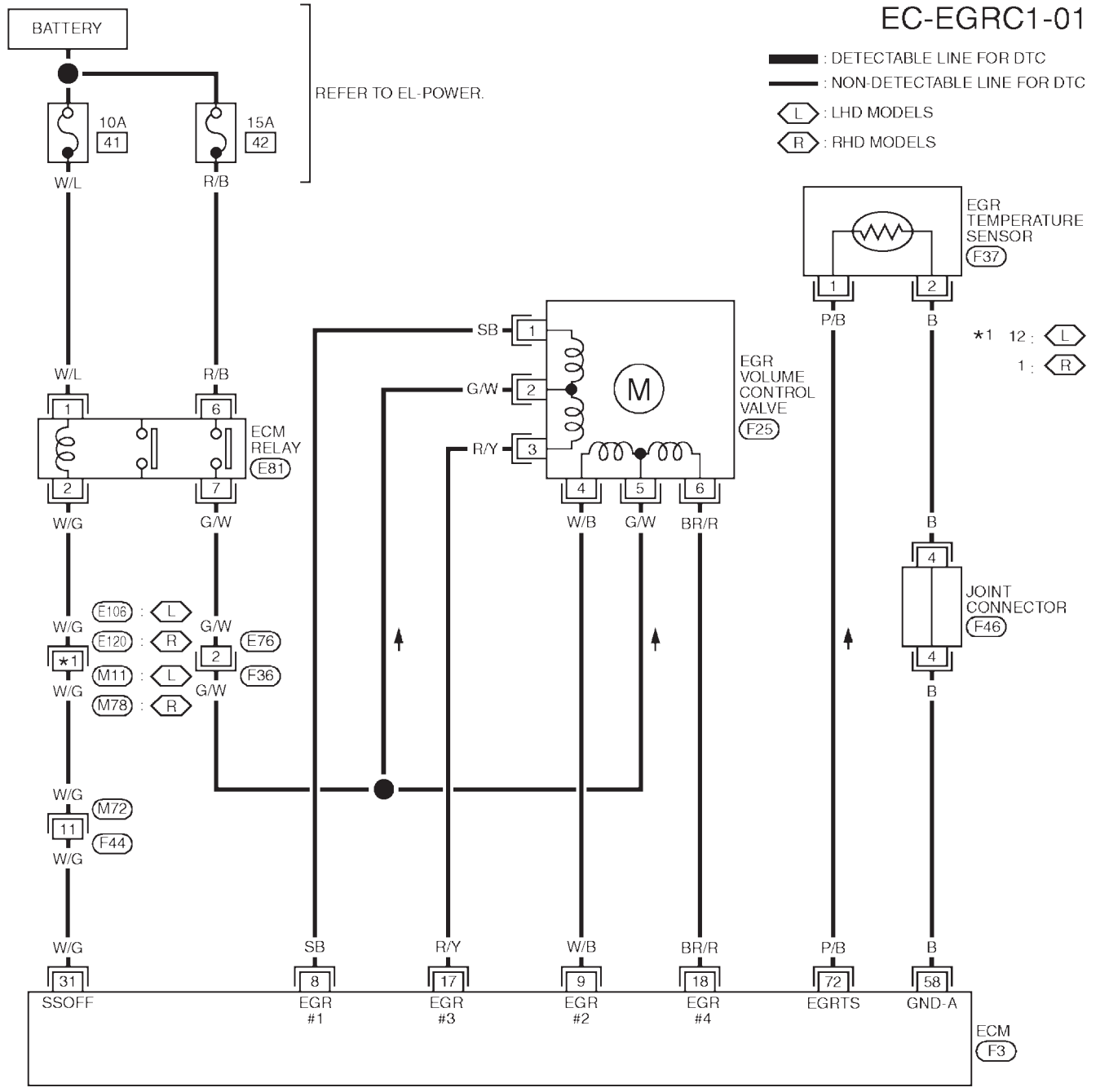


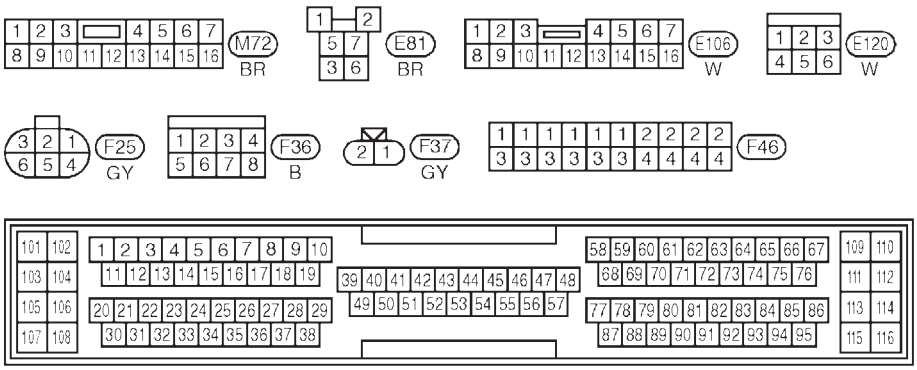
REFER TO THE FOLLOWING.
E44 , E45 , E55 , E57
-FUSE AND FUSIBLE LINK BOX

YEC664

MODELS WITH ECM IN CABIN

NLEC0231S02





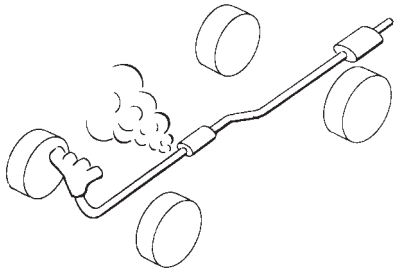
YEC884

Diagnostic Procedure

NLEC0232

1	CHECK EXHAUST SYSTEM

1. Start engine.
2. Check exhaust pipes and muffler for leaks.



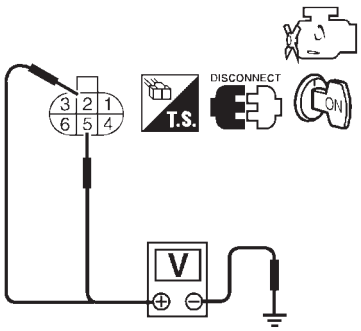
SEF099P

OK or NG

OK (With CONSULT-II)	▶	GO TO 2.
OK (Without CONSULT-II)	▶	GO TO 4.
NG	▶	Repair or replace exhaust system.

2	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch “ON”.
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF782Z

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness connectors E76, F36
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between fuse and ECM relay
- ECM relay
- Harness for open or short between EGR volume control valve and ECM relay.

	▶	Repair harness or connectors or replace fuse or ECM relay.

4	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and EGR volume control valve terminal 1,
   ECM terminal 9 and EGR volume control valve terminal 4,
   ECM terminal 17 and EGR volume control valve terminal 3,
   ECM terminal 18 and EGR volume control valve terminal 6.
   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, short to ground or short to power in harness connectors.

5	CHECK EGR PASSAGE

Check EGR passage for clogging and cracks.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair or replace EGR passage.

6	CHECK EGR TEMPERATURE SENSOR

Refer to "COMPONENT INSPECTION", EC-392.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace EGR temperature sensor.

7	CHECK EGR VOLUME CONTROL VALVE

Refer to "COMPONENT INSPECTION", EC-318.

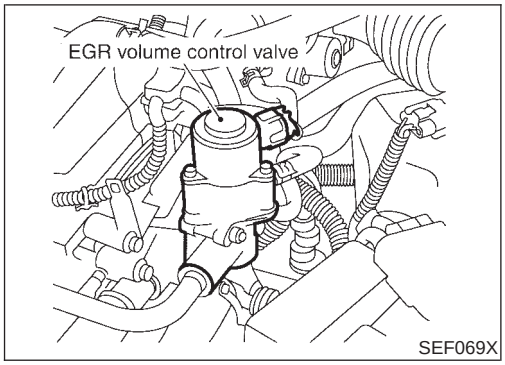
OK or NG

OK	▶	GO TO 8.
NG	▶	Replace EGR volume control valve.

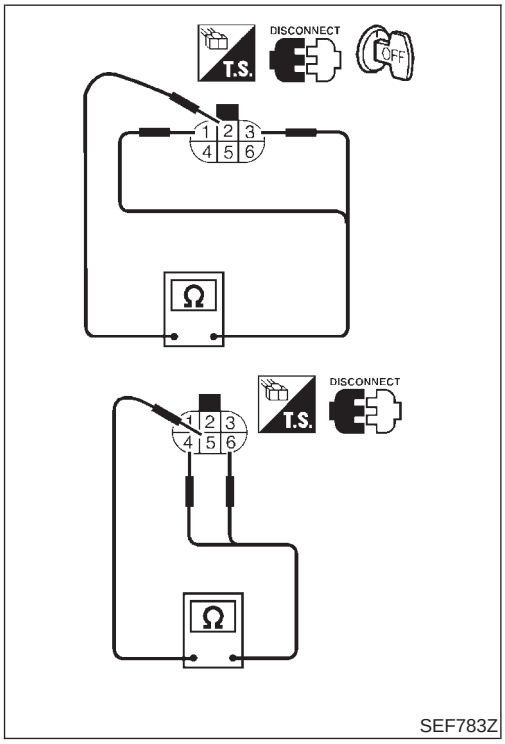
8	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

▶ **INSPECTION END**



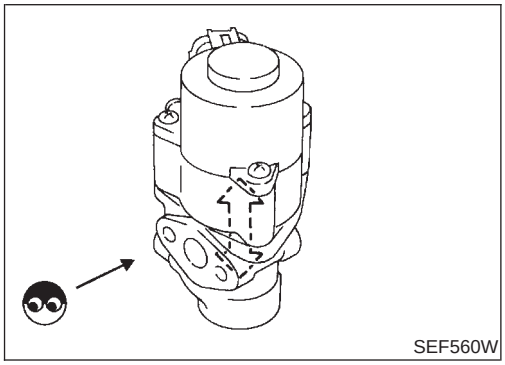
SEF069X



SEF783Z

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF015Y


SEF560W

Component Inspection

NLEC0233

EGR VOLUME CONTROL VALVE

NLEC0233S01

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON".
6) Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EGR volume control valve.

Without CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.

Description

SYSTEM DESCRIPTION

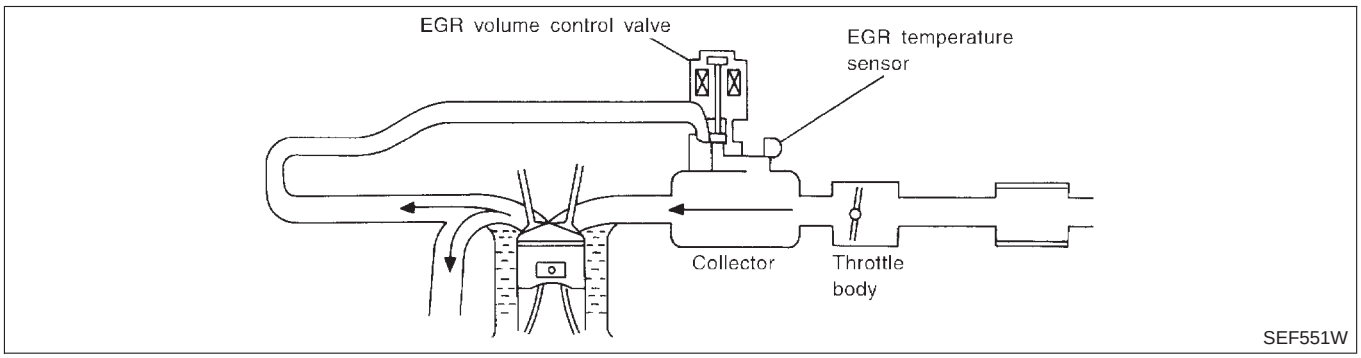
NLEC0504

NLEC0504S01

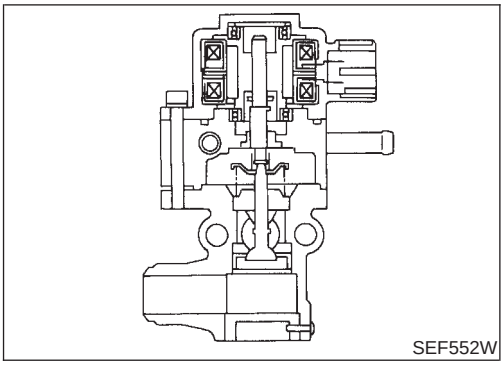
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	EGR volume control	EGR volume control valve
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
PNP switch	Park/Neutral position signal		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Extremely light load engine operation
- Engine idling
- Excessively high engine coolant temperature
- Wide open throttle
- Mass air flow sensor malfunction
- Low battery voltage



Description (Cont'd)


SEF552W

COMPONENT DESCRIPTION

NLEC0504S02

EGR Volume Control Valve

NLEC0504S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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

NLEC0506

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	• Engine: After warming up • Shift lever: "N" • No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	1 - 10 step

ECM Terminals and Reference Value

NLEC0507

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

CAUTION:

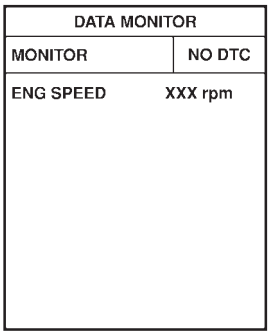
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8 9 17 18	SB W/B R/Y BR/R	EGR volume control valve	**[Engine is running]** • **Warm-up condition** • Idle speed	0 - 14V

On Board Diagnosis Logic

NLEC0508

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0403 0403	• An improper voltage signal is sent to ECM through the valve.	• Harness or connectors (The EGR volume control valve circuit is open or shorted.) • EGR volume control valve



SEF058Y

DTC Confirmation Procedure

NLEC0509

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Rev engine from idle to 2,000 rpm 20 times.

If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-324.

With GST

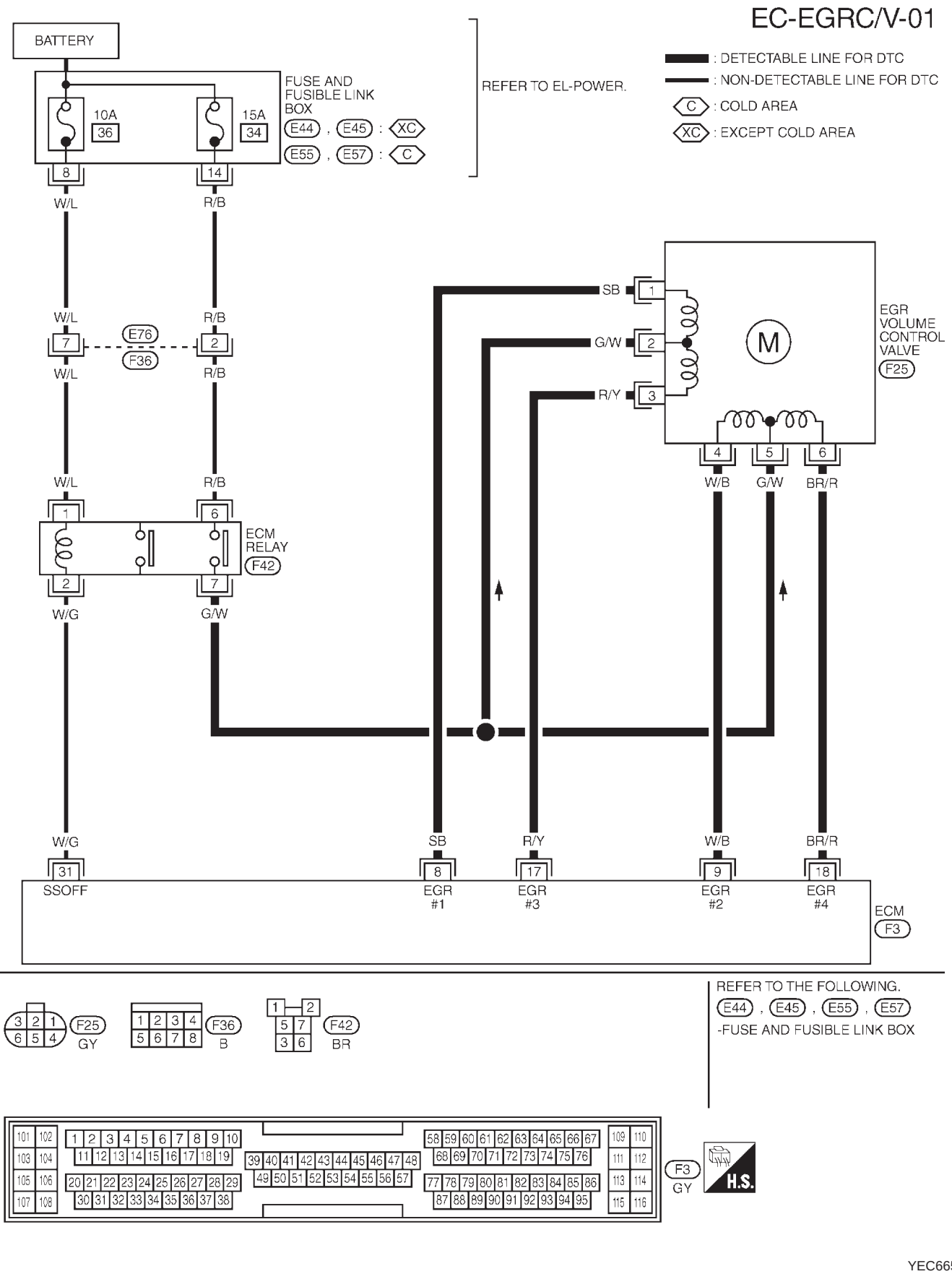
Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NLEC0510

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0510S01

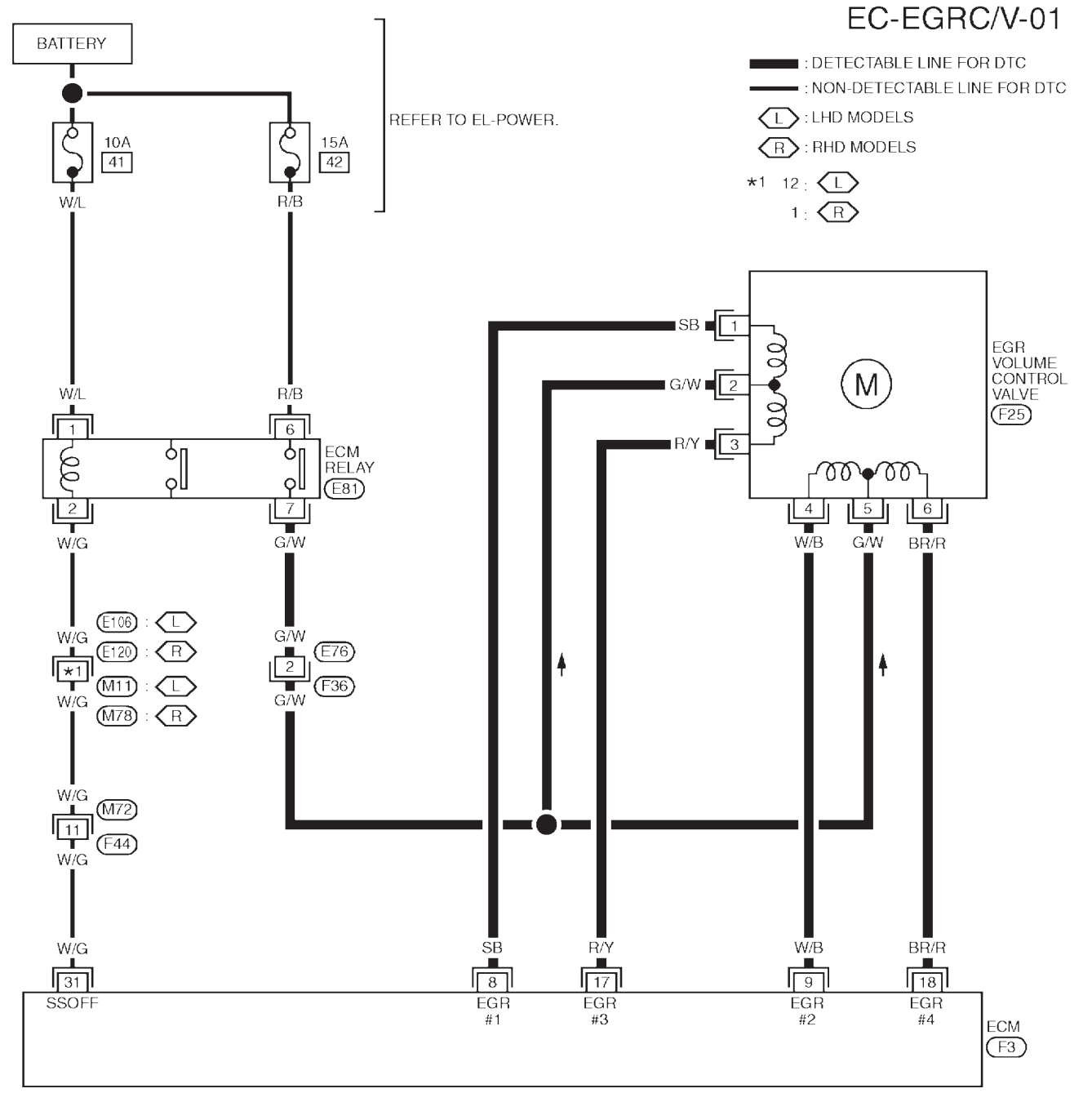


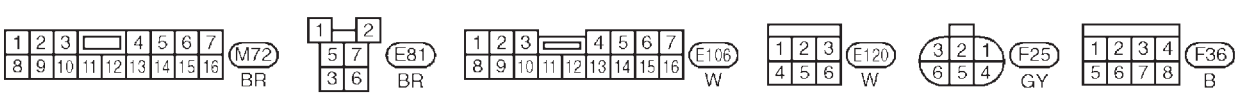
REFER TO THE FOLLOWING.
E44 , E45 , E55 , E57
-FUSE AND FUSIBLE LINK BOX

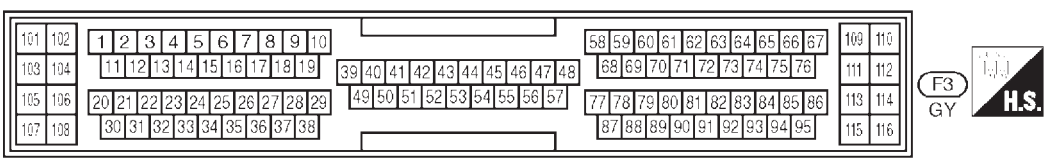
YEC665

MODELS WITH ECM IN CABIN

NLEC0510S02







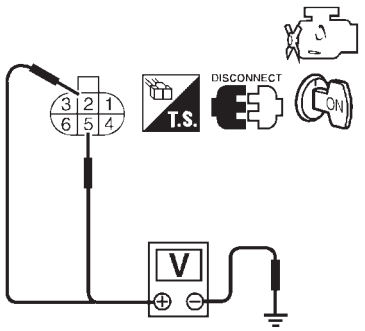
YEC885

Diagnostic Procedure

NLEC0511

1	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch “ON”.
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF782Z

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuse
- Harness connectors E76, F36
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Harness for open or short between fuse and ECM relay
- Harness for open or short between EGR volume control valve and ECM relay
- ECM relay

	▶	Repair harness or connectors, or replace fuse or ECM relay.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and EGR volume control valve terminal 1,
   ECM terminal 9 and EGR volume control valve terminal 2,
   ECM terminal 17 and EGR volume control valve terminal 3,
   ECM terminal 18 and EGR volume control valve 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, short to ground or short to power in harness connectors.

4	CHECK EGR VOLUME CONTROL VALVE

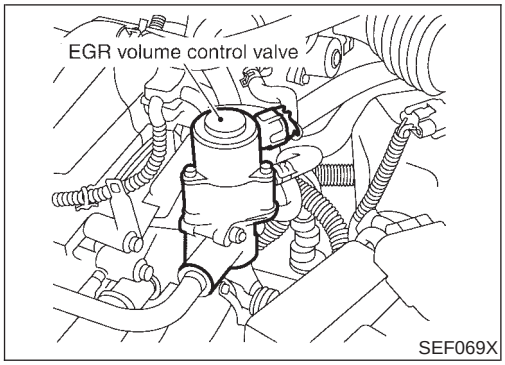
Refer to “COMPONENT INSPECTION”, EC-326.

OK or NG

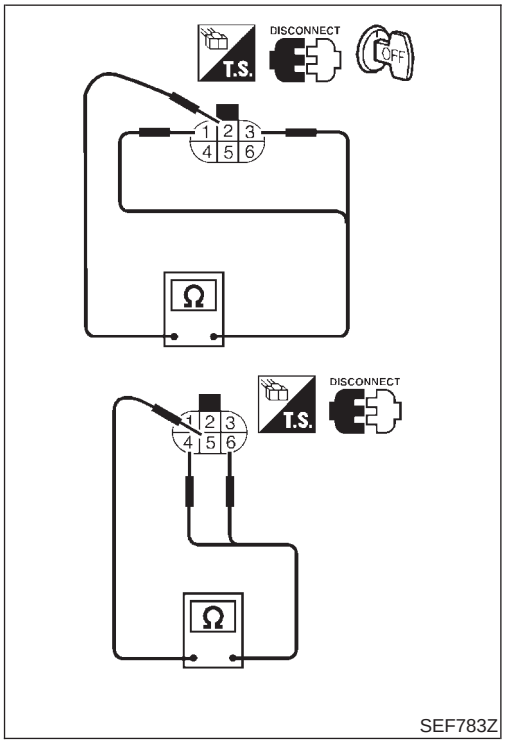
OK	▶	GO TO 5.
NG	▶	Replace EGR volume control valve.

5	**CHECK INTERMITTENT INCIDENT**
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**

Diagnostic Procedure (Cont'd)



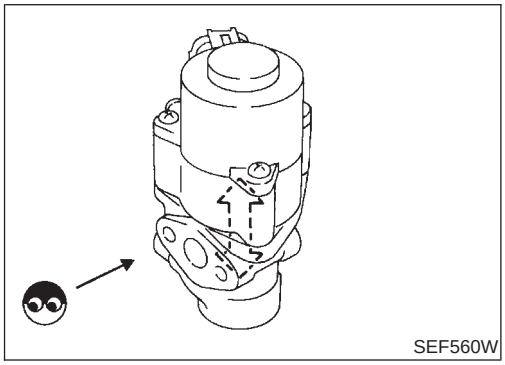
SEF069X



SEF783Z

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF015Y


SEF560W

Component Inspection

NLEC0512

EGR VOLUME CONTROL VALVE

NLEC0512S01

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

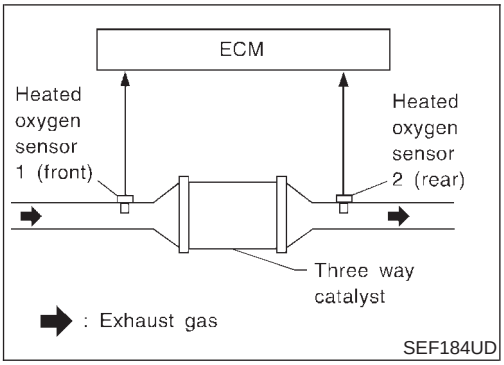
3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON".
6) Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EGR volume control valve.

Without CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.

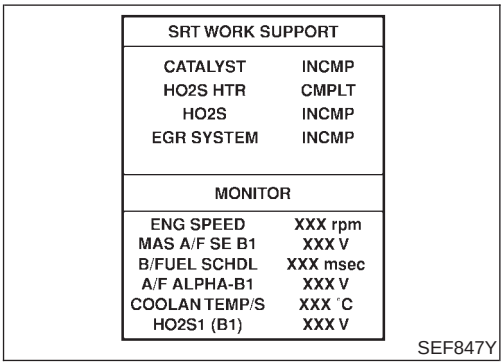


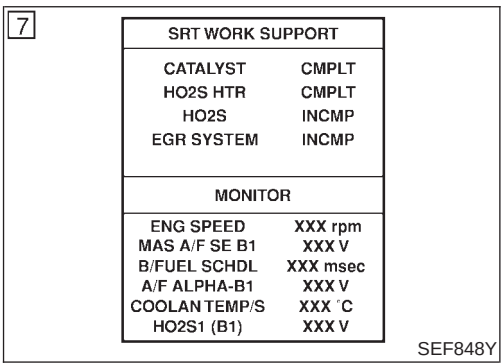
On Board Diagnosis Logic

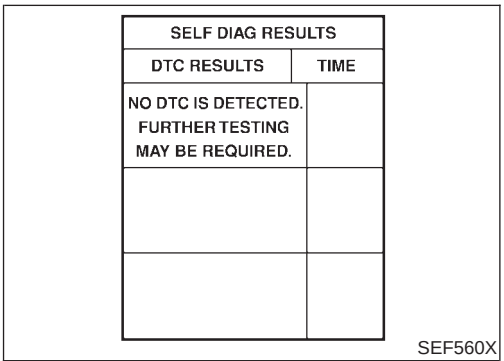
NLEC0240

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 (front) and 2 (rear).
A three way catalyst 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 sensors 1 (front) and 2 (rear) approaches a specified limit value, the three way catalyst malfunction is diagnosed.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420 0420	● Three way catalyst does not operate properly. ● Three way catalyst does not have enough oxygen storage capacity.	● Three way catalyst ● Exhaust tube ● Intake air leaks ● Injectors ● Injector leaks ● Spark plug ● Improper ignition timing







DTC Confirmation Procedure

NLEC0241

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

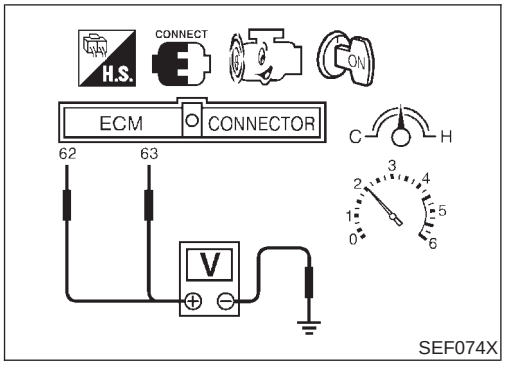
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

With CONSULT-II

TESTING CONDITION:

- **Open engine hood before conducting following procedure.**
- **Do not hold engine speed more than 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.
   If "COMPLETED" appears on the CONSULT-II screen, go to step 7.
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-328.



Overall Function Check

NLEC0242

Use this procedure to check the overall function of the three way catalyst. During this check, a 1st trip DTC might not be confirmed.

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 voltmeters probes between ECM terminals 62 (HO2S1 signal), 63 (HO2S2 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 terminal 63 and engine ground is much less than that of ECM terminal 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 does not operate properly.

NOTE:
If the voltage at terminal 62 does not switch periodically more than 5 times within 10 seconds at step 4, perform trouble diagnosis for DTC P0133 first. (See EC-204.)

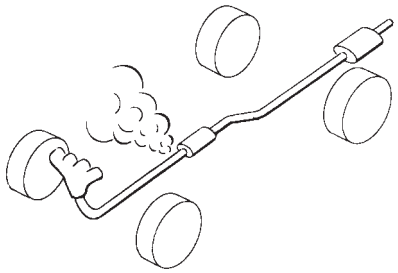
Diagnostic Procedure

NLEC0243

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.



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

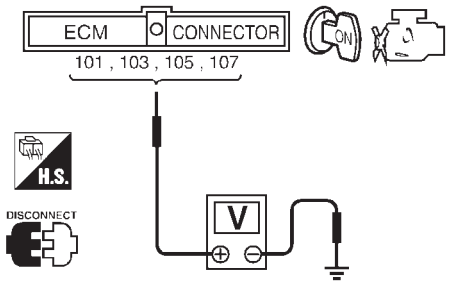
Check for ignition timing.
Refer to "BASIC INSPECTION", EC-99.

OK or NG

OK	▶	GO TO 5.
NG	▶	Check camshaft position sensor (PHASE) (EC-302) and crankshaft position sensor (POS) (EC-295).

5	CHECK INJECTORS

1. Refer to Wiring Diagram for Injectors, EC-495.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals 101, 103, 105 and 107 and ground with CONSULT-II or tester.



SEF075X

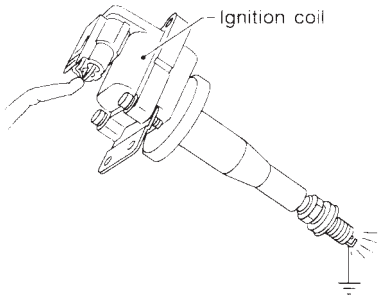
Battery voltage should exist.

OK or NG

OK	▶	GO TO 6.
NG	▶	Perform "Diagnostic Procedure" INJECTOR, EC-497.

6	CHECK IGNITION SPARK

1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.



SEF575Q

OK or NG

OK	▶	GO TO 7.
NG	▶	Check ignition coil, power transistor and their circuits. Refer to EC-500.

7	CHECK INJECTOR

1. Turn ignition switch "OFF".
2. Remove injector assembly. Refer to EC-44.
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect camshaft position sensor harness connector.
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**
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
Trouble is fixed ▶	**INSPECTION END**
Trouble is not fixed ▶	Replace three way catalyst.

Description

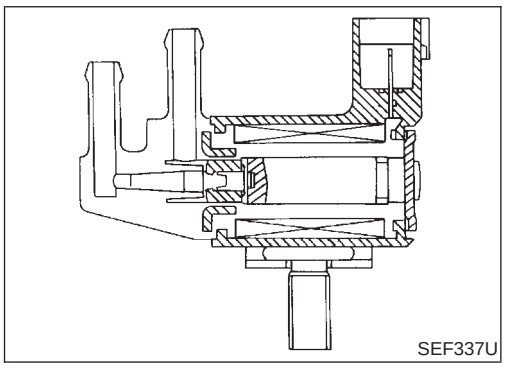
NLEC0248

SYSTEM DESCRIPTION

NLEC0248S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	EVAP canister purge control	EVAP canister purge volume control solenoid valve
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage		
Ignition switch	Start signal		
Closed throttle position switch	Closed throttle position		
Throttle position sensor	Throttle position		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
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

NLEC0248S02

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

NLEC0249

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● No-load	Idle	0%
		Revving engine	—

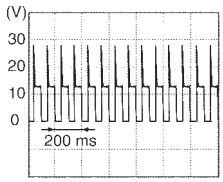
ECM Terminals and Reference Value

=NLEC0250

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● 2,000 rpm	5 - 12V  SEF975W

On Board Diagnosis Logic

NLEC0251

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0443 0443	● An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

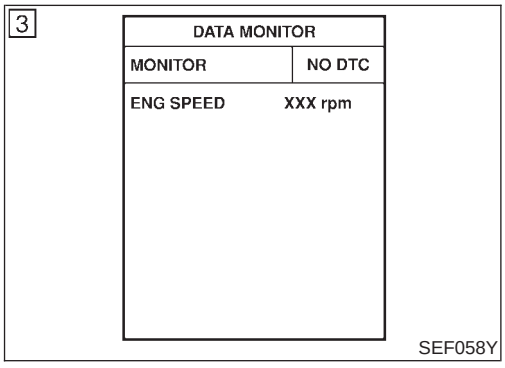
NLEC0252

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

TESTING CONDITION:

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



SEF058Y

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and let it idle for at least 5 seconds.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-336.

With GST

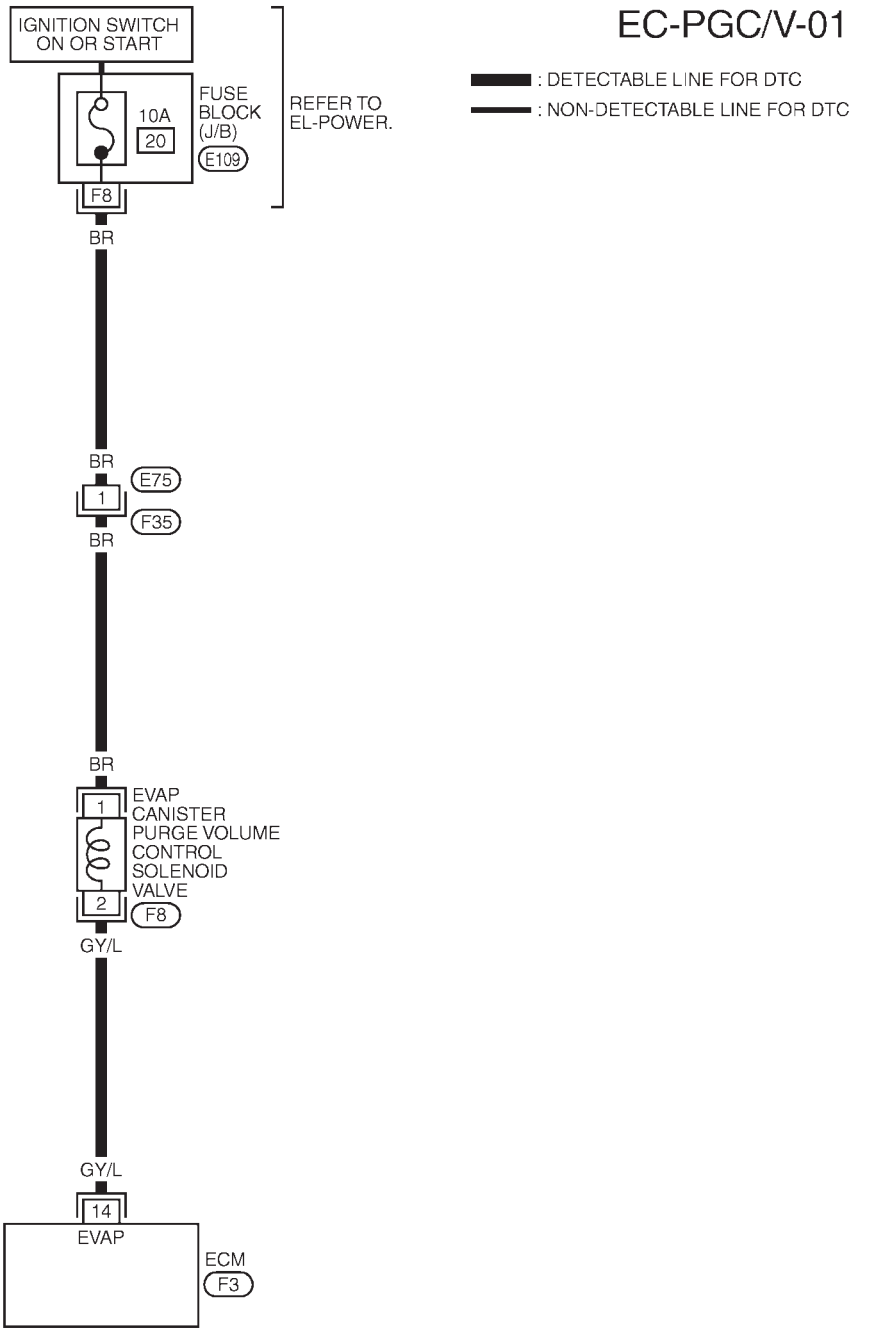
Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NLEC0253

MODELS WITH ECM IN ENGINE COMPARTMENT

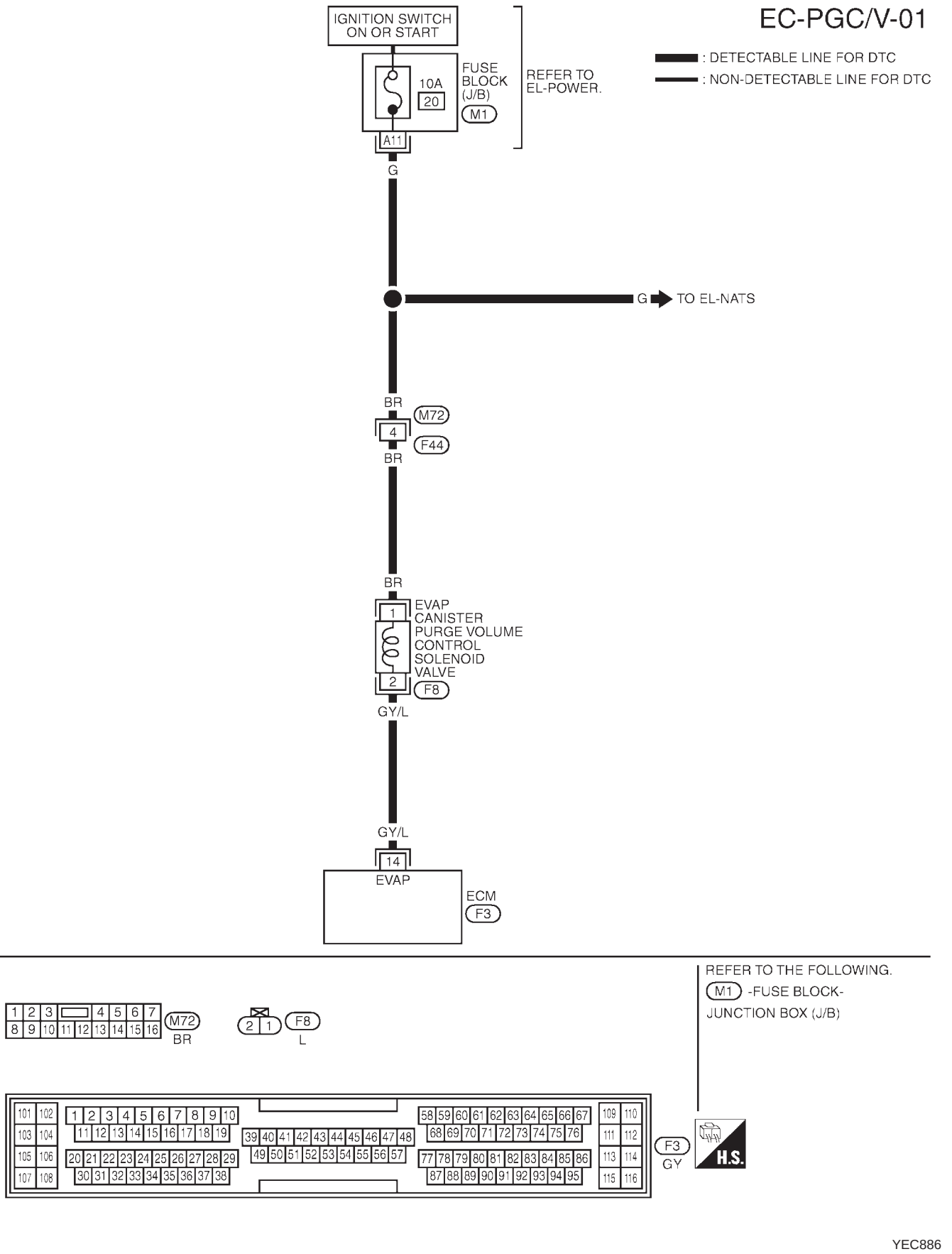
NLEC0253S01



YEC666

MODELS WITH ECM IN CABIN

NLEC0253S02



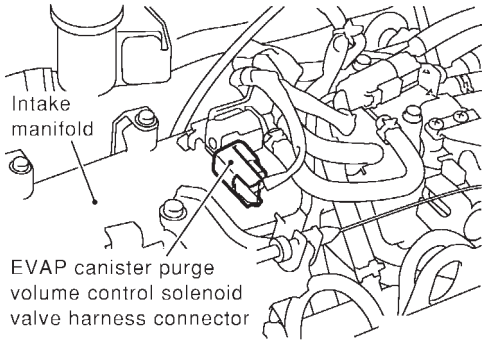
YEC886

Diagnostic Procedure

NLEC0254

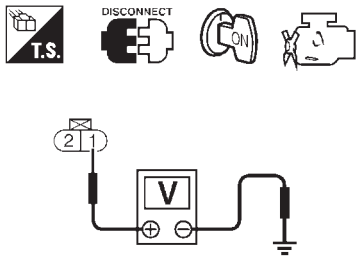
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF076X

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



Voltage: Battery voltage

SEF606Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E75, F35 (where fitted)
- Harness connectors M72, F44 (where fitted)
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

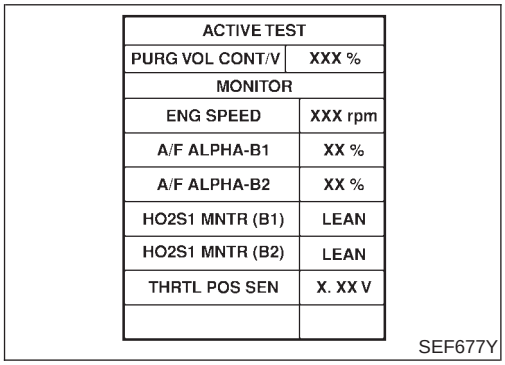
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 14 and terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

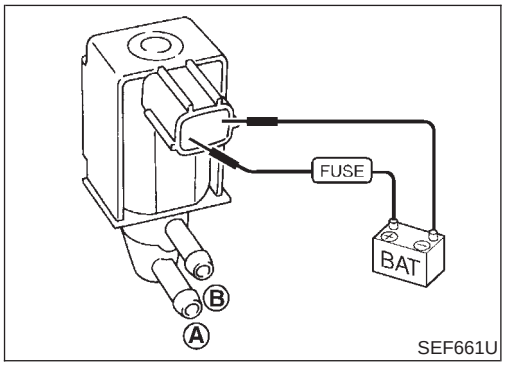
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	
Refer to "Component Inspection" EC-337.		
	OK or NG	
OK	▶	GO TO 5.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

5	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF677Y



SEF661U

Component Inspection

NLEC0255

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

NLEC0255S01

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.
   If OK, inspection end. If NG, go to following step.
3) Check air passage continuity.

Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

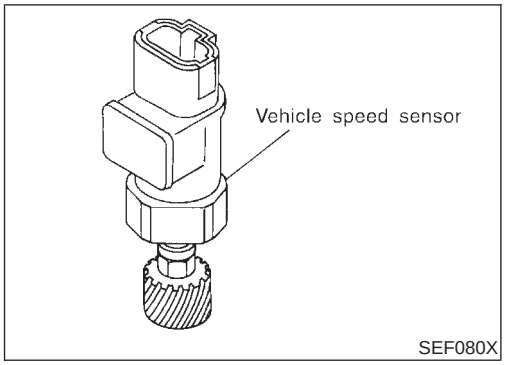
If NG, replace the EVAP canister purge volume control solenoid valve.

Without CONSULT-II

Check air passage continuity.

Condition	Air passage continuity between A and B
12V direct current supply between terminals	Yes
No supply	No

If NG, replace the EVAP canister purge volume control solenoid valve.



Component Description

NLEC0272

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.

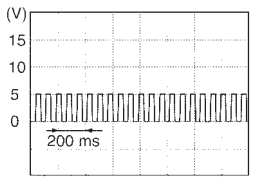
ECM Terminals and Reference Value

NLEC0273

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)
86	PU/R	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● In 2nd gear position ● Vehicle speed is 40 km/h (25 MPH)	2.5 - 3V  SEF976W

On Board Diagnosis Logic

NLEC0274

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0500 0500	● The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connector (The vehicle speed sensor circuit is open or shorted.) ● Vehicle speed sensor

DTC Confirmation Procedure

NLEC0275

CAUTION:

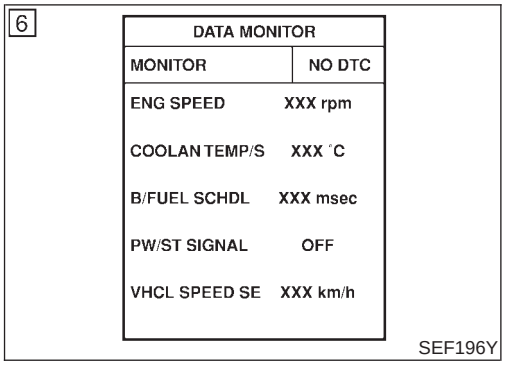
Always drive vehicle at a safe speed.

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

TESTING CONDITION:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.



With CONSULT-II

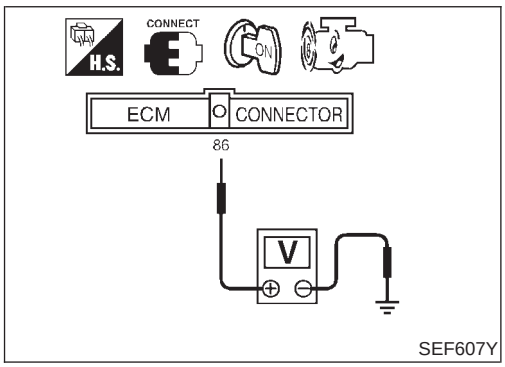
1) Start engine
2) Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
3) If NG, go to "Diagnostic Procedure", EC-342.
   If OK, go to following step.
4) Select "DATA MONITOR" mode with CONSULT-II.
5) Warm engine up to normal operating temperature.
6) Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	2,600 - 4,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	5.3 - 10.7 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF

7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-342.

With GST

Follow the procedure "With CONSULT-II" above.



Without CONSULT-II

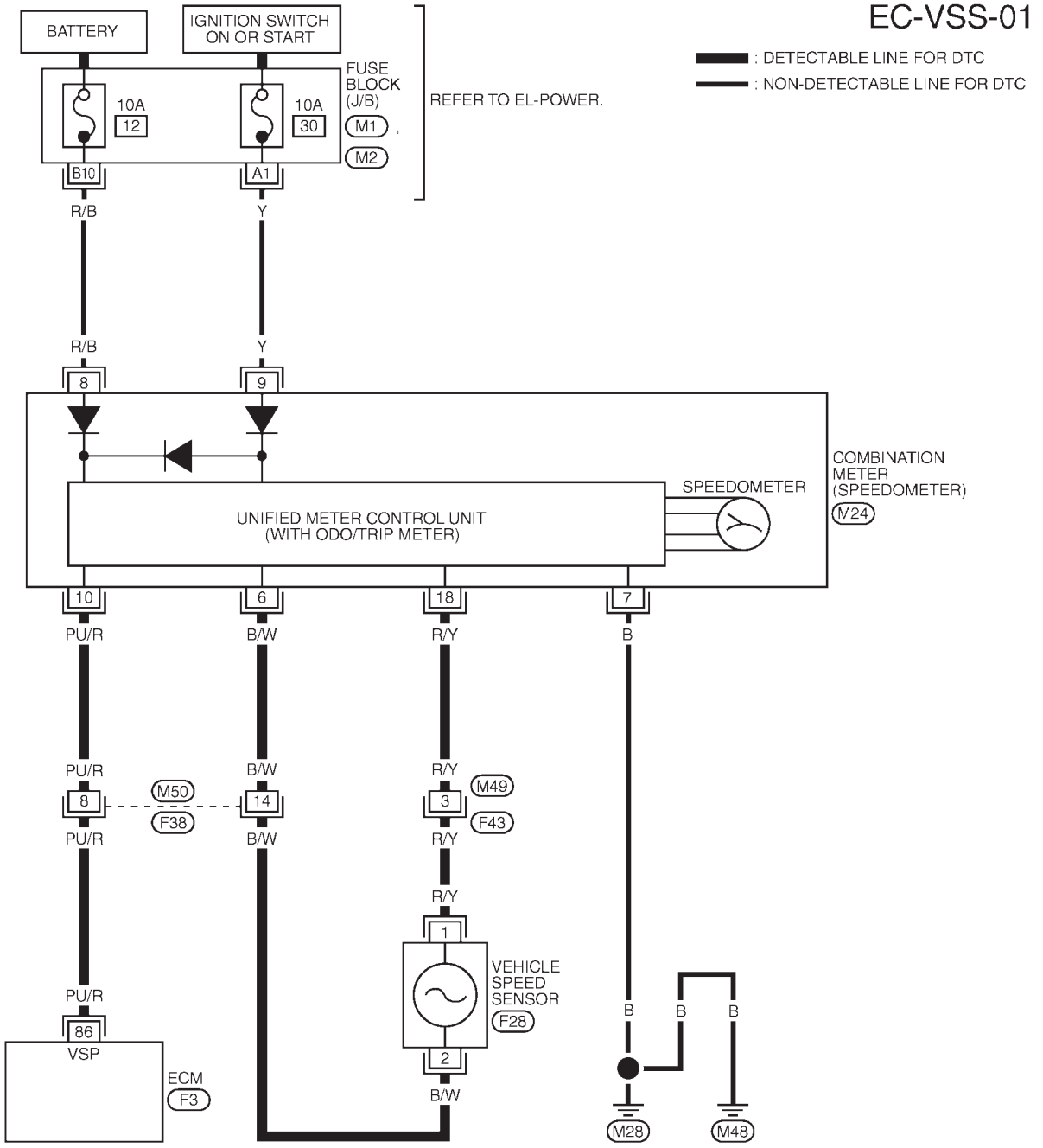
1) Lift up drive wheels.
2) Start engine.
3) Read the voltage signal between ECM terminal 86 (Vehicle speed sensor signal) and ground with oscilloscope.
4) Verify that the oscilloscope screen shows the signal wave as shown in the figure.
5) If NG, go to "Diagnostic Procedure", EC-342.

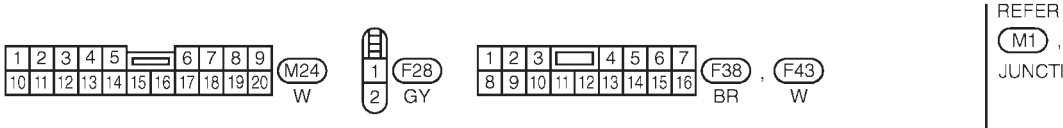
Wiring Diagram

NLEC0277

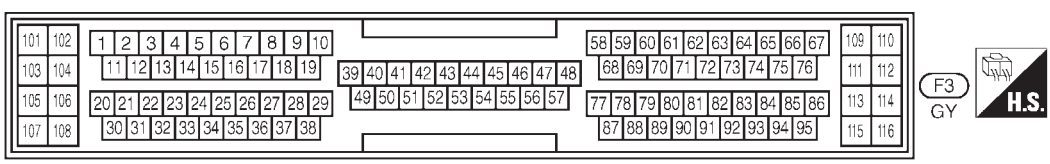
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0277S03





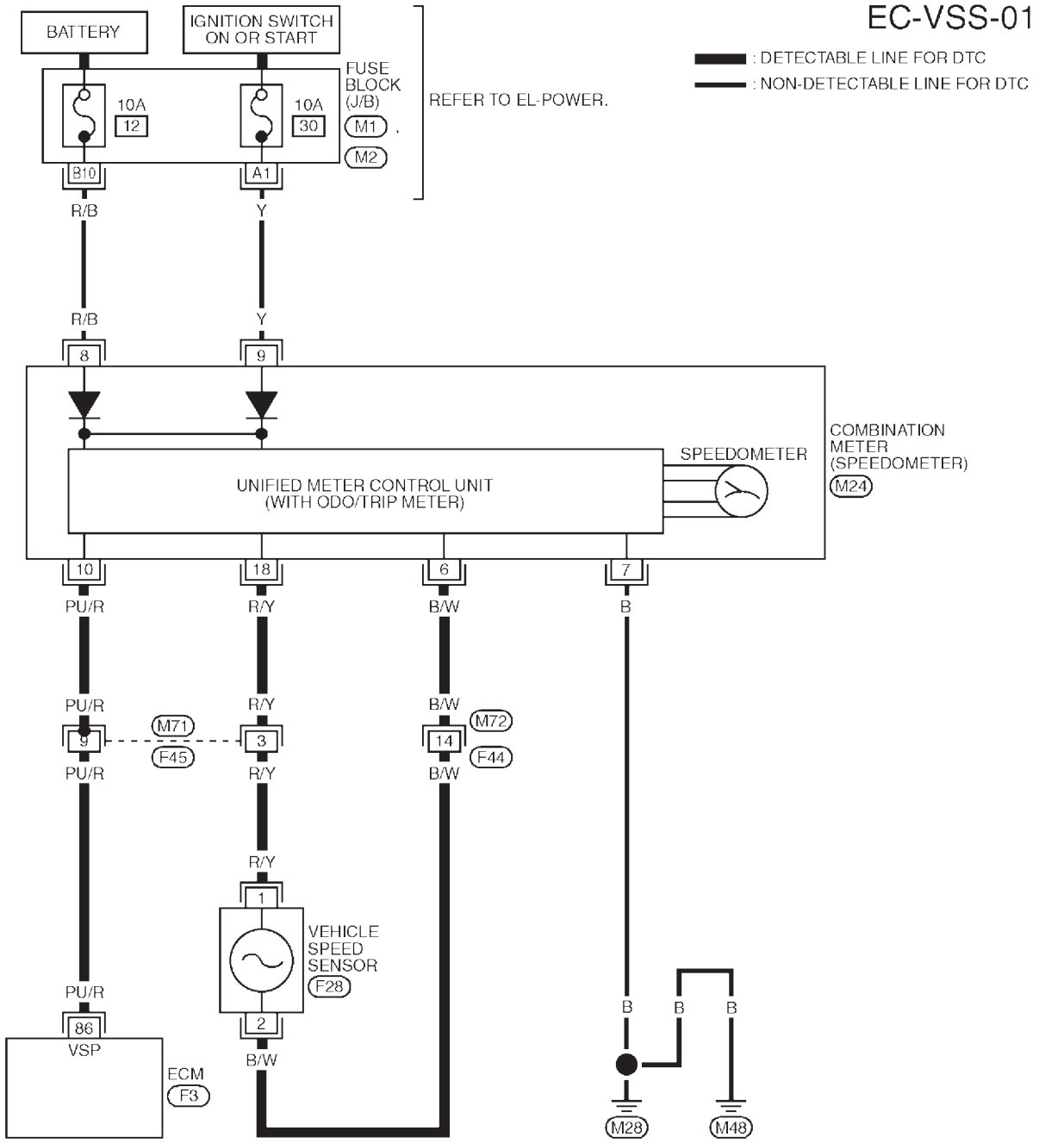
REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK-JUNCTION BOX (J/B)

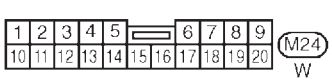


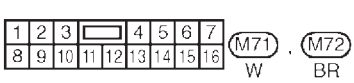
YEC667

MODELS WITH ECM IN CABIN

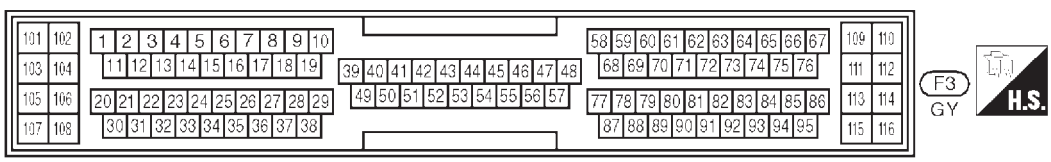
NLEC0277S04







REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK-JUNCTION BOX (J/B)



YEC887

Diagnostic Procedure

NLEC0278

1	CHECK INPUT SIGNAL CIRCUIT	
1. Turn ignition switch “OFF”. 2. Disconnect ECM harness connector and combination meter harness connector. 3. Check harness continuity between ECM terminal 86 and meter terminal 39. 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 M50, F38 ● 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	
Check the following. ● Harness connectors M50, F38 (where fitted) ● Harness connectors M49, F43 (where fitted) ● Harness connectors M71, F45 (where fitted) ● Harness connectors M72, F44 (where fitted) ● Harness for open or short between combination meter and vehicle speed sensor		
OK	▶	Check combination meter and vehicle speed sensor. Refer to EL-130, “METERS AND GAUGES”.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT	
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-145.		
	▶	**INSPECTION END**

Description

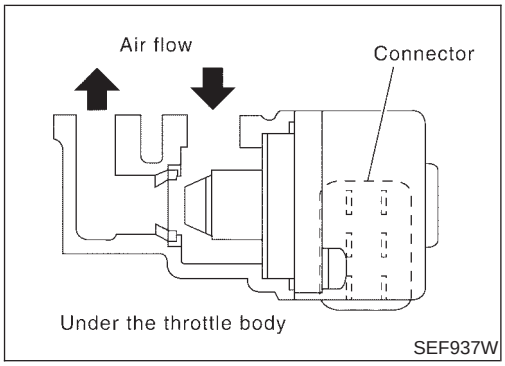
SYSTEM DESCRIPTION

NLEC0279

NLEC0279S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Idle air control	IACV-AAC valve
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle 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		
Cooling fan	Cooling fan operation		
Electrical load	Electrical load signal		

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 taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering, cooling fan operation and electrical load).



COMPONENT DESCRIPTION

NLEC0279S02

IACV-AAC Valve

NLEC0279S0202

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 sequence. Each time the IACV-AAC valve opens or closes to change the 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

NLEC0280

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	5 - 25 steps
		2,000 rpm	—

ECM Terminals and Reference Value

NLEC0281

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

CAUTION:

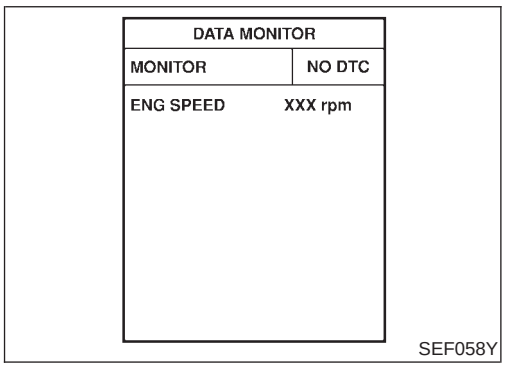
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM’s transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6 7 15 16	BR LG P OR	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V

On Board Diagnosis Logic

NLEC0282

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0505 0505	● An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The IACV-AAC valve circuit is open.) ● IACV-AAC valve



DTC Confirmation Procedure

NLEC0283

NOTE:

- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform “Idle Air Volume Learning”, EC-57, before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to “Service Data and Specifications (SDS)”, EC-547.**

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Rev engine from idle to 2,000 rpm 20 times.
   If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-324.

With GST

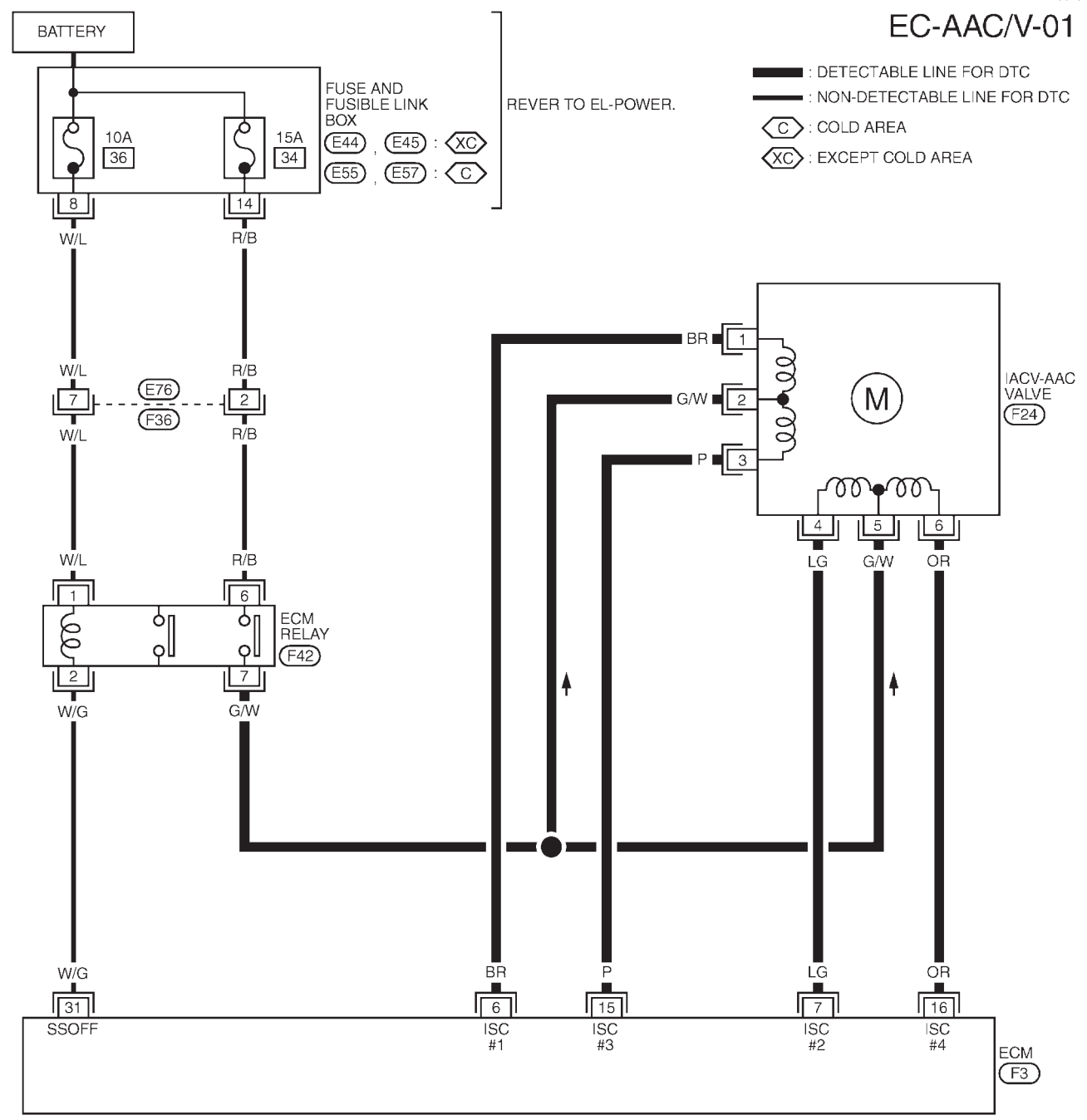
Follow the procedure “With CONSULT-II” above.

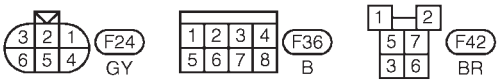
Wiring Diagram

NLEC0284

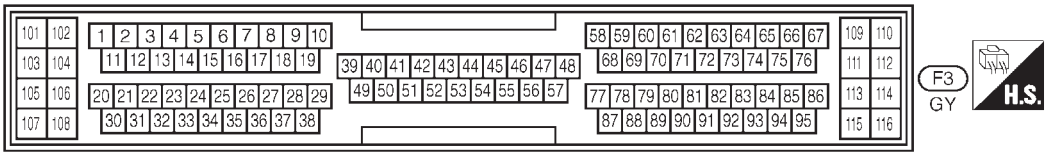
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0284S01





REFER TO THE FOLLOWING.
E44 , E45 , E55 , E57
-FUSE AND FUSIBLE LINK BOX

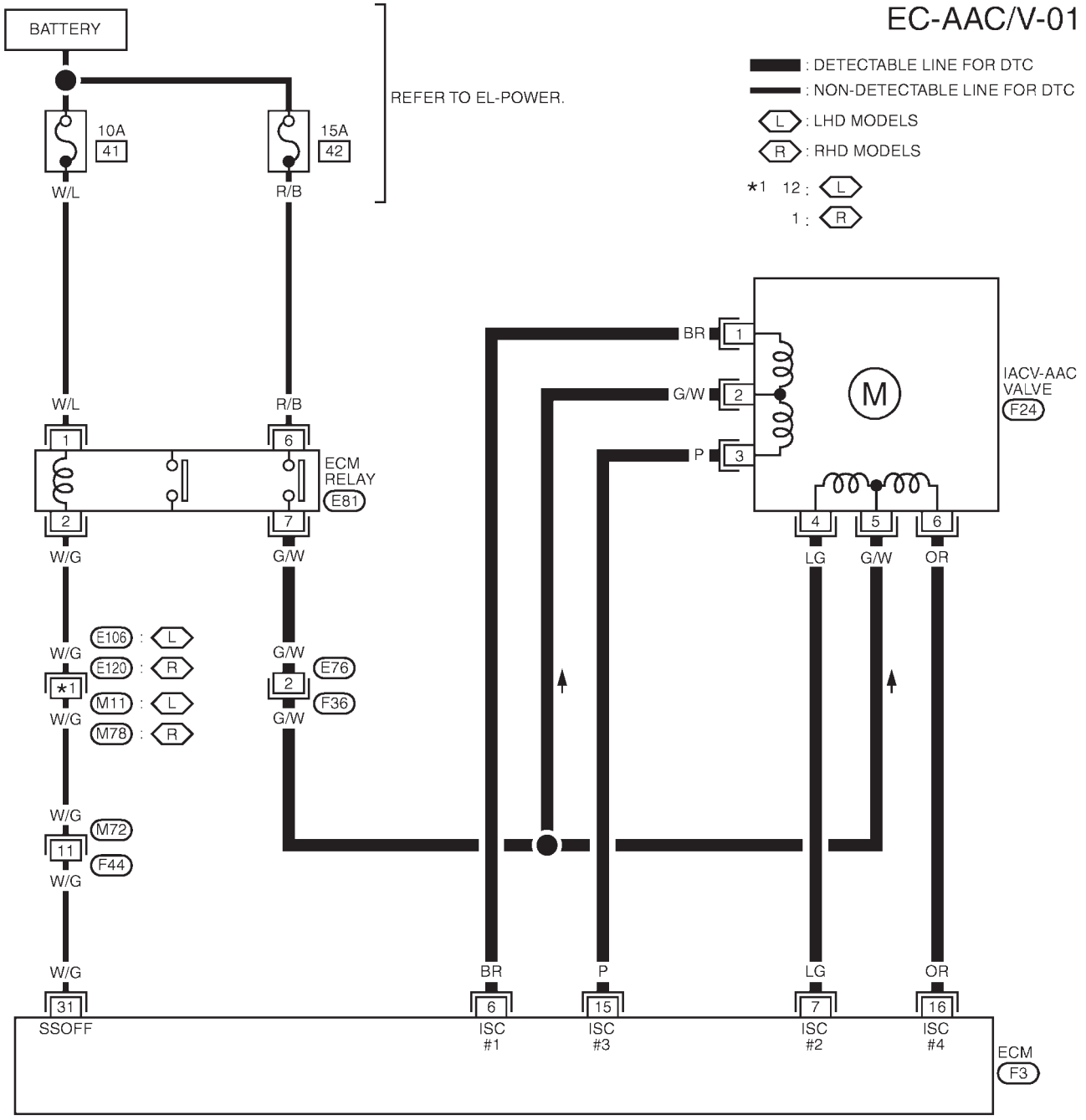


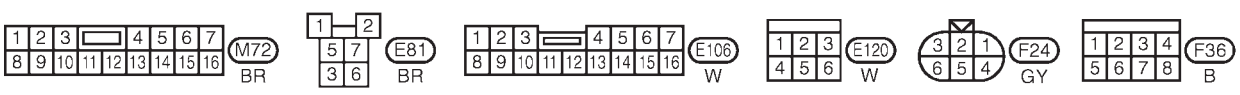
YEC668

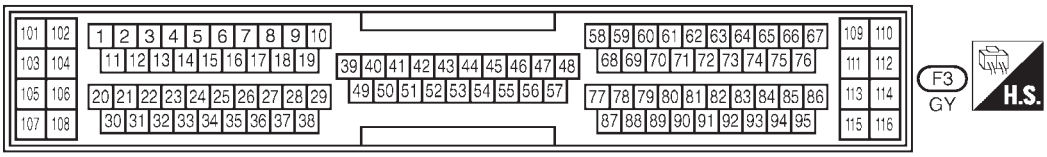
Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0284S02







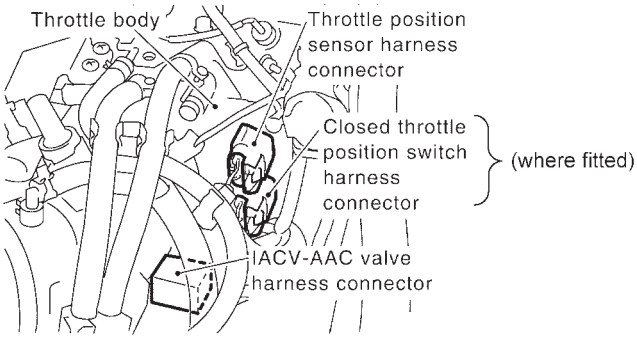
YEC888

Diagnostic Procedure

NLEC0285

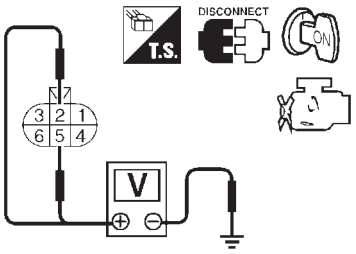
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect IACV-AAC valve harness connector.



NEF316A

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

- 15A fuse
- Harness connectors E76, F36 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Harness for open or short between fuse and ECM relay
- ECM relay
- Harness for open or short between IACV-AAC and ECM relay.

	▶	Repair harness or connectors, or replace fuse or ECM relay.

Diagnostic Procedure (Cont'd)

3	CHECK OUTPUT SIGNAL CIRCUIT

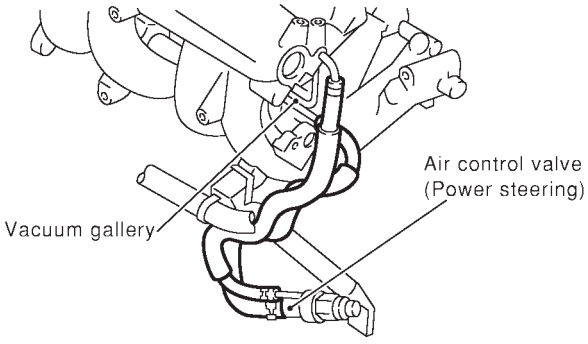
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 6 and IACV-AAC valve terminal 1,
   ECM terminal 7 and IACV-AAC valve terminal 4,
   ECM terminal 15 and IACV-AAC valve terminal 3,
   ECM terminal 16 and IACV-AAC valve terminal 6.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

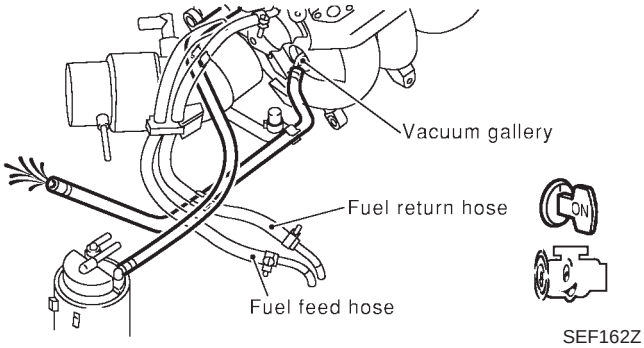
OK or NG

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

4	CHECK 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.





SEF162Z

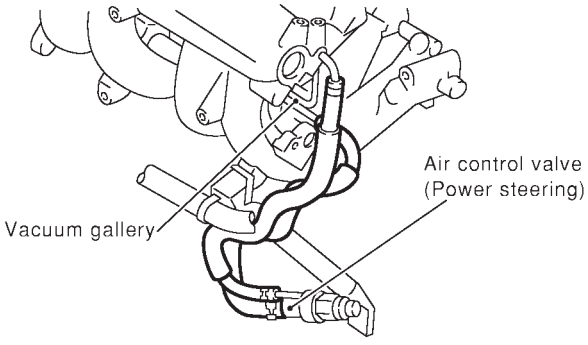
Vacuum does not exist or slightly exist.

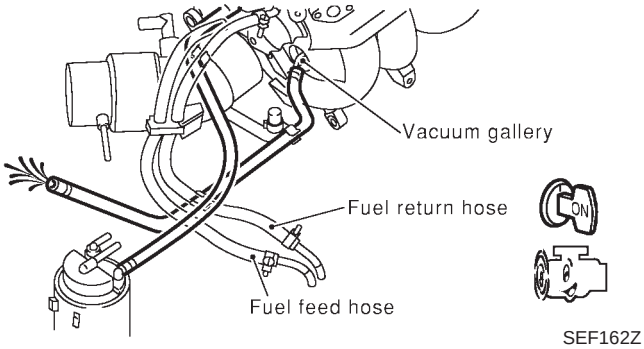
OK or NG

OK	▶	GO TO 5.
NG	▶	Replace air control valve (Power steering).

5	CHECK AIR CONTROL VALVE (POWER STEERING) OPERATION-II

Check the vacuum hose for vacuum existence when steering wheel is turned.





SEF162Z

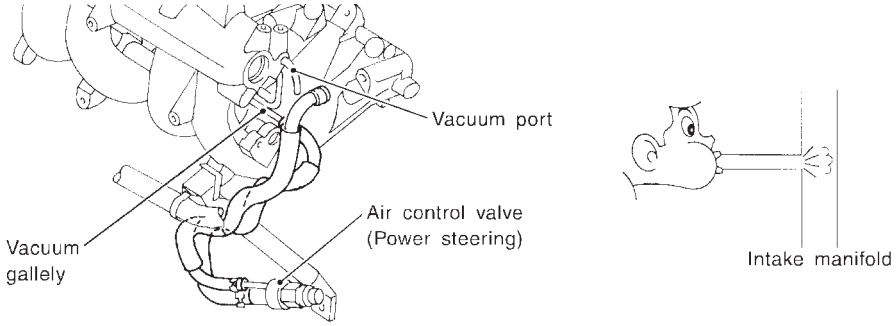
Vacuum should exist.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 6.

6	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.



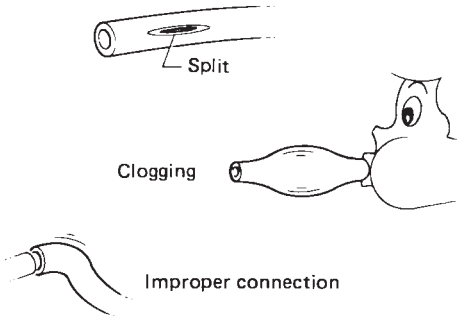
SEF924Y

OK or NG

OK	▶	GO TO 7.
NG	▶	Repair or clean vacuum port.

7	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 8.
NG	▶	Repair hoses or tubes.

8	CHECK IACV-AAC VALVE

Refer to "Component Inspection", EC-351.

OK or NG

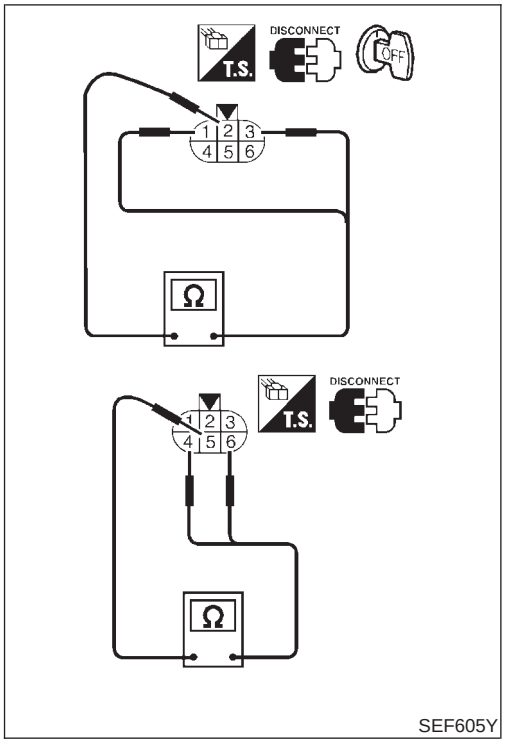
OK	▶	GO TO 10.
NG	▶	GO TO 9.

Diagnostic Procedure (Cont'd)

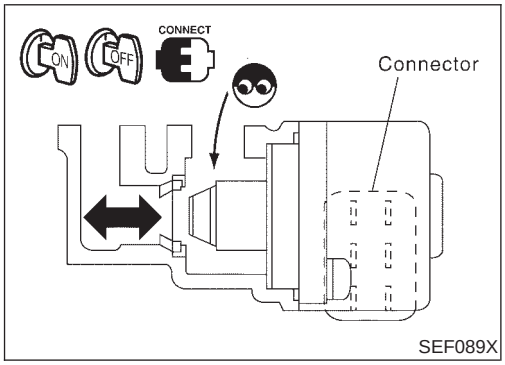
9	REPLACE IACV-AAC VALVE
1. Replace IACV-AAC valve assembly. 2. Perform "Idle Air Volume Learning", EC-57. **Is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	**INSPECTION END**
INCMP ▶	Follow the construction of "Idle Air Volume Learning".

10	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 M/T models, drive vehicle for 10 minutes. 5. Stop vehicle with engine running. 6. Check target idle speed. **700±50 rpm**	
OK or NG	
OK ▶	GO TO 11.
NG ▶	Perform "Idle Air Volume Learning", EC-57.

11	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF605Y



SEF089X

Component Inspection

NLEC0286

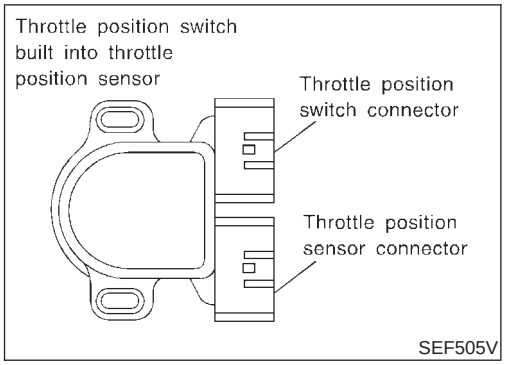
IACV-AAC VALVE

NLEC0286S01

1) Disconnect IACV-AAC valve harness connector.
2) Check IACV-AAC valve resistance.

Condition	Resistance
Terminal 2 and terminals 1, 3	20 - 24Ω [at 20°C (68°F)]
Terminal 5 and terminals 4, 6	

3) Reconnect IACV-AAC valve harness connector.
4) Remove idle air adjusting unit assembly (IACV-AAC valve is built-in) from engine.
   (The IACV-AAC valve harness connector should remain connected.)
5) Turn ignition switch “ON” and “OFF”, and ensure the IACV-AAC valve shaft smoothly moves forward and backward, according to the ignition switch position.
   If NG, replace the IACV-AAC valve.



Component Description

NLEC0287

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 not used.

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 control valve when the throttle position sensor is malfunctioning.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0571

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
CLSD THL/P SW	● Engine: Idle	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

ECM Terminals and Reference Value

NLEC0288

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

CAUTION:

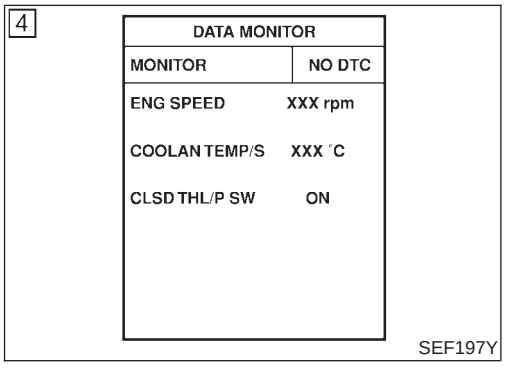
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	Y/PU	Throttle position switch (Closed position)	**[Engine is running]** ● Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Accelerator pedal depressed	Approximately 0V

On Board Diagnosis Logic

NLEC0289

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0510 0510	● Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened.	● Harness or connectors (The closed throttle position switch circuit is shorted.) ● Closed throttle position switch ● Throttle position sensor



DTC Confirmation Procedure

NLEC0290

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 9 seconds before conducting the next test.

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF", wait at least 9 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.

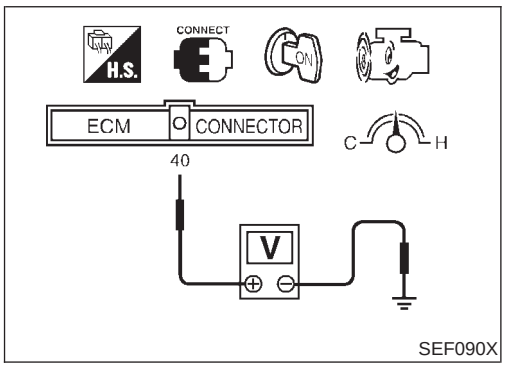
Condition	Signal indication
Throttle valve: Idle position	ON
Throttle valve: Slightly open	OFF

If the result is NG, go to "Diagnostic Procedure", EC-355.
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 2.3V
VHCL SPEED SE	More than 4 km/h (2 MPH)
Selector lever	Suitable position
Driving pattern	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-355.



Overall Function Check

NLEC0291

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.

Without CONSULT-II

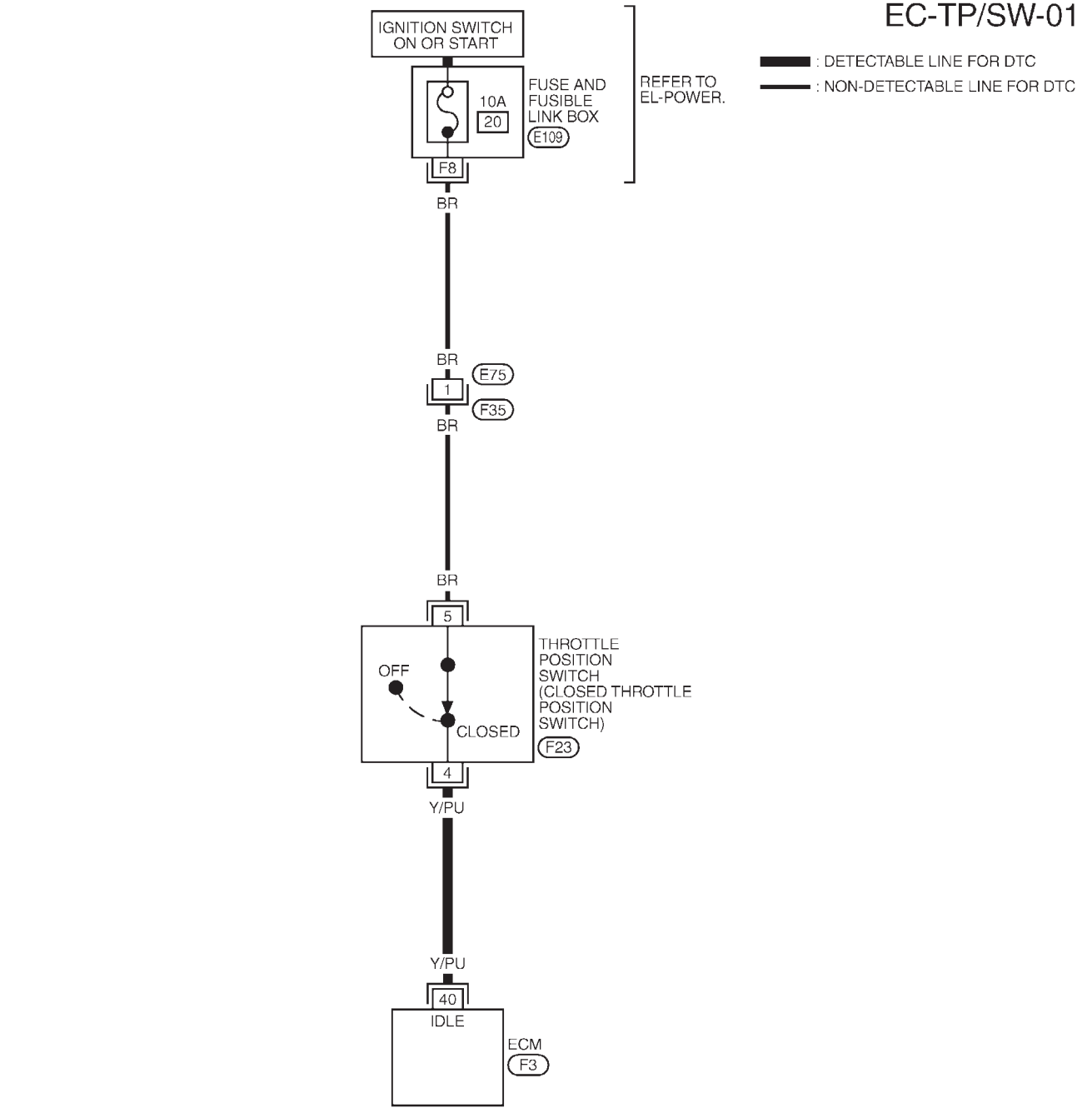
1) Start engine and warm it up to normal operating temperature.
2) Check the voltage between ECM terminal 40 (Closed throttle position switch signal) and ground under the following conditions.

Condition	Voltage
At idle	Battery voltage
At 2,000 rpm	Approximately 0V

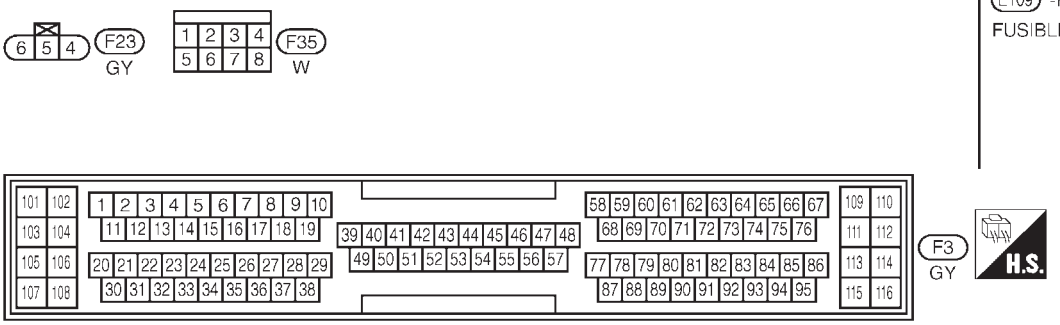
3) If NG, go to "Diagnostic Procedure", EC-355.

Wiring Diagram

NLEC0292



REFER TO THE FOLLOWING.
E109 -FUSE AND FUSIBLE LINK BOX



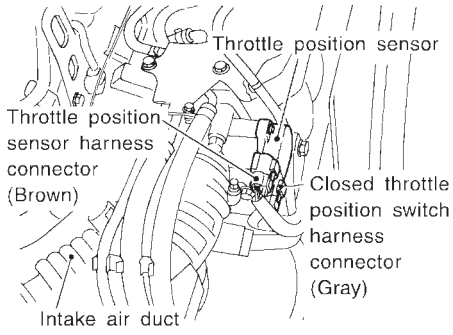
YEC669

Diagnostic Procedure

NLEC0293

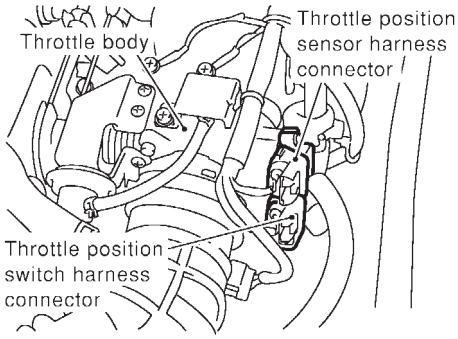
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect throttle position switch harness connector.



JEF091Y

3. Turn ignition switch “ON”.
4. Check voltage between terminal 5 and engine ground with CONSULT-II or tester.



SEF837X

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F35
- 10A fuse
- Harness for open or short between throttle position switch and fuse

	▶	Repair harness or connectors.

3	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 40 and 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	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

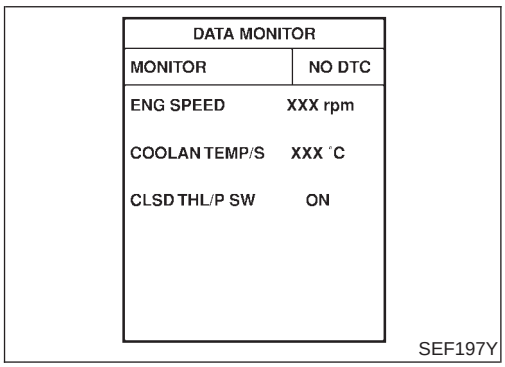
4	DETECT MALFUNCTIONING PART
Check the harness for open or short between throttle position switch and ECM.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	ADJUST THROTTLE POSITION SWITCH IDLE POSITION
Perform Basic Inspection, EC-99.	
▶	GO TO 6.

6	CHECK CLOSED THROTTLE POSITION SWITCH
Refer to "Component Inspection", EC-356.	
OK or NG	
OK ▶	GO TO 7.
NG ▶	Replace throttle position switch.

7	CHECK THROTTLE POSITION SENSOR
Refer to "Component Inspection", EC-182.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Replace throttle position sensor.

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



Component Inspection

NLEC0294

CLOSED THROTTLE POSITION SWITCH

NLEC0294S01

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and turn ignition switch "ON".
3) Select "DATA MONITOR" mode with CONSULT-II.
4) Check indication of "CLSD THL/P SW" under the following conditions.

NOTE:
Measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-99.

5) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

Without CONSULT-II

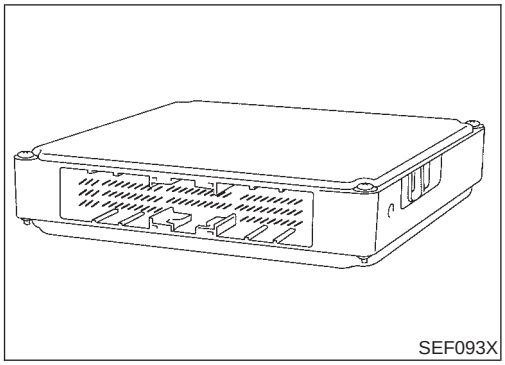
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF".
3) Disconnect throttle position switch harness connector.
4) Check continuity between terminals 4 and 5 under the following conditions. Refer to wiring diagram.

NOTE:
Continuity measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-99.

5) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.



SEF093X

Component Description

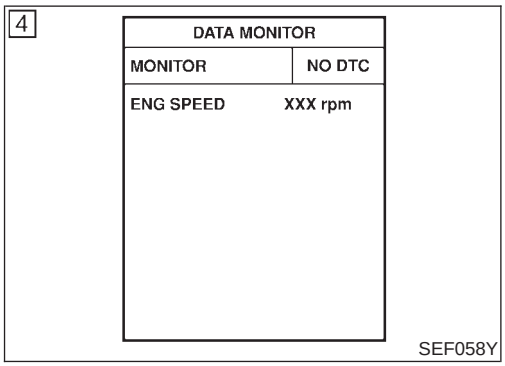
NLEC0295

The ECM consists of a microcomputer, and connectors for signal input and output and for power supply. The ECM controls the engine.

On Board Diagnosis Logic

NLEC0296

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0605 0605	● ECM calculation function is malfunctioning.	● ECM



SEF058Y

DTC Confirmation Procedure

NLEC0297

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine.
4) Run engine for at least 1 second at idle speed.
5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-359.

With GST

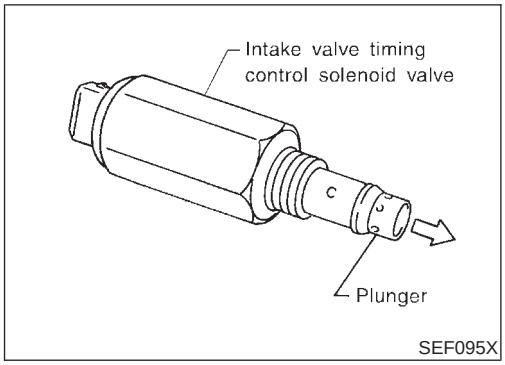
Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

=NLEC0298

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-358. 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-358. 5. Is the 1st trip DTC P0605 displayed again?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	**INSPECTION END**

2	REPLACE ECM
1. Replace ECM. 2. Perform initialization of NATS (NISSAN ANTI-THEFT SYSTEM) system and registration of all NATS ignition key IDs. Refer to “NATS (NISSAN ANTI-THEFT SYSTEM)”, EC-72. 3. Perform “Idle Air Volume Learning”, EC-57, **Is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	**INSPECTION END**
INCMP ▶	Follow the construction of “Idle Air Volume Learning”.



Component Description

NLEC0513

The valve timing control system is utilized to control intake valve opening and closing timing. Engine coolant temperature signals, engine speed and throttle position are used to determine intake valve timing.

The intake camshaft sprocket position is regulated by oil pressure controlled by the intake valve timing control.

When ECM sends ON signal to intake valve timing control solenoid valve, oil pressure is transmitted to camshaft sprocket. Then, intake side camshaft is advanced.

Operation

NLEC0514

Engine operating condition				Intake valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap
Engine coolant temperature	Engine speed	B/FUEL SCHDL	Neutral switch			
20°C (68°F) - 70°C (158°F)	1,150 - 4,600 rpm	Above 3 msec	OFF	ON	Advance	Increased
Above 70°C (158°F)		Above 7 msec				
Conditions other than those above				OFF	Normal	Normal

CONSULT-II Reference Value in Data Monitor Mode

NLEC0515

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL-B1	● Engine: After warming up ● Lift up vehicle and suitable gear position	Idle	OFF
		Revving engine from 2,000 to 3,000 rpm	ON

ECM Terminals and Reference Value

NLEC0516

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	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Warm-up condition ● Lift up vehicle and suitable gear position ● Rev engine from 2,000 to 3,000 rpm	Approximately 0V

On Board Diagnosis Logic

NLEC0517

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1111 1111	● An improper voltage signal is entered to ECM through intake valve timing control solenoid valve.	● Harness or connectors (The intake valve timing control solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msee
INT/V SOL-BL	OFF

SEF608Y

DTC Confirmation Procedure

NLEC0518

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-364.

Without CONSULT-II

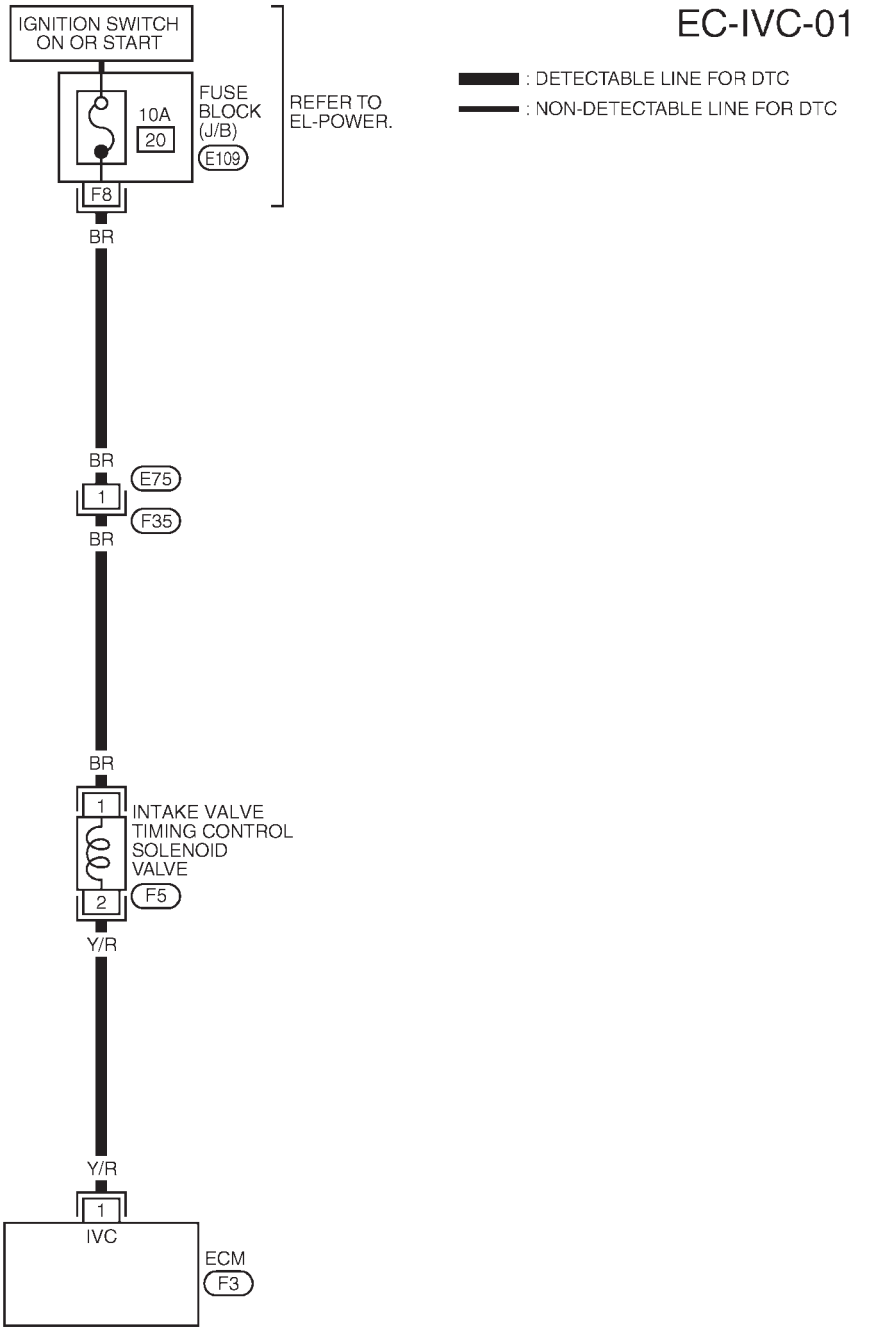
1) Turn ignition switch “ON”, wait at least 5 seconds.
2) Perform “Diagnostic Test Mode II” (Self-diagnostic results), EC-73.
3) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-364.

Wiring Diagram

NLEC0519

MODELS WITH ECM IN ENGINE COMPARTMENT

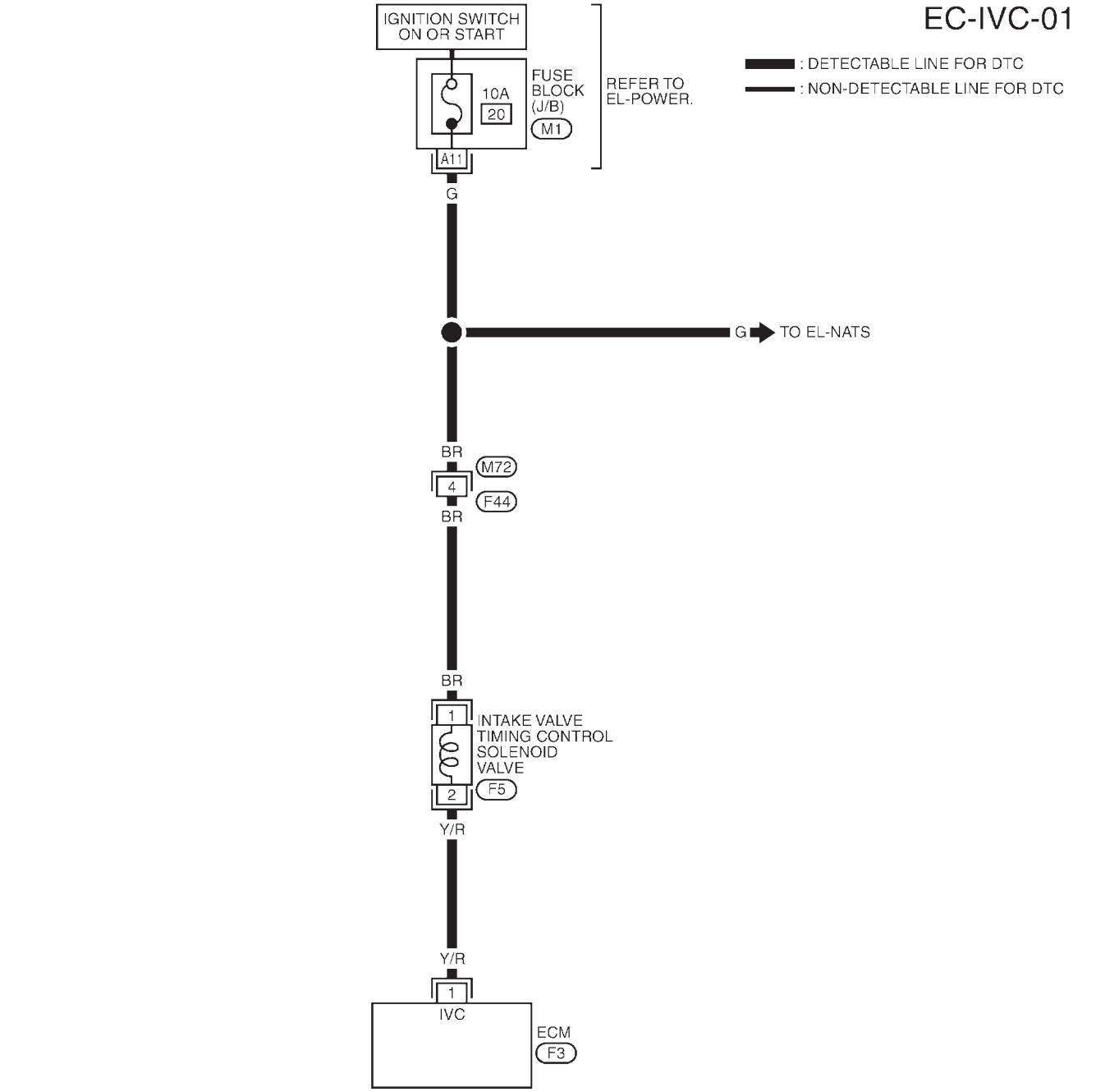
NLEC0519S01

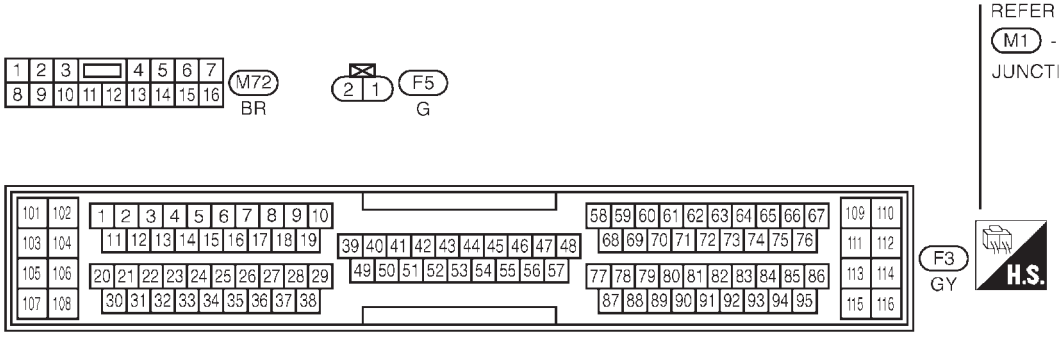


YEC680

MODELS WITH ECM IN CABIN

NLEC0519S02





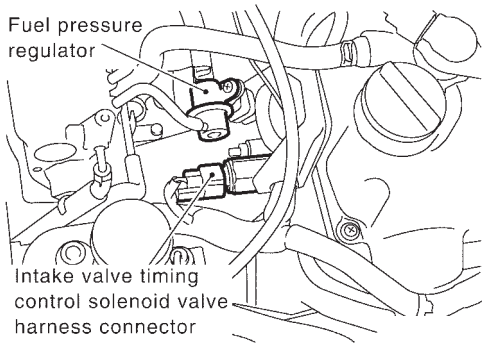
YEC889

Diagnostic Procedure

NLEC0520

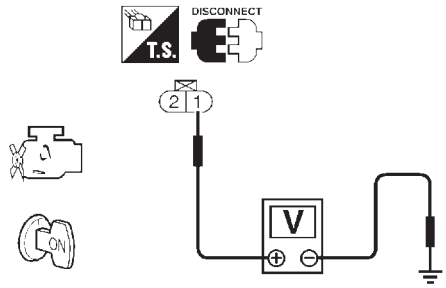
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.



SEF149X

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



Voltage: Battery voltage

SEF619X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F35, E75 (where fitted)
- Harness connectors M72, F44 (where fitted)
- 10A fuse
- Harness for open or short between valve timing control solenoid valve and fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

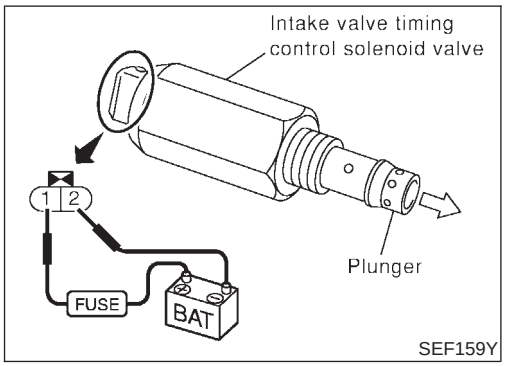
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 1 and intake valve timing control solenoid valve harness connector terminal 2. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground to short to power or connectors.

4	CHECK VALVE TIMING CONTROL SOLENOID VALVE	
Refer to "Component Inspection", EC-365.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace valve timing control solenoid valve.

5	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**



Component Inspection

NLEC0521

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

NLEC0521S01

1. Check oil passage visually for any metal debris.
2. Supply intake valve timing control solenoid valve terminals with battery voltage.
3. Make sure that inside plunger protrudes.
   If NG, replace intake valve timing control solenoid valve.

Description

NLEC0522

SYSTEM DESCRIPTION

NLEC0522S01

Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position	Swirl control valve system control	Swirl control valve control solenoid valve via swirl control valve
Ignition switch	Start signal		
Crankshaft position sensor (POS)	Engine speed		
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		

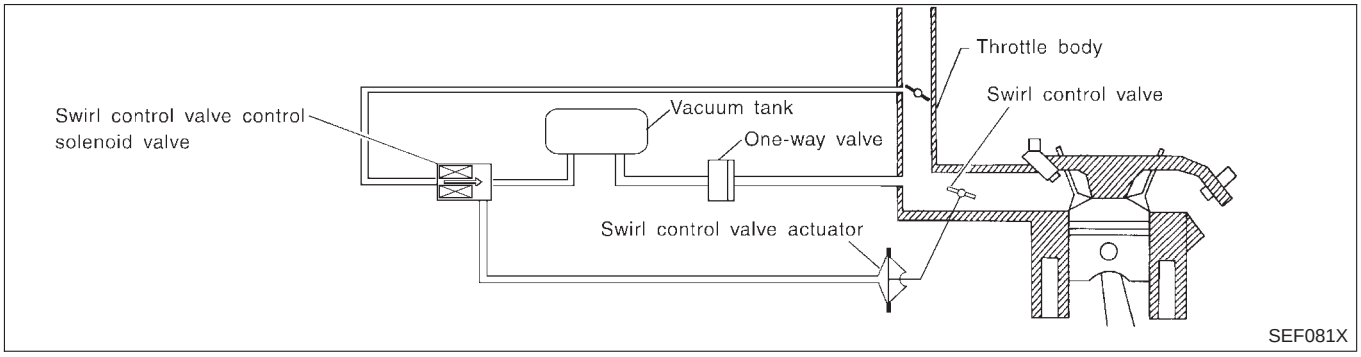
This system has a swirl control valve in the intake passage of each cylinder.
While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion 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.
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

OPERATION

NLEC0522S02

Engine coolant temperature	Throttle position sensor (Idle position)	Engine speed	Swirl control valve control solenoid valve	Swirl control valve
15 - 40°C (59 - 104°F)	ON	—	ON	Closed
	OFF	Below 2,400 rpm*		
Except above			OFF	Open

*: The value may vary according to accelerator pedal operation.



CONSULT-II Reference Value in Data Monitor Mode

NLEC0523

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 40°C (104°F).	ON
		Engine coolant temperature is above 40°C (104°F).	OFF

ECM Terminals and Reference Value

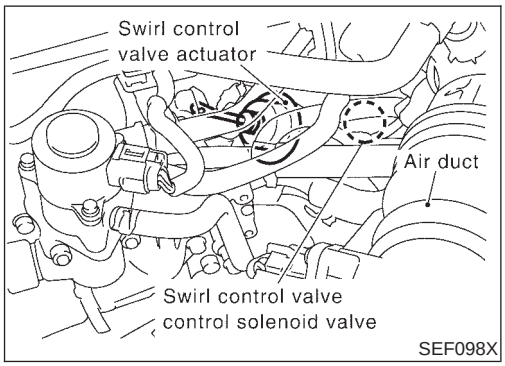
=NLEC0524

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)
104	SB	Swirl control valve control solenoid valve	**[Engine is running]** ● Engine coolant temperature is between 15°C (59°F) to 40°C (104°F). ● Idle speed	0 - 1V
			[Engine is running] ● Engine coolant temperature is above 40°C (104°F). ● Idle speed	BATTERY VOLTAGE (11 - 14V)



Component Description

NLEC0525

SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

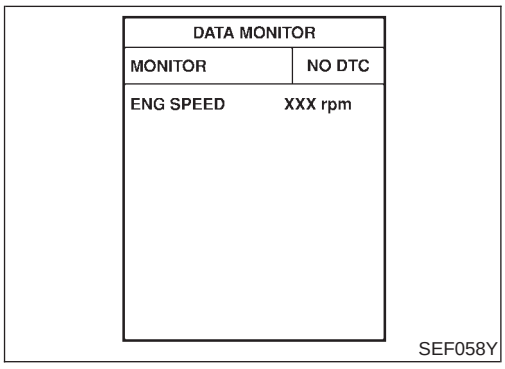
NLEC0525S01

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.

On Board Diagnosis Logic

NLEC0526

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1131 1131	An improper voltage signal is sent to ECM through swirl control valve control solenoid valve.	● Harness or connectors (The swirl control valve control solenoid valve circuit is open or shorted.) ● Swirl control valve control solenoid valve



DTC Confirmation Procedure

NLEC0527

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch "OFF" and wait at least 9 seconds, then turn ignition switch ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.

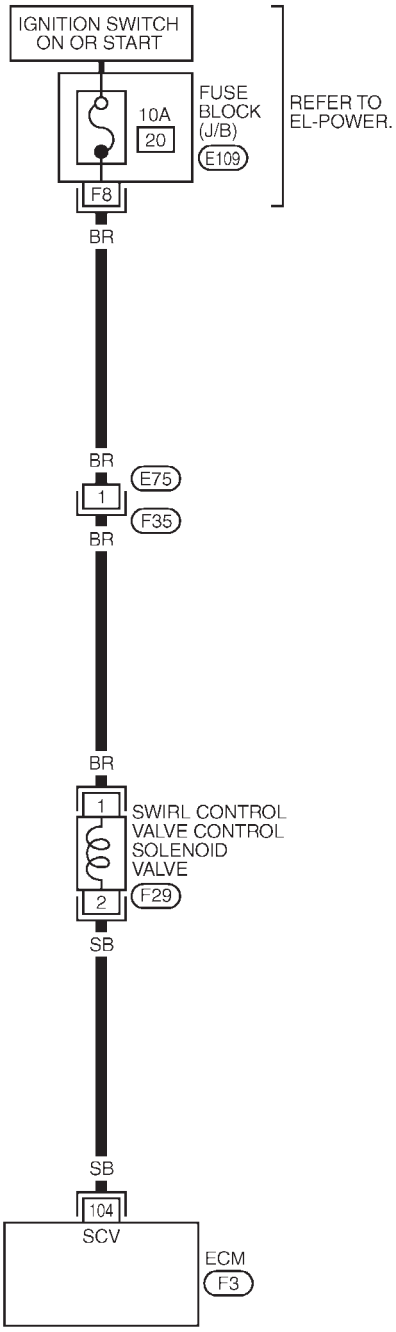
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-370.

With GST

Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NLEC0528



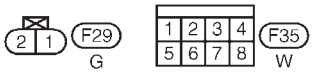
EC-SWL/V-01

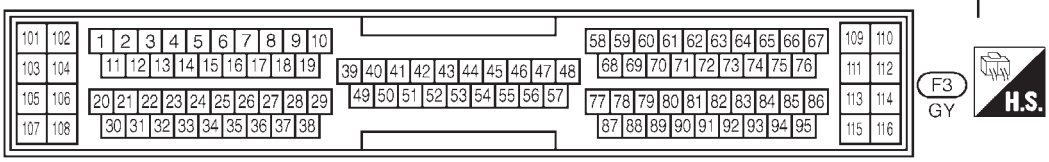
: DETECTABLE LINE FOR DTC

: NON-DETECTABLE LINE FOR DTC

REFER TO THE FOLLOWING.

E109 -FUSE BLOCK-JUNCTION BOX (J/B)





YEC681

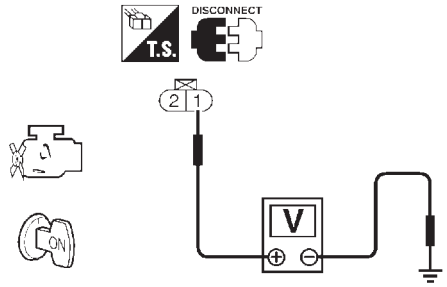
Diagnostic Procedure

NLEC0529

1	INSPECTION START
Do you have CONSULT-II?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK CIRCUIT
1. Perform “SWIRL CONT SOL/V” in “ACTIVE TEST” mode. 2. 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 POWER SUPPLY
1. Disconnect swirl control valve control solenoid valve harness connector. 2. Turn ignition switch “ON”. 3. Check voltage between terminal 2 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 E75, F35 ● 10A fuse ● Harness for open or short between swirl control valve control solenoid valve and fuse	
▶	Repair harness or connectors.

5	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 104 and swirl control valve control solenoid valve harness connector terminal 2 with CONSULT-II or tester.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, 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.

6	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

Refer to "COMPONENT INSPECTION", EC-371.

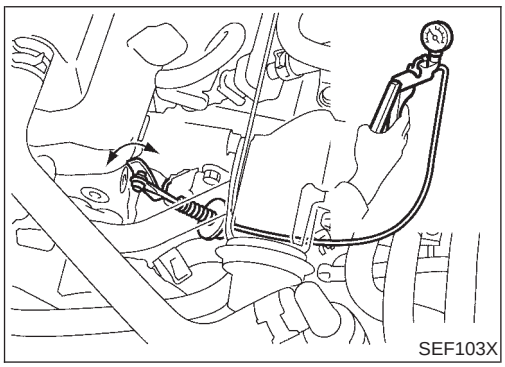
OK or NG

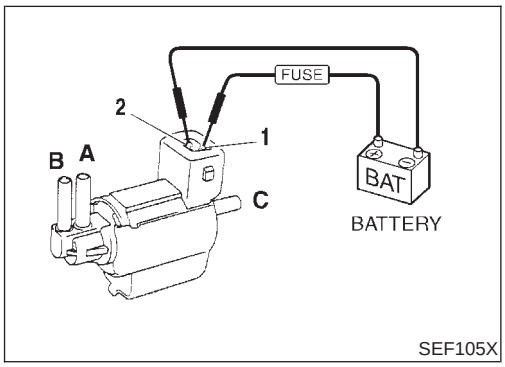
OK	▶	GO TO 7.
NG	▶	Replace swirl control valve control solenoid valve.

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

	▶	**INSPECTION END**


SEF103X



SEF105X

Component Inspection

SWIRL CONTROL VALVE AND ACTUATOR

NLEC0530

NLEC0530S01

Supply vacuum to actuator and check swirl control valve operation.

Condition	Swirl control valve
Supply vacuum to actuator	Close
No supply	Open

If NG, replace swirl control valve and actuator.

SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

NLEC0530S02

Check solenoid valve air passage continuity.

With CONSULT-II

Turn ignition switch "ON" and perform "SWIRL CONT SOL/V" in "ACTIVE TEST" mode.

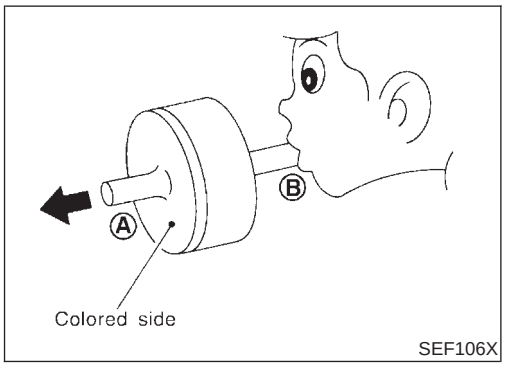
Condition SWIRL CONT SOL/V	Air passage continuity between A and B	Air passage continuity between A and C
ON	Yes	No
OFF	No	Yes

If NG or operation takes more than 1 second, replace solenoid valve.

Without CONSULT-II

Condition	Air passage continuity between A and B	Air passage continuity between A and C
12V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

If NG or operation takes more than 1 second, replace solenoid valve.



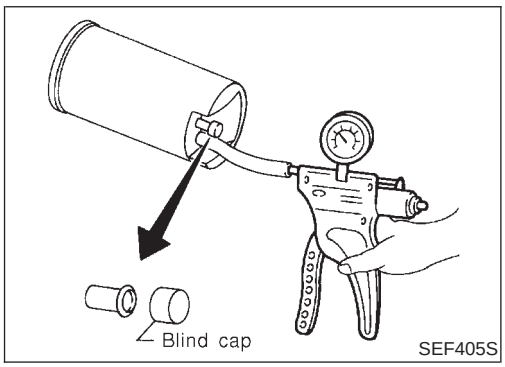
ONE-WAY VALVE

NLEC0530S03

Check one-way valve air passage continuity.

Condition	Air passage continuity
Blow air from side B to A	Yes
Blow air from side A to B	No

If NG, replace one-way valve.



VACUUM TANK

NLEC0530S04

Check vacuum tank leakage.

Apply vacuum −80.0 kPa (−800 mbar, −600 mmHg, −23.62 inHg, −11.60 psi). Then keep it for 10 seconds and check there is no leakage.

If NG, replace vacuum tank.

System Description

NLEC0433

COOLING FAN CONTROL

NLEC0433S01

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 ON-OFF control.

OPERATION

NLEC0433S02

Engine coolant temperatures at which the cooling fan turns “ON” are indicated in the Table below.

		Vehicle speed km/h (MPH)		
Air conditioner switch	High pressure of refrigerant kPa (bar, kg/cm^2, psi)	Less than 50 (30)	50 - 80 (30 - 50)	More than 80 (50)
ON	More than 1,680 (16.8, 17.14, 244)	Always	Always	More than 95°C (203°F)
	Less than 1,680 (16.8, 17.14, 244)	Always	More than 95°C (203°F)	More than 95°C (203°F)
OFF		More than 100°C (212°F)	More than 95°C (203°F)	More than 95°C (203°F)

CONSULT-II Reference Value in Data Monitor Mode

NLEC0486

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 less than 100°C (212°F)	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

ECM Terminals and Reference Value

=NLEC0487

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	LG/R	Cooling fan relay	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	0 - 0.6V
23	L/W	Air conditioner switch	**[Engine is running]** ● Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			[Engine is running] ● Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NLEC0572

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

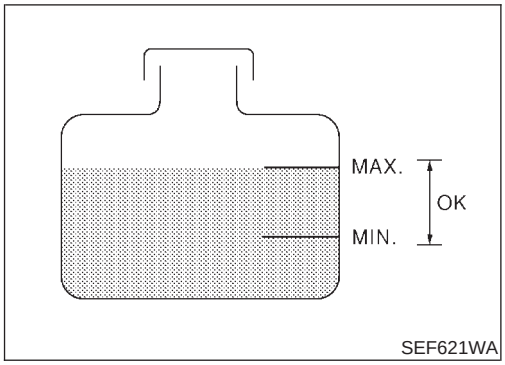
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1217 1217	● The engine coolant temperature is extraordinary high, even when the load is not heavy.	● Harness or connectors (The cooling fan circuit is open or shorted) ● Cooling fan ● Thermostat ● Improper ignition timing ● Engine coolant temperature sensor ● Blocked radiator ● Blocked front end (Improper fitting of nose mask) ● Crushed vehicle frontal area (Vehicle frontal is collided but not repaired) ● Blocked air passage by improper installation of front fog lamp or fog lamps. ● Improper mixture ratio of coolant ● Damaged bumper For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-384.

CAUTION:

When a malfunction is indicated, be sure to replace the coolant following the procedure in the LC-19, "Changing Engine Coolant". Also, replace the engine oil.

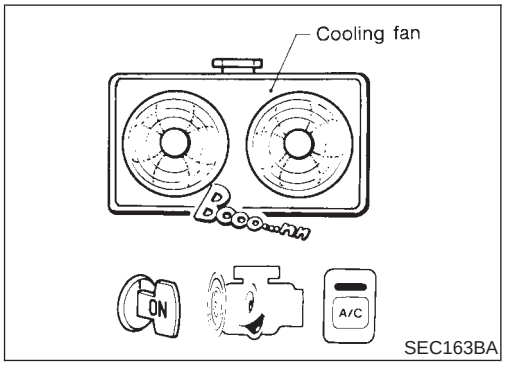
1) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-20, "Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS".
2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.



SEF621WA

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF646X



SEC163BA

Overall Function Check

NLEC0489

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

With CONSULT-II

1) Check the coolant level and mixture ratio (using coolant tester) in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level and mixture ratio.
- 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-378.
- If the coolant mixture ratio is out of the range of 45 to 55%, replace the coolant in the following procedure LC-19, "Changing Engine Coolant".

2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-378.
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-378.

Without CONSULT-II

1) Check the coolant level and mixture ratio (using coolant tester) in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level and mixture ratio.
- 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-378.
- If the coolant mixture ratio is out of the range of 45 to 55%, replace the coolant in the following procedure LC-19, "Changing Engine Coolant".

2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-378.
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 air conditioner operating.
   Be careful not to overheat engine.
8) Make sure that cooling fan operates. Refer to "OPERATION" table for cooling fan, EC-373.
   If NG, go to "Diagnostic Procedure", EC-378.

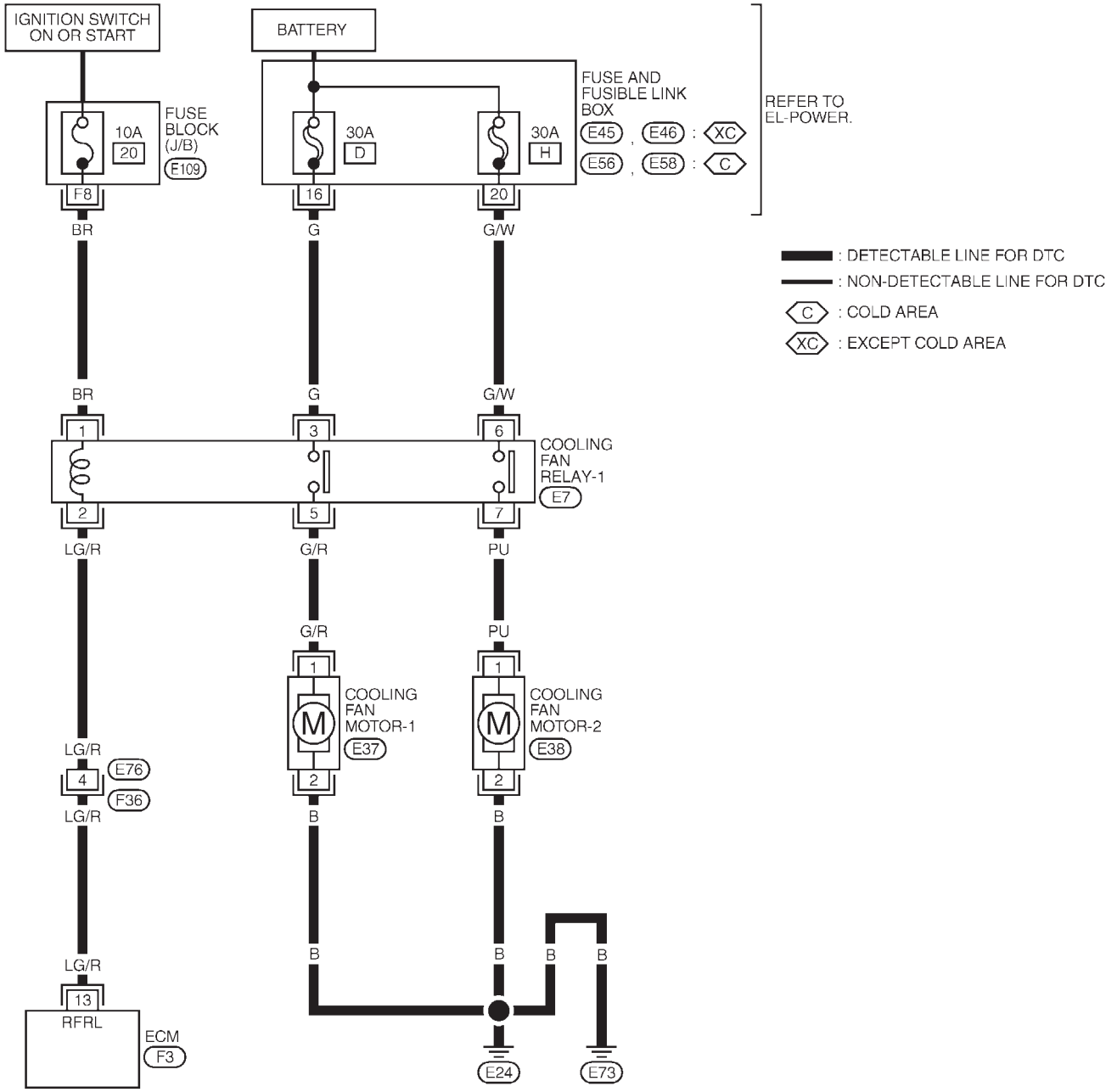
Wiring Diagram

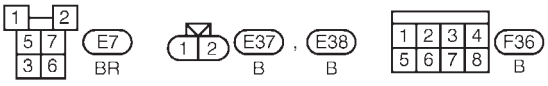
NLEC0490

MODELS WITH FUSE AND FUSIBLE LINK BOX E43

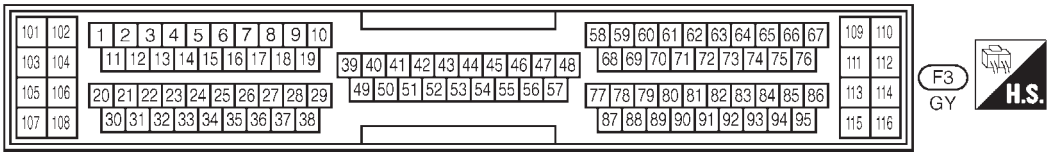
NLEC0490S03

EC-COOL/F-01





REFER TO THE FOLLOWING.
E109 -FUSE BLOCK-JUNCTION BOX (J/B)
E45 , E46 , E56 , E58
-FUSE AND FUSIBLE LINK BOX

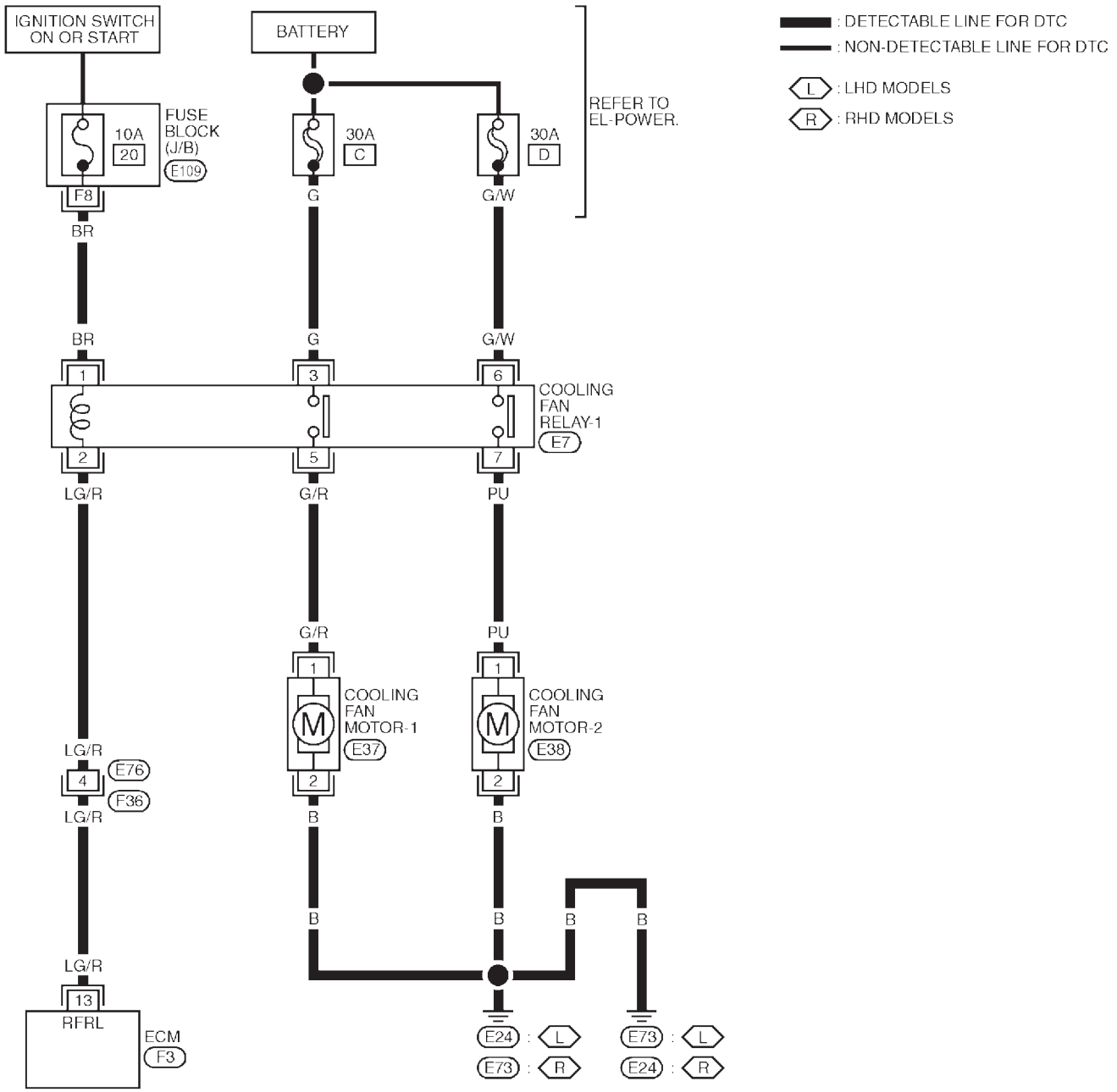


YEC682

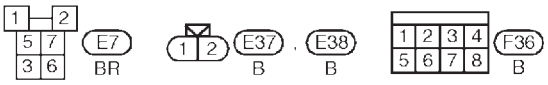
MODELS WITH FUSE AND FUSIBLE LINK BOX E90

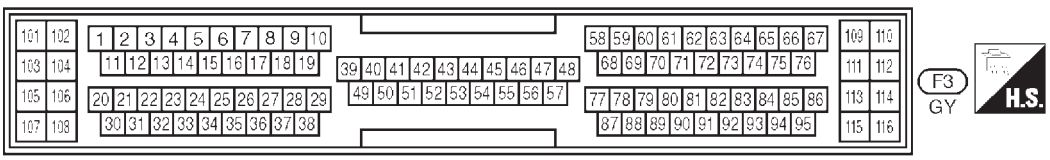
NLEC0490S04

EC-COOL/F-01



REFER TO THE FOLLOWING.
E109 -FUSE BLOCK-
JUNCTION BOX (J/B)





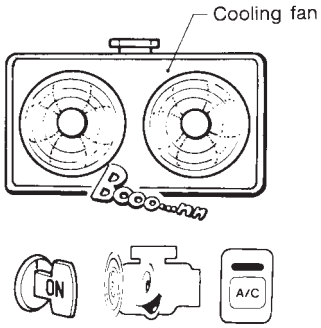
YEC890

Diagnostic Procedure

NLEC0491

1	CHECK COOLING FAN OPERATION

1. Start engine and let it idle.
2. Set temperature lever at full cold position.
3. Turn air conditioner switch “ON”.
4. Turn blower fan switch “ON”.
5. Make sure that cooling fans-1 and -2 operate.



SEC163BA

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 2.

2	CHECK AIR CONDITIONER OPERATION

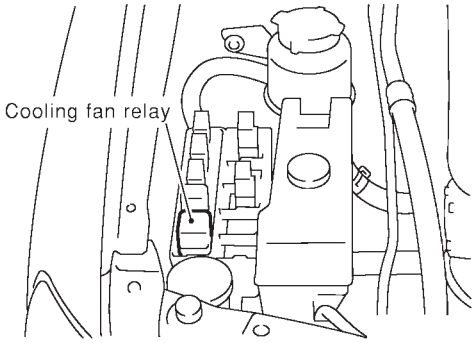
Is air conditioner operating?
(Check operation of compressor and blower motor.)

OK or NG

OK	▶	GO TO 3.
NG	▶	Check for failure of air conditioner to operate. Refer to HA section.

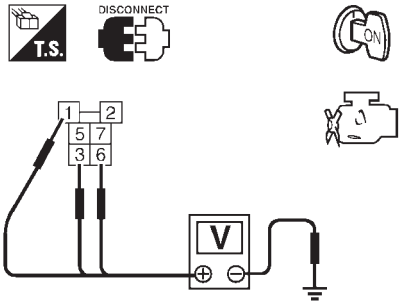
3	CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay.



SEF628Y

3. Turn ignition switch "ON".
4. Check voltage between terminals 1, 3, 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF590X

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

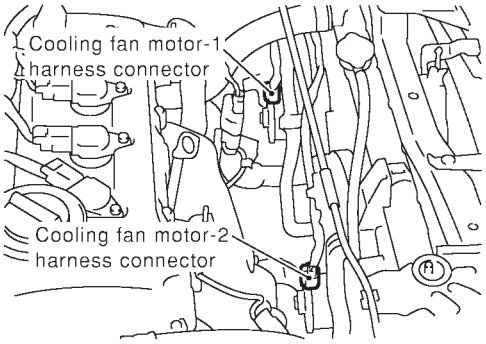
Check the following.
- 10A fuse
- 30A fusible link
- Harness for open or short between cooling fan relay and fuse

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

Diagnostic Procedure (Cont'd)

5	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.



SEF609Y

3. Check harness continuity between relay terminal 5 and motor-1 terminal 1, motor-1 terminal 2 and body ground. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to power.
5. Check harness continuity between relay terminal 7 and motor-2 terminal 1, motor-2 terminal 2 and body ground. Refer to wiring diagram.
   Continuity should exist.
6. Also check harness for short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to power in harness or connectors.

6	CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 13 and 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 E76, F36
- Harness for open or short between cooling fan relay and ECM

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

8	CHECK COOLING FAN RELAY

Refer to "Component Inspection", EC-384.

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace cooling fan relay.

9	CHECK COOLING FAN MOTORS-1 AND -2	
Refer to "Component Inspection", EC-384.		
OK or NG		
OK	▶	GO TO 10.
NG	▶	Replace cooling fan motors.

10	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**

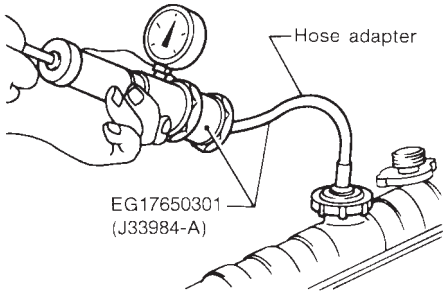
11 CHECK COOLING SYSTEM FOR LEAK

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.

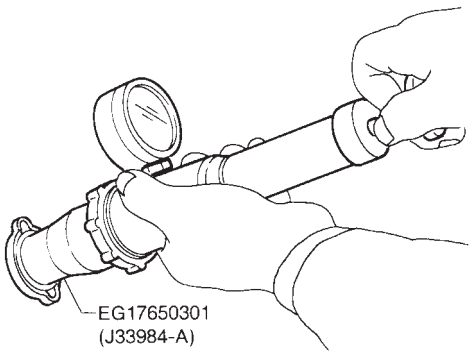
OK or NG

OK	▶	GO TO 12.
NG	▶	**Check the following for leak** ● Hose ● Radiator ● Water pump Refer to LC-14, "Water Pump".

Diagnostic Procedure (Cont'd)

12	CHECK RADIATOR CAP

Apply pressure to cap with a tester.



SLC755A

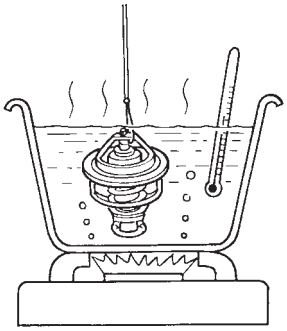
Radiator cap relief pressure:
59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace radiator cap.

13	CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.



SLC343

Valve opening temperature:
82°C (180°F) [standard]
Valve lift:
More than 8 mm/95°C (0.31 in/203°F)

3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC section ("Thermostat").

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace thermostat

14	CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to "COMPONENT INSPECTION", EC-174.

OK or NG

OK	▶	GO TO 15.
NG	▶	Replace engine coolant temperature sensor.

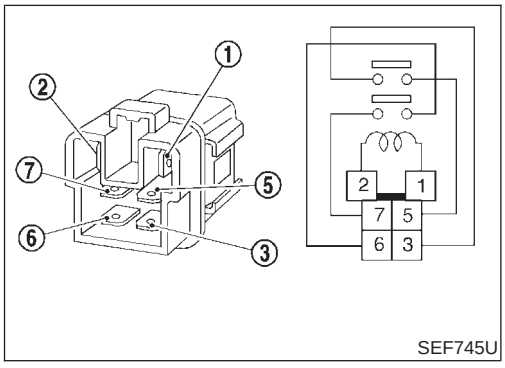
15	**CHECK MAIN 12 CAUSES**
If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-384.	
▶	**INSPECTION END**

Main 12 Causes of Overheating

=NLEC0492

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-20, “RECOMMENDED FLUIDS AND LUBRICANTS”.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See LC-19, “Changing Engine Coolant”.
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See LC-10, “System Check”.
ON*2	5	● Coolant leaks	● Visual	No leaks	See LC-10, “System Check”.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-15, “Thermostat” and LC-17, “Radiator”.
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See “TROUBLE DIAGNOSIS FOR OVERHEAT” (EC-373).
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 LC-19, “Changing Engine Coolant”.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See LC-20, “Refilling Engine Coolant”.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-36, “Inspection”, “CYLINDER HEAD”.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-54, “Inspection”, “CYLINDER BLOCK”.

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to LC-21, “OVERHEATING CAUSE ANALYSIS”.



SEF745U

Component Inspection

NLEC0493

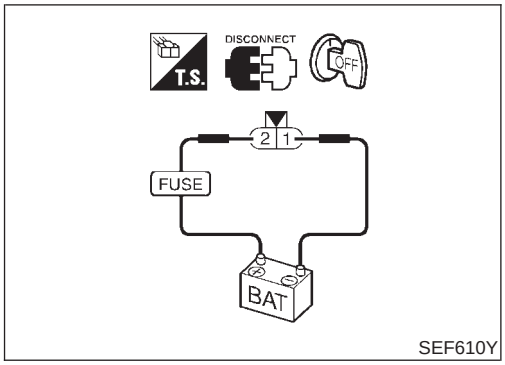
COOLING FAN RELAY

NLEC0493S01

Check continuity between terminals 3 and 5, 6 and 7.

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

If NG, replace relay.



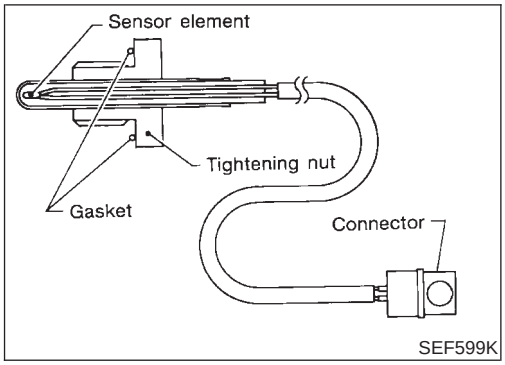
COOLING FAN MOTORS-1 AND -2

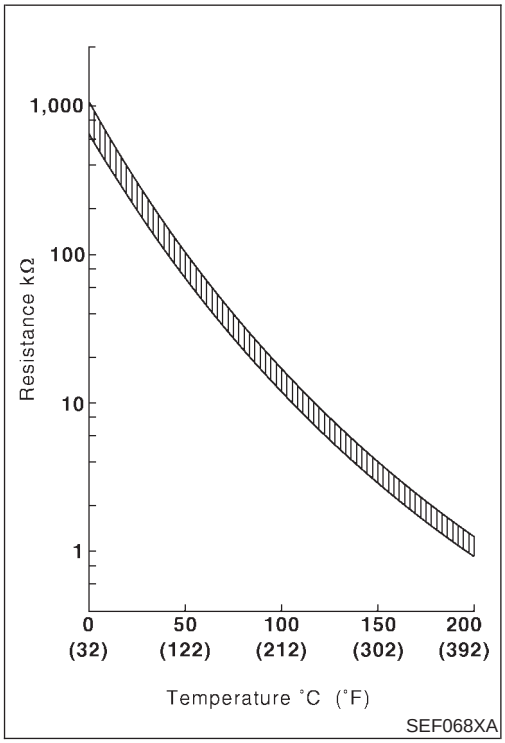
NLEC0493S02

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(−)
Cooling fan motor	2	1

Cooling fan motor should operate.
If NG, replace cooling fan motor.





Component Description

NLEC0342

The EGR temperature sensor detects temperature changes in the EGR passageway. When the EGR volume control valve opens, hot exhaust gases flow, and the temperature in the passageway changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases. This sensor is not used to control the engine system.
It is used only for the on board diagnosis.

<Reference data>

EGR temperature °C (°F)	Voltage* V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

*: These data are reference values and are measured between ECM terminal 72 (EGR temperature sensor) and ground.
When EGR system is operating.
Voltage: 0 - 1.5V

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

NLEC0343

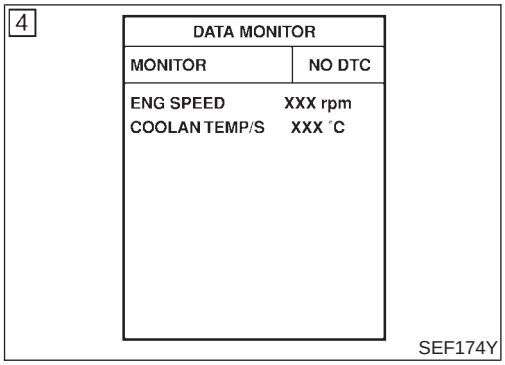
DTC No.		Malfunction is detected when ...	Check Items (Possible Cause)
P1401 1401	A)	An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low.	• Harness or connectors (The EGR temperature sensor circuit is shorted.) • EGR temperature sensor • Malfunction of EGR function
	B)	An excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high.	• Harness or connectors (The EGR temperature sensor circuit is open.) • EGR temperature sensor • Malfunction of EGR function

DTC Confirmation Procedure

NLEC0344

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 9 seconds before conducting the next test.



PROCEDURE FOR MALFUNCTION A

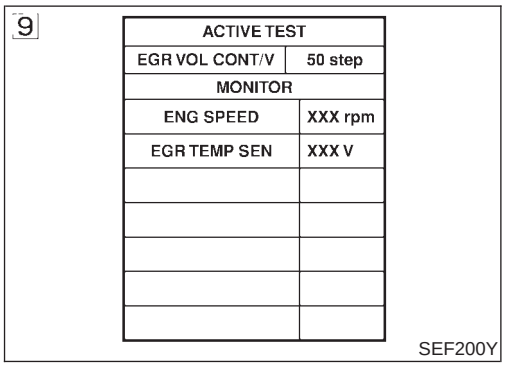
=NLEC0344S01

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Verify that "COOLAN TEMP/S" is less than 50°C (122°F).
   If the engine coolant temperature is above the range, cool the engine down.
4) Start engine and let it idle for at least 5 seconds.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-391.

With GST

Follow the procedure "With CONSULT-II" above.



PROCEDURE FOR MALFUNCTION B

NLEC0344S02

CAUTION:

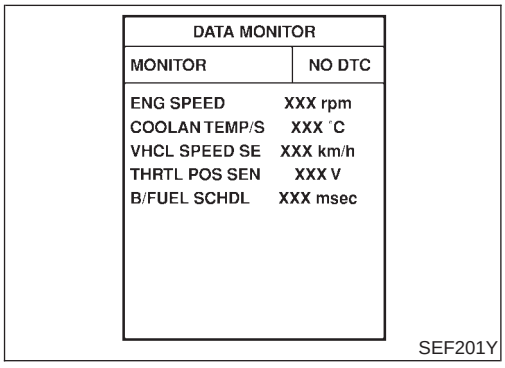
Always drive vehicle at a safe speed.

TESTING CONDITION:

Always perform the test at a temperature above −10°C (14°F).

With CONSULT-II

1) Start engine and warm it up to above 80°C (176°F).
2) Select "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
3) Hold engine speed at 1,500 rpm.
4) Touch "Qu" and set the EGR volume control valve opening to 50 step and check EGR TEMP SEN.
   EGR TEMP SEN should decrease to less than 1.0V.
   If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-391.
   If the check result is OK, go to the following step.



5) Turn ignition switch "OFF" and wait at least 9 seconds.
6) Start engine and maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	Above 2,400 rpm
VHCL SPEED SE	Above 90 km/h (56 MPH) or more
B/FUEL SCHDL	4.0 - 4.8 msec
Selector lever	Suitable position

7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-391.

With GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 9 seconds, then turn "ON".
3) Select "MODE 1" with GST and maintain the following conditions for at least 5 consecutive seconds.

Engine speed	Above 2,400 rpm
Vehicle speed	Above 90 km/h (56 MPH)
Selector lever	4th or 5th

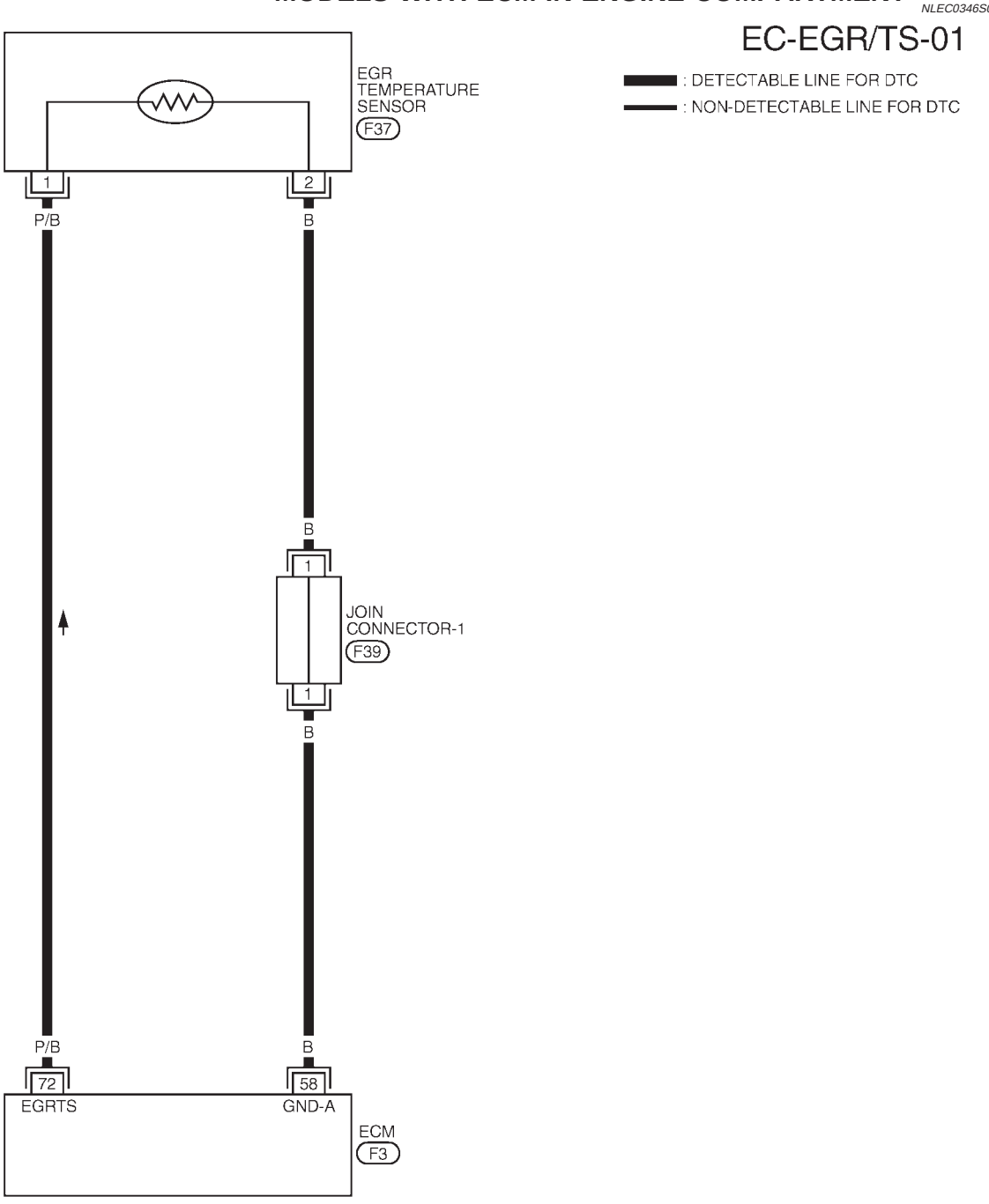
4) Select "MODE 7" with GST
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-391.

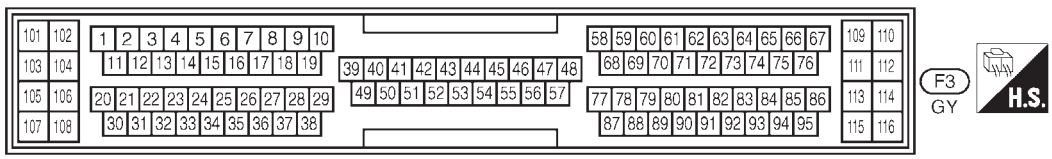
Wiring Diagram

NLEC0346

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0346S01





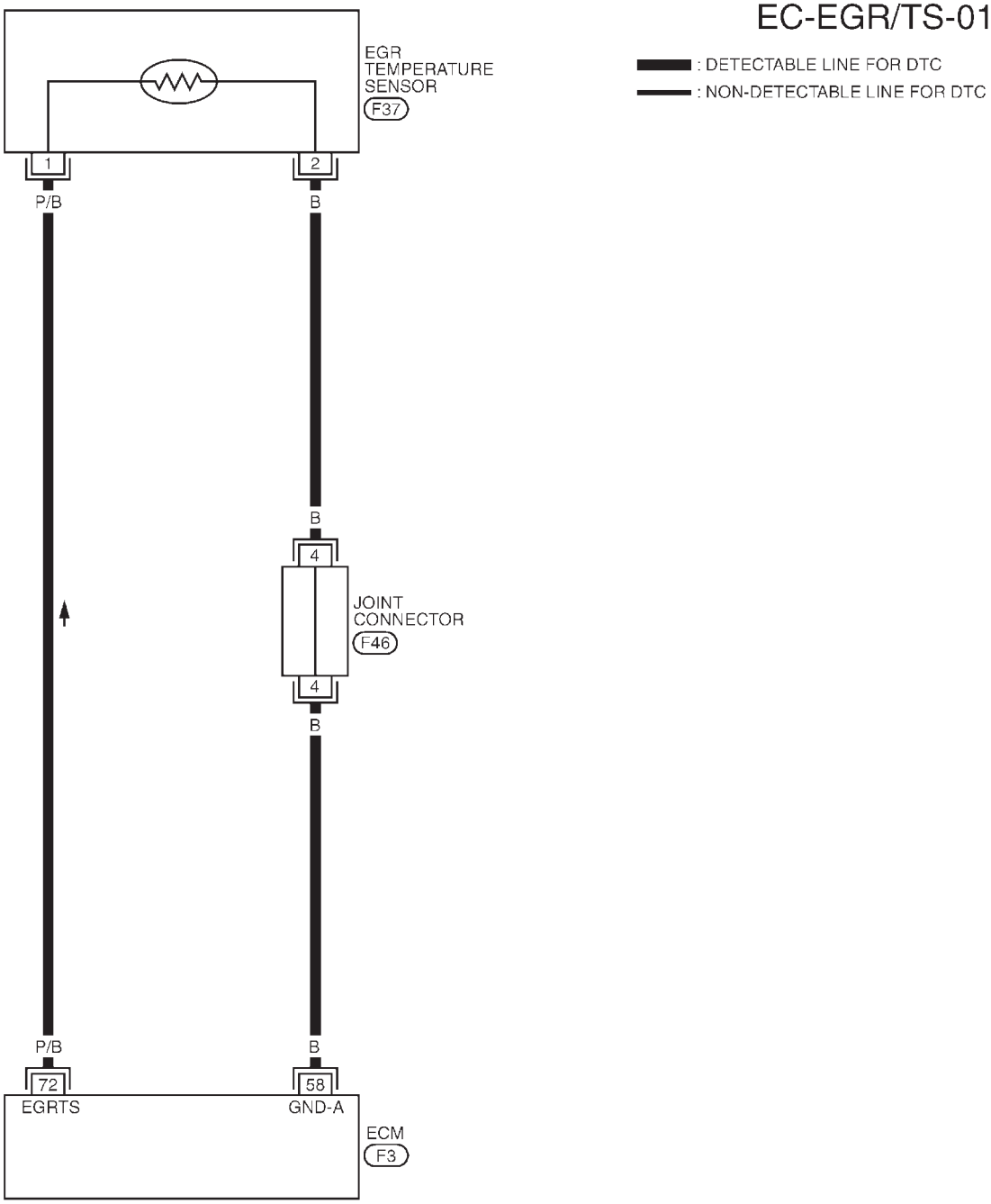
YEC670

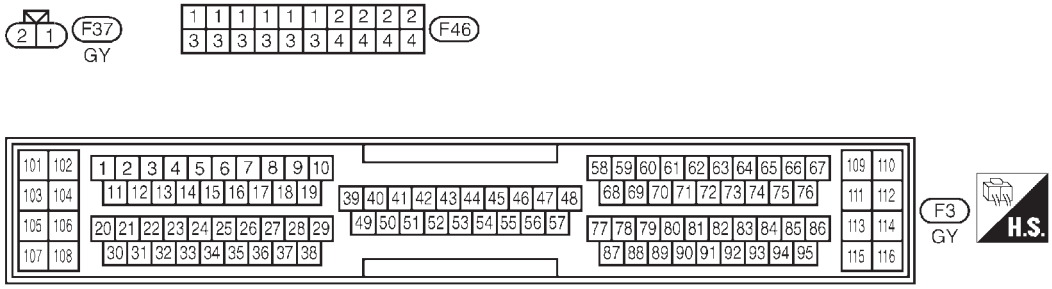
Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0346S02

EC-EGR/TS-01





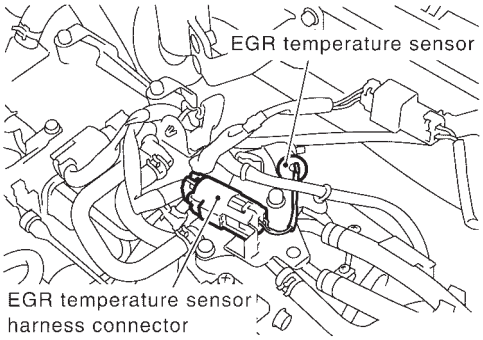
YEC891

Diagnostic Procedure

NLEC0347

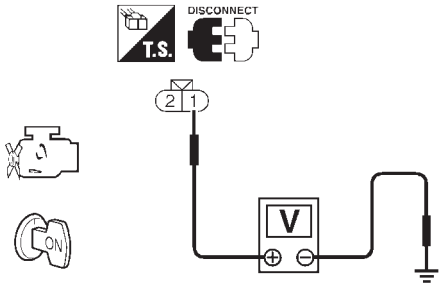
1	CHECK POWER SUPPLY

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



SEF127X

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



Voltage: Battery voltage

SEF500Y

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair harness or connectors.

2	CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EGR temperature sensor harness 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 EGR temperature sensor and ECM
- Joint connector-1 (where fitted)
- Joint connector F46 (where fitted)

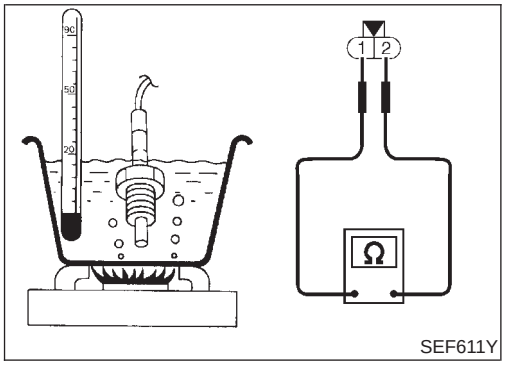
	▶	Repair open circuit or short to power in harness or connector.

Diagnostic Procedure (Cont'd)

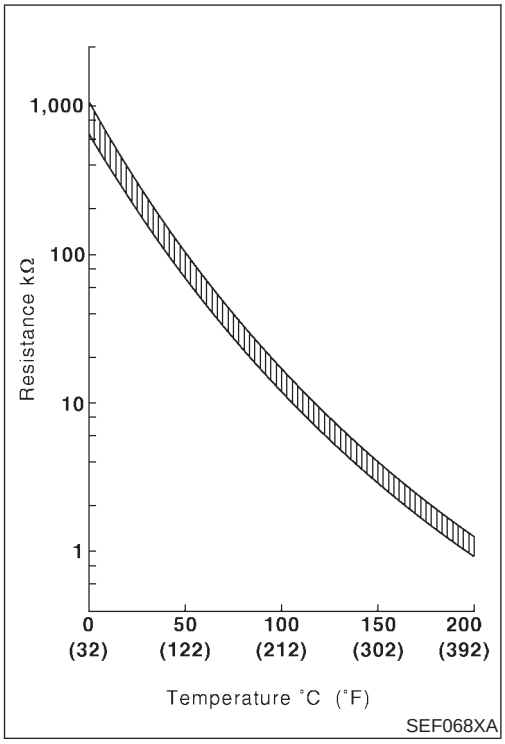
4	CHECK EGR TEMPERATURE SENSOR	
Refer to "Component Inspection", EC-392.		
	OK or NG	
OK	▶	GO TO 5.
NG	▶	Replace EGR temperature sensor.

5	CHECK EGR VOLUME CONTROL VALVE	
Refer to "Component Inspection", EC-400.		
	OK or NG	
OK	▶	GO TO 6.
NG	▶	Replace EGR volume control valve.

6	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**



SEF611Y



SEF068XA

Component Inspection

EGR TEMPERATURE SENSOR

NLEC0348

NLEC0348S01

Check resistance change and resistance value.
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

If NG, replace EGR temperature sensor.

Description

NLEC0349

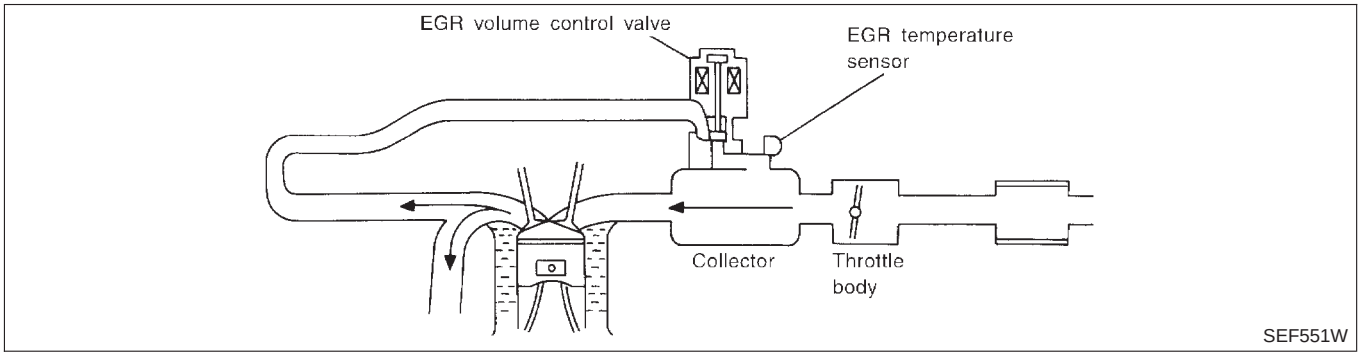
SYSTEM DESCRIPTION

NLEC0349S01

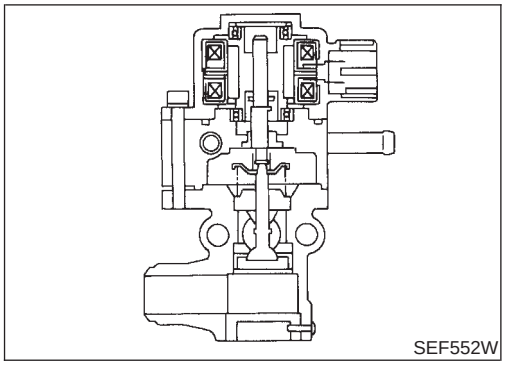
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	EGR volume control	EGR volume control valve
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Extremely light load engine operation
- Mass air flow sensor malfunction
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High-speed engine operation
- Wide open throttle
- Low battery voltage
- Engine starting



Description (Cont'd)


SEF552W

COMPONENT DESCRIPTION

NLEC0349S02

EGR Volume Control Valve

NLEC0349S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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

NLEC0539

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

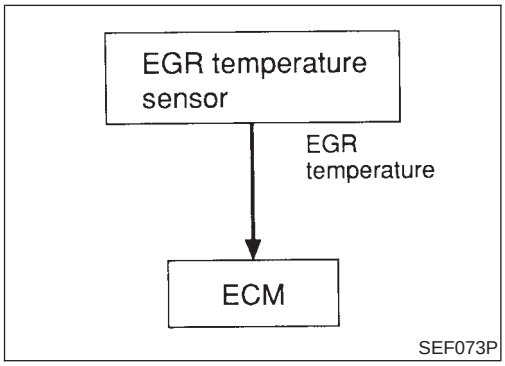
NLEC0540

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)
8 9 17 18	SB W/B R/Y BR/R	EGR volume control valve	**[Engine is running.]** ● Warm-up condition ● Idle speed	0 - 14V
58	B	Sensor's ground	**[Engine is running.]** ● Warm-up condition ● Idle speed	0V
72	P/B	EGR temperature sensor	**[Engine is running.]** ● Warm-up condition ● Idle speed	Less than 4.5V
			[Engine is running.] ● Warm-up condition ● EGR system is operating.	0 - 1.0V



SEF073P

On Board Diagnosis Logic

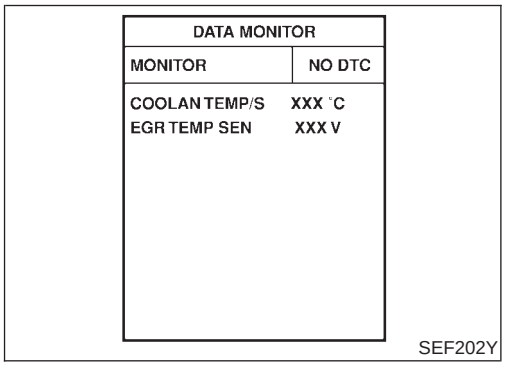
NLEC0350

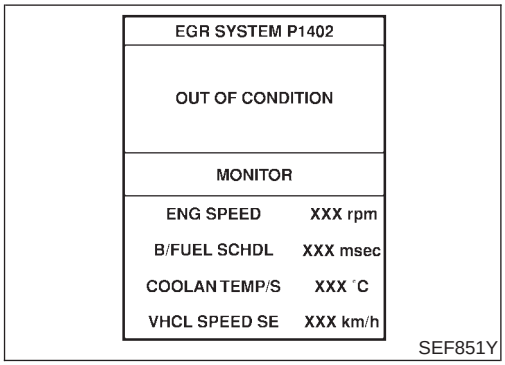
If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

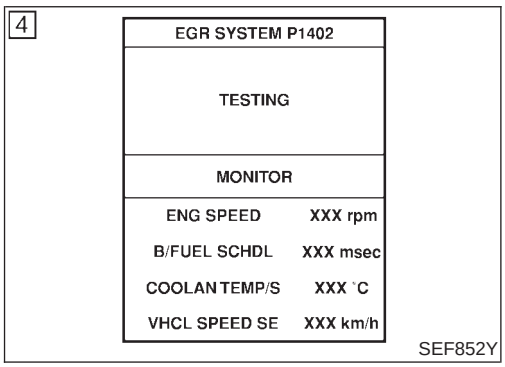
NOTE:

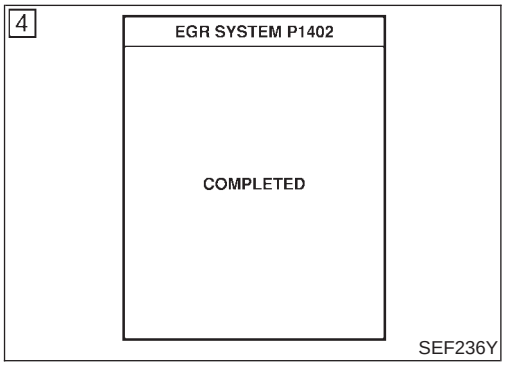
Diagnosis for this DTC will occur when engine coolant temperature is below 50 to 60°C (122 to 140°F). Therefore, it will be better to turn ignition switch "ON" (start engine) at the engine coolant temperature below 30°C (86°F) when starting DTC confirmation procedure.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1402 1402	● EGR flow is detected under conditions that do not call for EGR.	● Harness or connectors (The valve circuit is open or shorted.) ● EGR volume control valve leaking or stuck open ● EGR temperature sensor









DTC Confirmation Procedure

NLEC0351

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 9 seconds before conducting the next test.

TESTING CONDITION:

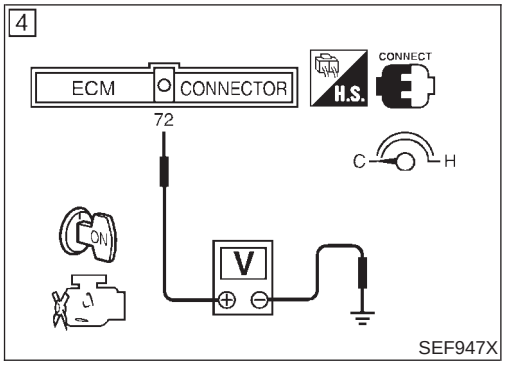
- **Always perform at a temperature above −10°C (14°F).**
- **Engine coolant temperature and EGR temperature must be verified in "DATA MONITOR" mode with CONSULT-II before starting DTC WORK SUPPORT test. If it is out of range below, the test cannot be conducted.**
  COOLAN TEMP/S: −10 to 40°C (14 to 104°F)*
  EGR TEMP SEN: Less than 4.8V
  If the values are out of the ranges indicated above, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to reduce the engine coolant or EGR temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

*: Although CONSULT-II screen displays "−10 to 40°C (14 to 104°F)" as a range of engine coolant temperature, ignore it.

With CONSULT-II

1) Turn ignition switch "OFF" and wait at least 9 seconds, then turn ignition switch "ON".
2) Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
3) Touch "START". Follow instruction of CONSULT-II.
4) Start engine and let it idle until "TESTING" on CONSULT-II screen is turned to "COMPLETED". (It will take 45 seconds or more.)
   If "TESTING" is not displayed after 5 minutes, turn ignition "OFF" and cool the engine coolant temperature to the range of −10 to 40°C (14 to 104°F). Retry from step 1.
5) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-399.

DTC Confirmation Procedure (Cont'd)



With GST

1) Turn ignition switch "ON" and select "MODE 1" with GST.
2) Check that engine coolant temperature is within the range of −10 to 40°C (14 to 104°F).
3) Check that voltage between ECM terminal 72 (EGR temperature sensor signal) and ground is less than 4.8V.
4) Start engine and let it idle for at least 45 seconds.
5) Stop engine.
6) Perform from step 1 to 4.
7) Select "MODE 3" with GST.
8) If DTC is detected, go to "Diagnostic Procedure", EC-399.

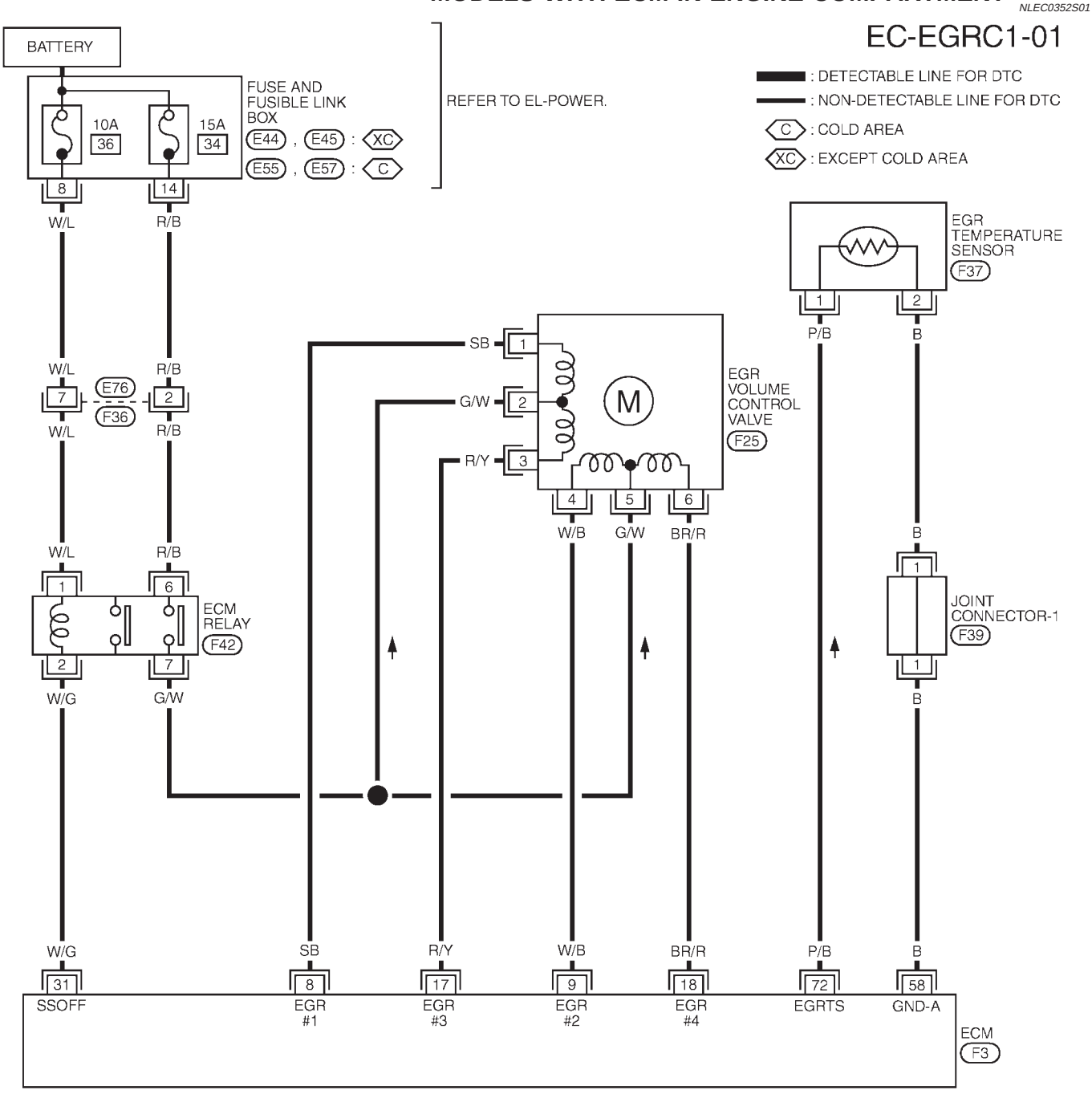
- **When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

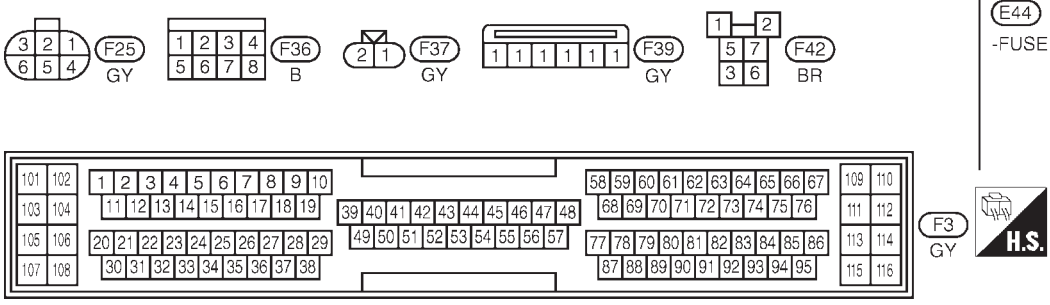
Wiring Diagram

NLEC0352

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0352S01



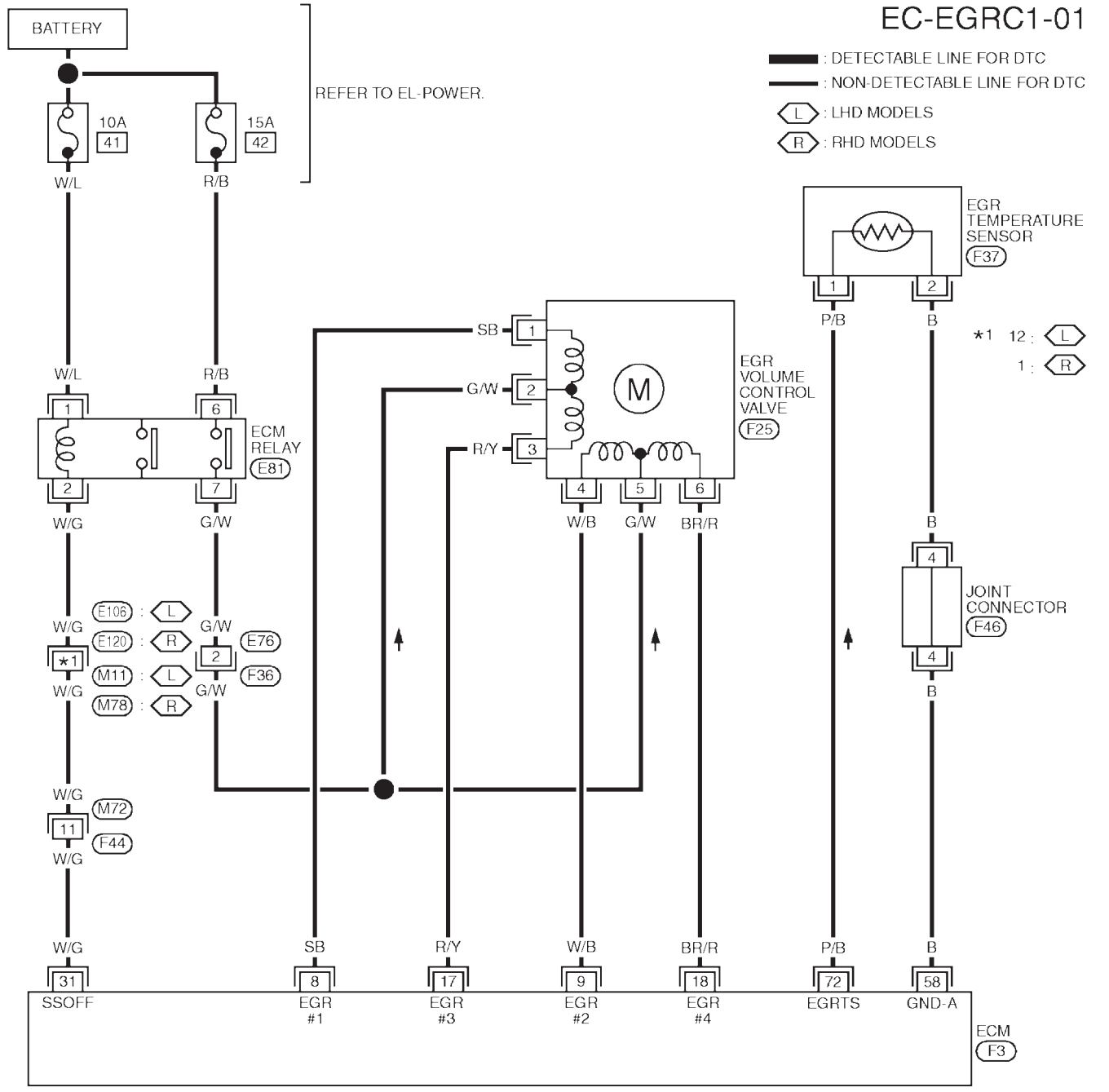


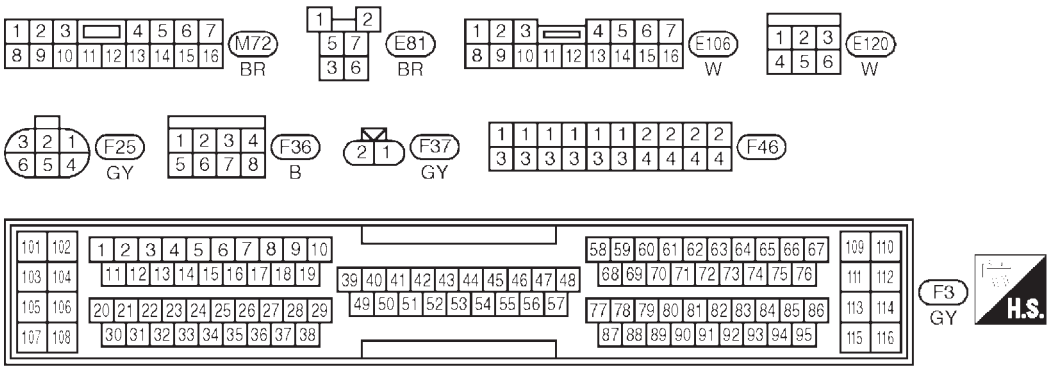
YEC664

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0352S02





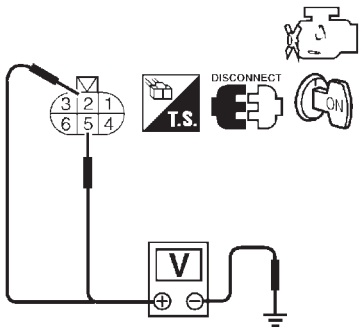
YEC884

Diagnostic Procedure

NLEC0353

1	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch “ON”.
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF327X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the harness for open or short between EGR volume control valve and ECM relay.

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and EGR volume control valve terminal 1,
   ECM terminal 9 and EGR volume control valve terminal 4,
   ECM terminal 17 and EGR volume control valve terminal 3,
   ECM terminal 18 and EGR volume control valve terminal 6.
   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, short to ground or short to power in harness connectors.

4	CHECK EGR TEMPERATURE SENSOR

Refer to “COMPONENT INSPECTION”, EC-400.

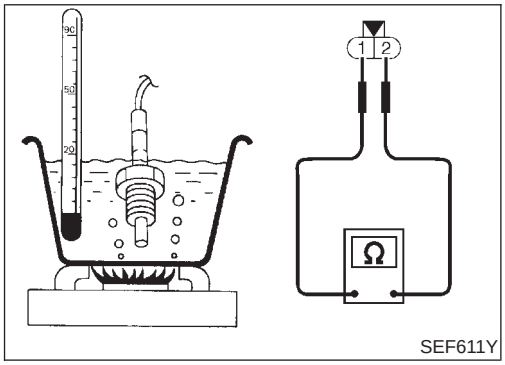
OK or NG

OK	▶	GO TO 5.
NG	▶	Replace EGR temperature sensor.

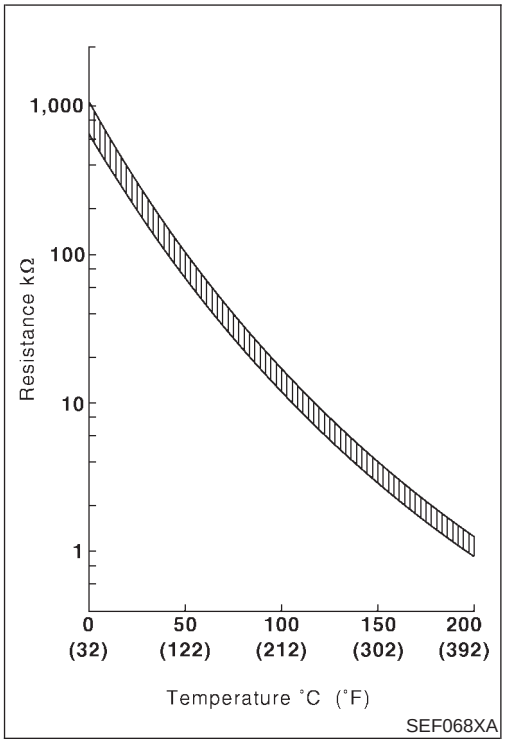
Diagnostic Procedure (Cont'd)

5	CHECK EGR VOLUME CONTROL VALVE	
Refer to "COMPONENT INSPECTION", EC-400.		
	OK or NG	
OK	▶	GO TO 6.
NG	▶	Replace EGR volume control valve.

6	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**



SEF611Y



SEF068XA

Component Inspection

NLEC0354

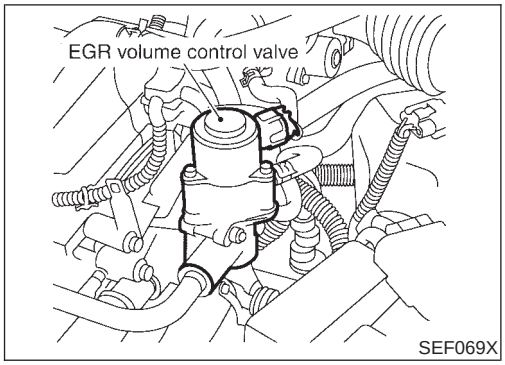
EGR TEMPERATURE SENSOR

NLEC0354S01

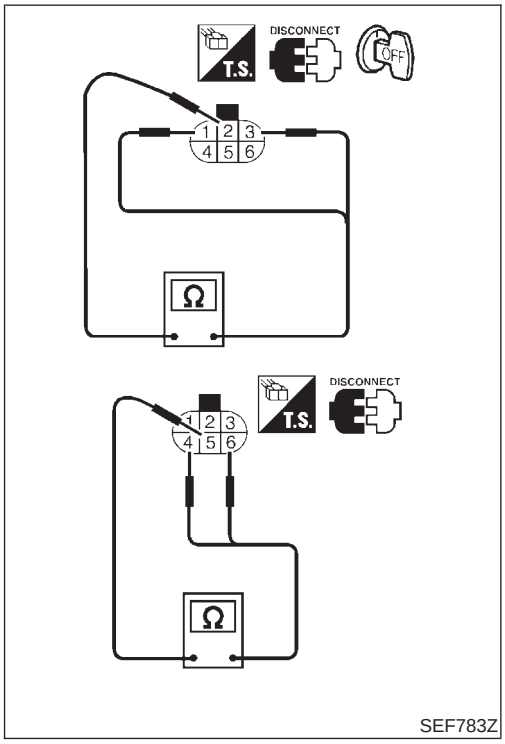
Check resistance change and resistance value.
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

If NG, replace EGR temperature sensor.



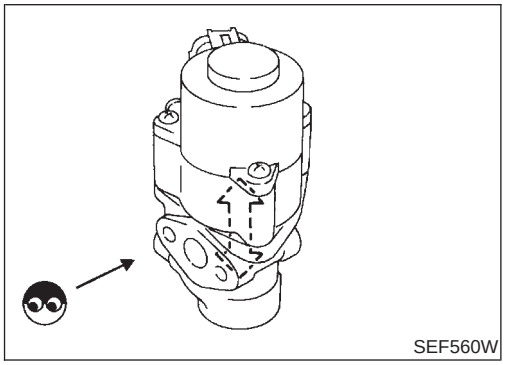
SEF069X



SEF783Z

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF015Y


SEF560W

EGR VOLUME CONTROL VALVE

NLEC0354S04

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

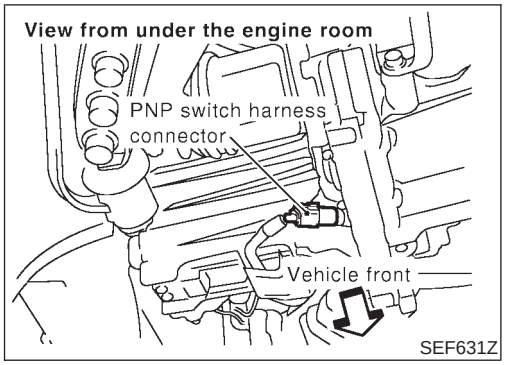
3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON".
6) Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening
   If NG, replace the EGR volume control valve.

Without CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.



Component Description

NLEC0424

When the gear position is “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the park/neutral position when continuity with ground exists.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0425

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: “N”	ON
		Except above	OFF

ECM Terminals and Reference Value

NLEC0426

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)
42	G/OR	PNP switch	**[Ignition switch “ON”]** ● Gear position is “Neutral position”	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	Approximately 5V

On Board Diagnosis Logic

NLEC0427

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1706 1706	● The signal of the PNP switch is not changed in the process of engine starting and driving.	● Harness or connectors (The PNP switch circuit is open or shorted.) ● PNP switch

DTC Confirmation Procedure

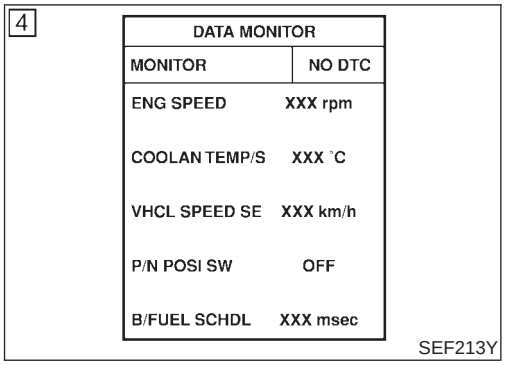
NLEC0428

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 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch “ON”.



2) Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II. Then check the "P/N POSI SW" signal under the following conditions.

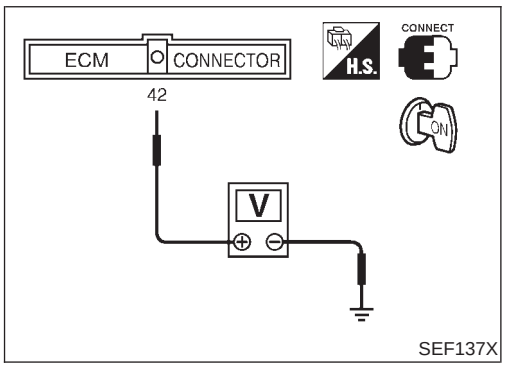
Position (Selector lever)	Known-good signal
"N" position	ON
Except the above position	OFF

If NG, go to "Diagnostic Procedure", EC-405.
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 50 consecutive seconds.

ENG SPEED	1,550 - 4,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.0 msec or more
VHCL SPEED SE	70 - 130 km/h (43 - 81 MPH)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-405.



Overall Function Check

NLEC0429

Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a 1st trip DTC might not be confirmed.

Without CONSULT-II

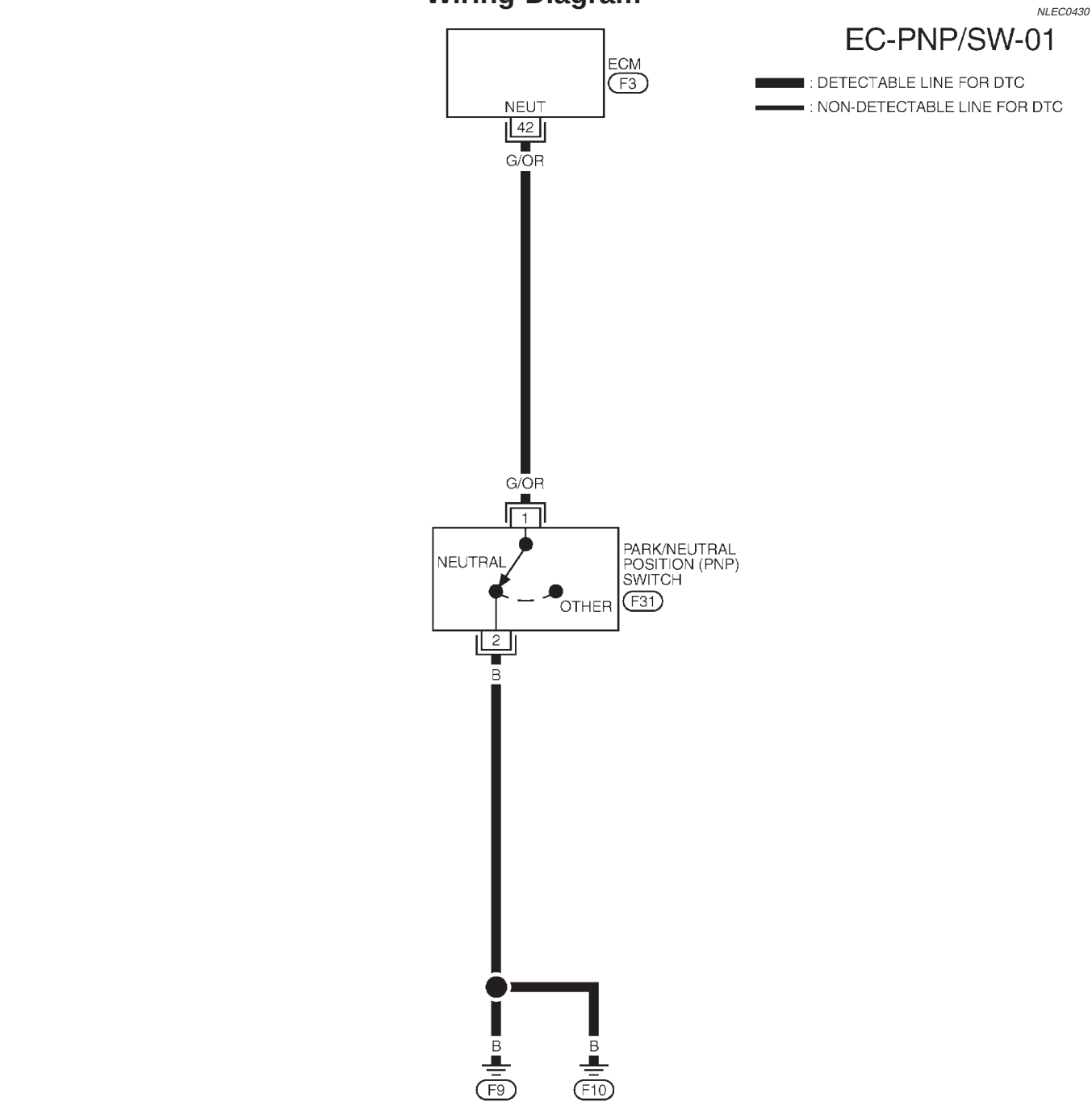
1) Turn ignition switch "ON".
2) Check voltage between ECM terminal 42 (PNP switch signal) and body ground under the following conditions.

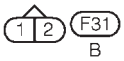
Condition (Gear position)	Voltage (V) (Known good data)
"N" position	Approx. 0
Except the above position	Approx. 5

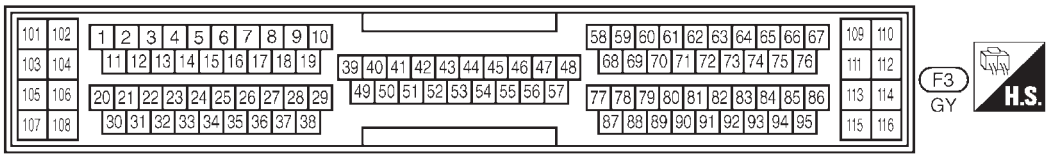
3) If NG, go to "Diagnostic Procedure", EC-405.

Wiring Diagram

NLEC0430







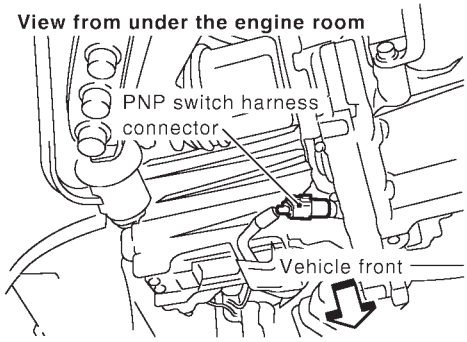
YEC671

Diagnostic Procedure

NLEC0431

1	CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect PNP switch harness connector.



SEF631Z

3. Check harness continuity between PNP switch harness connector terminal 2 and body ground. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the harness for open or short between PNP switch and body ground.

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

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 42 and PNP switch harness connector 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 harness for open or short between ECM and PNP switch.

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

5	CHECK PNP SWITCH

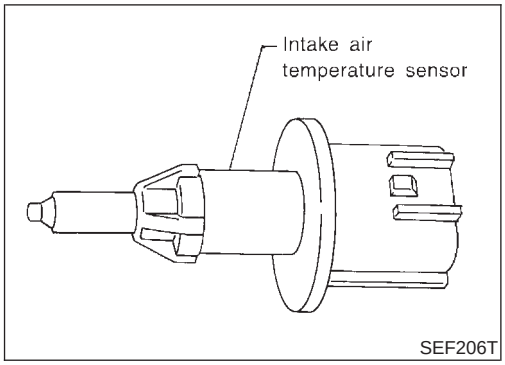
Refer to MT-16, “POSITION SWITCH CHECK”.

OK or NG

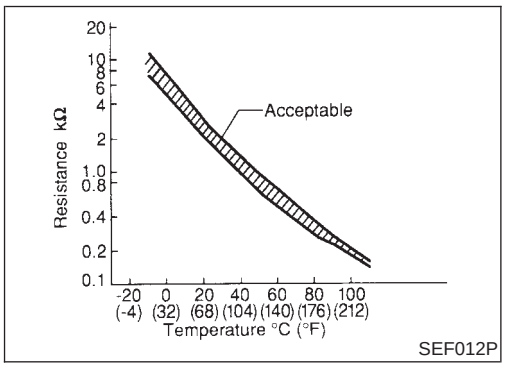
OK	▶	GO TO 6.
NG	▶	Replace PNP switch.

Diagnostic Procedure (Cont'd)

6	**CHECK INTERMITTENT INCIDENT**
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF206T



SEF012P

Component Description

NLEC1275

MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT

NLEC1275S01

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.

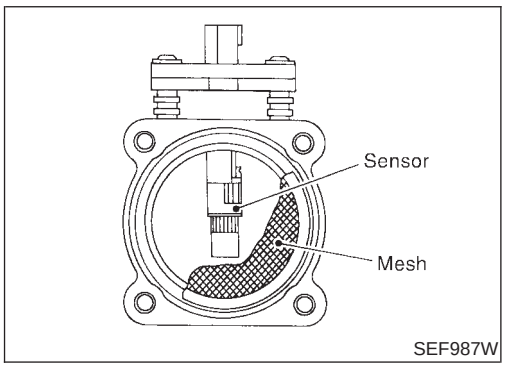
<Reference data>

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

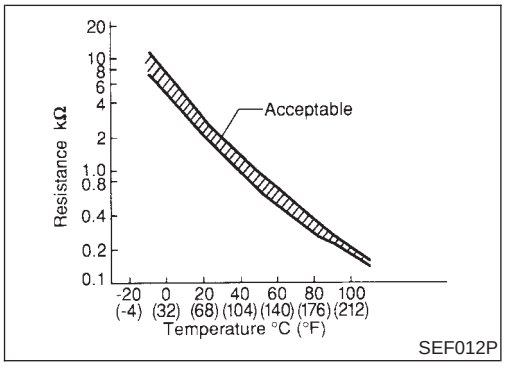
*: These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) and ground.

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.



SEF987W



SEF012P

MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR

NLEC1275S02

The intake air temperature sensor is built into the mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
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.

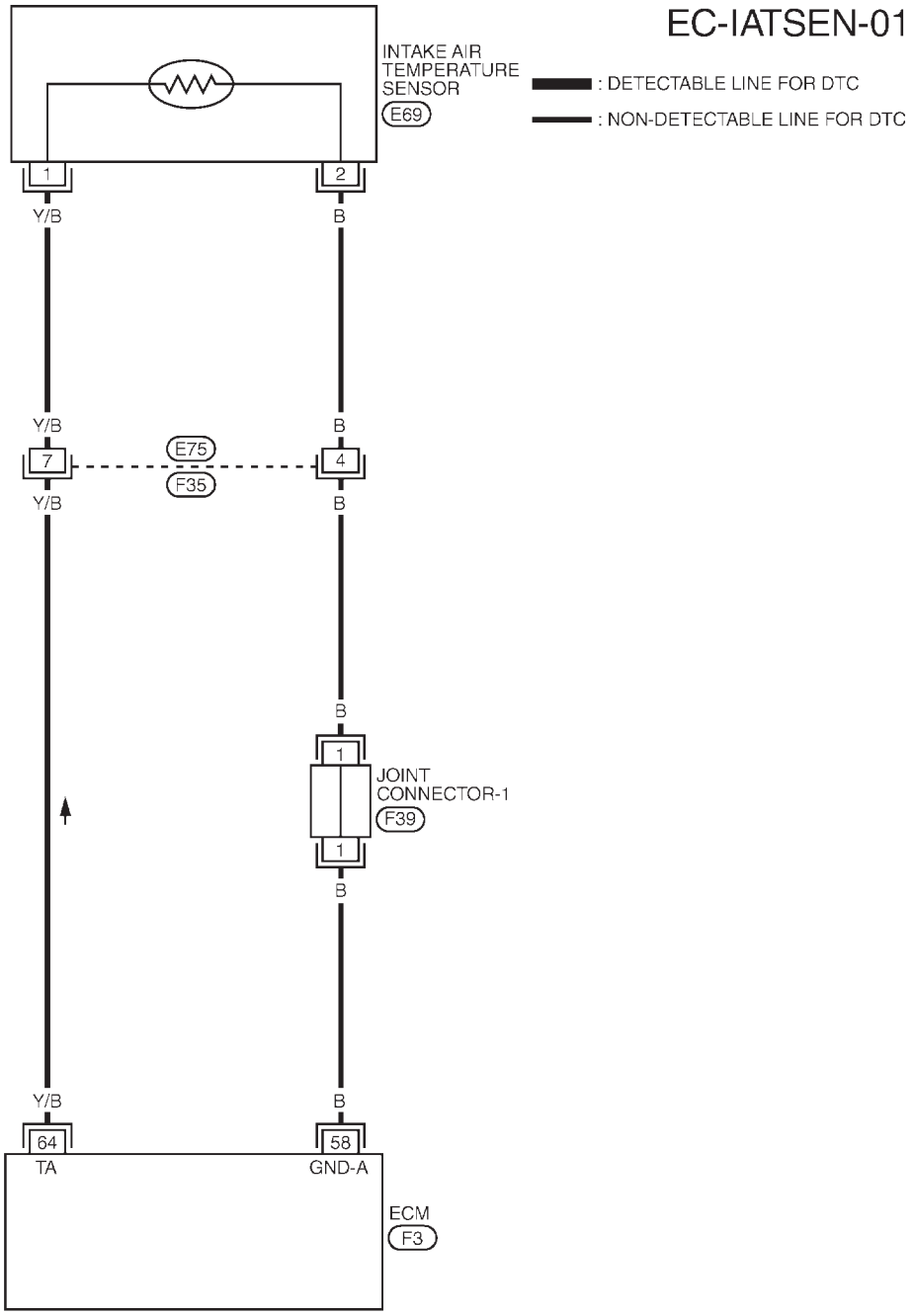
Wiring Diagram

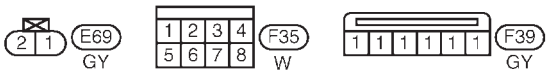
NLEC1278

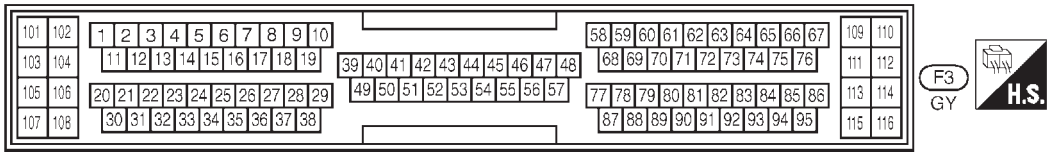
MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT

NLEC1278S01

EC-IATSEN-01





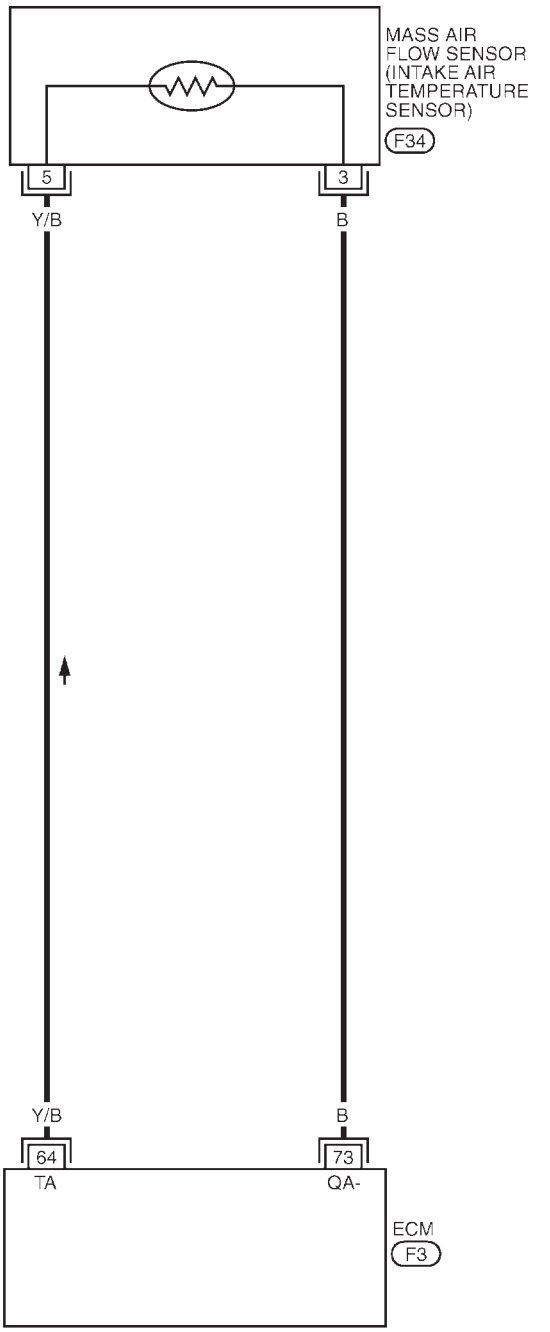


YEC749

MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR

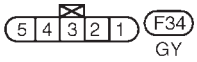
NLEC1278S02

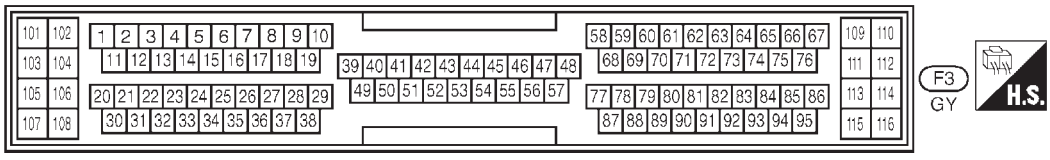
EC-IATSEN-01



: DETECTABLE LINE FOR DTC

: NON-DETECTABLE LINE FOR DTC





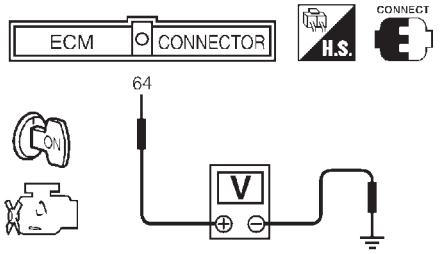
YEC892

Diagnostic Procedure

NLEC1279

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

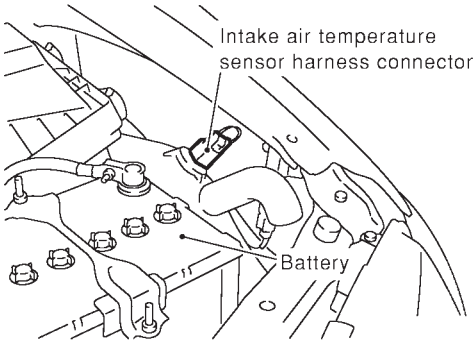
SEF004Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

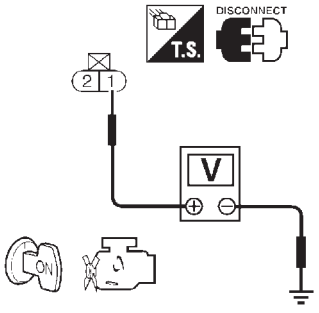
2	CHECK POWER SUPPLY (Models with intake air temperature sensor on intake air duct)

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



SEF602Y

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



Voltage: Approximately 5V

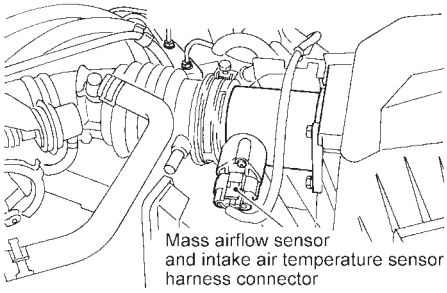
SEF301X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

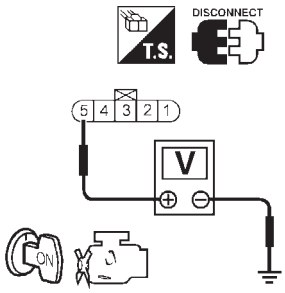
3	CHECK POWER SUPPLY (Models with intake air temperature in mass air flow sensor)

1. Turn ignition switch "OFF".
2. Disconnect intake air temperature sensor (mass air flow sensor) harness connector.



NEF306A

3. Turn ignition switch "ON".
4. Check voltage between terminal 5 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

NEF307A

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E75, F35 (where fitted)
- Harness for open or short between ECM and intake air temperature sensor

	▶	Repair harness or connectors.

5	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between intake air temperature sensor harness connector and engine ground.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to power.

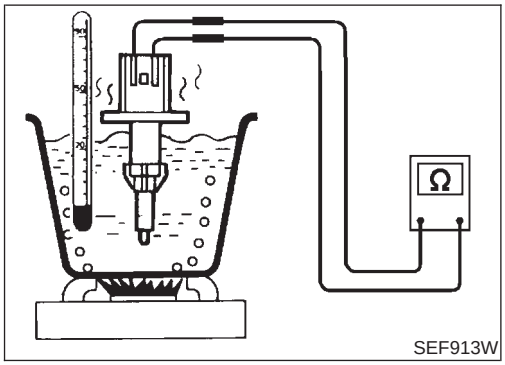
OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

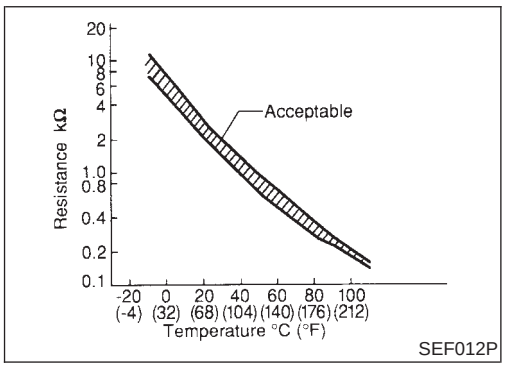
6	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-1 (where fitted) ● Harness connectors E75, F35 (where fitted) ● Harness for open or short between ECM and intake air temperature sensor	
▶	Repair open circuit or short to power in harness or connectors.

7	CHECK INTAKE AIR TEMPERATURE SENSOR
Refer to "Component Inspection", EC-413.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Replace intake air temperature sensor.

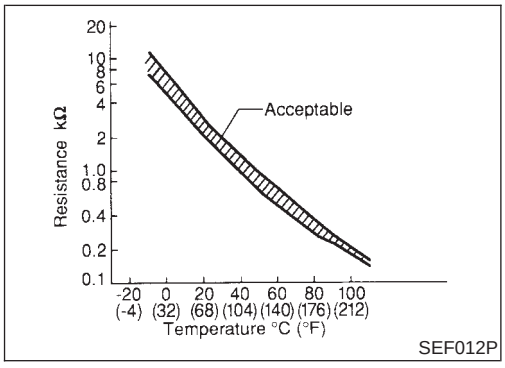
8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF913W



SEF012P



SEF012P

Component Inspection

NLEC1280

INTAKE AIR TEMPERATURE SENSOR

NLEC1280S01

Models with intake air temperature sensor on intake air duct

NLEC1280S0101

Check resistance as shown in the figure.

<Reference data>

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

If NG, replace intake air temperature sensor.

Models with intake air temperature sensor in mass air flow sensor

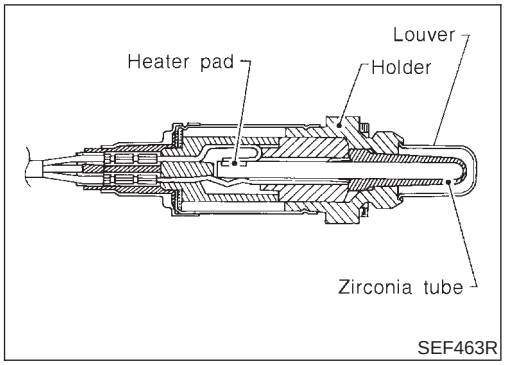
NLEC1280S0102

Check resistance between intake air temperature sensor (mass air flow sensor) terminal 3 and 5.

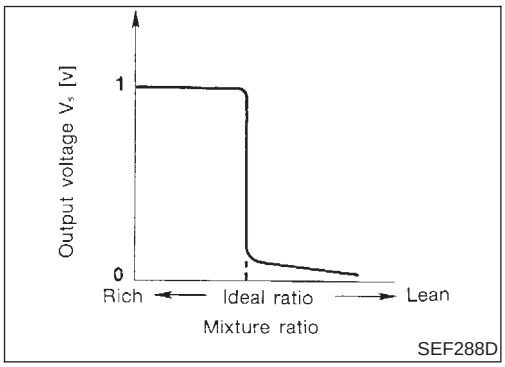
<Reference data>

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

If NG, replace intake air temperature sensor.



SEF463R



SEF288D

Component Description

NLEC1214

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

NLEC1215

Specification data are reference values.

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

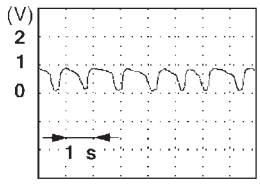
ECM Terminals and Reference Value

NLEC1216

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

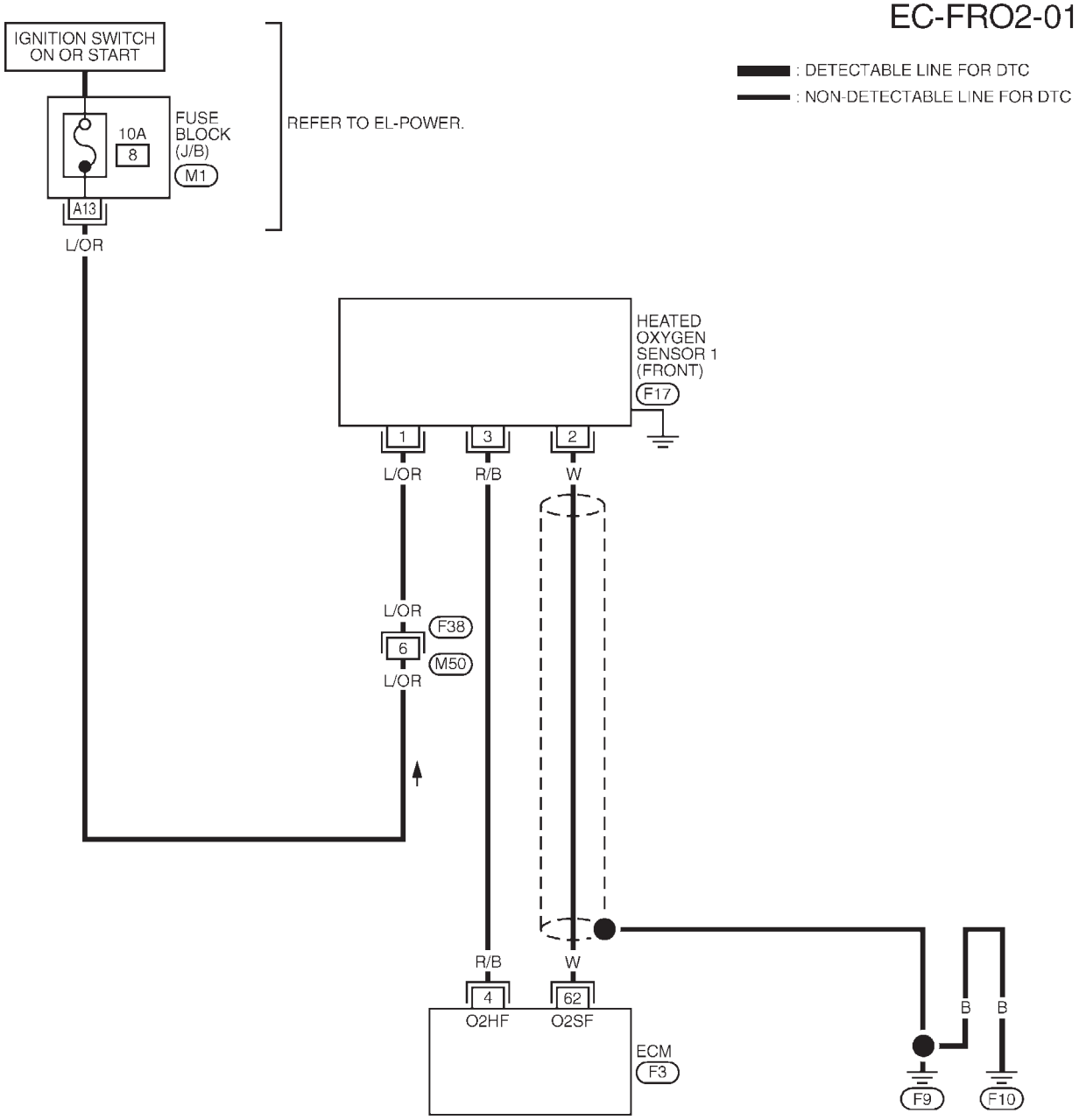
Wiring Diagram

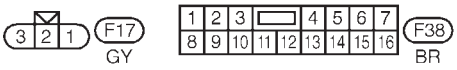
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1220

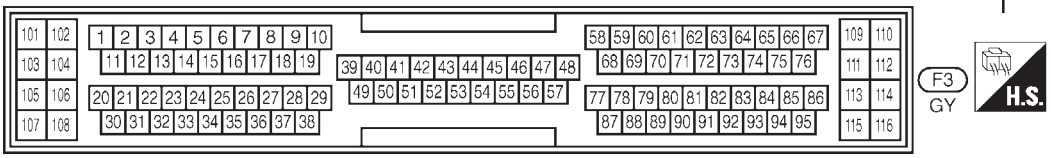
NLEC1220S03

EC-FRO2-01





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

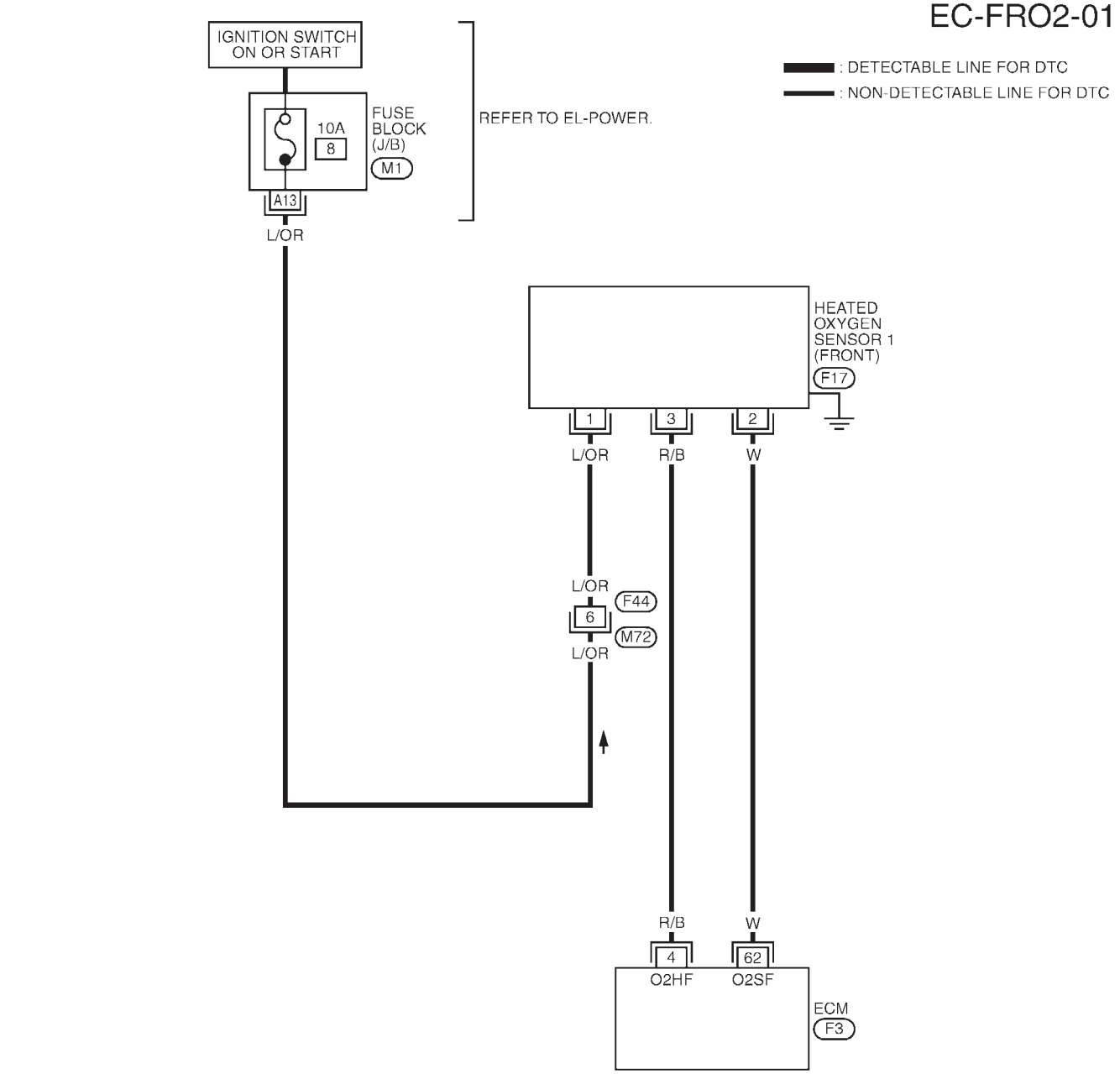


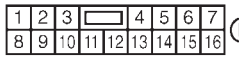
YEC676

MODELS WITH ECM IN CABIN

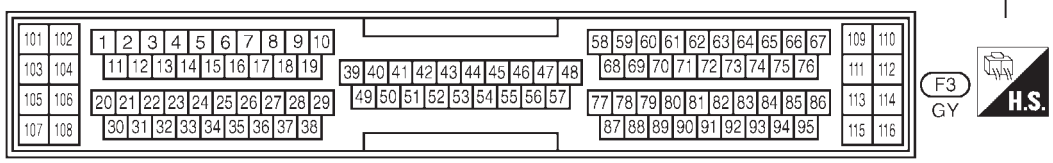
NLEC1220S04

EC-FRO2-01





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



YEC893

Diagnostic Procedure

NLEC1221

1	INSPECTION START
Do you have CONSULT-II?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 MNTR (B1)” in “DATA MONITOR” mode with CONSULT-II.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuate between LEAN and RICH more than five times in 10 seconds.

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

1 time: RICH → LEAN → RICH
2 times: RICH → LEAN → RICH → LEAN → RICH

SEF218Z

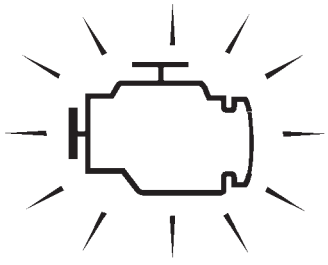
OK or NG

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-73.
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.



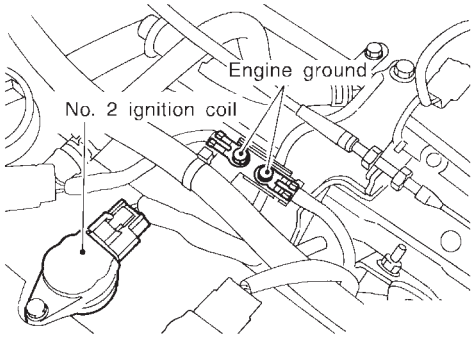
SAT652J

OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

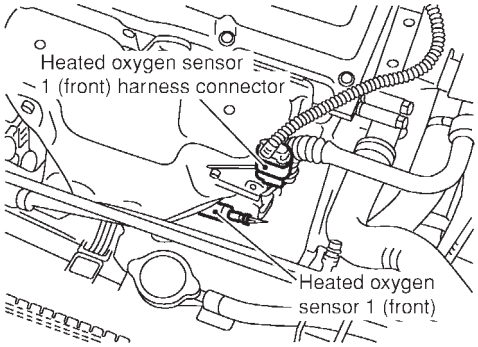
4	RETIGHTEN GROUND SCREWS

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



JEF104Y

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



SEF012XA

	▶	GO TO 5.

5	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)

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

Tightening torque:

40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

	▶	GO TO 6.

6	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 62 and heated oxygen sensor 1 (front) harness connector terminal 2. Refer to wiring diagram.

   Continuity should exist.
3. Check harness continuity between ECM terminal 62 (or terminal 2) and ground.

   Continuity should not exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

7	CHECK HEATED OXYGEN SENSOR 1 (FRONT)	
Refer to "Component Inspection", EC-419.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	Replace heated oxygen sensor 1 (front).

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	INSPECTION END

4

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 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

SEF647Y

Component Inspection

NLEC1222

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC1222S01

With CONSULT-II

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

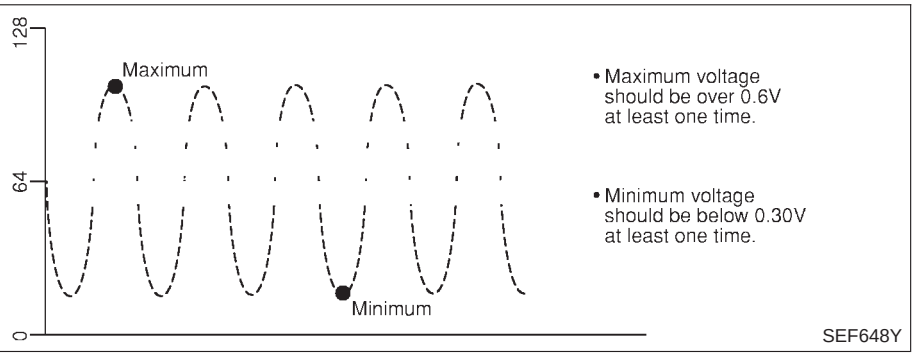
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "HO2S1 MNTR (B1)", "RICH"
  L = "HO2S1 MNTR (B1)", "LEAN"
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

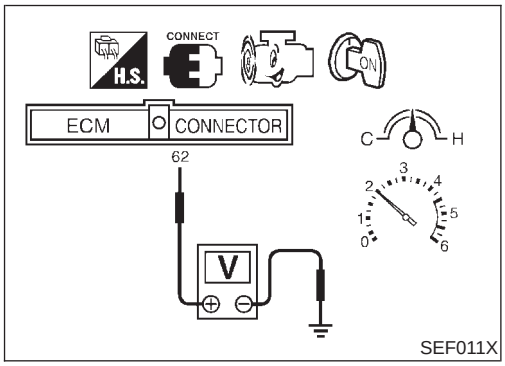
CAUTION:

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

Component Inspection (Cont'd)

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





Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]
- 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.

CAUTION:

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

Description

NLEC1223

SYSTEM DESCRIPTION

NLEC1223S01

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

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

OPERATION

NLEC1223S02

Engine speed	Heated oxygen sensor 1 heater (front)
Above 3,200 rpm	OFF
Below 3,200 rpm	ON

CONSULT-II Reference Value in Data Monitor Mode

NLEC1224

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine speed: Below 3,200 rpm	ON
	● Engine speed: Above 3,200 rpm	OFF

ECM Terminals and Reference Value

NLEC1225

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	R/B	Heated oxygen sensor 1 heater (front)	**[Engine is running]** ● Engine speed is below 3,200 rpm.	Approximately 0V
			[Engine is running] ● Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)

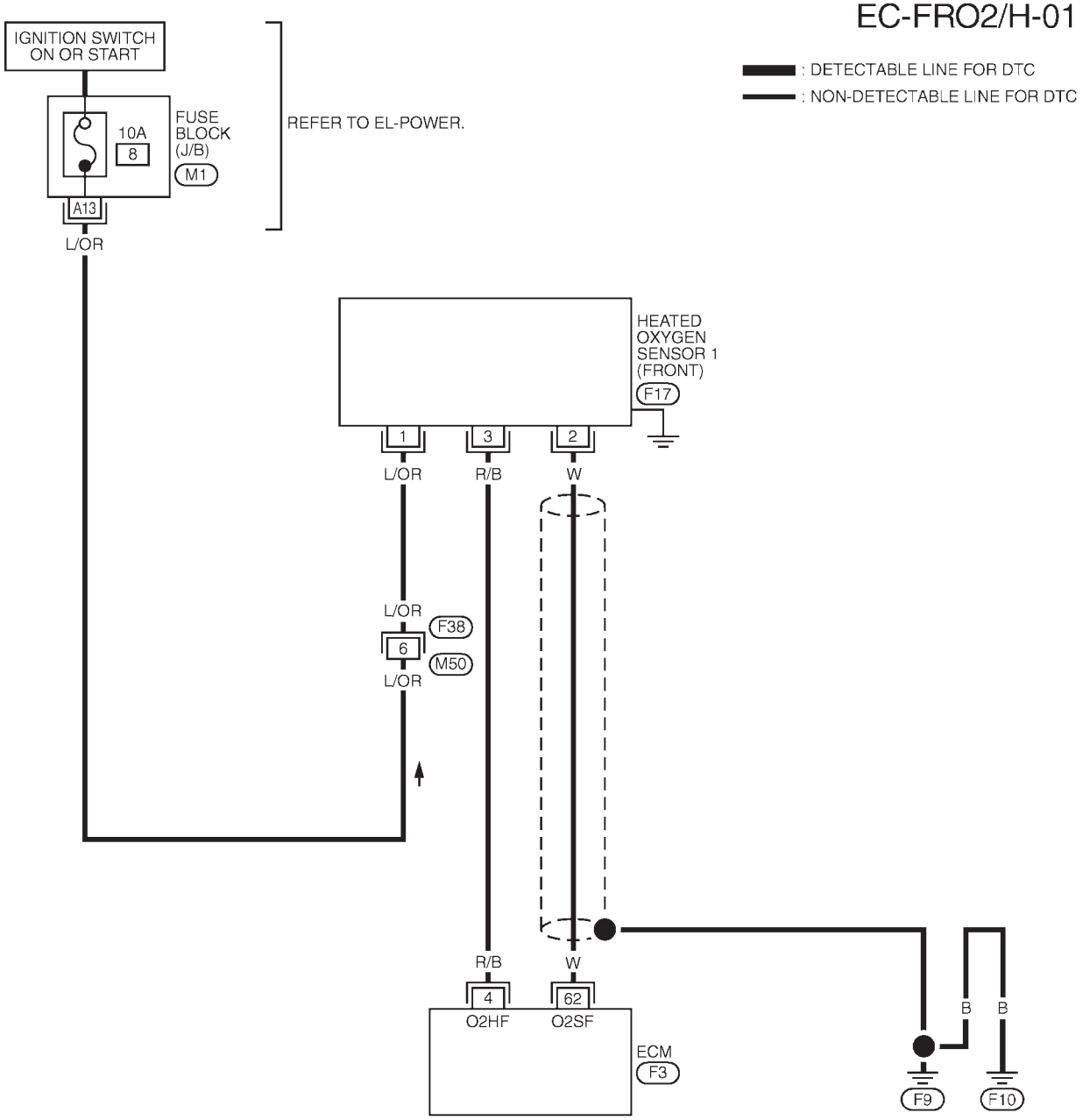
Wiring Diagram

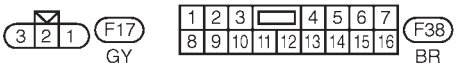
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1228

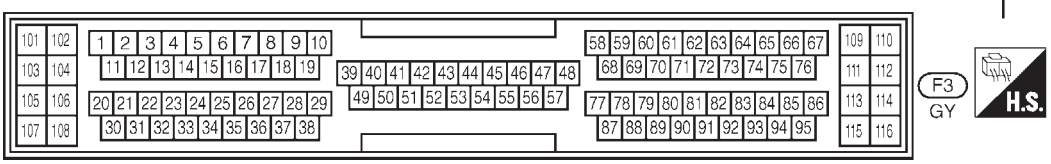
NLEC1228S03

EC-FRO2/H-01





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

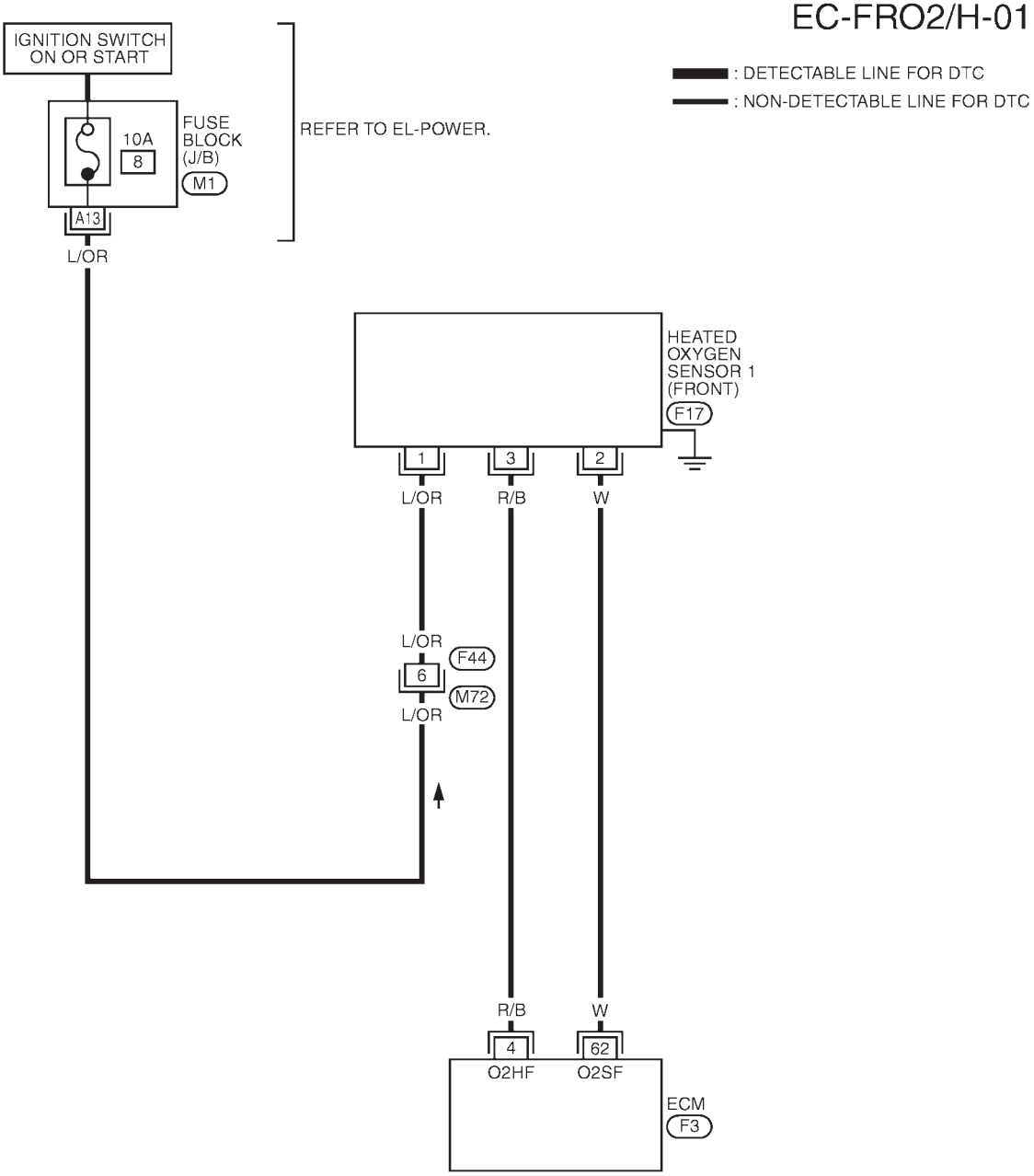


YEC677

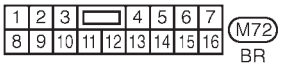
MODELS WITH ECM IN CABIN

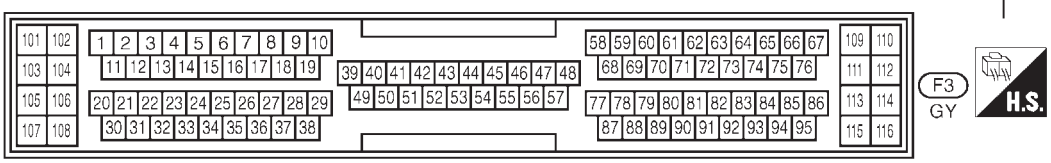
NLEC1228S04

EC-FRO2/H-01



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





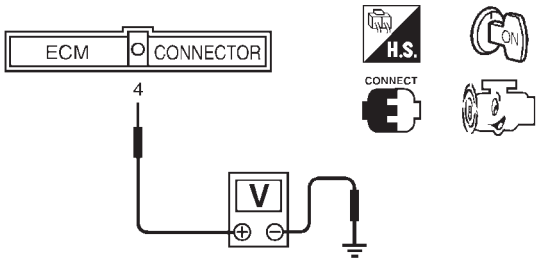
YEC894

Diagnostic Procedure

NLEC1229

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Set the tester probe between ECM terminals 4 [HO2S1 Heater (front) 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 3,200 rpm.	Battery voltage

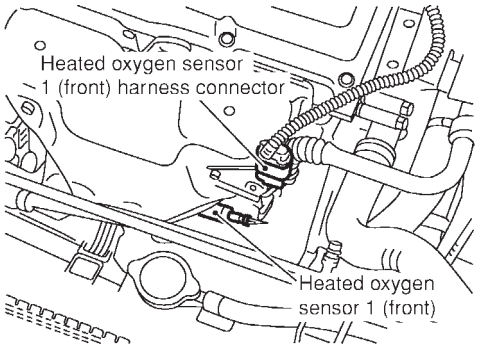
SEF239Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

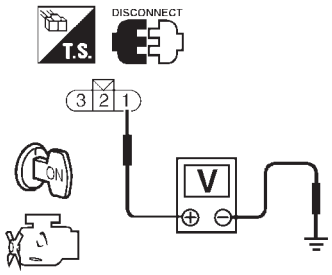
2	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (front) harness connector.



SEF012XA

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



Voltage: Battery voltage

SEF934X

OK or NG

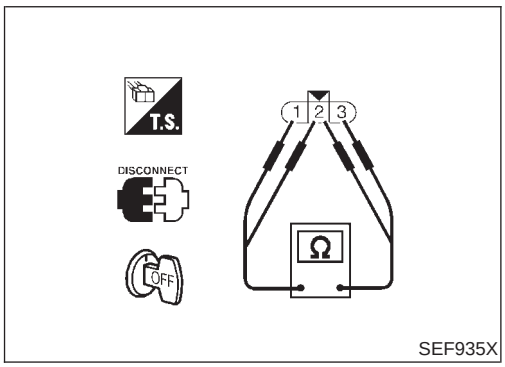
OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F38, M50 (where fitted) ● Harness connectors M72, F44 (where fitted) ● 10A fuse ● Harness for open or short between heated oxygen sensor 1 (front) and fuse	
▶	Repair harness or connectors.

4	CHECK OUTPUT SIGNAL CIRCUIT	
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between heated oxygen sensor 1 (front) harness connector terminal 3 and ECM 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 HEATED OXYGEN SENSOR 1 HEATER (FRONT)	
Refer to "Component Inspection", EC-425. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	Replace heated oxygen sensor 1 (front).

6	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
▶	**INSPECTION END**	



Component Inspection

NLEC1230

HEATED OXYGEN SENSOR 1 HEATER (FRONT)

NLEC1230S01

Check resistance between terminals 3 and 1.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

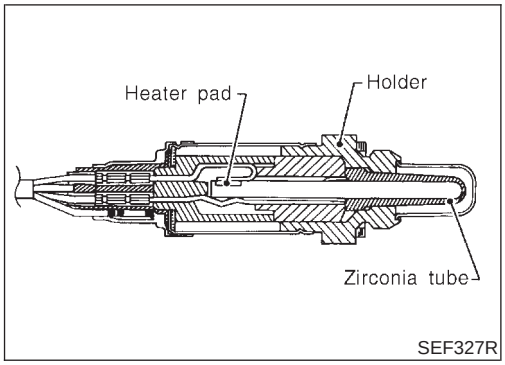
Check continuity between terminals 2 and 1, 3 and 2.

Continuity should not exist.

If NG, replace the heated oxygen sensor 1 (front).

CAUTION:

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



Component Description

NLEC1231

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

NLEC1232

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

NLEC1233

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 3,000 rpm	0 - Approximately 1.0V

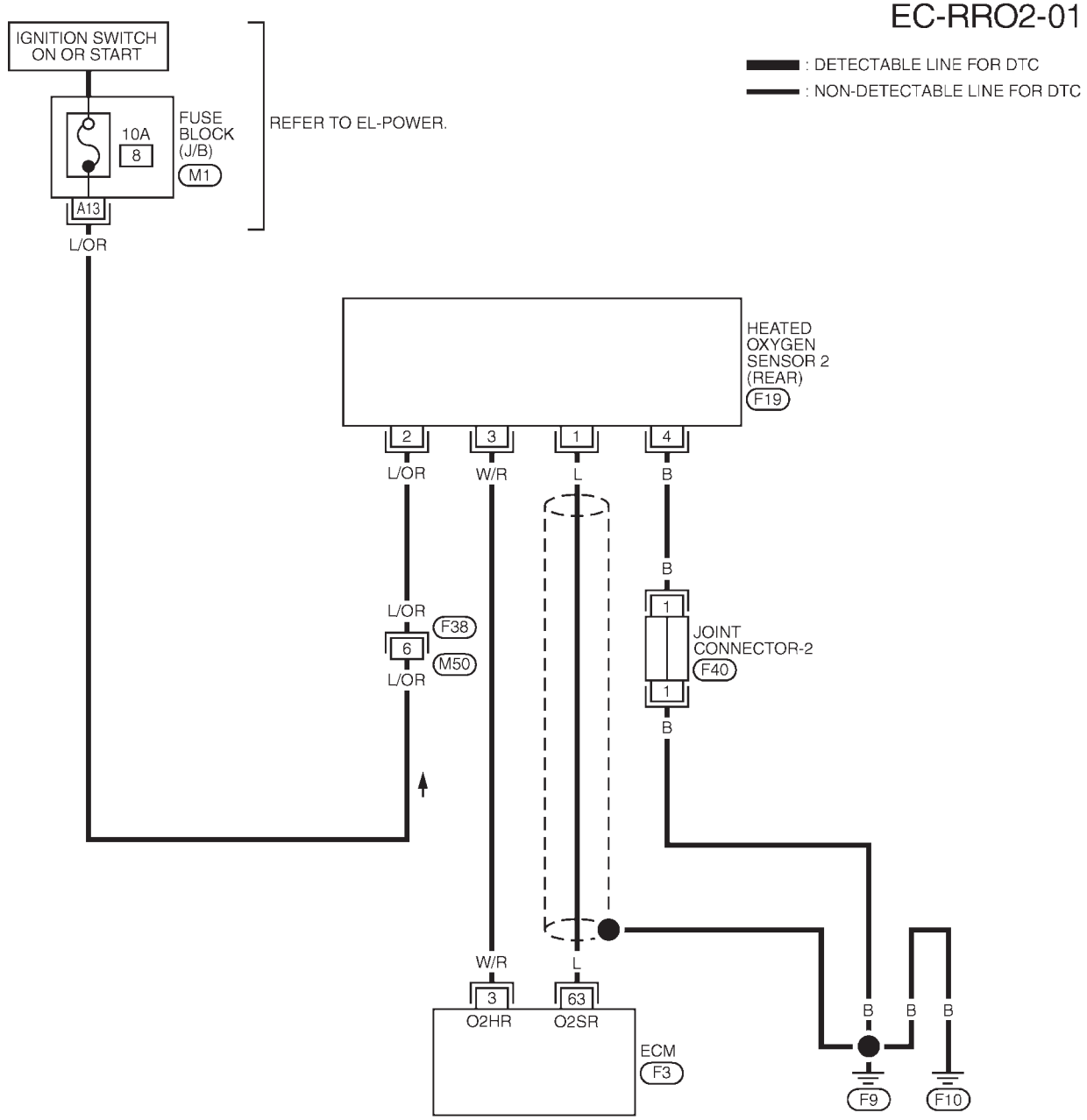
Wiring Diagram

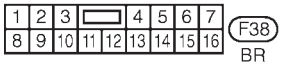
MODELS WITH ECM IN ENGINE COMPARTMENT

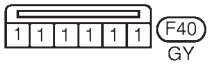
NLEC1237

NLEC1237S03

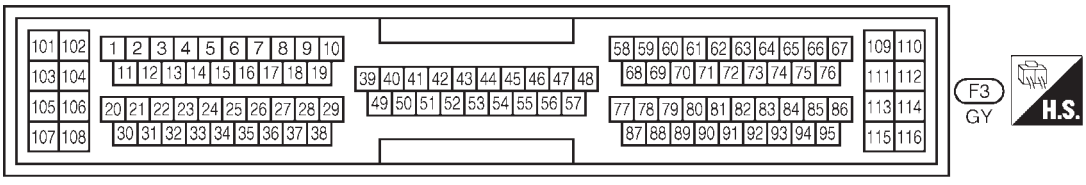
EC-RRO2-01







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

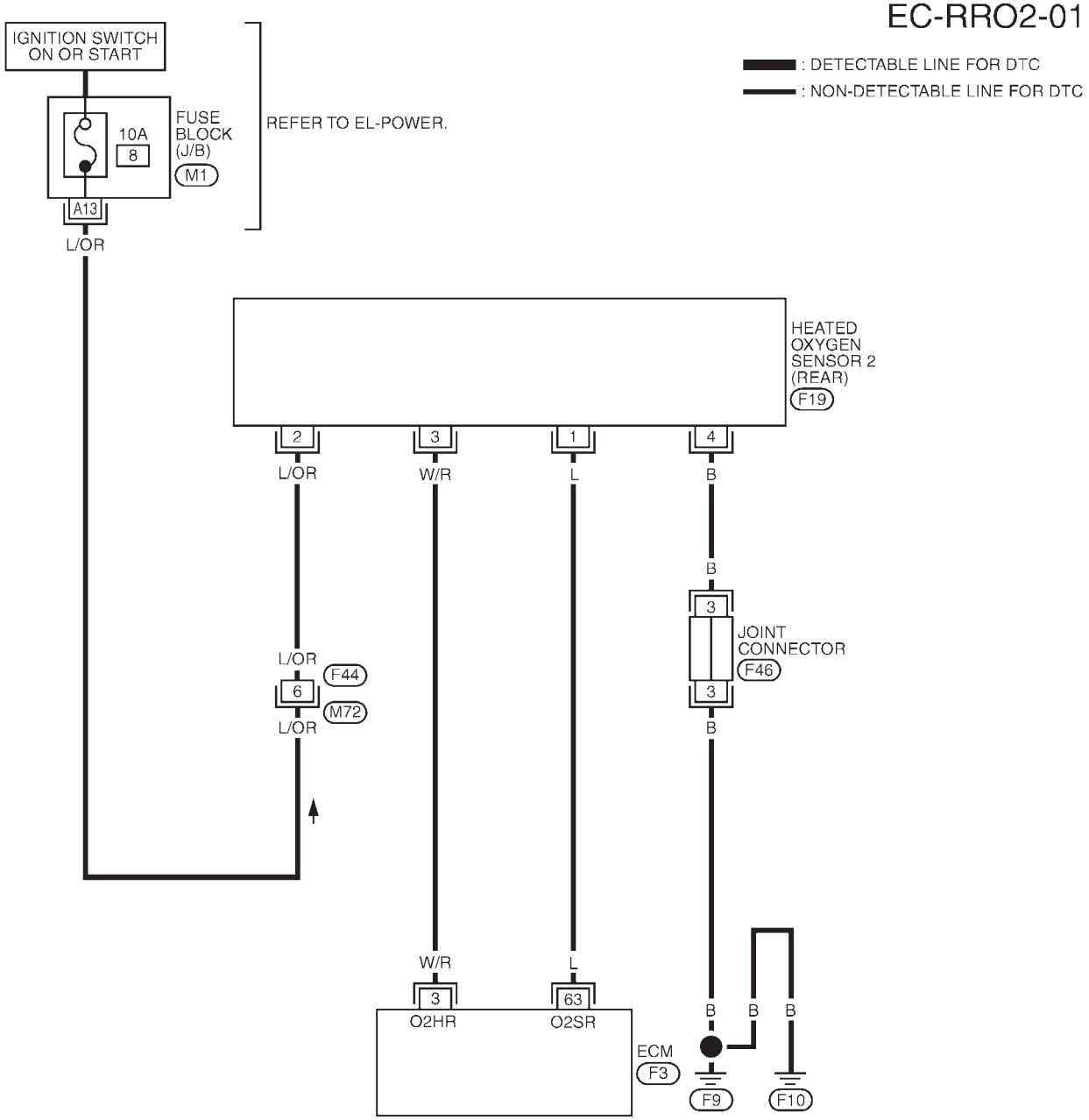


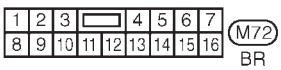
YEC746

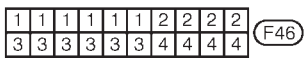
MODELS WITH ECM IN CABIN

NLEC1237S04

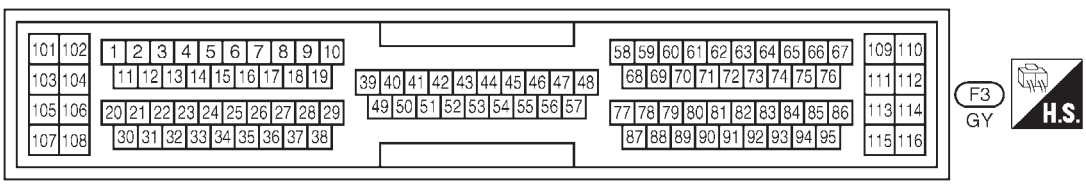
EC-RRO2-01







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



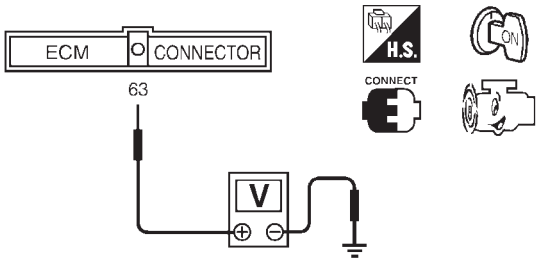
YEC895

Diagnostic Procedure

NLEC1238

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 63 [HO2S2 (B1) 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.

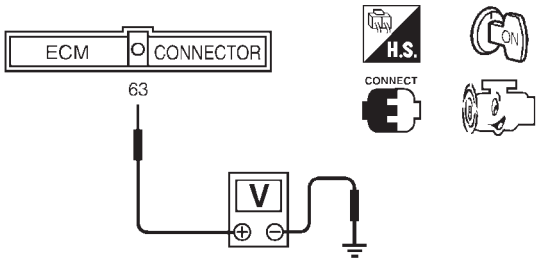
SEF240Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK OVERALL FUNCTION-II

Keep engine at idle for 10 minutes, then check the voltage between ECM terminal 63 and ground, or check the voltage when coasting at 80 km/h (50 MPH) in 3rd gear.



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

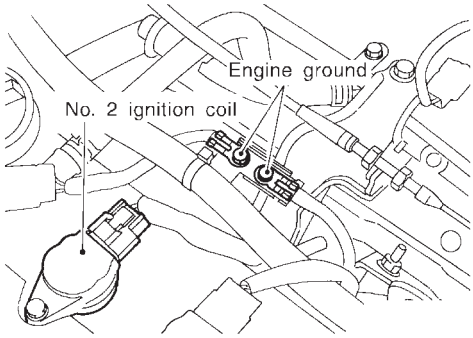
SEF240Z

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.

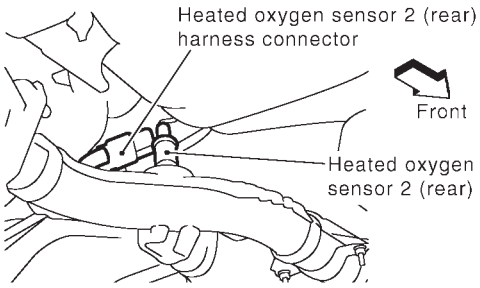


JEF104Y

▶	GO TO 4.

4	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

3. Check harness continuity between ECM terminal 63 and heated oxygen sensor 2 (rear) harness connector terminal 1. Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 63 [or heated oxygen sensor 2 (rear) harness connector terminal 1] and ground.
   Continuity should not exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the harness for open or short between heated oxygen sensor 2 (rear) and ECM.

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

6	CHECK GROUND CIRCUIT	
1. Check harness continuity between heated oxygen sensor 2 (rear) harness connector terminal 4 and body ground. Refer to wiring diagram. **Continuity should exist.** 2. Also check harness for short to power.		
OK or NG		
OK	▶	GO TO 7.
NG	▶	Repair open circuit or short to power in harness or connectors.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)	
Refer to "Component Inspection", EC-431.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	Replace heated oxygen sensor 2 (rear).

8	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC1239

HEATED OXYGEN SENSOR 2 (REAR)

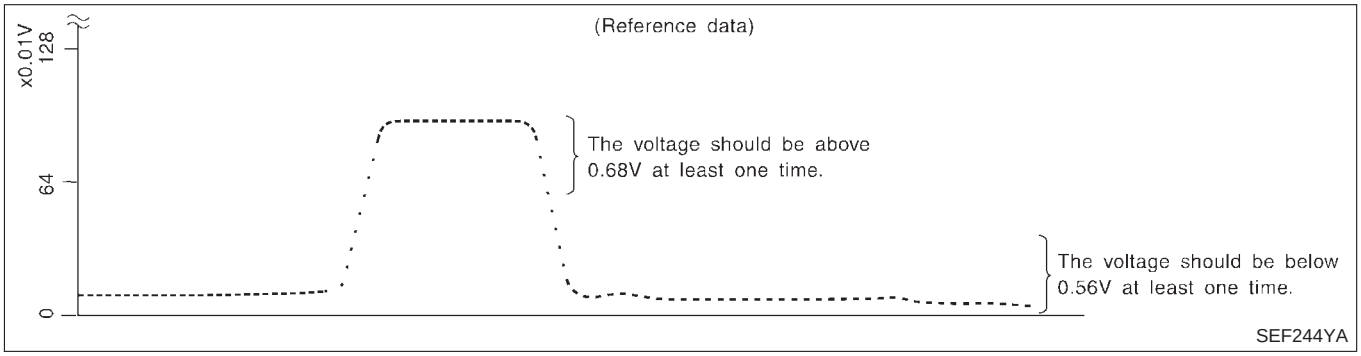
NLEC1239S01

With CONSULT-II

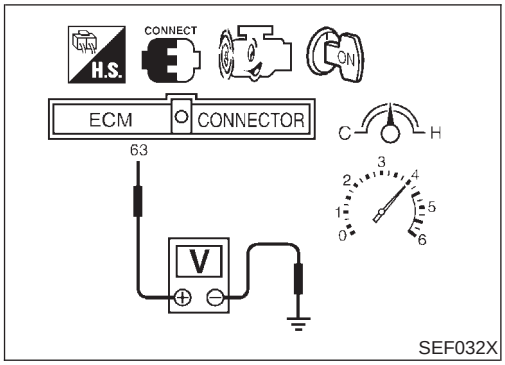
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-II.
4) Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)" should be below 0.56V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

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



Component Inspection (Cont'd)



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 terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or 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.
   The voltage should be below 0.56V at least once.

CAUTION:

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

Description

NLEC1240

SYSTEM DESCRIPTION

NLEC1240S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 2 heater (rear) control	Heated oxygen sensor 2 heater (rear)

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater (rear) corresponding to the engine speed.

OPERATION

NLEC1240S02

Engine condition		Heated oxygen sensor 2 heater (rear)
Engine stopped		OFF
Engine is running.	Engine speed below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
	Engine speed above 3,600 rpm	OFF

CONSULT-II Reference Value in Data Monitor Mode

NLEC1241

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 HTR (B1)	● Engine speed	Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
		Above 3,600 rpm	OFF
	● Ignition switch ON (Engine stopped)		OFF

ECM Terminals and Reference Value

NLEC1242

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	W/R	Heated oxygen sensor 2 heater (rear)	**[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 - 1V
			[Engine is running] ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Engine stopped	

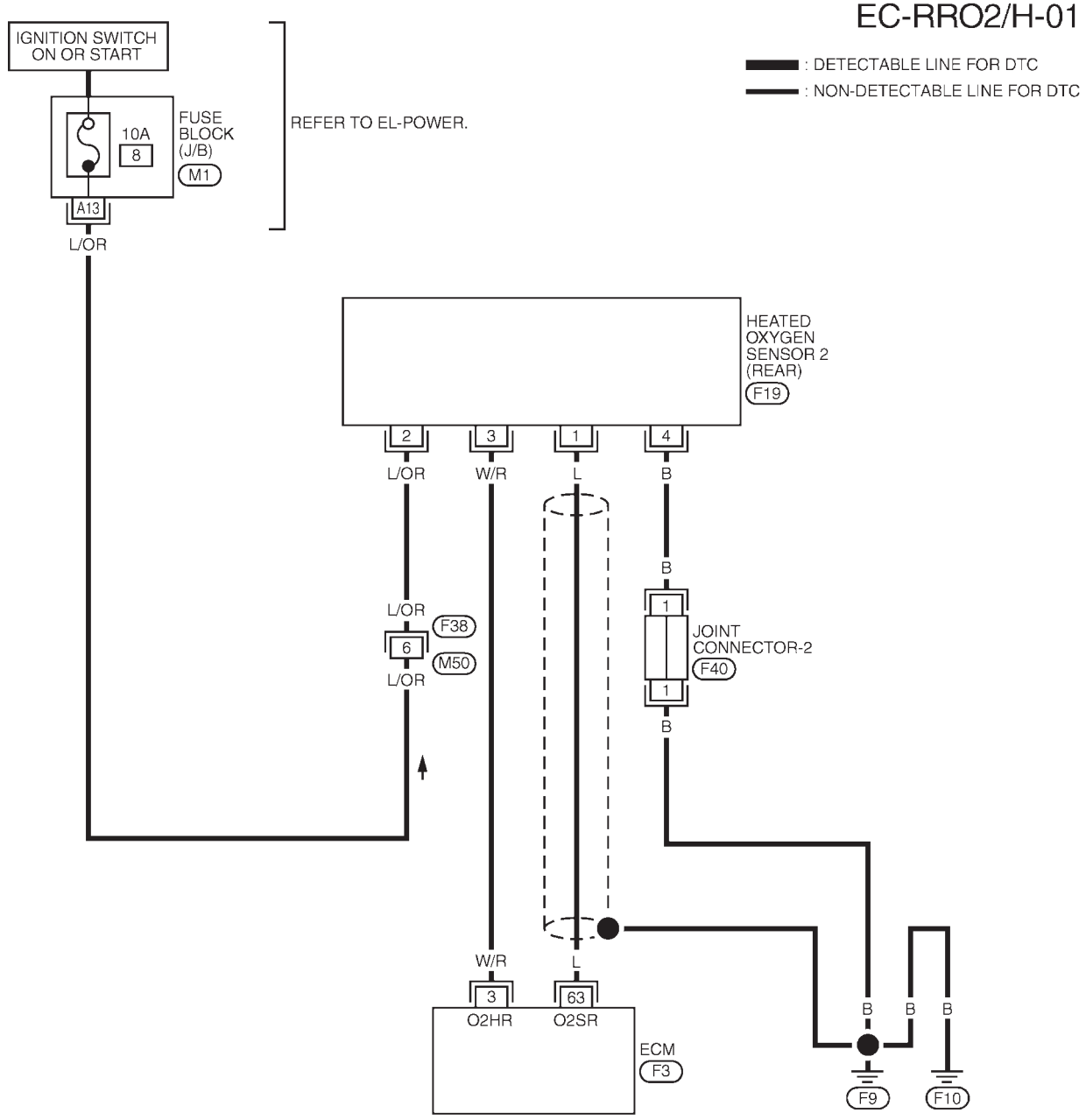
Wiring Diagram

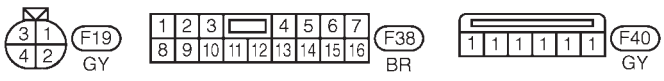
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1245

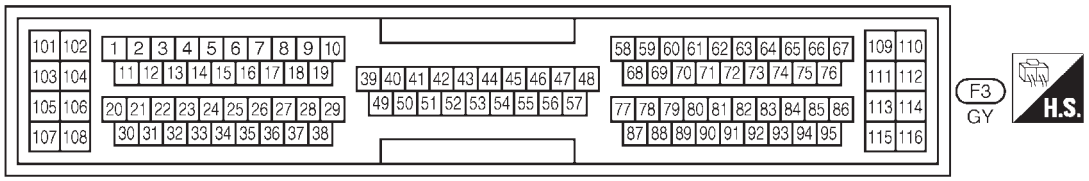
NLEC1245S03

EC-RRO2/H-01





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

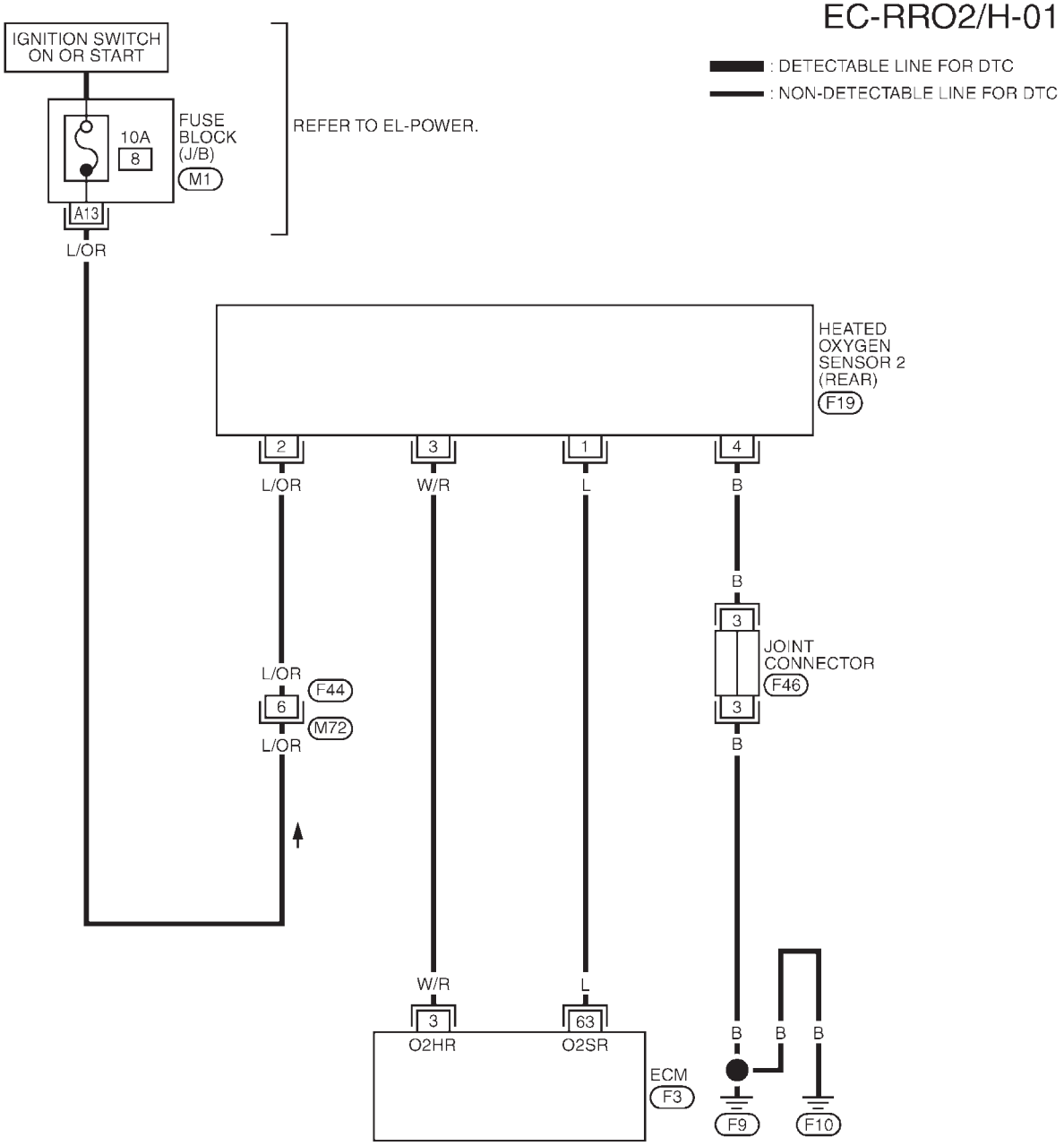


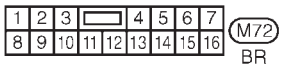
YEC747

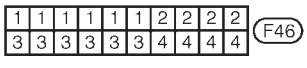
MODELS WITH ECM IN CABIN

NLEC1245S04

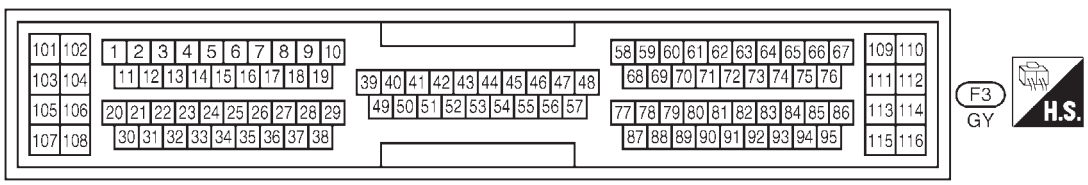
EC-RRO2/H-01







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



YEC896

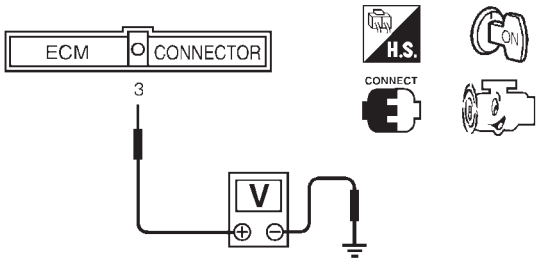
Diagnostic Procedure

NLEC1246

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 3 [HO2S2 HTR (B1) 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

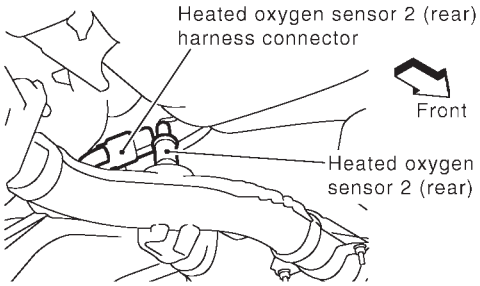
SEF241Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK POWER SUPPLY

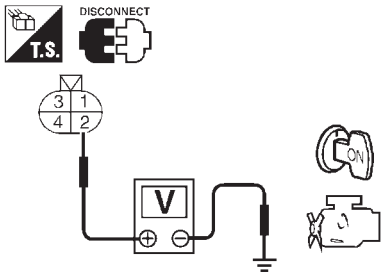
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 (rear) harness connector.



View from the underside of the vehicle

SEF639Z

3. Turn ignition switch “ON”.
4. Check voltage between terminal 2 and ground.



SEF218W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

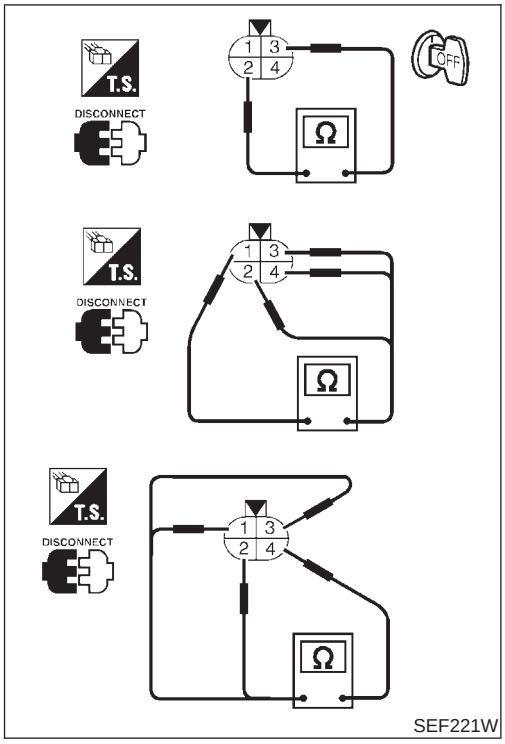
3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F38, M50 (where fitted) ● Harness connectors M72, F44 (where fitted) ● Harness for open or short between heated oxygen sensor 2 (rear) and fuse ● 10A fuse	
▶	Repair harness or connectors.

4	CHECK OUTPUT SIGNAL CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between heated oxygen sensor 2 (rear) harness connector terminal 3 and ECM 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 harness for open or short between heated oxygen sensor 2 heater (rear) and ECM.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK HEATED OXYGEN SENSOR 2 HEATER (REAR)
Refer to "Component Inspection", EC-438.	
OK or NG	
OK ▶	GO TO 7.
NG ▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



Component Inspection

NLEC1247

HEATED OXYGEN SENSOR 2 HEATER (REAR)

NLEC1247S01

Check the following.

1. Check resistance between terminals 2 and 3.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

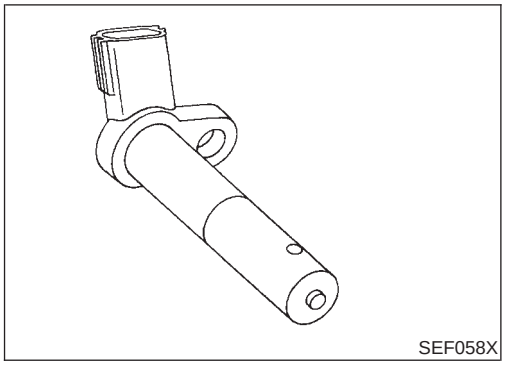
2. Check continuity.

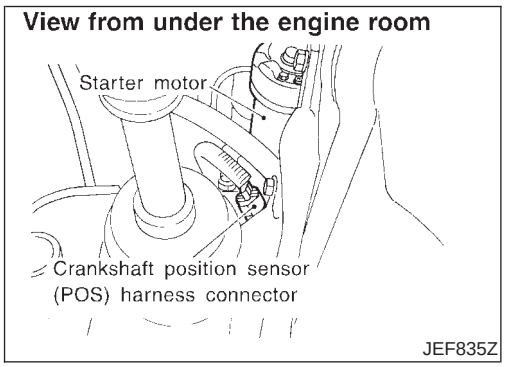
Terminal No.	Continuity
1 and 2, 3, 4	No
4 and 1, 2, 3	

If NG, replace the heated oxygen sensor 2 (rear).

CAUTION:

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


SEF058X



JEF835Z

Component Description

NLEC1281

The crankshaft position sensor (POS) is located on the right-rear wall of the cylinder block in relation to the signal plate at the rear end of the crankshaft.
The sensor consists of a permanent magnet, and hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

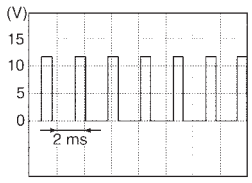
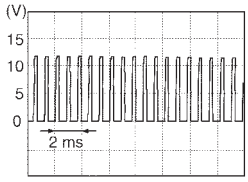
ECM Terminals and Reference Value

NLEC1282

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.

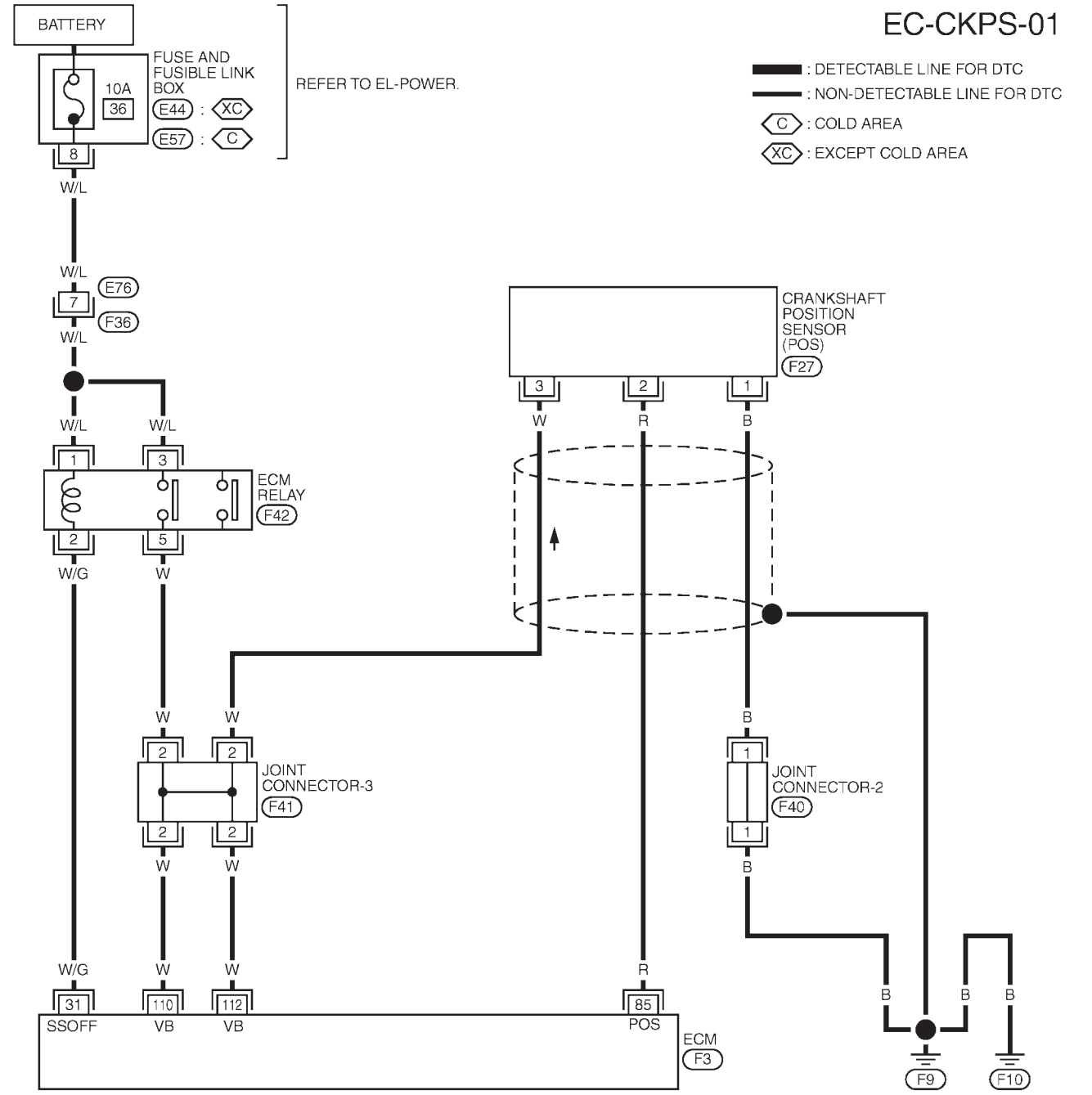
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (AC Voltage)
85	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	3 - 4V  SEF979W
			[Engine is running] ● Engine speed is 2,000 rpm	3 - 4V  SEF980W

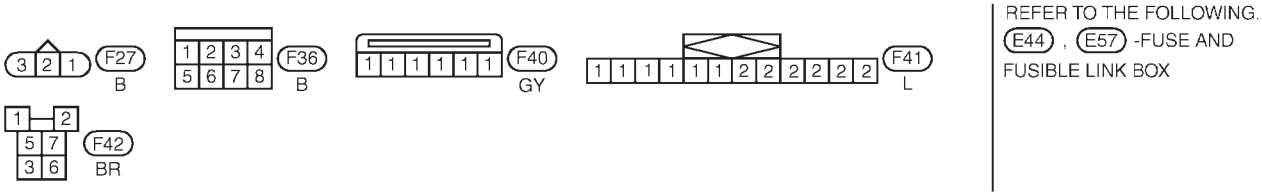
Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

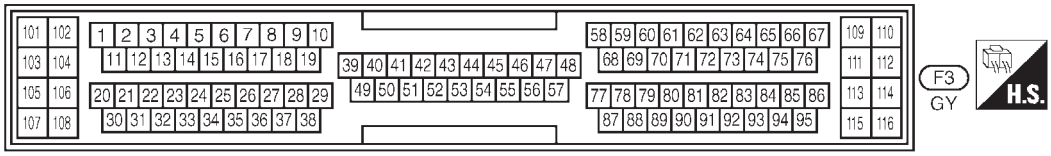
NLEC1285

NLEC1285S01





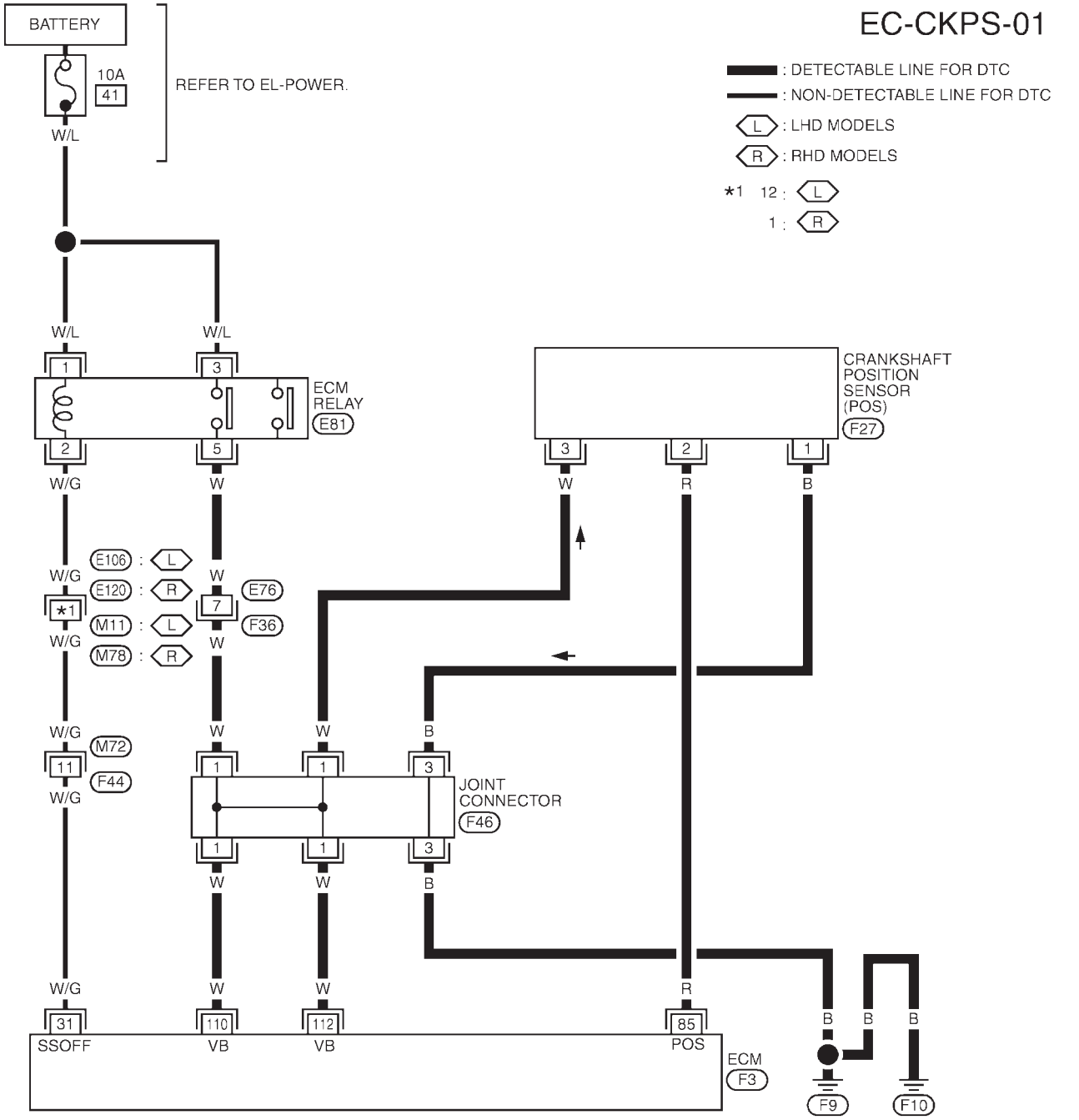
REFER TO THE FOLLOWING.
E44 , E57 -FUSE AND FUSIBLE LINK BOX

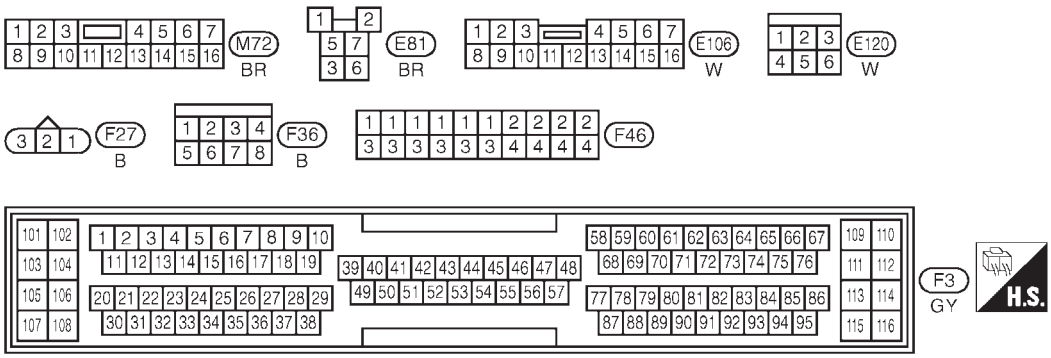


YEC750

MODELS WITH ECM IN CABIN

NLEC1285S02





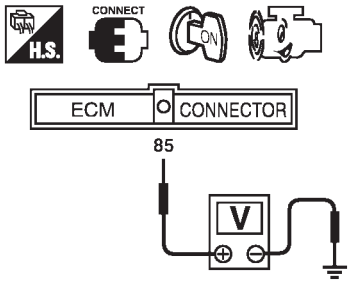
YEC897

Diagnostic Procedure

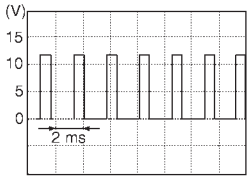
NLEC1286

1	CHECK OVERALL FUNCTION

1. Start engine and let it idle.
2. Check voltage between ECM terminal 85 and ground.



Voltage is 3 to 4V.



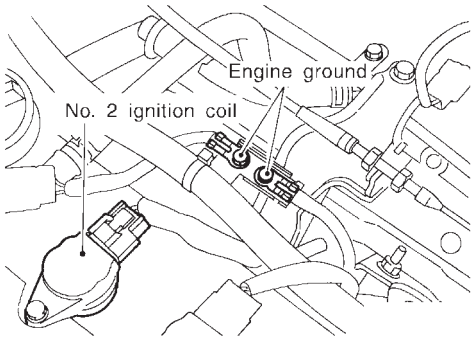
SEF761Z

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.



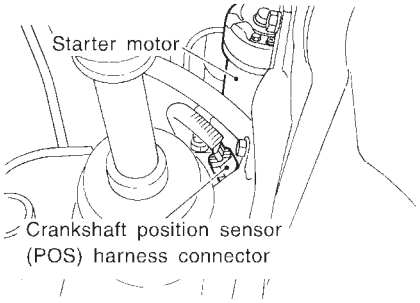
JEF104Y

	▶	GO TO 3.

3	CHECK POWER SUPPLY

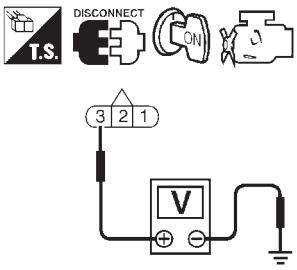
1. Disconnect crankshaft position sensor harness connector.

View from under the engine room



JEF835Z

2. Turn ignition switch "ON".
3. Check voltage between terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF113Y

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- Harness connectors E76, F36 (where fitted)
- Harness for open or short between joint connector and ECM relay
- Harness for open or short between crankshaft position sensor and joint connector
- Harness for open or short between joint connector and ECM
- ECM relay

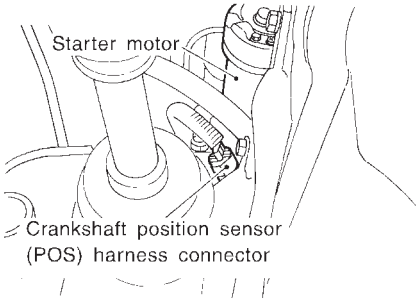
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

5	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connectors.

View from under the engine room



JEF835Z

3. Check continuity between ECM terminal 85 and crankshaft position sensor harness connector 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 or short to ground or short to power in harness or connectors.

6	CHECK GROUND CIRCUIT

1. Reconnect ECM harness connector.
2. Check harness continuity between 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 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-2 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open between crankshaft position sensor harness connector terminal 1 and engine ground.

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

8	CHECK CRANKSHAFT POSITION SENSOR

Refer to "Component Inspection", EC-445.

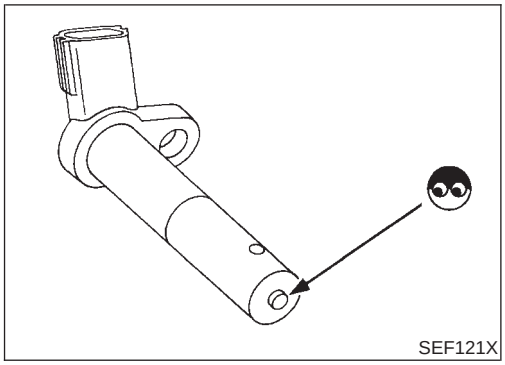
OK or NG

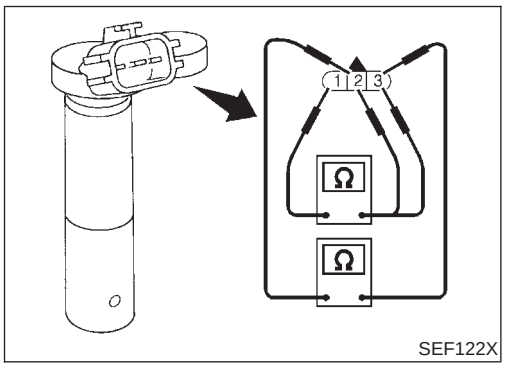
OK	▶	GO TO 9.
NG	▶	Replace crankshaft position sensor.

9	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

	▶	**INSPECTION END**


SEF121X



SEF122X

Component Inspection

NLEC1287

CRANKSHAFT POSITION SENSOR (POS)

NLEC1287S01

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.

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (–)	Except 0 or ∞
2 (+) - 1 (–)	
3 (+) - 2 (–)	

If NG, replace crankshaft position sensor.

Description

NLEC1288

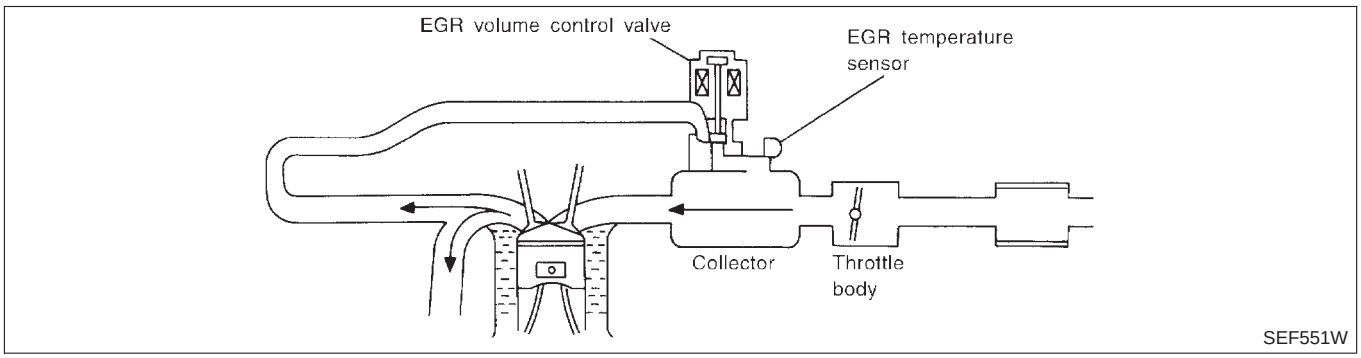
SYSTEM DESCRIPTION

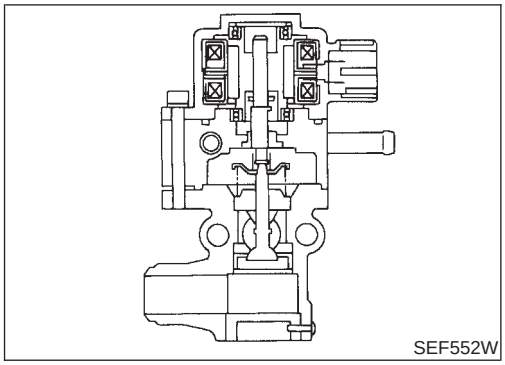
NLEC1288S01

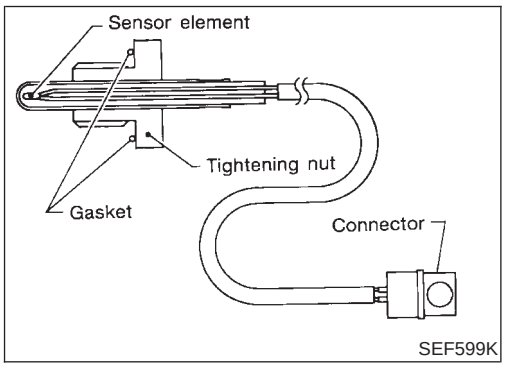
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	EGR volume control	EGR volume control valve
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
PNP switch	Park/Neutral position signal		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

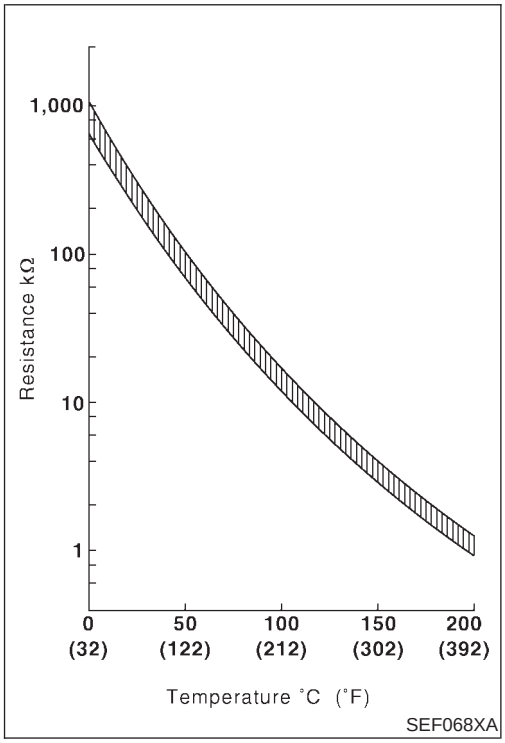
- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Extremely light load engine operation
- Engine idling
- Excessively high engine coolant temperature
- Wide open throttle
- Mass air flow sensor malfunction
- Low battery voltage




SEF552W



SEF599K



SEF068XA

COMPONENT DESCRIPTION

NLEC1288S02

EGR Volume Control Valve

NLEC1288S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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.

EGR Temperature Sensor

NLEC1288S0203

The EGR temperature sensor detects temperature changes in the EGR passageway. When the EGR volume control valve opens, hot exhaust gases flow, and the temperature in the passageway changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases. This sensor is not used to control the engine system.

<Reference data>

EGR temperature °C (°F)	Voltage* V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

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

When EGR system is operating.

Voltage: 0 - 1.5V

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.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1289

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	• Engine: After warming up		Less than 4.5V
EGR VOL CON/V	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

NLEC1290

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.

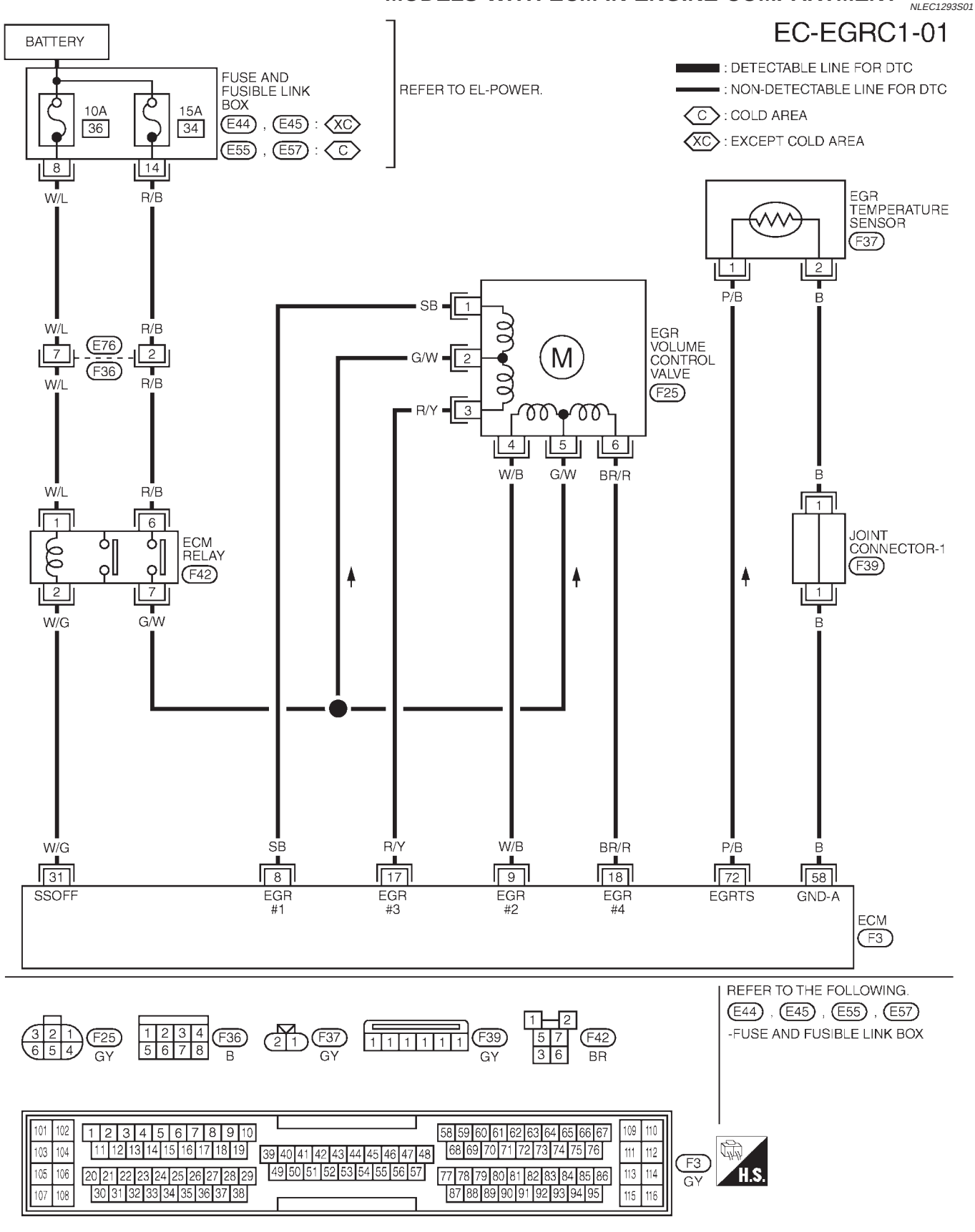
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8 9 17 18	SB W/B R/Y BR/R	EGR volume control valve	**[Engine is running]** ● Idle speed	0 - 14V
58	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0V
72	P/B	EGR temperature sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Less than 4.5V
			[Engine is running] ● **Warm-up condition** ● EGR system is operating.	0 - 1V

Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1293

NLEC1293S01

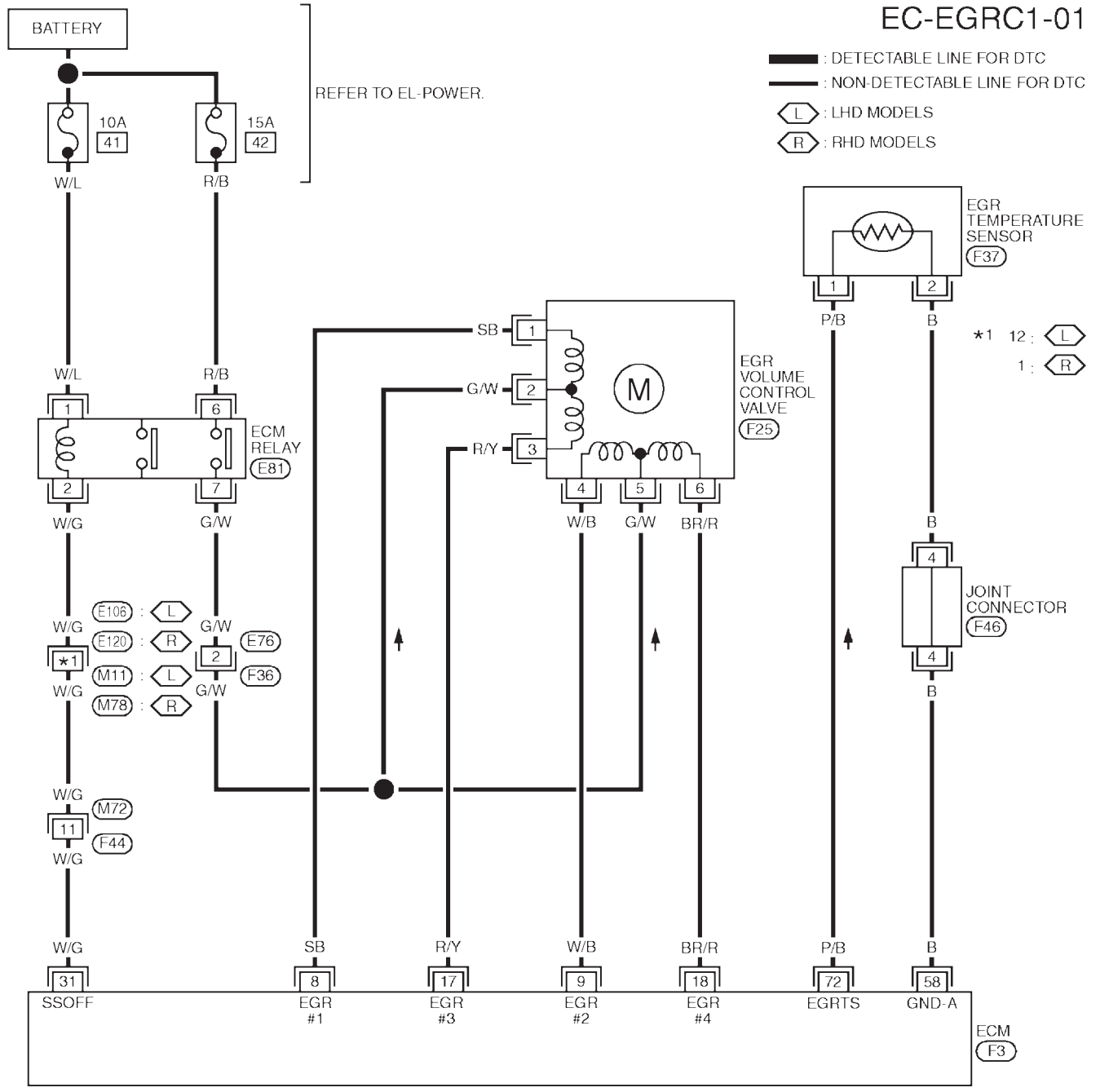


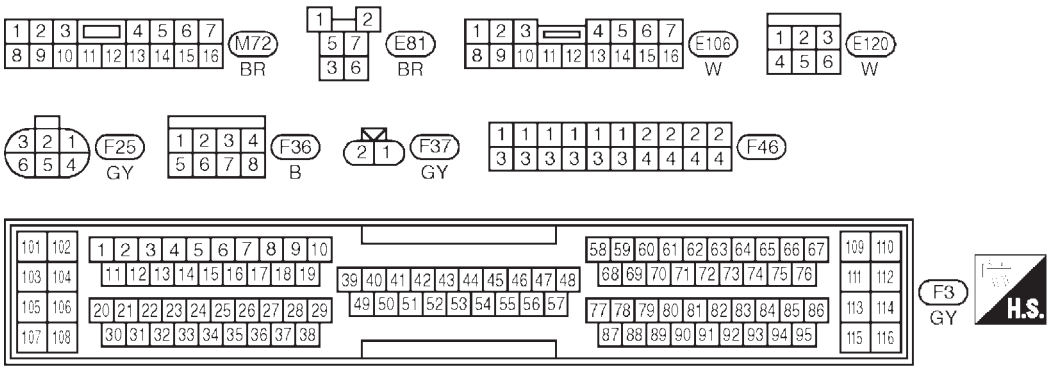
YEC664

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC1293S02





YEC884

Diagnostic Procedure

NLEC1296

1	INSPECTION START	
Do you have CONSULT-II?		
Yes or No		
Yes	▶	GO TO 2.
No	▶	GO TO 4.

2	CHECK OVERALL FUNCTION-I	

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Confirm that “COOLAN TEMP/S” indicates less than 40°C (104°F).
   If the indication is out of range, cool the engine down.

DATA MONITOR	
MONITOR	NO DTC
COOLAN TEMP/S	XXX °C

SEF013Y

4. Start engine and let it idle.
5. Make sure that “EGR TEMP SEN” in “DATA MONITOR” mode indicates more than 3V. Print out the screen or note the indication.

DATA MONITOR	
MONITOR	NO DTC
EGR TEMP SEN	XXX V

SEF014Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 6.

3	CHECK OVERALL FUNCTION-II

With CONSULT-II

1. Warm up engine to normal operating temperature.
2. Select "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Keep engine speed at 2,000 rpm and set the "EGR VOL CONT/V" opening to "20 step".
4. Make sure the "EGR TEMP SEN" indicated is lower than the value indicated in test No. 2 by 1.0V or more.

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF015Y

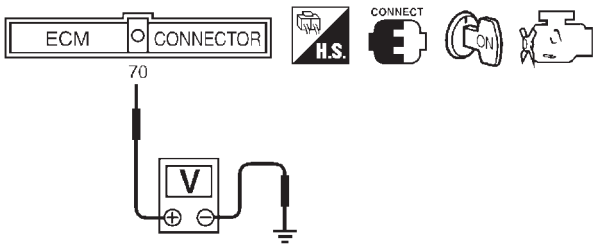
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 6.

4	CHECK OVERALL FUNCTION-I

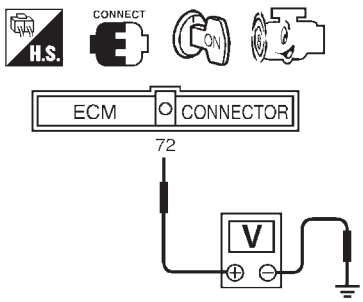
Without CONSULT-II

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 that the voltage between ECM terminal 72 (EGR temperature sensor signal) and ground is more than 3V.



SEF755Z

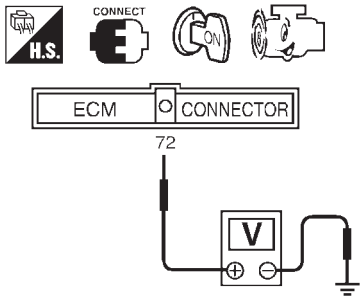
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 6.

5	CHECK OVERALL FUNCTION-II

Without CONSULT-II

1. Warm up engine to normal operating temperature.
2. Rev engine from idle up to about 3,000 rpm two to three times.
3. Make sure the voltage between ECM terminal 72 and ground is lower than the voltage measured in test No. 4 by 1.0V or more.



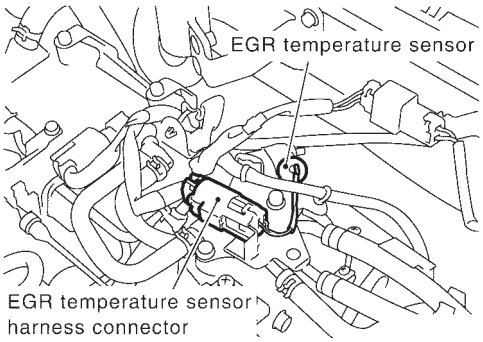
SEF755Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 6.

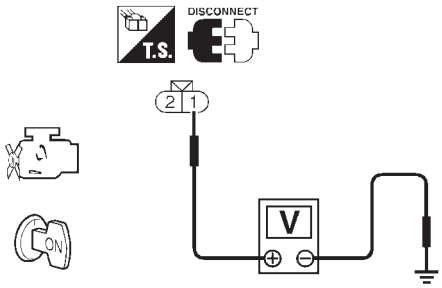
6	CHECK EGR TEMPERATURE SENSOR POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect EGR temperature sensor harness connector.



SEF127X

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



Voltage: Battery voltage

SEF500Y

OK or NG

OK	▶	GO TO 7.
NG	▶	Repair harness or connectors.

Diagnostic Procedure (Cont'd)

7	CHECK EGR TEMPERATURE SENSOR GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between EGR temperature sensor harness 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 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EGR temperature sensor and ECM
- Joint connector-1 (where fitted)
- Joint connector F46 (where fitted)

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

9	CHECK EGR TEMPERATURE SENSOR

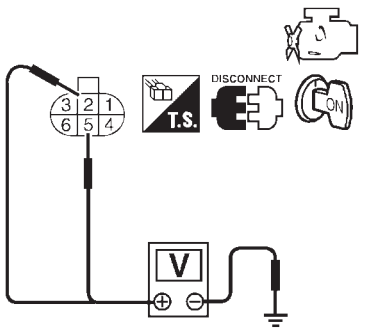
Refer to "Component Inspection", EC-457.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace EGR temperature sensor.

10	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF782Z

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

11	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuse
- Harness connectors E76, F36
- Harness for open or short between fuse and ECM relay
- ECM relay
- Harness for open or short between EGR volume control valve and ECM relay

	▶	Repair harness or connectors or replace fuse or ECM relay.

12	CHECK EGR VOLUME CONTROL VALVE OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and EGR volume control valve terminal 1,
   ECM terminal 9 and EGR volume control valve terminal 4,
   ECM terminal 17 and EGR volume control valve terminal 3,
   ECM terminal 18 and EGR volume control valve terminal 6.
   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 13.
NG	▶	Repair open circuit, short to ground or short to power in harness connectors.

13	CHECK EGR PASSAGE

Check EGR passage for clogging and cracks.

OK or NG

OK	▶	GO TO 14.
NG	▶	Repair or replace EGR passage.

14	CHECK EGR VOLUME CONTROL VALVE

Refer to "COMPONENT INSPECTION", EC-318.

OK or NG

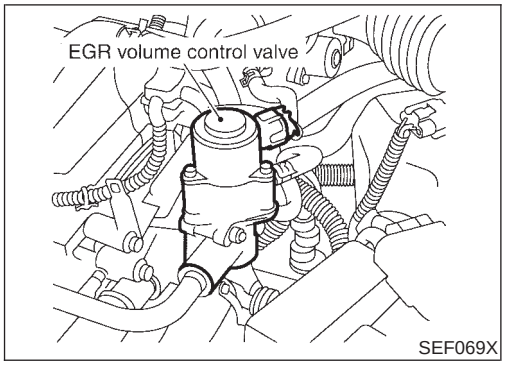
OK	▶	GO TO 15.
NG	▶	Replace EGR volume control valve.

15	CHECK INTERMITTENT INCIDENT

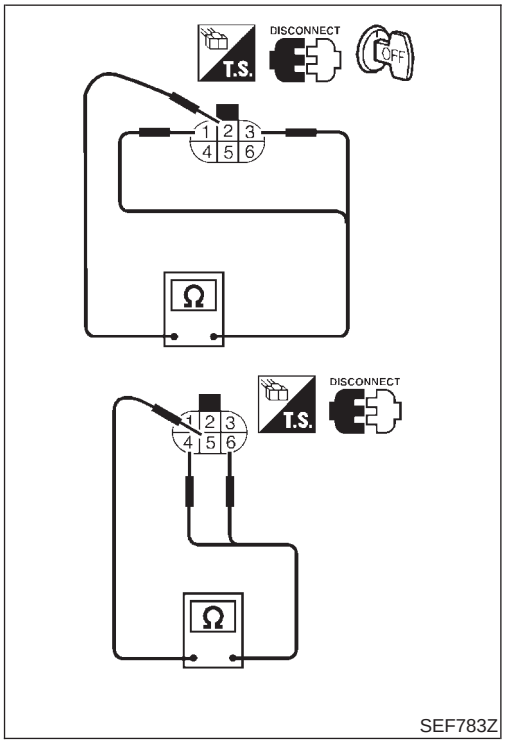
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

	▶	**INSPECTION END**

Diagnostic Procedure (Cont'd)



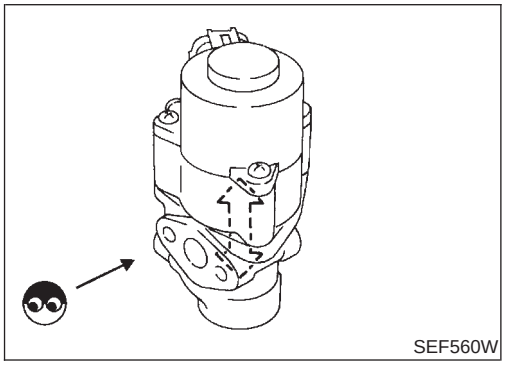
SEF069X



SEF783Z

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF015Y


SEF560W

Component Inspection

NLEC1295

EGR VOLUME CONTROL VALVE

NLEC1295S01

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

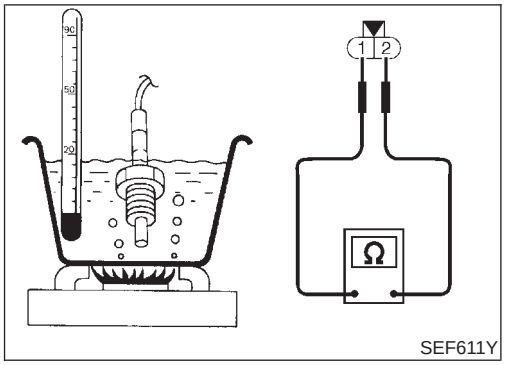
3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON".
6) Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EGR volume control valve.

Without CONSULT-II

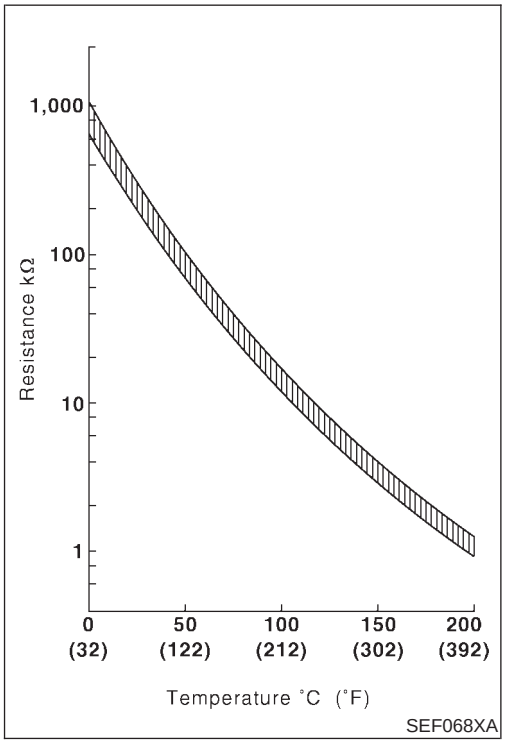
1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.



SEF611Y



SEF068XA

EGR TEMPERATURE SENSOR

NLEC1295S07

Check resistance change and resistance value.
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

If NG, replace EGR temperature sensor.

Description

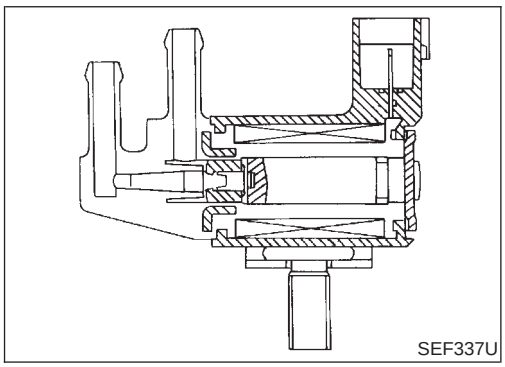
SYSTEM DESCRIPTION

NLEC1297

NLEC1297S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	EVAP canister purge control	EVAP canister purge volume control solenoid valve
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage		
Ignition switch	Start signal		
Closed throttle position switch	Closed throttle position		
Throttle position sensor	Throttle position		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
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

NLEC1297S02

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

NLEC1298

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● No-load	Idle	0%
		Revving engine	—

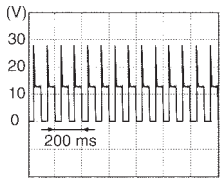
ECM Terminals and Reference Value

=NLEC1299

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

CAUTION:

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

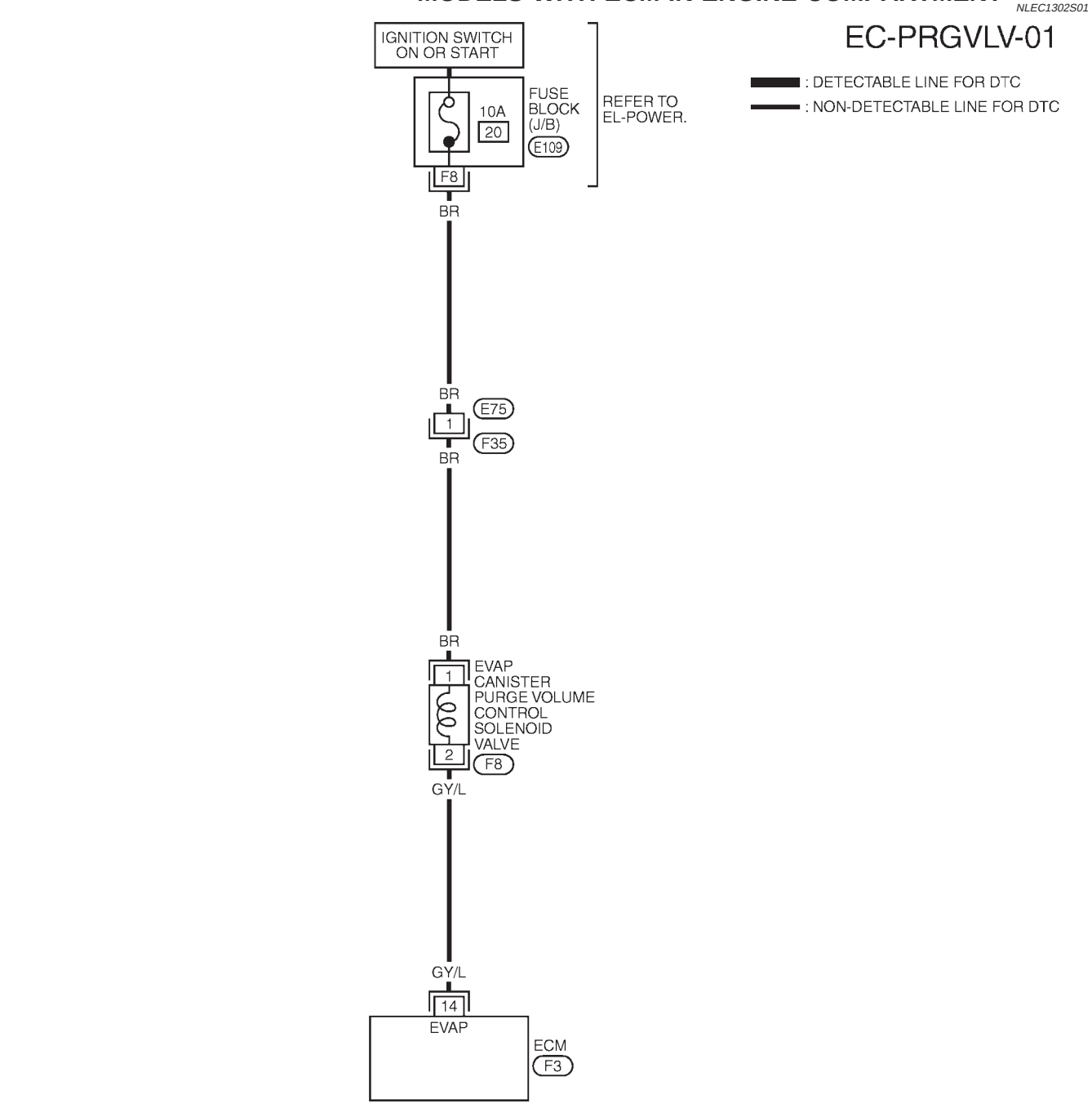
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● 2,000 rpm	5 - 12V  SEF975W

Wiring Diagram

NLEC1302

MODELS WITH ECM IN ENGINE COMPARTMENT

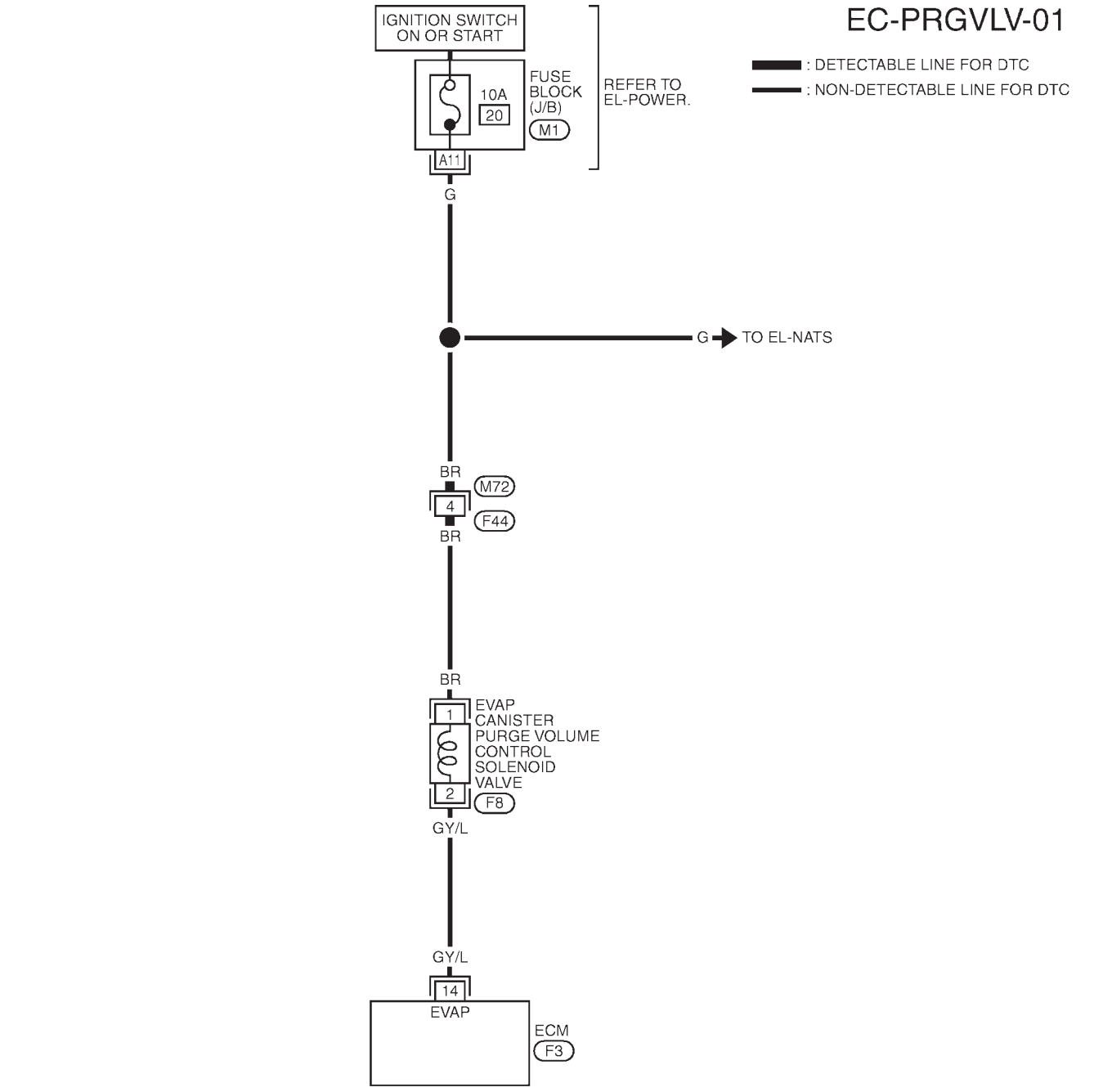
NLEC1302S01

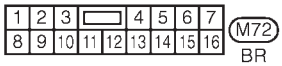


YEC751

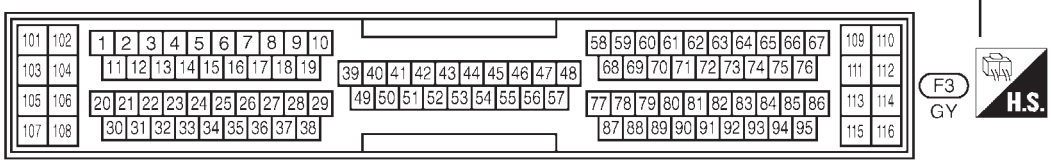
MODELS WITH ECM IN CABIN

NLEC1302S02





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



YEC898

Diagnostic Procedure

NLEC1303

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 “ACTIVE TEST” mode with CONSULT-II.
4. Start engine and let it idle.
5. Change the valve opening percentage touching “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

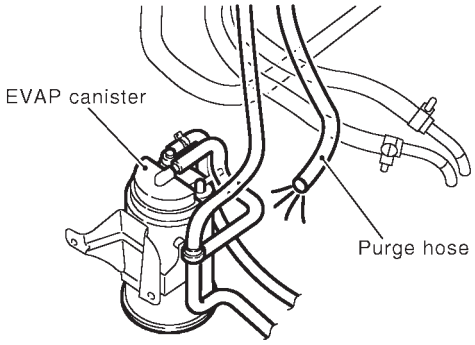
OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 5.

3	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE CONTROL FUNCTION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect the EVAP purge hose connected to the EVAP canister purge volume control solenoid valve at the EVAP canister.
4. Start engine and let it idle for at least 90 seconds.
5. Check for vacuum existence at the EVAP purge hose under the following conditions.



Conditions	Vacuum
At idle	Should not exist.
Engine speed is approx. 2,000 rpm.	Should exist.

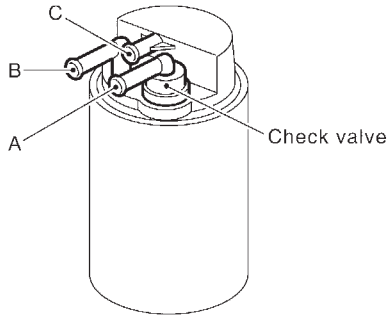
SEF760Z

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 5.

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

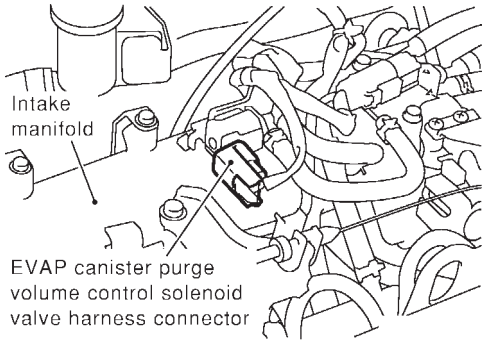
OK or NG

OK	▶	**INSPECTION END**
NG	▶	Replace EVAP canister.

Diagnostic Procedure (Cont'd)

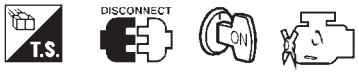
5	CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.

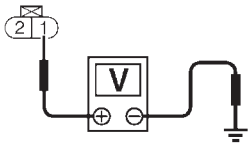


SEF076X

3. Turn ignition switch "ON".
4. Check voltage between terminals 1 and engine ground with CONSULT-II or tester.



Voltage: Battery voltage



SEF606Y

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E75, F35 (where fitted)
- Harness connectors M72, F44 (where fitted)
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

	▶	Repair harness or connectors.

7	CHECK OUTPUT SIGNAL CIRCUIT

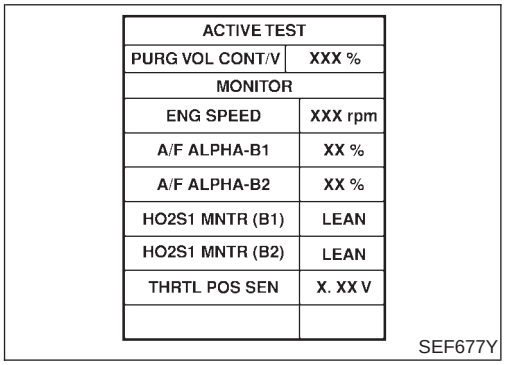
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 14 and terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

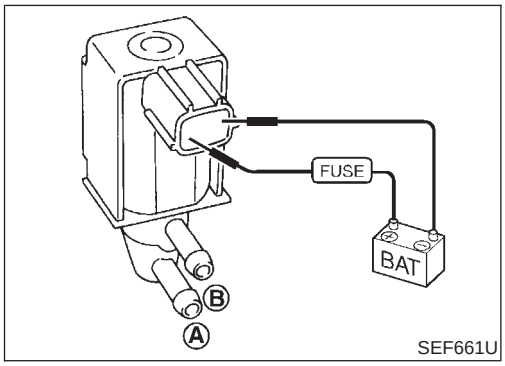
OK	▶	GO TO 8.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	
Refer to "Component Inspection" EC-465. **OK or NG**		
OK	▶	GO TO 9.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

9	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**



SEF677Y



SEF661U

Component Inspection

NLEC1304

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

NLEC1304S01

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.
   If OK, inspection end. If NG, go to following step.
3) Check air passage continuity.

Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

Without CONSULT-II

Check air passage continuity.

Condition	Air passage continuity between A and B
12V direct current supply between terminals	Yes
No supply	No

If NG, replace the EVAP canister purge volume control solenoid valve.

Description

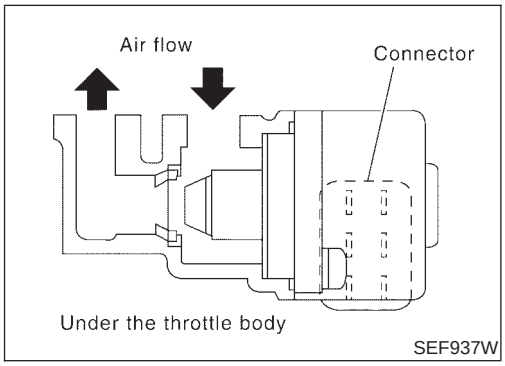
NLEC1305

SYSTEM DESCRIPTION

NLEC1305S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Idle air control	IACV-AAC valve
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle 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		
Cooling fan	Cooling fan operation		
Electrical load	Electrical load signal		

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 taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering, cooling fan operation and electrical load).



COMPONENT DESCRIPTION

NLEC1305S02

IACV-AAC Valve

NLEC1305S0201

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 sequence. Each time the IACV-AAC valve opens or closes to change the 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

NLEC1306

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	5 - 25 steps
		2,000 rpm	—

ECM Terminals and Reference Value

NLEC1307

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.

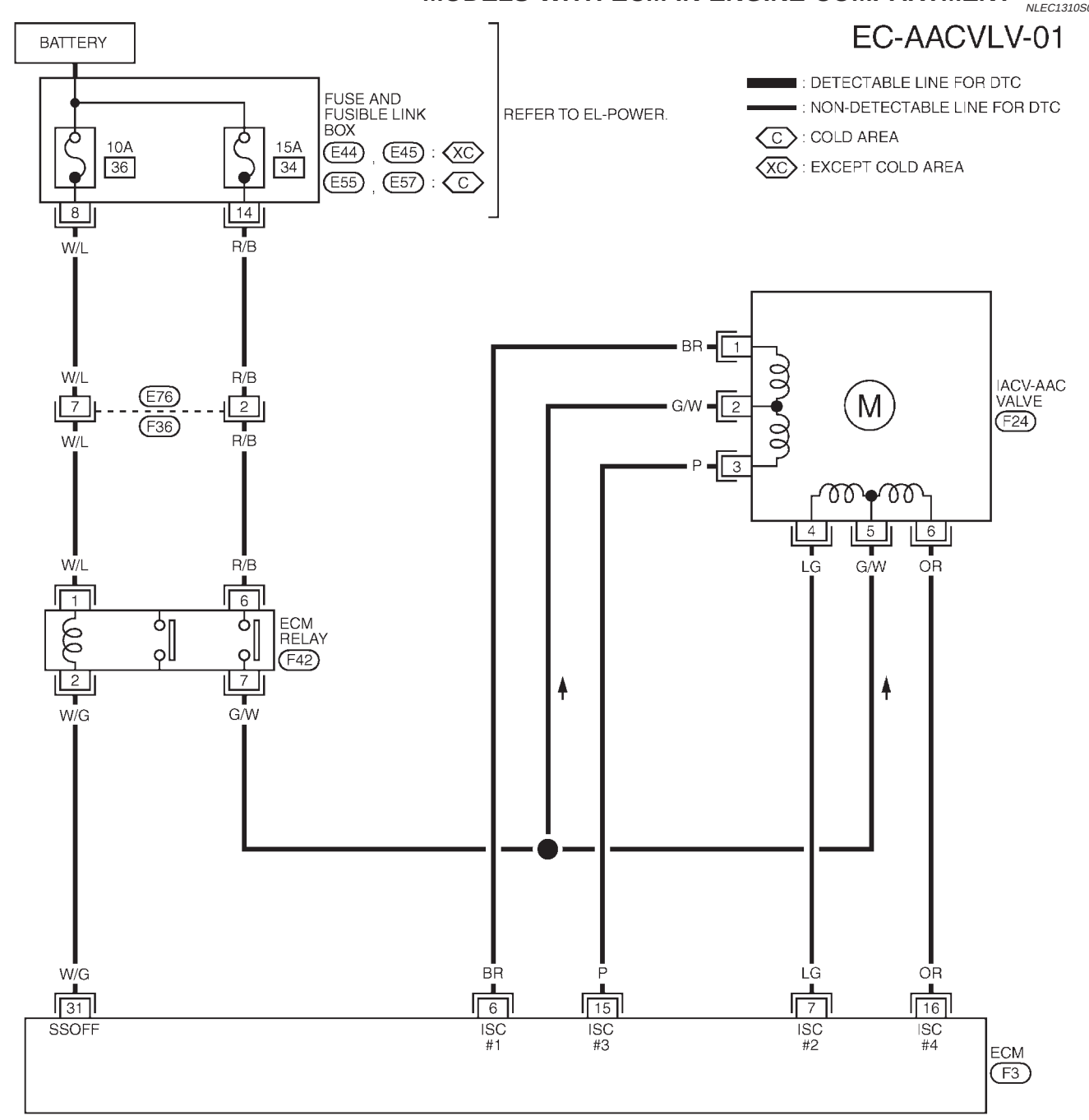
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6 7 15 16	BR LG P OR	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V

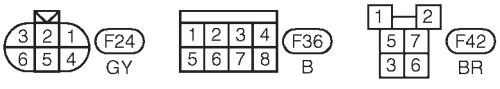
Wiring Diagram

NLEC1310

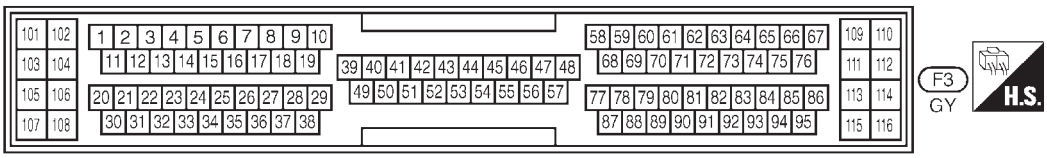
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1310S01





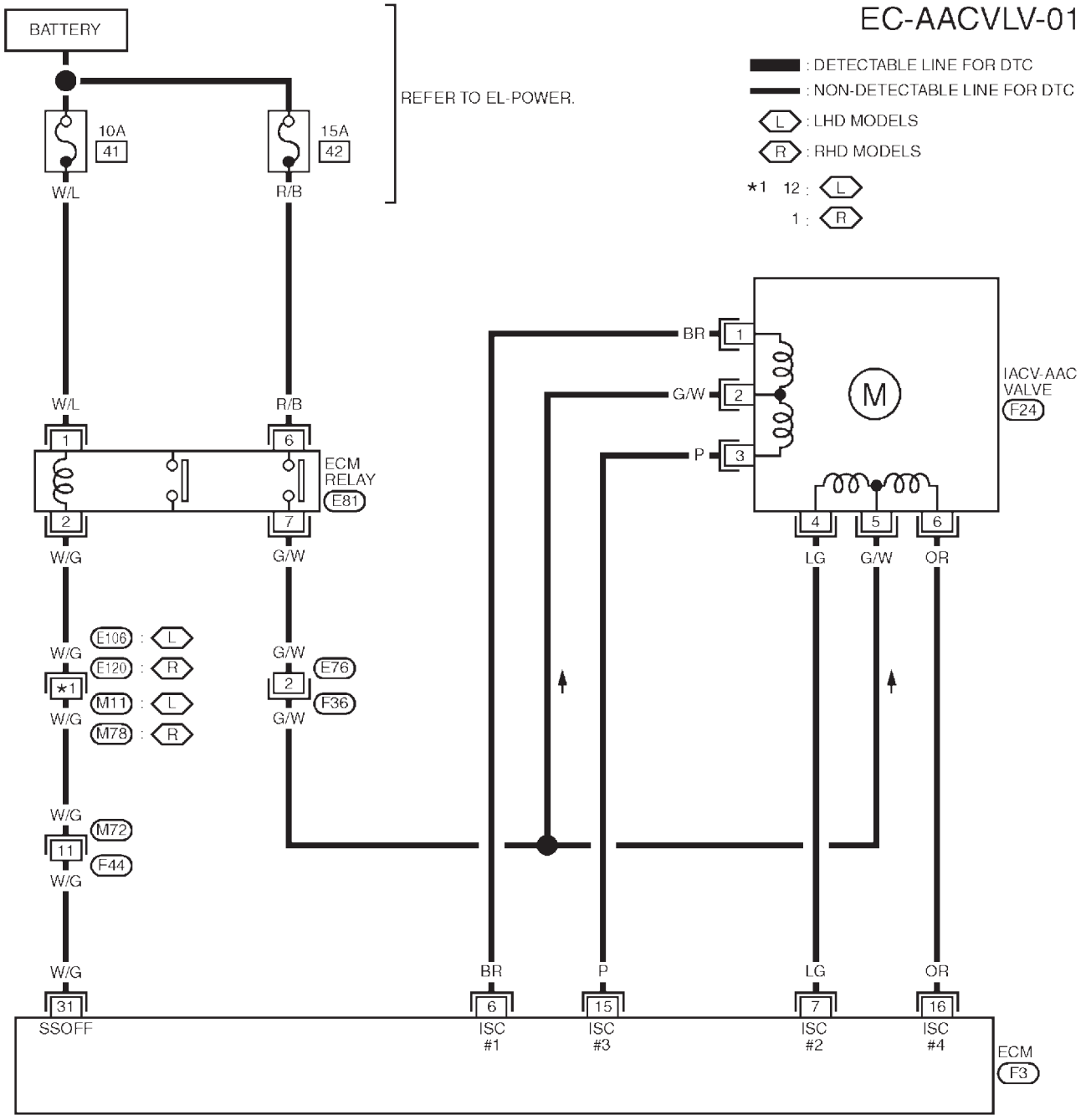
REFER TO THE FOLLOWING.
E44 , E45 , E55 , E57
-FUSE AND FUSIBLE LINK BOX

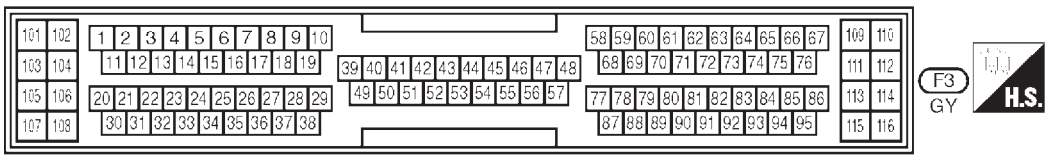


YEC752

MODELS WITH ECM IN CABIN

NLEC1310S02





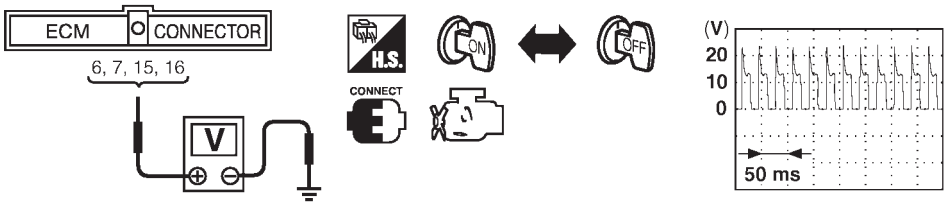
YEC899

Diagnostic Procedure

NLEC1311

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “OFF”.
2. Read the voltage signal between ECM terminals 6, 7, 15, 16 (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”.



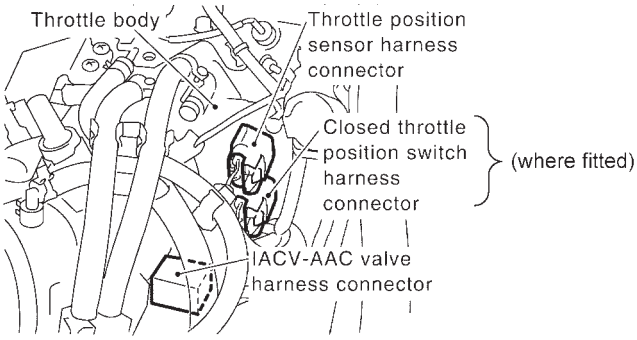
SEF756Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

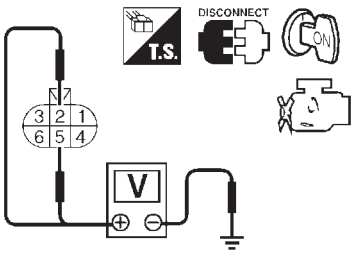
2	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect IACV-AAC valve harness connector.



NEF316A

3. Turn ignition switch “ON”.
4. Check voltage between terminal 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.
- 15A fuse
- Harness connectors E76, F36
- Harness for open or short between fuse and ECM relay
- ECM relay
- Harness for open or short between IACV-AAC and ECM relay

	▶	Repair harness or connectors or replace fuse or ECM relay.

4	CHECK OUTPUT SIGNAL CIRCUIT

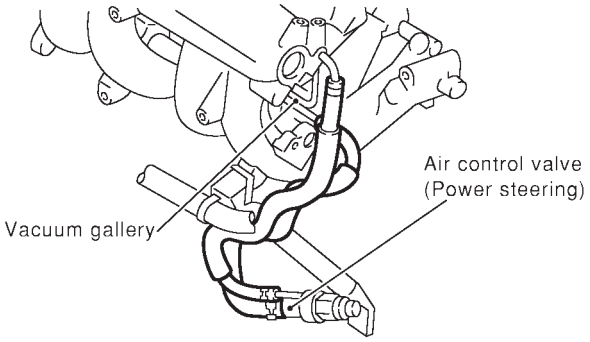
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 6 and IACV-AAC valve terminal 1,
   ECM terminal 7 and IACV-AAC valve terminal 4,
   ECM terminal 15 and IACV-AAC valve terminal 3,
   ECM terminal 16 and IACV-AAC valve terminal 6.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

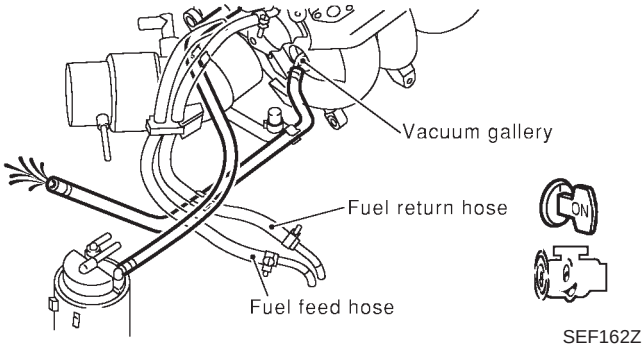
OK or NG

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

5	CHECK 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.





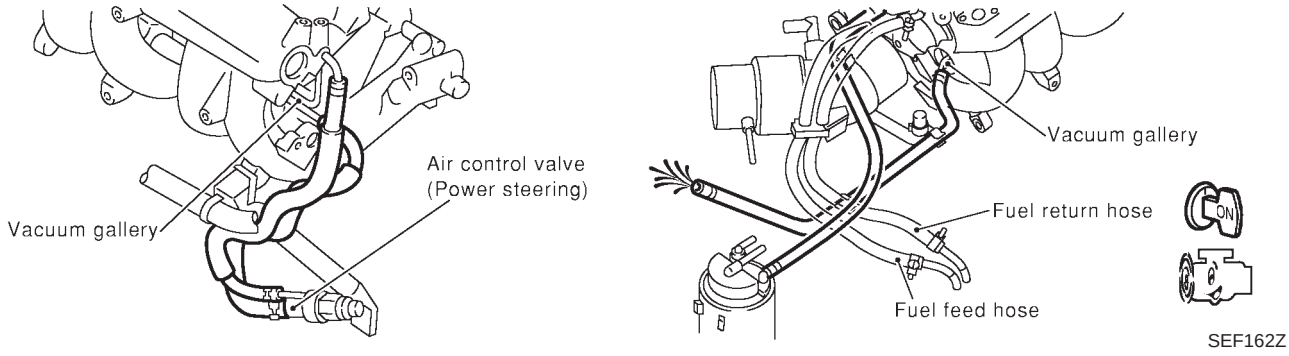
Vacuum does not exist or slightly exist.

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.



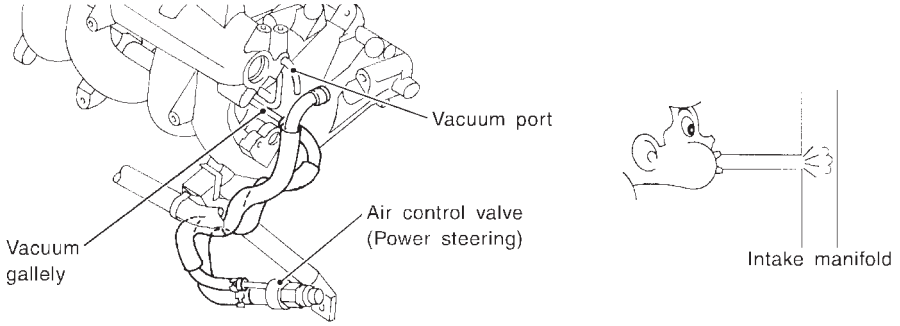
Vacuum should exist.

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.

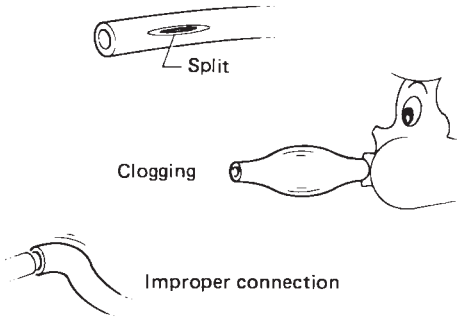


OK or NG

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

Refer to "Component Inspection", EC-474.

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-57.

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 M/T models, drive vehicle for 10 minutes.

5. Stop vehicle with engine running.
6. Check target idle speed.

700±50 rpm

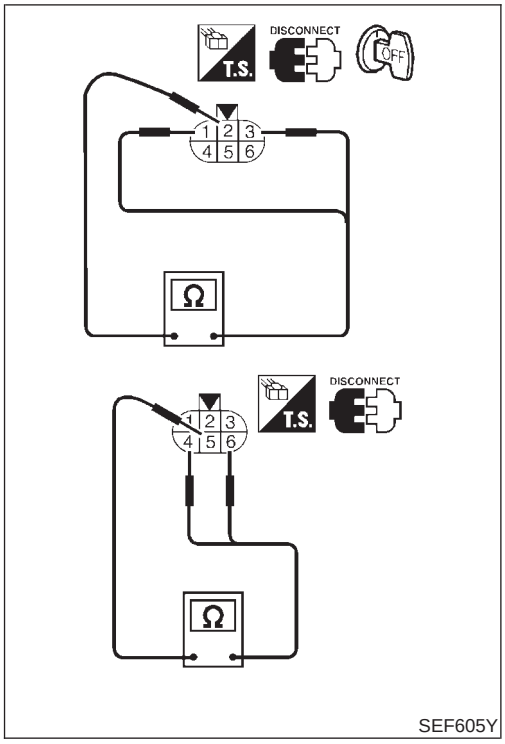
OK or NG

OK	▶	GO TO 12.
NG	▶	Perform "Idle Air Volume Learning", EC-57.

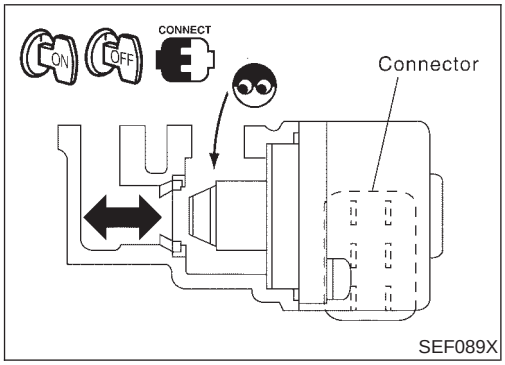
12	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

	▶	**INSPECTION END**



SEF605Y



SEF089X

Component Inspection

NLEC1312

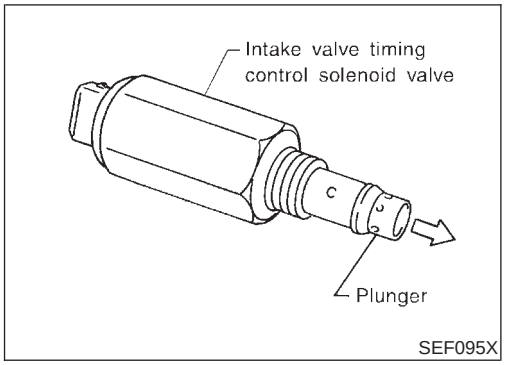
IACV-AAC VALVE

NLEC1312S01

1) Disconnect IACV-AAC valve harness connector.
2) Check IACV-AAC valve resistance.

Condition	Resistance
Terminal 2 and terminals 1, 3	20 - 24Ω [at 20°C (68°F)]
Terminal 5 and terminals 4, 6	

3) Reconnect IACV-AAC valve harness connector.
4) Remove idle air adjusting unit assembly (IACV-AAC valve is built-in) from engine.
   (The IACV-AAC valve harness connector should remain connected.)
5) Turn ignition switch “ON” and “OFF”, and ensure the IACV-AAC valve shaft smoothly moves forward and backward, according to the ignition switch position.
   If NG, replace the IACV-AAC valve.



Component Description

NLEC1313

The valve timing control system is utilized to control intake valve opening and closing timing. Engine coolant temperature signals, engine speed and throttle position are used to determine intake valve timing.
The intake camshaft sprocket position is regulated by oil pressure controlled by the intake valve timing control.
When ECM sends ON signal to intake valve timing control solenoid valve, oil pressure is transmitted to camshaft sprocket. Then, intake side camshaft is advanced.

Operation

NLEC1314

Engine operating condition				Intake valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap
Engine coolant temperature	Engine speed	B/FUEL SCHDL	Neutral switch			
20°C (68°F) - 70°C (158°F)	1,150 - 4,600 rpm	Above 3 msec	OFF	ON	Advance	Increased
Above 70°C (158°F)		Above 7 msec				
Conditions other than those above				OFF	Normal	Normal

CONSULT-II Reference Value in Data Monitor Mode

NLEC1315

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL-B1	● Engine: After warming up ● Lift up vehicle and suitable gear position	Idle	OFF
		Revving engine from 2,000 to 3,000 rpm	ON

ECM Terminals and Reference Value

NLEC1316

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.

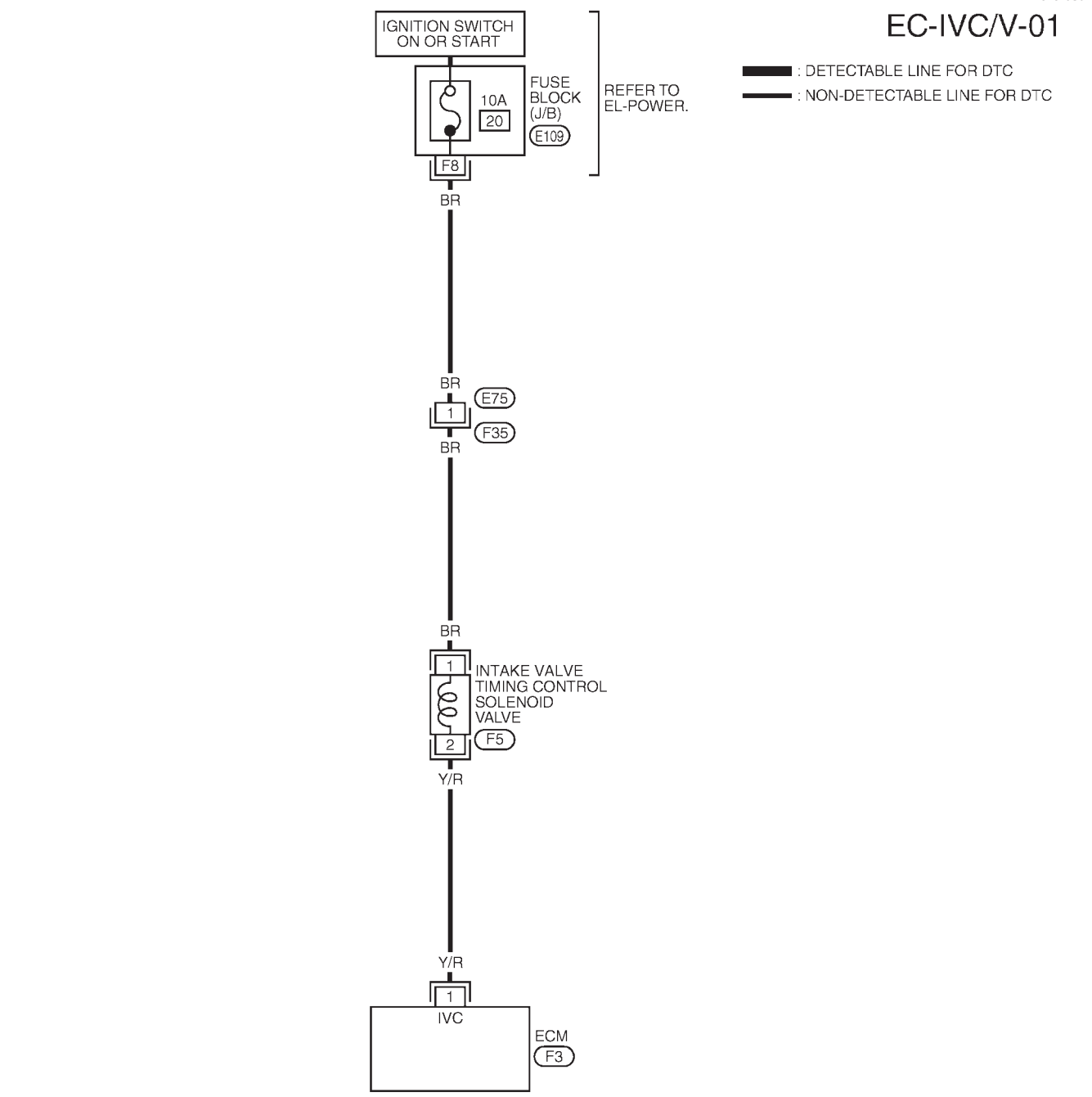
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Warm-up condition ● Lift up vehicle and suitable gear position ● Rev engine up from 2,000 to 3,000 rpm	Approximately 0V

Wiring Diagram

NLEC1319

MODELS WITH ECM IN ENGINE COMPARTMENT

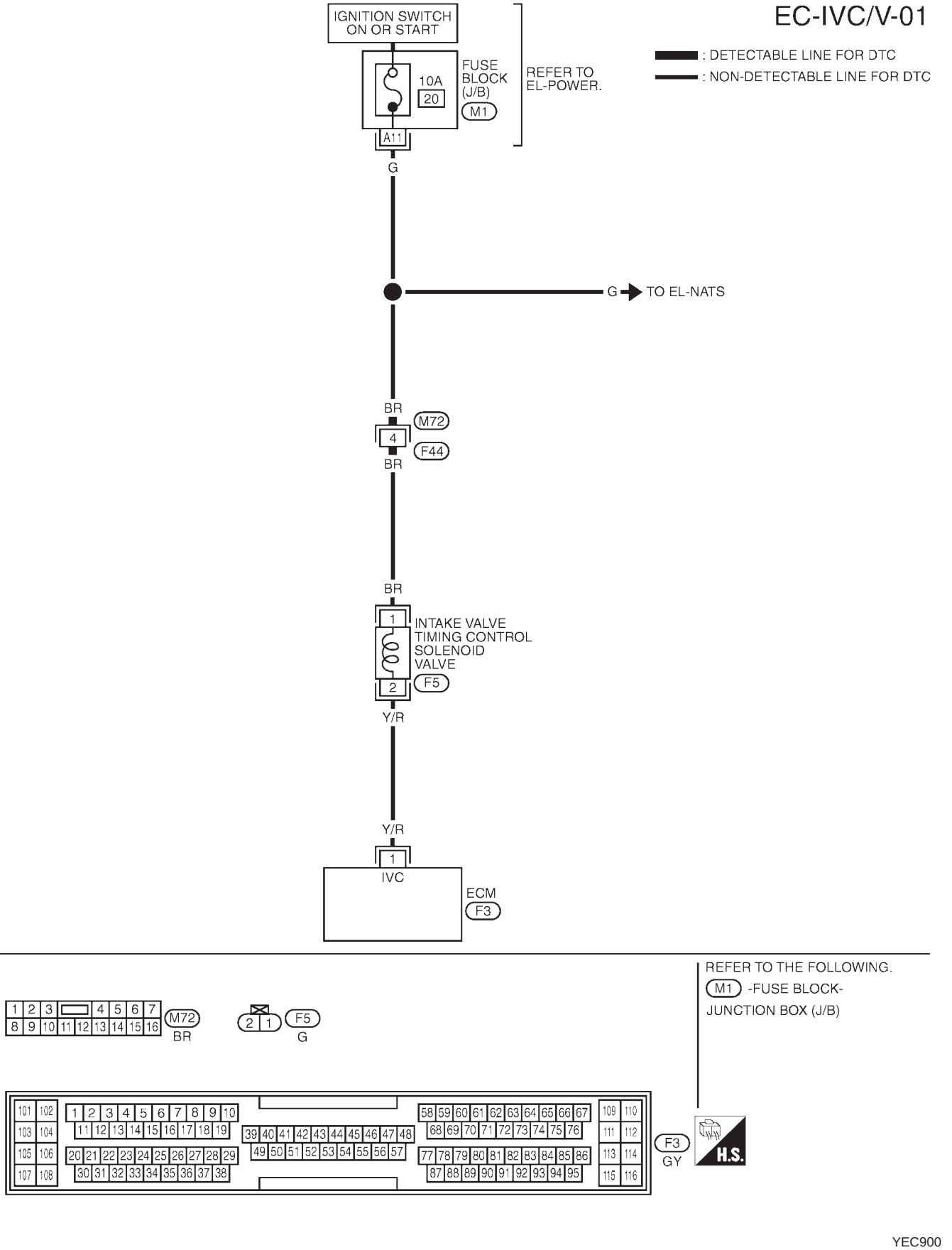
NLEC1319S01



YEC754

MODELS WITH ECM IN CABIN

NLEC1319S02



YEC900

Diagnostic Procedure

NLEC1320

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 operation temperature.
2. Select “INT/V SOL-B1” in “DATA MONITOR” mode with CONSULT-II.
3. Lift up vehicle and simulate driving in a suitable gear position.
4. Check the “INT/V SOL-B1” singal under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
INT/V SOL-B1	ON

Conditions	INT/V SOL-B1
At idle	OFF
Rev engine from 2,000 to 3,000 rpm at suitable gear position.	ON

SEF758Z

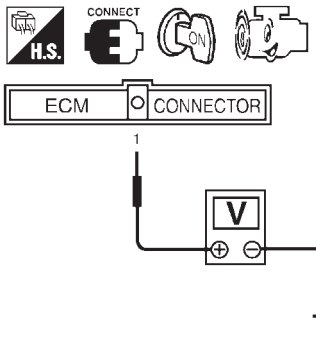
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine engine and warm it up to normal operation temperature.
2. Lift up vehicle and simulate driving in a suitable gear position.
3. Check the voltage between ECM terminal 1 and ground under the following conditions.



Conditions	Voltage
At idle	Battery voltage
Rev engine from 2,000 to 3,000 rpm at suitable gear position.	Approximately 0V

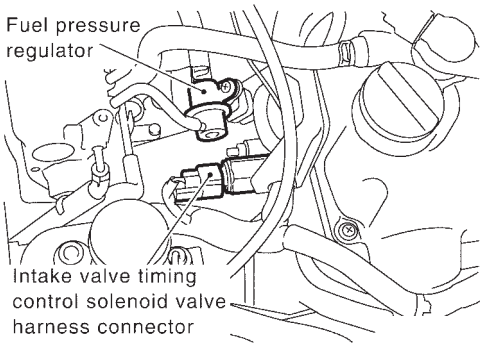
SEF757Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

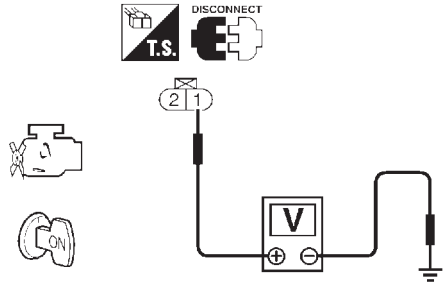
4	CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect intake valve timing control solenoid valve harness connector.



SEF149X

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



Voltage: Battery voltage

SEF619X

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F35, E75 (where fitted)
- Harness connectors M72, F44 (where fitted)
- 10A fuse
- Harness for open or short between valve timing control solenoid valve and fuse

	▶	Repair harness or connectors.

6	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 1 and intake valve timing control solenoid valve harness connector terminal 2. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

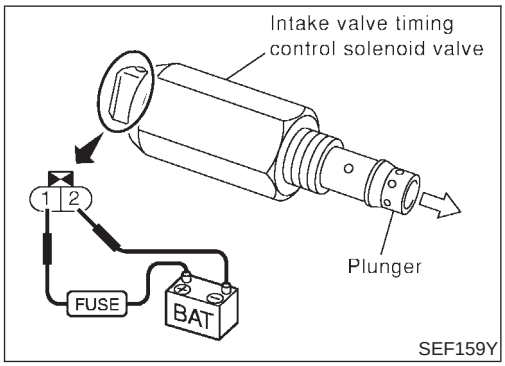
OK or NG

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

Diagnostic Procedure (Cont'd)

7	CHECK VALVE TIMING CONTROL SOLENOID VALVE	
Refer to "Component Inspection", EC-480.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	Replace valve timing control solenoid valve.

8	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**



Component Inspection

NLEC1321

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

NLEC1321S01

1. Check oil passage visually for any metal debris.
2. Supply intake valve timing control solenoid valve terminals with battery voltage.
3. Make sure that inside plunger protrudes.
   If NG, replace intake valve timing control solenoid valve.

Description

NLEC1248

SYSTEM DESCRIPTION

NLEC1248S01

Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position	Swirl control valve system control	Swirl control valve control solenoid valve via swirl control valve
Ignition switch	Start signal		
Crankshaft position sensor (POS)	Engine speed		
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		

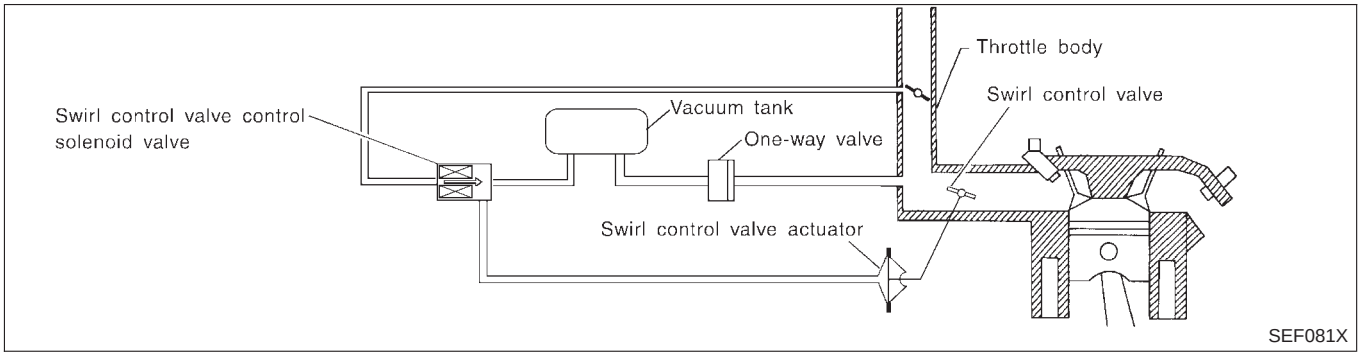
This system has a swirl control valve in the intake passage of each cylinder.
While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion 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.
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

OPERATION

NLEC1248S02

Engine coolant temperature	Throttle position sensor (Idle position)	Engine speed	Swirl control valve control solenoid valve	Swirl control valve
15 - 40°C (59 - 104°F)	ON	—	ON	Closed
	OFF	Below 2,400 rpm*		
Except above			OFF	Open

*: The value may vary according to accelerator pedal operation.



CONSULT-II Reference Value in Data Monitor Mode

NLEC1249

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 40°C (104°F).	ON
		Engine coolant temperature is above 40°C (104°F).	OFF

ECM Terminals and Reference Value

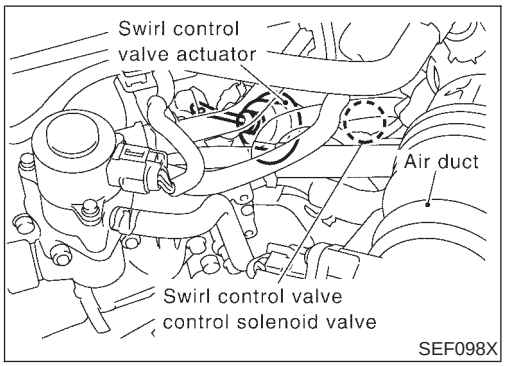
=NLEC1250

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)
104	SB	Swirl control valve control solenoid valve	**[Engine is running]** ● Engine coolant temperature is between 15°C (59°F) to 40°C (104°F). ● Idle speed	0 - 1V
			[Engine is running] ● Engine coolant temperature is above 40°C (104°F). ● Idle speed	BATTERY VOLTAGE (11 - 14V)



Component Description

NLEC1251

SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

NLEC1251S01

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.

SWIRL CONTROL VALVE AND ACTUATOR

NLEC1251S02

By controlling the solenoid valve, the actuator pulls on the lever of the swirl control valve and closes it when vacuum accumulated in the vacuum tank is supplied.

VACUUM TANK

NLEC1251S03

The vacuum tank is for accumulating vacuum to move the actuator. The vacuum pressure is supplied through the one-way valve from the intake manifold.

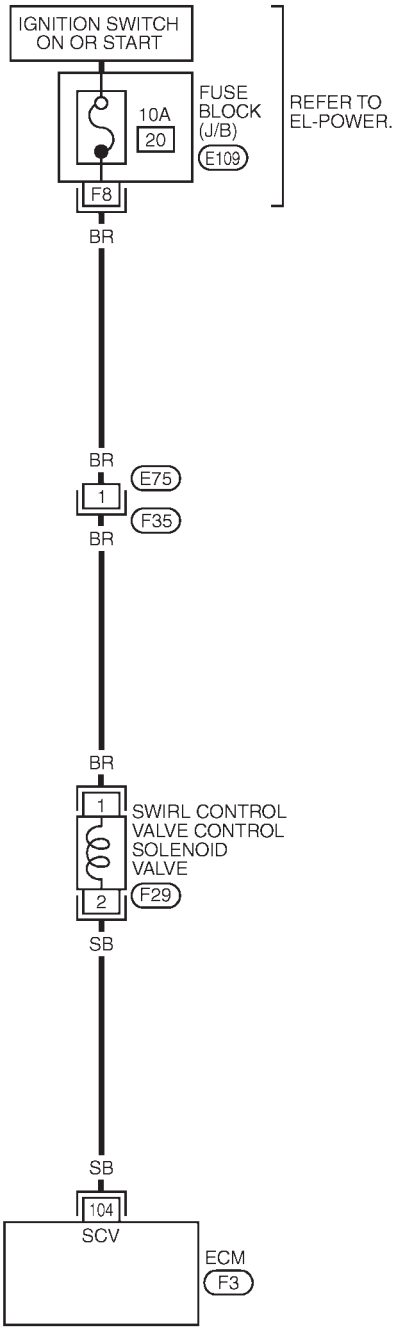
ONE-WAY VALVE

NLEC1251S04

The one-way valve, located between the intake manifold and the vacuum tank, prevents back-flow of the vacuum tank. When installing, the colored side should face the vacuum source.

Wiring Diagram

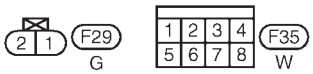
NLEC1254



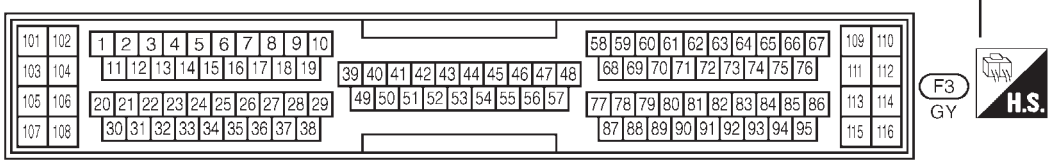
EC-SWL/C-01

: DETECTABLE LINE FOR DTC

: NON-DETECTABLE LINE FOR DTC



REFER TO THE FOLLOWING.
E109 -FUSE BLOCK-
JUNCTION BOX (J/B)



YEC661

Diagnostic Procedure

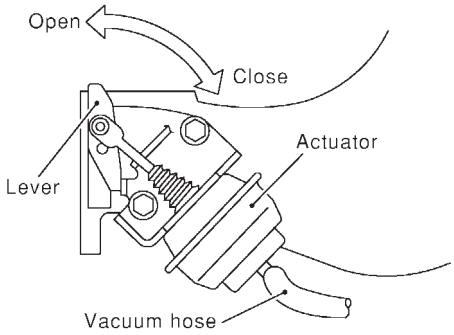
NLEC1255

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” on CONSULT-II screen.
4. Make sure that the swirl control valve opens and closes by observing the lever movement.



SEF242Z

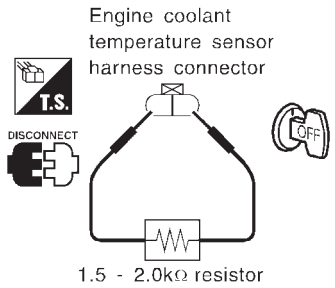
OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

3	CHECK OVERALL FUNCTION

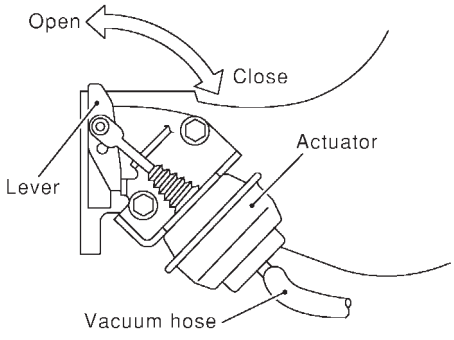
Without CONSULT-II

1. Disconnect engine coolant temperature sensor harness connector.
2. Connect a resistor (1.5 - 2.0 kΩ) between terminals of engine coolant temperature sensor harness connector.



SEF982UB

3. Start engine and let it idle.
4. In idle with the swirl control valve set to CLOSE, verify by observing the lever movement that the valve changes to OPEN when the engine rpm exceeds 2,400 rpm.



SEF242Z

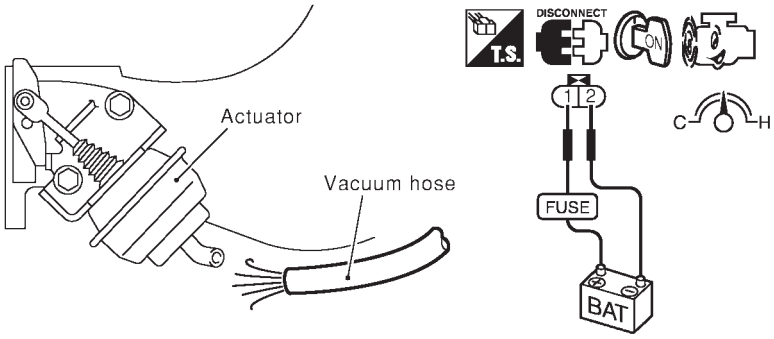
OK or NG

OK	▶	**INSPECTION END**
NG	▶	Remove resistor. GO TO 4.

4	CHECK VACUUM EXISTENCE

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.

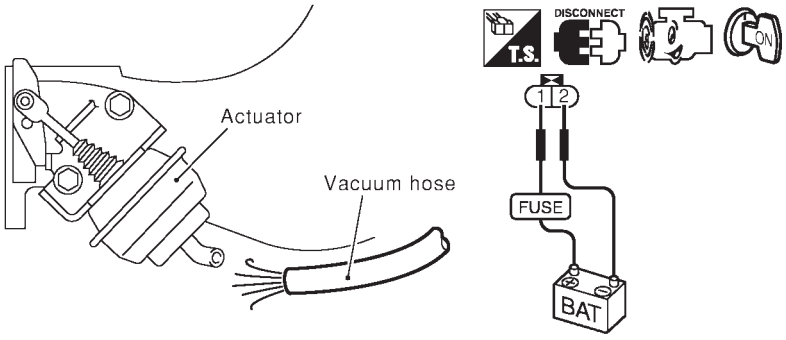


Condition	Vacuum
ON	Should exist.
OFF	Should not exist.

SEF243Z

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.

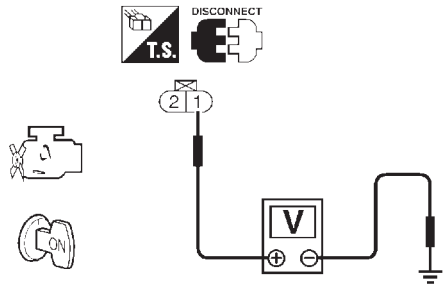
SEF244Z

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 5.

5	CHECK POWER SUPPLY

1. Disconnect swirl control valve control solenoid valve harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF619X

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F35
- 10A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse

	▶	Repair harness or connectors.

7	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 104 and swirl control valve control solenoid valve harness connector terminal 2 with CONSULT-II or tester.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

OK or NG

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

8	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

Refer to "Component Inspection", EC-488.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace swirl control valve control solenoid valve.

9	CHECK ACTUATOR

Refer to "Component Inspection", EC-488.

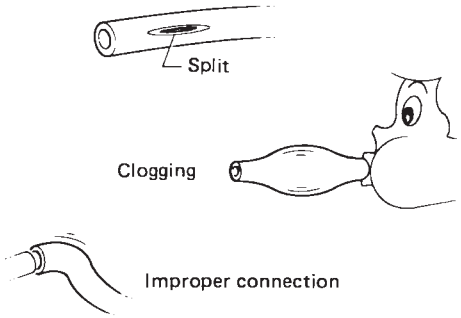
OK or NG

OK	▶	**INSPECTION END**
NG	▶	Replace swirl control valve and actuator.

Diagnostic Procedure (Cont'd)

10	CHECK HOSES

Check hoses and tubes between intake manifold, and swirl control valve actuator for crack, clogging, improper connection or disconnection.



SEF109L

OK or NG

OK	▶	GO TO 11.
NG	▶	Repair hoses or tubes.

11	CHECK VACUUM TANK

Refer to "Component Inspection", EC-488.

OK or NG

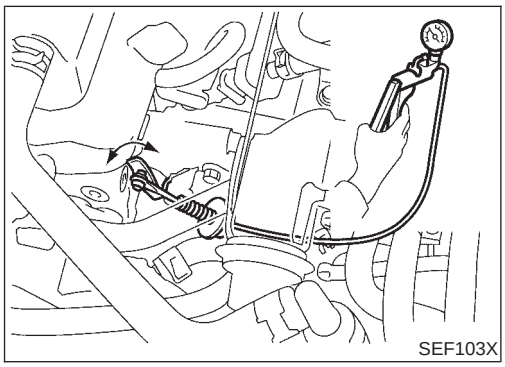
OK	▶	GO TO 12.
NG	▶	Replace vacuum tank.

12	CHECK ONE-WAY VALVE

Refer to "Component Inspection", EC-488.

OK or NG

OK	▶	**INSPECTION END**
NG	▶	Replace one-way valve.



SEF103X

Component Inspection

NLEC1256

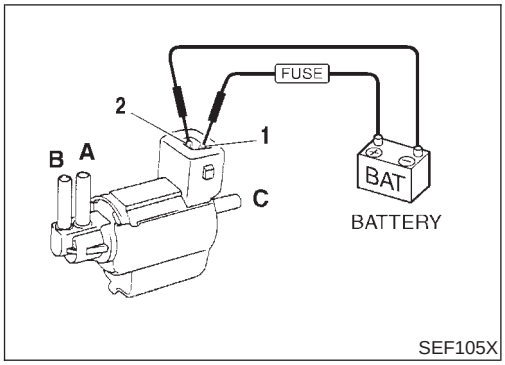
SWIRL CONTROL VALVE AND ACTUATOR

NLEC1256S01

Supply vacuum to actuator and check swirl control valve operation.

Condition	Swirl control valve
Supply vacuum to actuator	Close
No supply	Open

If NG, replace swirl control valve and actuator.



SEF105X

SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

NLEC1256S02

Check solenoid valve air passage continuity.

With CONSULT-II

Turn ignition switch "ON" and perform "SWIRL CONT SOL/V" in "ACTIVE TEST" mode.

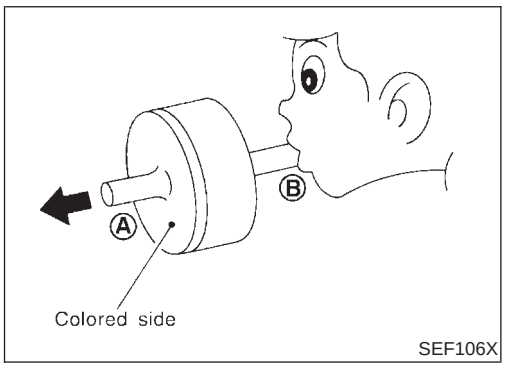
Condition SWIRL CONT SOL/V	Air passage continuity between A and B	Air passage continuity between A and C
ON	Yes	No
OFF	No	Yes

If NG or operation takes more than 1 second, replace solenoid valve.

Without CONSULT-II

Condition	Air passage continuity between A and B	Air passage continuity between A and C
12V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

If NG or operation takes more than 1 second, replace solenoid valve.



SEF106X

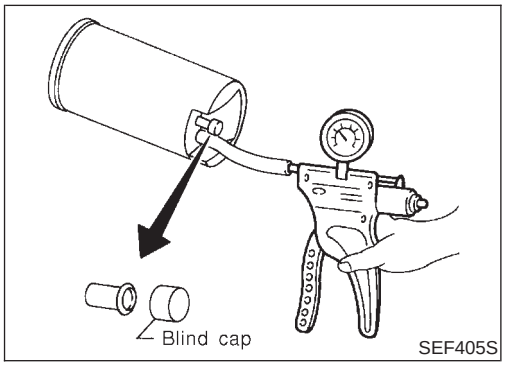
ONE-WAY VALVE

NLEC1256S03

Check one-way valve air passage continuity.

Condition	Air passage continuity
Blow air from side B to A	Yes
Blow air from side A to B	No

If NG, replace one-way valve.



SEF405S

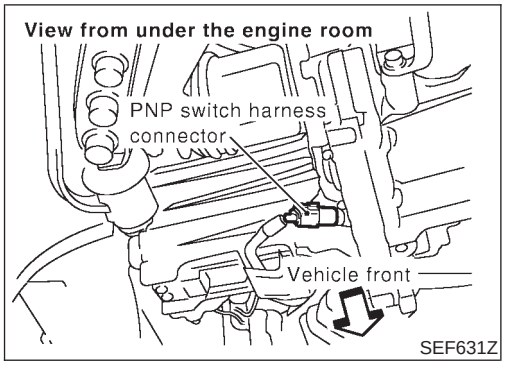
VACUUM TANK

NLEC1256S04

Check vacuum tank leakage.

Apply vacuum −80.0 kPa (−800 mbar, −600 mmHg, −23.62 inHg, −11.60 psi). Then keep it for 10 seconds and check there is no leakage.

If NG, replace vacuum tank.



Component Description

NLEC1322

When the gear position is “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the park/neutral position when continuity with ground exists.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1323

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: “N”	ON
		Except above	OFF

ECM Terminals and Reference Value

NLEC1324

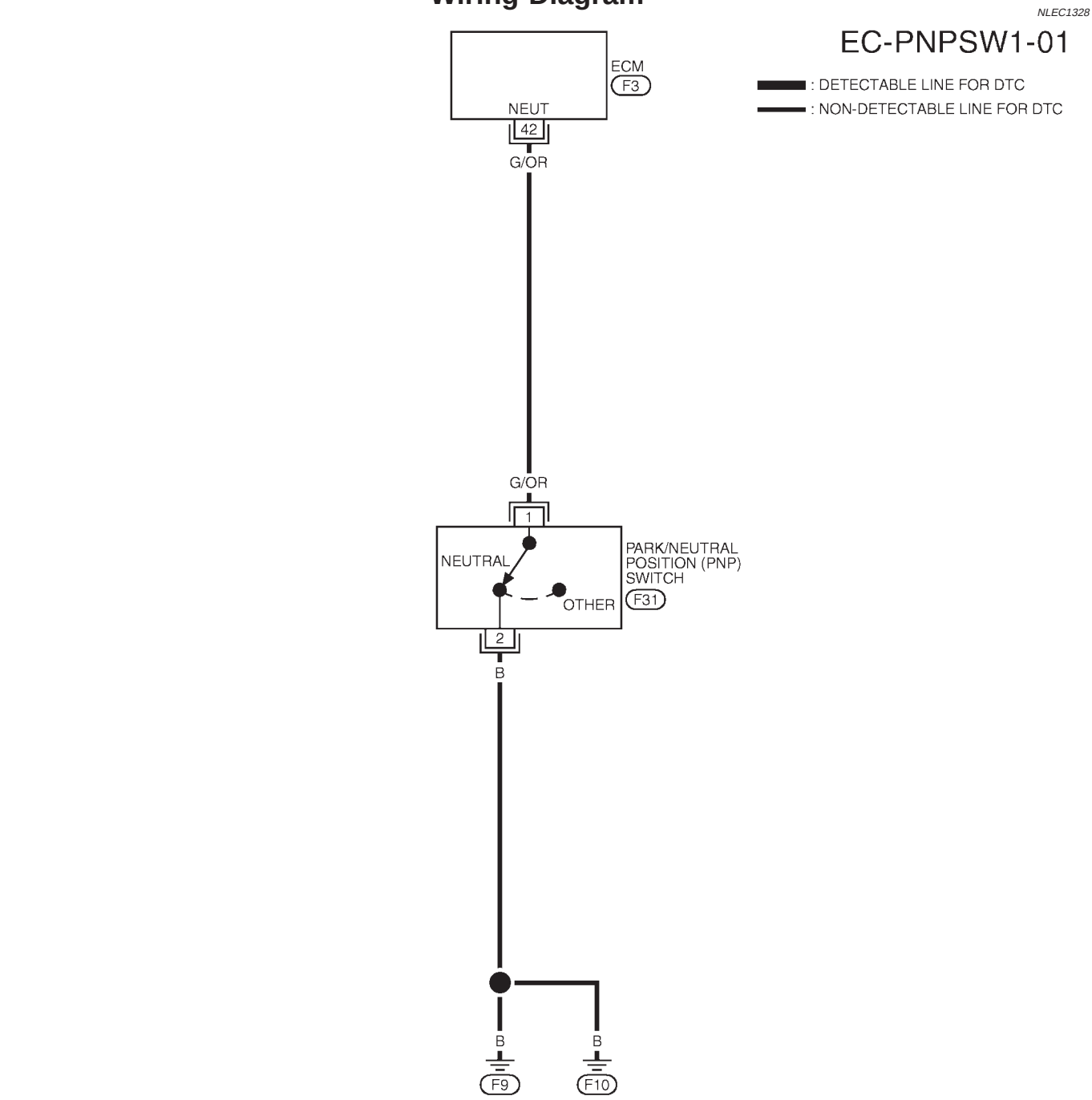
Specification data are reference values and are measured between each terminal and ground.

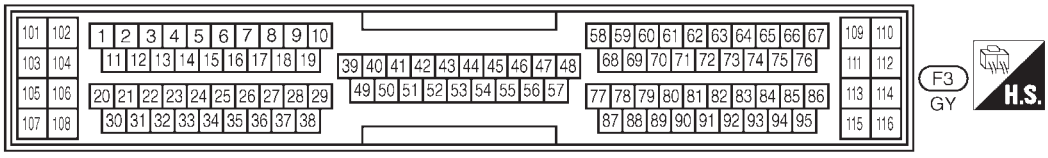
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM’s transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	G/OR	PNP switch	**[Ignition switch “ON”]** ● Gear position is “Neutral position”	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	Approximately 5V

Wiring Diagram

NLEC1328





YEC753

Diagnostic Procedure

NLEC1329

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

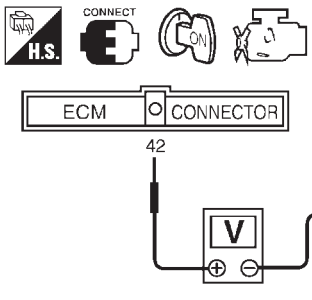
OK or NG

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 42 and ground under the following conditions.



Shift lever position	Voltage
Neutral position	Approx. 0V
Except the above position	5V

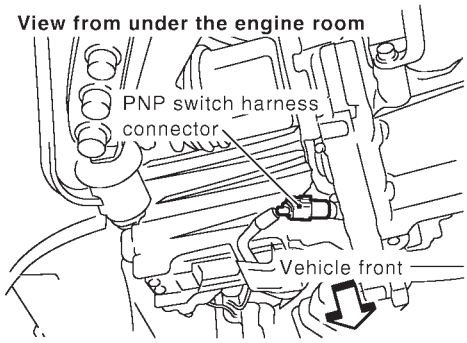
SEF759Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.



SEF631Z

3. Check harness continuity between PNP switch harness connector terminal 2 and body ground. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the harness for open or short between PNP switch and body ground.

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

6	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 42 and PNP switch harness connector 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 harness for open or short between ECM and PNP switch.

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

8	CHECK PNP SWITCH

Refer to MT-16, "POSITION SWITCH CHECK".

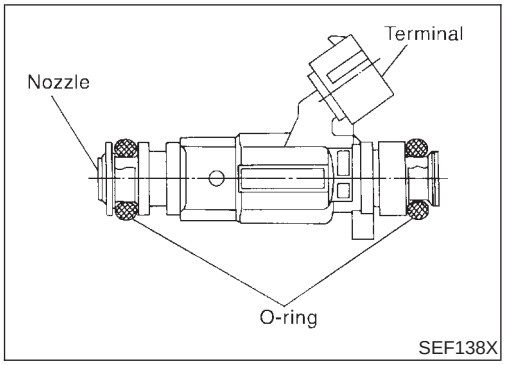
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace PNP switch.

9	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

	▶	**INSPECTION END**



Component Description

NLEC0435

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

NLEC0436

MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec

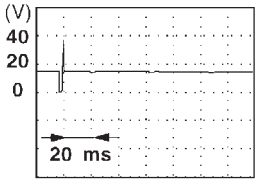
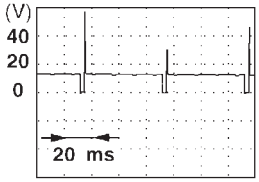
ECM Terminals and Reference Value

NLEC0437

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101 103 105 107	R/B Y/B G/B L/B	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF011W
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  SEF012W

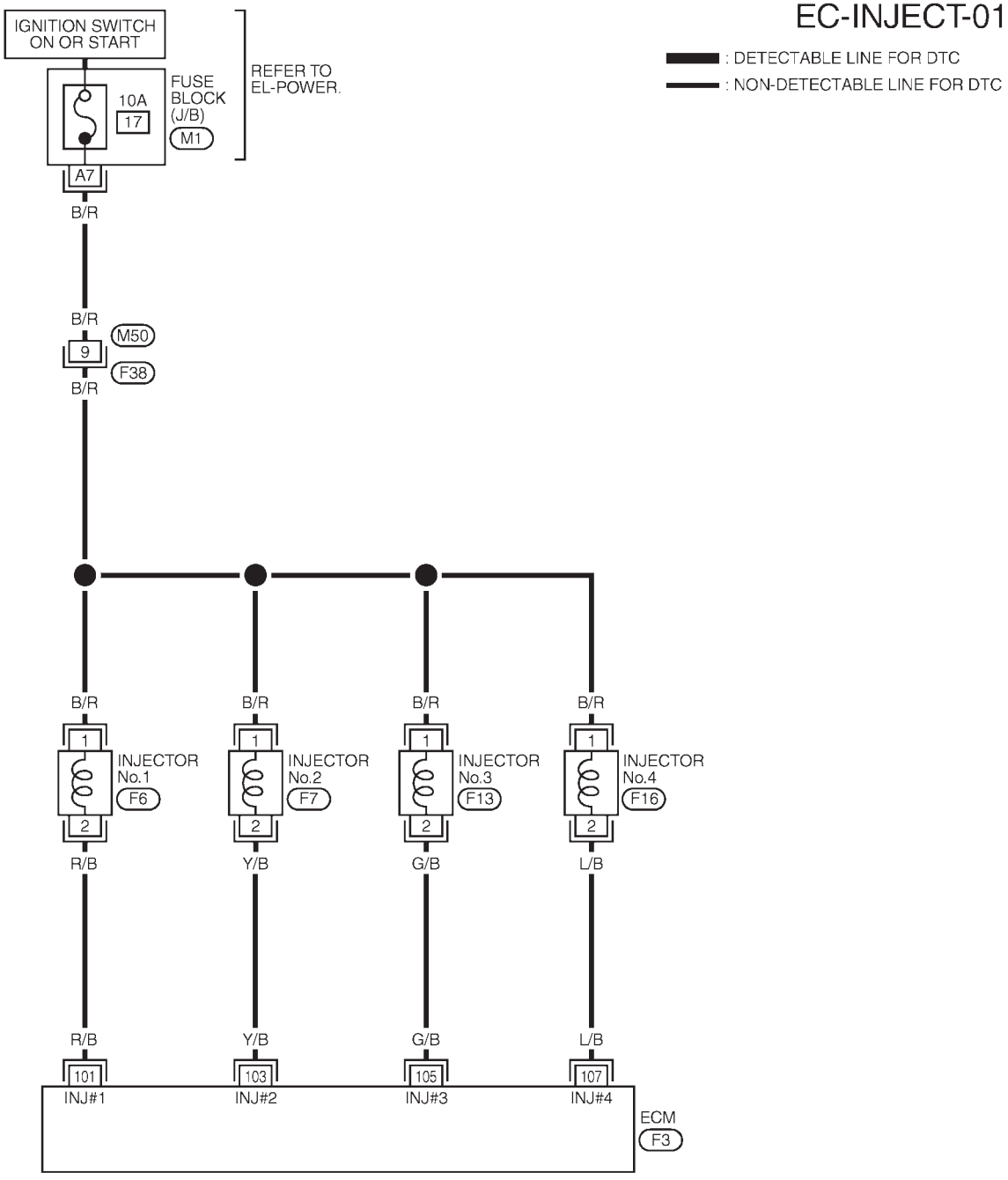
Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

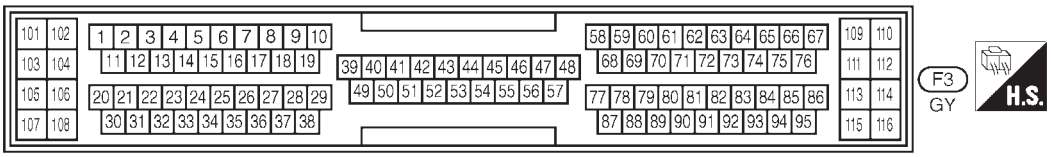
NLEC0434

NLEC0434S01

EC-INJECT-01



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



YEC672

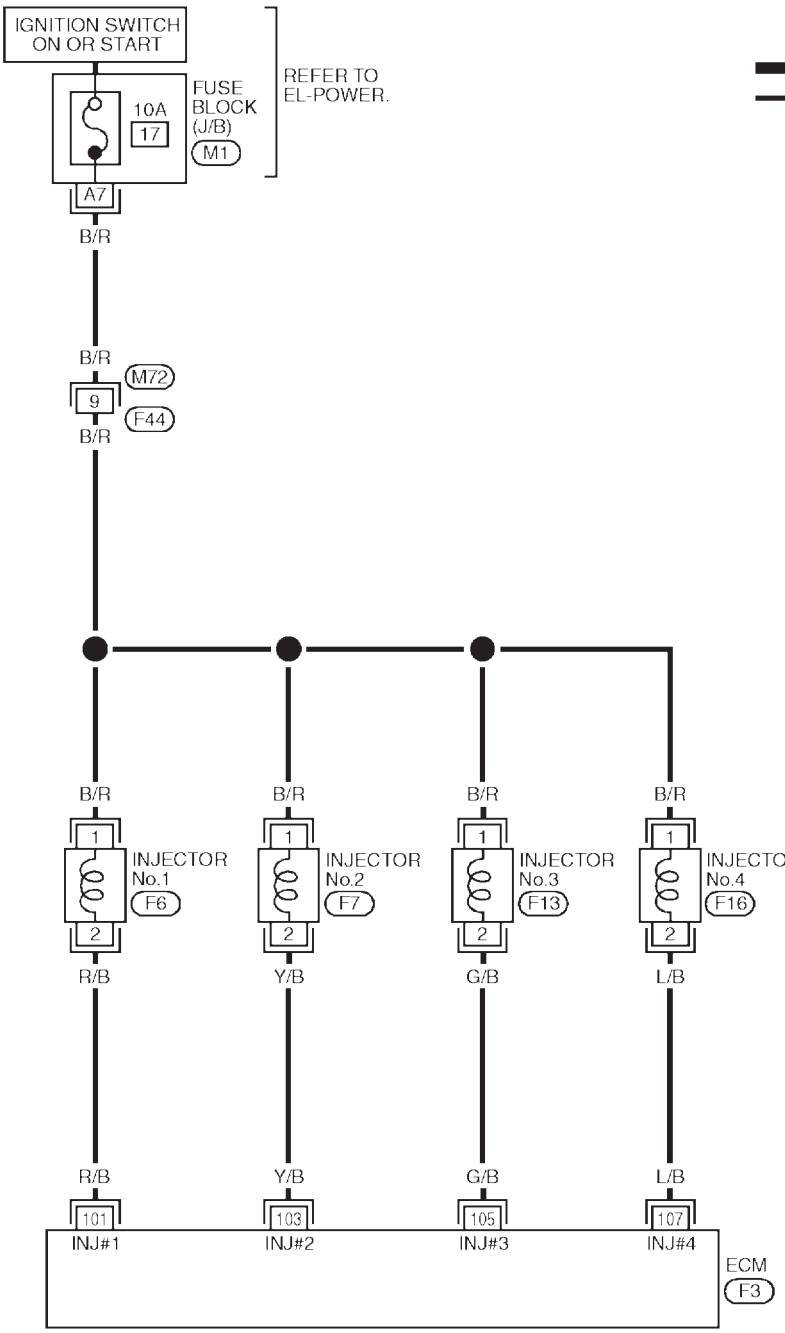
MODELS WITH ECM IN CABIN

NLEC0434S02

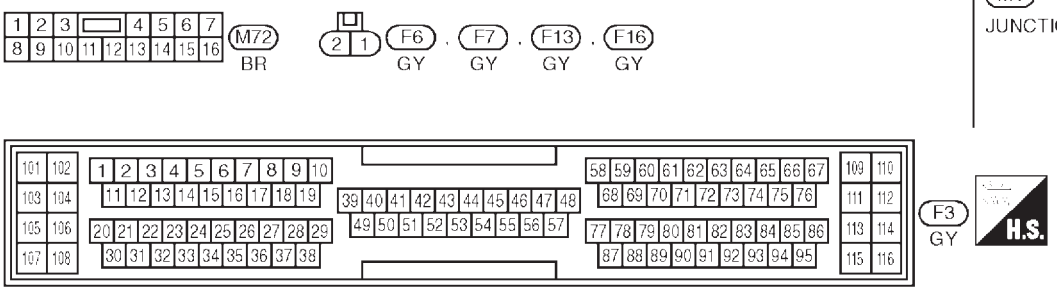
EC-INJECT-01

: DETECTABLE LINE FOR DTC

: NON-DETECTABLE LINE FOR DTC



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



YEC901

Diagnostic Procedure

NLEC0438

1	CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.

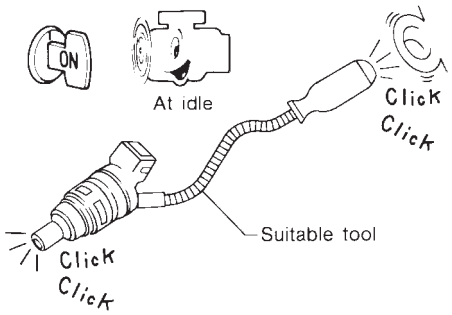
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

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

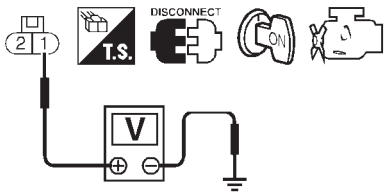
Clicking noise should be heard.

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK POWER SUPPLY

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF949X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness connectors F38, M50 (where fitted)
- Harness connectors F44, M72 (where fitted)
- Harness for open or short between injector and fuse

	▶	Repair harness or connectors.

4	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal 2 and ECM terminals 101, 103, 105, 107. 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 harness for open or short between ECM and injector.

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

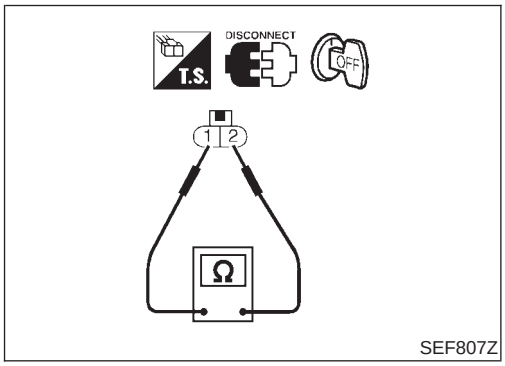
6	CHECK INJECTOR

Refer to "Component Inspection", EC-499.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace injector.

7	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	INSPECTION END



SEF807Z

Component Inspection

NLEC0439

INJECTOR

NLEC0439S01

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

   Resistance: 13.5 - 17.5Ω [at 25°C (77°F)]

   If NG, replace injector.

Component Description

NLEC0542

IGNITION COIL AND POWER TRANSISTOR

NLEC0542S01

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.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0543

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
IGNITION SW	● Ignition switch: ON → OFF → ON	ON → OFF → ON

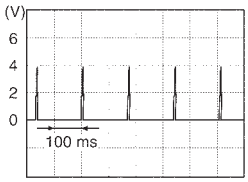
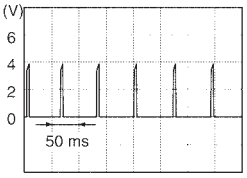
ECM Terminals and Reference Value

NLEC0544

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

CAUTION:

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

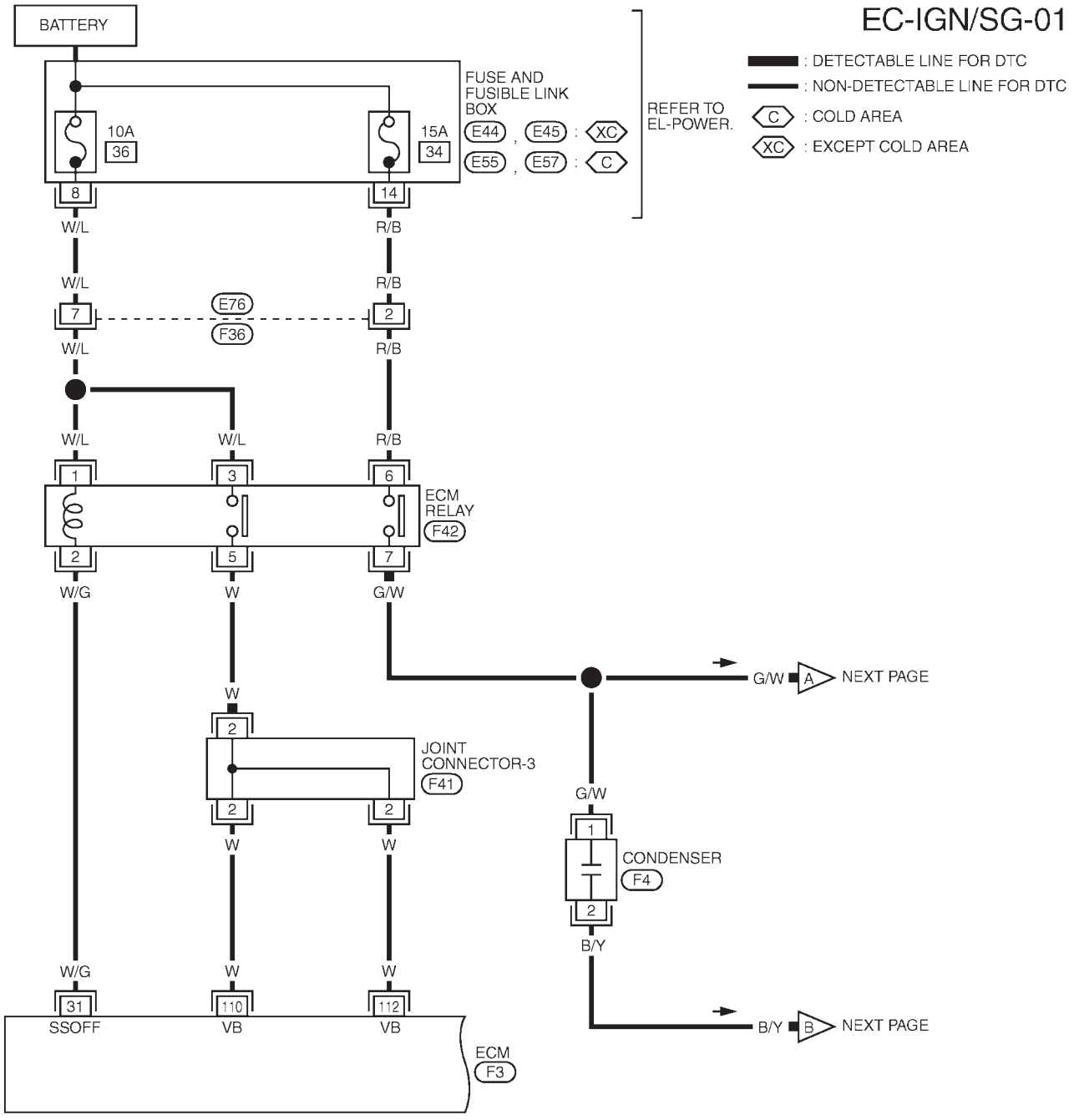
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35 36 37 38	L/W PU L/R GY/R	Ignition signal (No. 1) Ignition signal (No. 2) Ignition signal (No. 3) Ignition signal (No. 4)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.2V  SEF971W
			[Engine is running] ● Engine speed is 2,000 rpm	0.2 - 0.4V  SEF972W

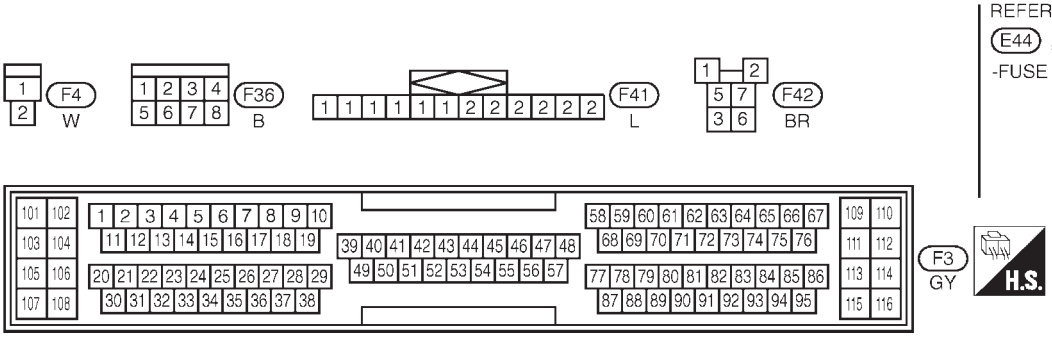
Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0545

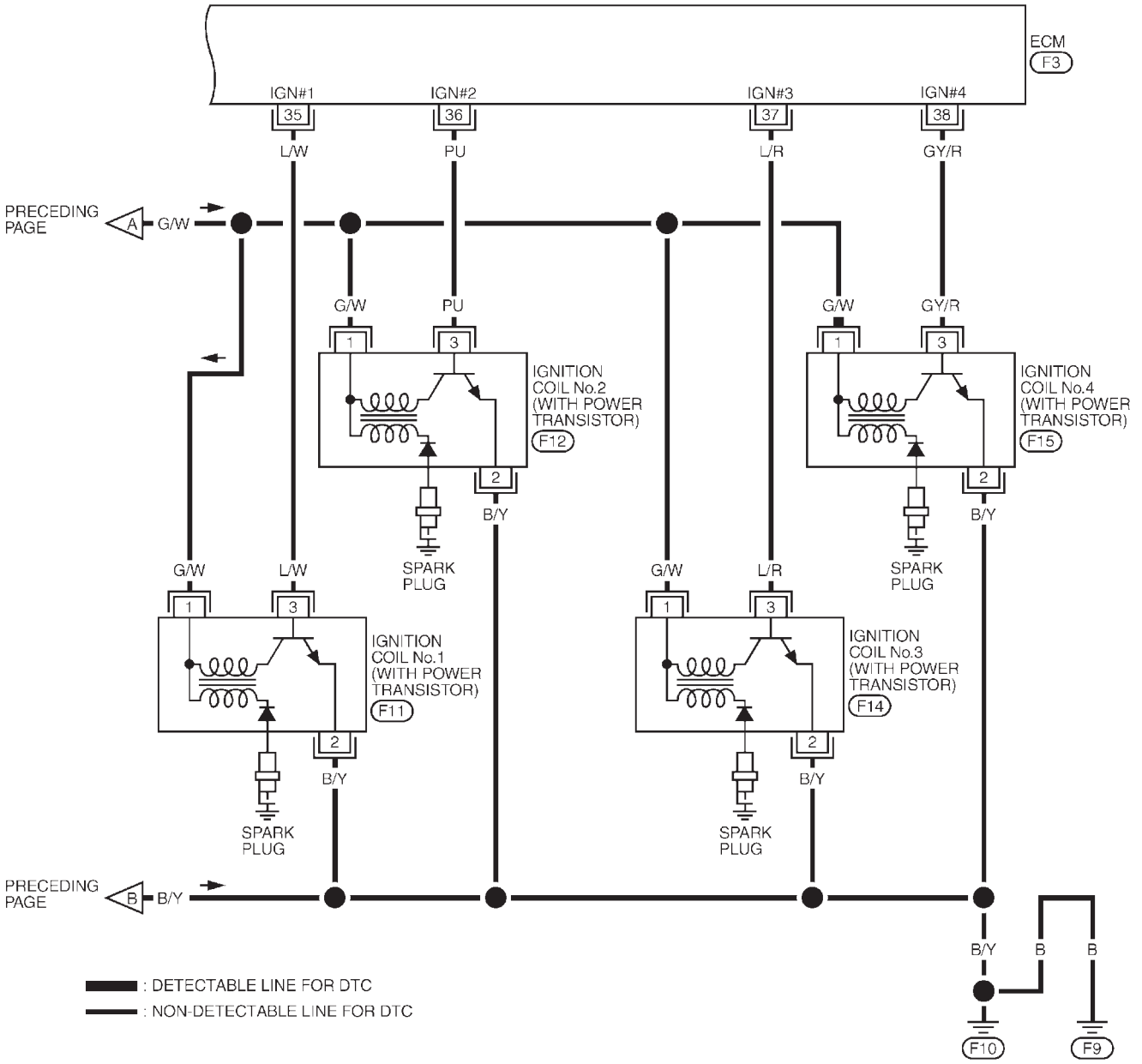
NLEC0545S01

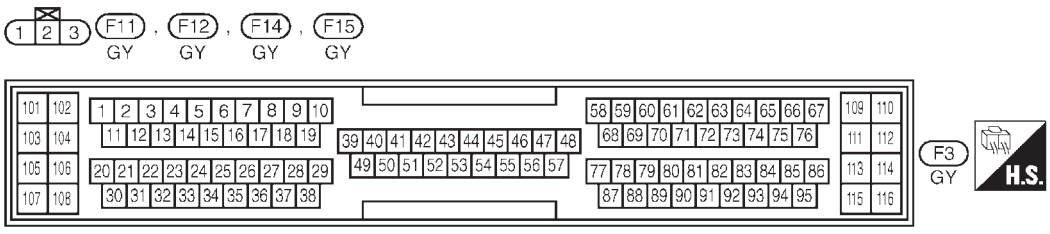




YEC673

EC-IGN/SG-02

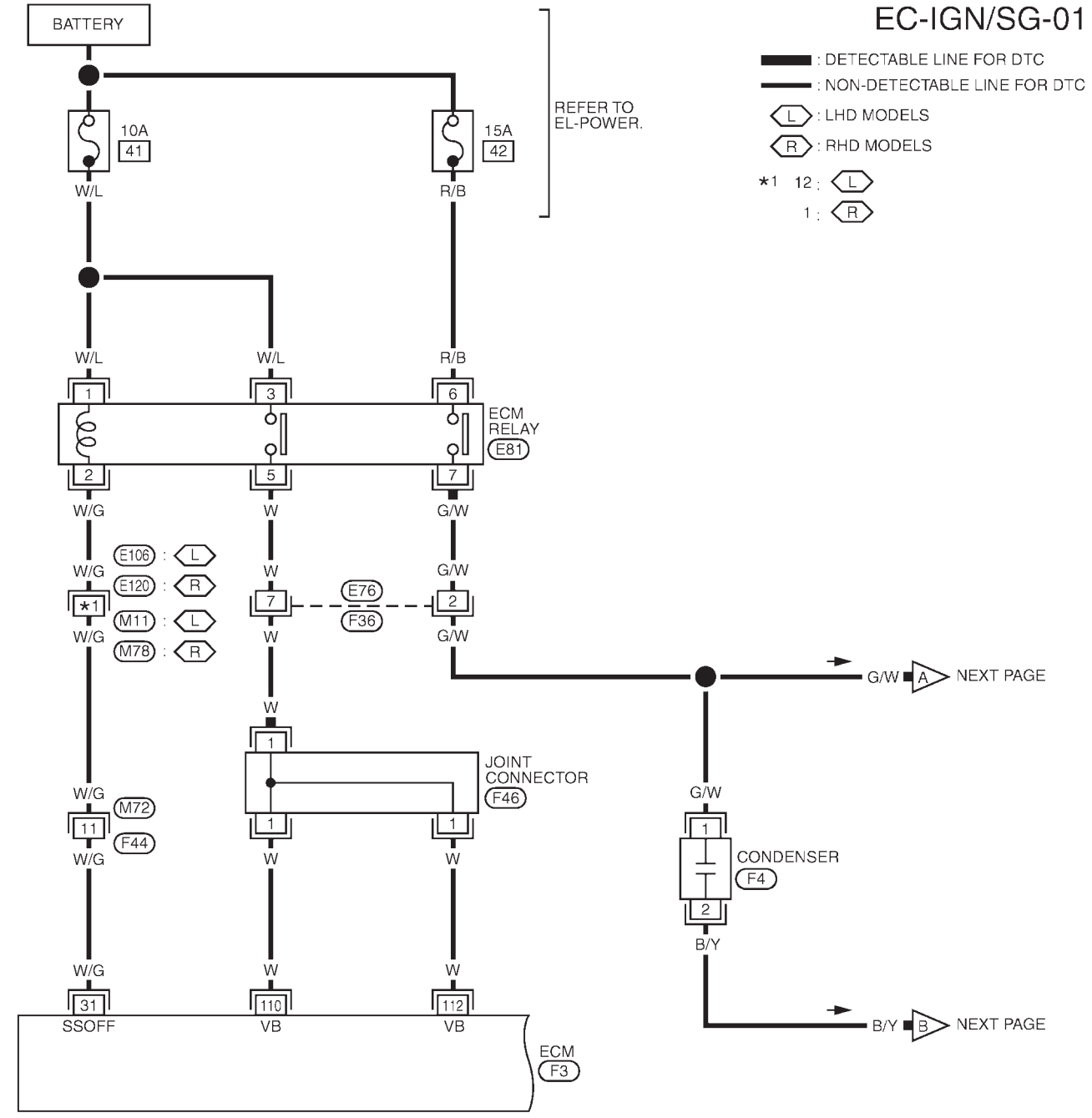


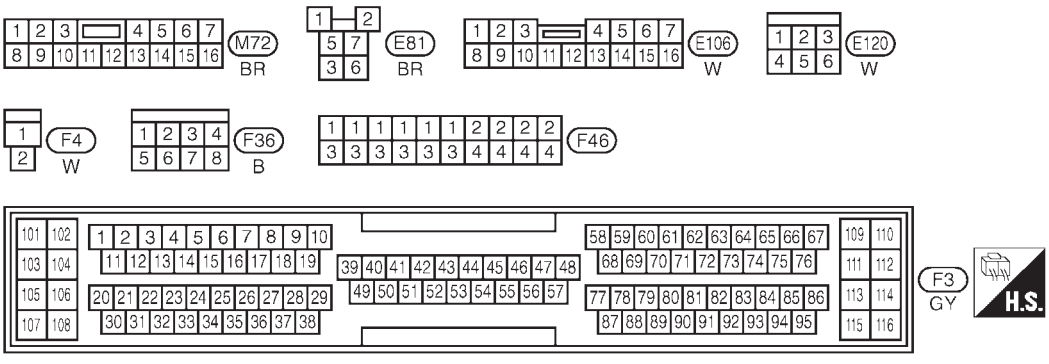


YEC674

MODELS WITH ECM IN CABIN

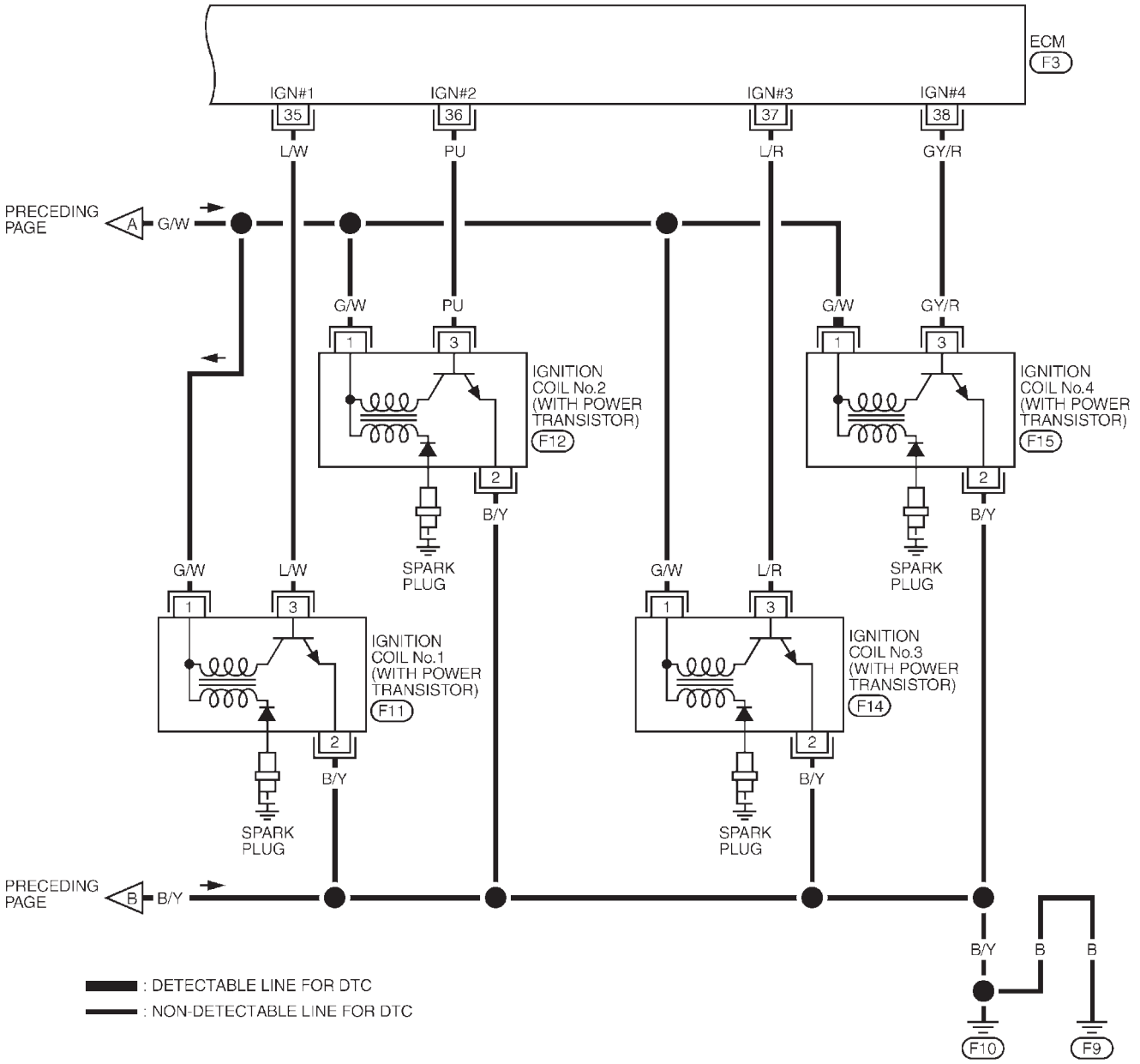
NLEC0545S02

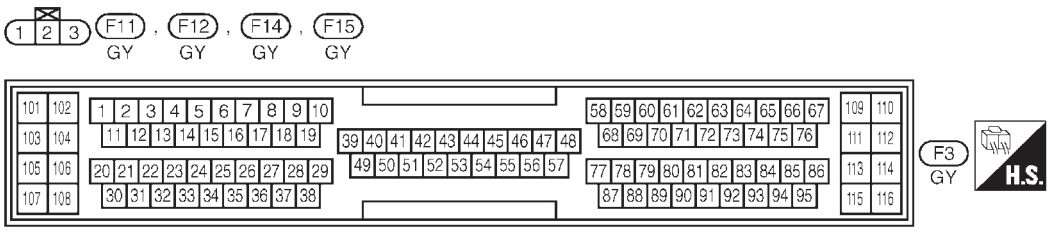




YEC902

EC-IGN/SG-02





YEC674

Diagnostic Procedure

NLEC0579

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.

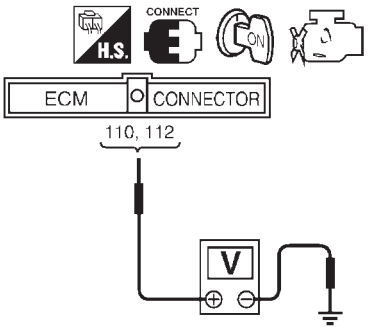
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

	▶	GO TO 12.

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

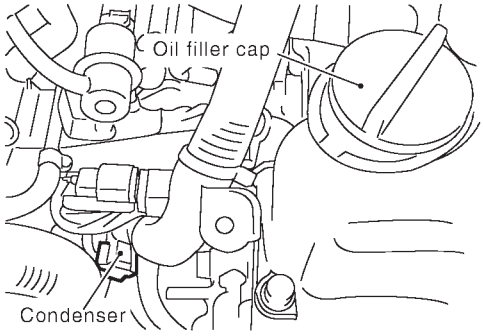
SEF366X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-146.

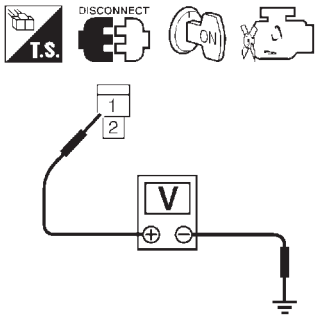
4	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.



SEF635Z

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.

5	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect ECM relay. (For ECM relay location, refer to "Engine Control Compartment Parts Location".)
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.

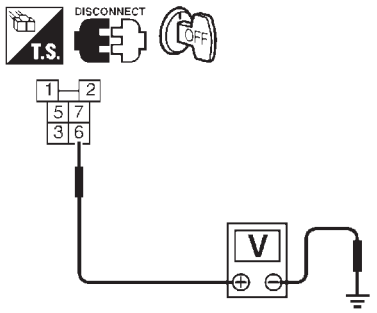
OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the 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 connectors E76, F36
- Harness connectors M72, F44 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Joint connector F46 (where fitted)
- Harness for open and short between ECM relay and fuse

	▶	Repair or replace harness or connectors.

9	CHECK ECM RELAY

Refer to "Component Inspection", EC-509.

OK or NG

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

10	CHECK CONDENSER GROUND CIRCUIT

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

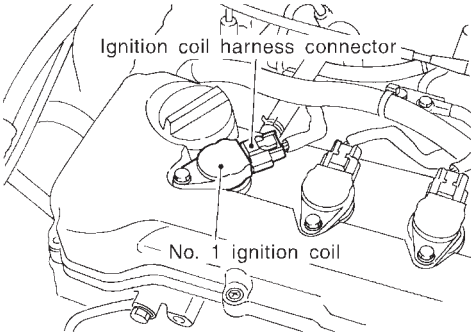
Refer to "Component Inspection", EC-509.

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace condenser.

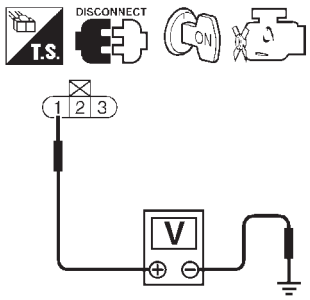
12	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect ignition coil harness connector.



JEF119Y

4. Turn ignition switch ON.
5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF122Y

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 ECM relay terminal 7.

	▶	Repair or replace harness or connectors.

14	CHECK IGNITION COIL GROUND CIRCUIT

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.

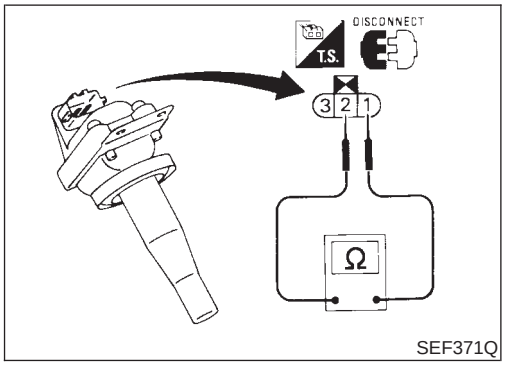
OK or NG

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

15	CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminals 35, 36, 37, 38 and ignition coil 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 16.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

16	CHECK IGNITION COIL WITH POWER TRANSISTOR	
Refer to "Component Inspection", EC-509.		
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-145.		
	▶	**INSPECTION END**



SEF371Q

Component Inspection

IGNITION COIL WITH POWER TRANSISTOR

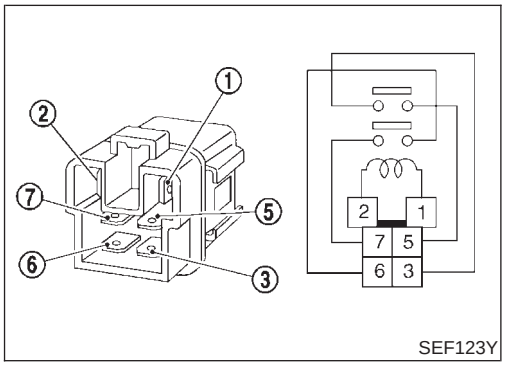
NLEC0547

NLEC0547S01

1. Disconnect ignition coil with power transistor harness connector.
2. Check ignition coil with power transistor for resistance as show in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 2 (−)	Except 0 or ∞
1 (+) - 3 (−)	Except 0
1 (+) - 2 (−)	

If NG, replace ignition coil with power transistor assembly.



SEF123Y

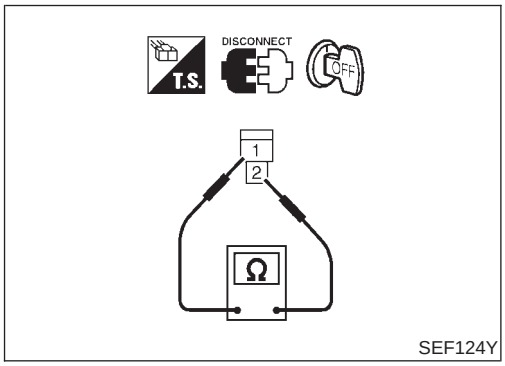
ECM RELAY

NLEC0547S03

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

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

If NG, replace ECM relay.



CONDENSER

NLEC0547S02

1. Disconnect condenser harness connector.
2. Check condenser continuity between terminals 1 and 2.

Resistance: Above 1 MΩ at 25°C (77°F)

If NG, replace condenser.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0441

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

ECM Terminals and Reference Value

NLEC0442

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.

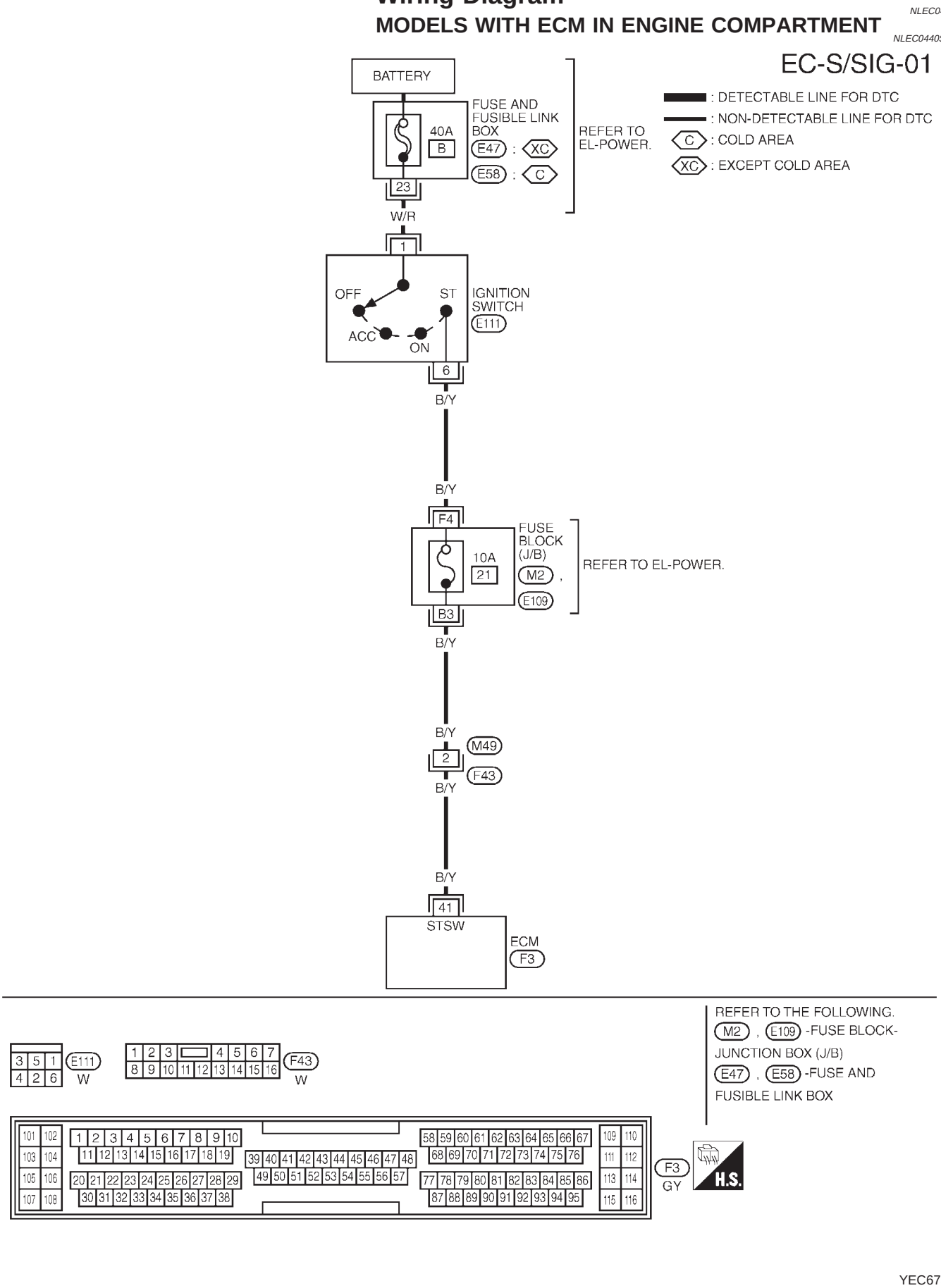
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V

Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0440

NLEC0440S01

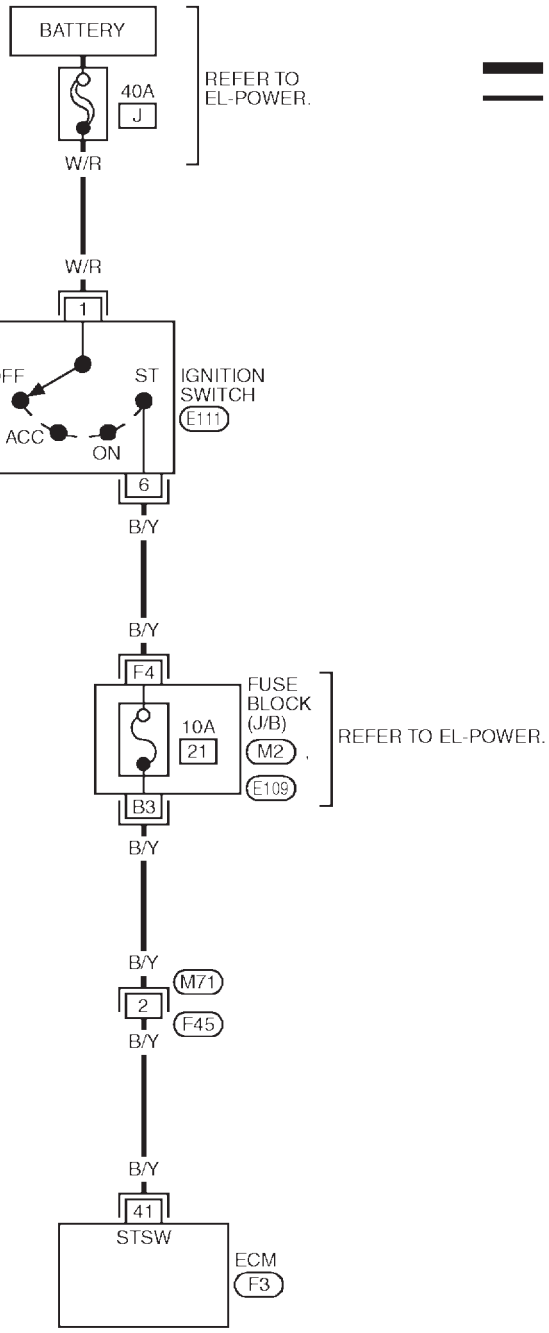


YEC675

MODELS WITH ECM IN CABIN

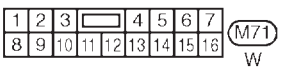
NLEC0440S02

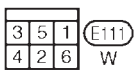
EC-S/SIG-01



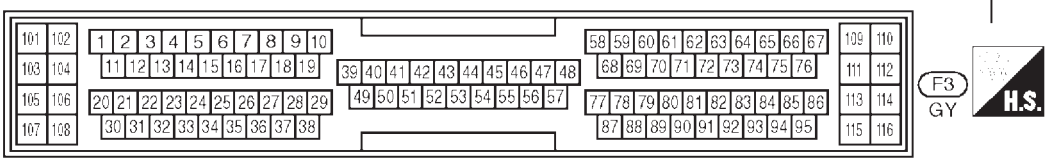
: DETECTABLE LINE FOR DTC

: NON-DETECTABLE LINE FOR DTC





REFER TO THE FOLLOWING.
M2 , E109 -FUSE BLOCK-
JUNCTION BOX (J/B)



YEC903

Diagnostic Procedure

=NLEC0443

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

Condition	“START SIGNAL”
Ignition switch “ON”	OFF
Ignition switch “START”	ON

SEF227Y

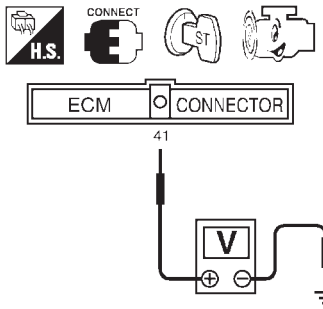
OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Turn ignition switch to “START”.
2. Check voltage between ECM terminal 41 and ground under the following conditions.



Condition	Voltage
Ignition switch “START”	Battery Voltage
Except above	Approximately 0V

SEF613Y

OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

4	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors M49, F43 (where fitted) ● Harness connectors M71, F45 (where fitted) ● 10A fuse ● Harness for open or short between ECM and ignition switch		
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 INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.		
	▶	**INSPECTION END**

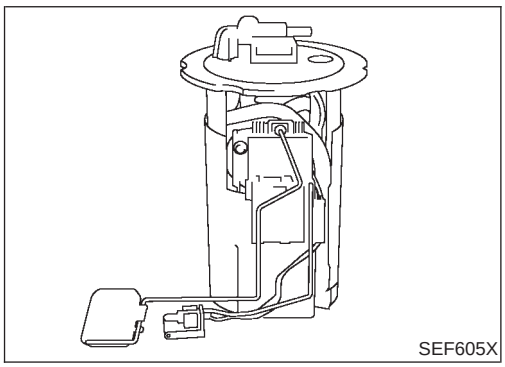
System Description

NLEC0444

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Fuel pump control	Fuel pump relay
Camshaft position sensor (PHASE)	Engine speed and cylinder number		
Ignition switch	Ignition signal and 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 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° 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 (Signal is not sent from crankshaft position sensor and camshaft position sensor.)	Stops in 1.5 seconds
Except as shown above	Stops


SEF605X

Component Description

NLEC0501

A turbine type design fuel pump is used in the fuel tank.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0445

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 1 second) ● Engine running and cranking ● When engine is stopped (stops in 1.5 seconds)	ON
	● Except as shown above	OFF

ECM Terminals and Reference Value

=NLEC0446

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.

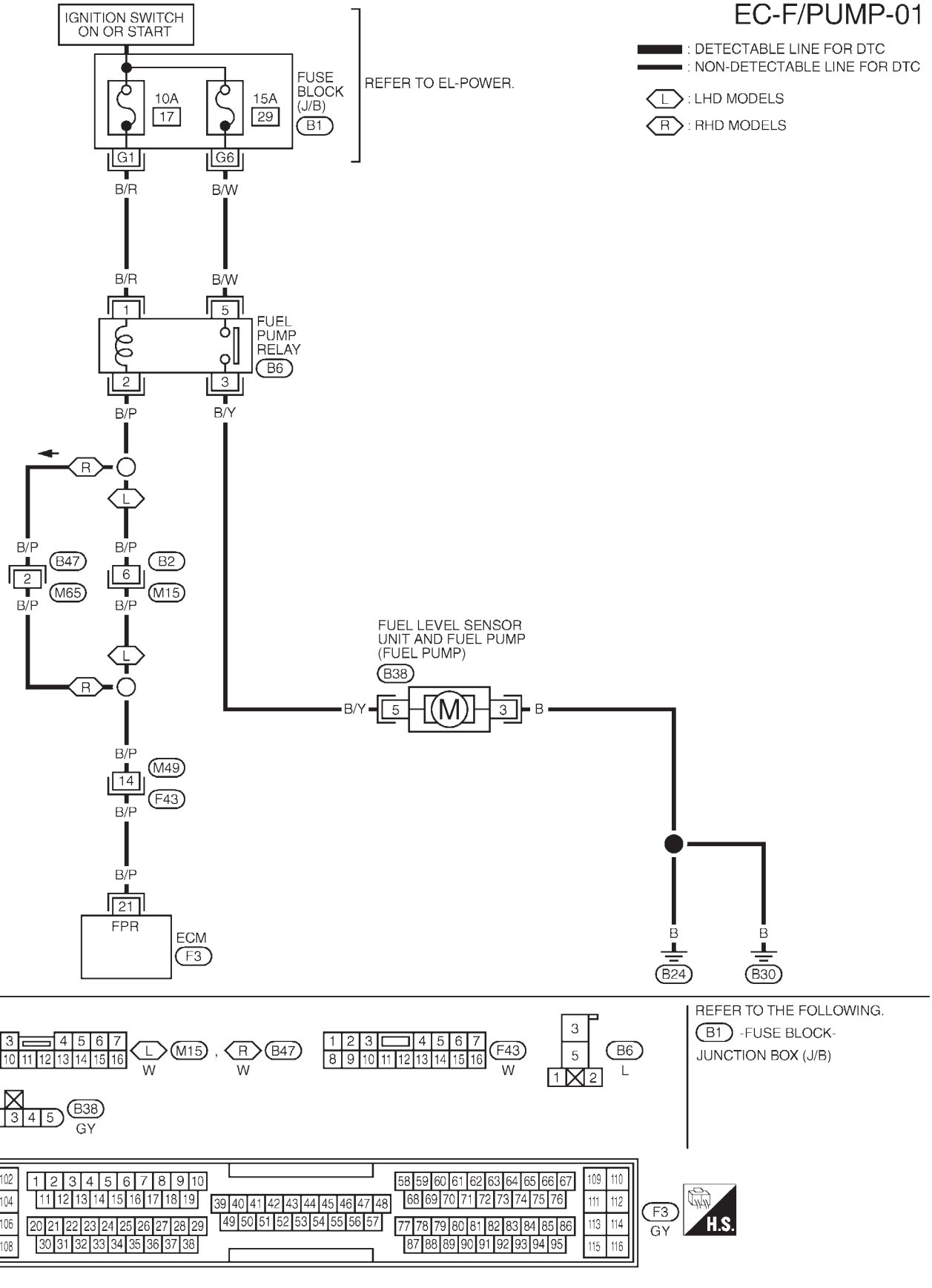
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

NLEC0447

MODELS WITH ECM IN ENGINE COMPARTMENT

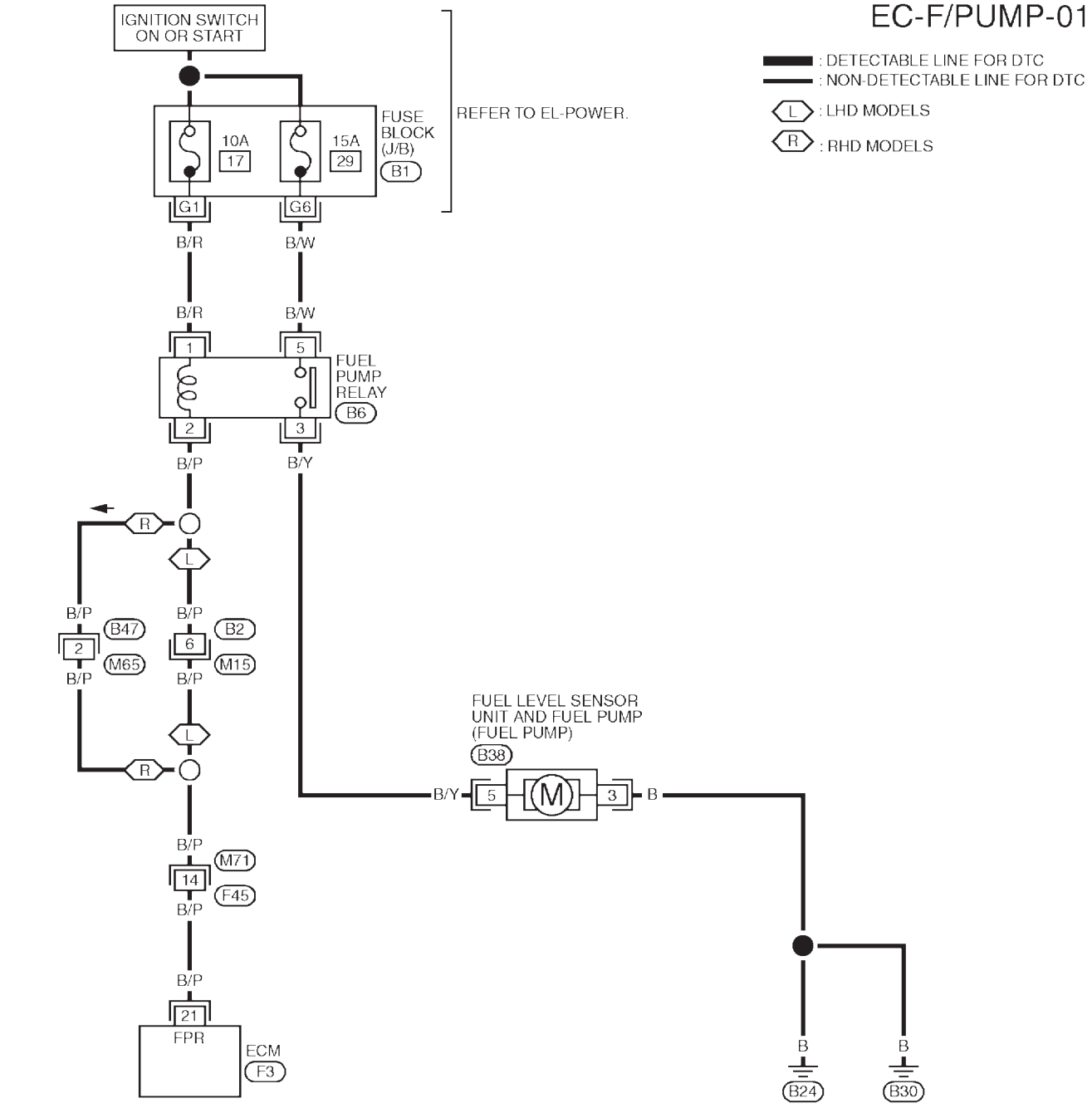
NLEC0447S01

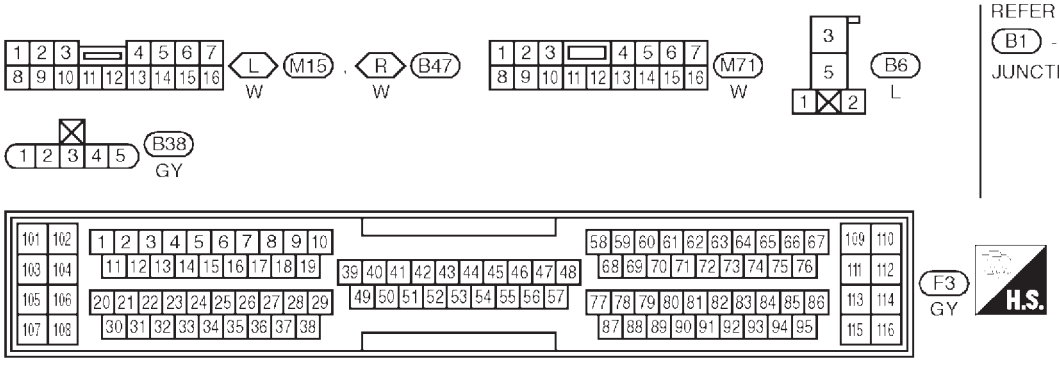


YEC714

MODELS WITH ECM IN CABIN

NLEC0447S02





REFER TO THE FOLLOWING.
B1 -FUSE BLOCK-
JUNCTION BOX (J/B)

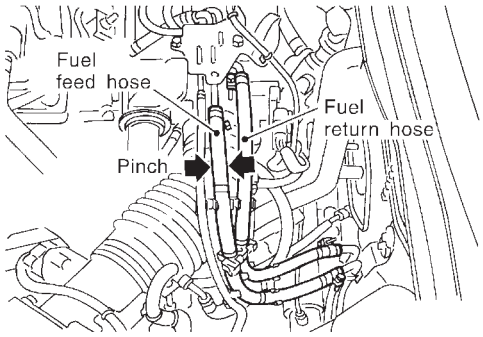
YEC904

Diagnostic Procedure

NLEC0448

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Pinch fuel feed hose with fingers.



JEF133Y

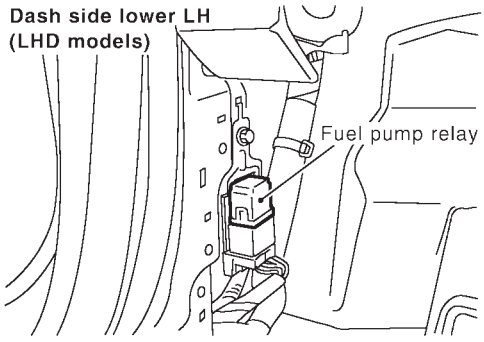
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned “ON”.

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

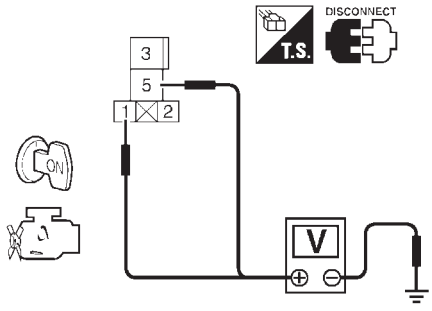
2	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect fuel pump relay.



SEF633Z

3. Turn ignition switch “ON”.
4. Check voltage between terminals 1, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF607X

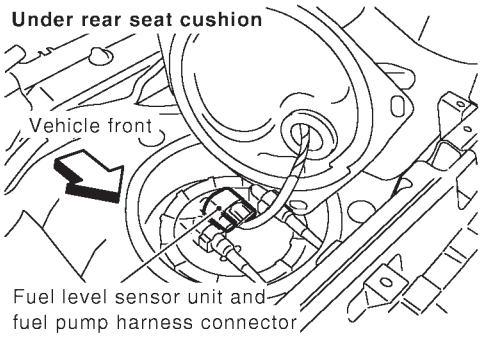
OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● 10A fuse ● 15A fuse ● Harness for open or short between fuse and fuel pump relay	
▶	Repair harness or connectors.

4	CHECK POWER GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF632Z

3. Check harness continuity between fuel level sensor unit and fuel pump harness connector terminal 3 and body ground, terminal 5 and fuel pump relay connector 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 and body ground ● Harness for open or short between fuel pump and fuel pump relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 21 and fuel pump relay connector 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.

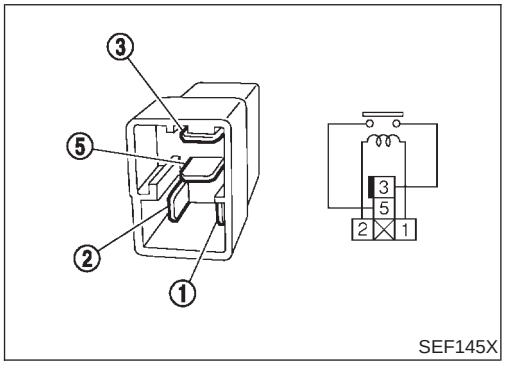
Diagnostic Procedure (Cont'd)

7	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors B2, M15 (LHD models), B47, M65 (RHD models) ● Harness connectors M49, F43 (where fitted) ● Harness connectors M71, F45 (where fitted) ● Harness for open or short between ECM and fuel pump relay	
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

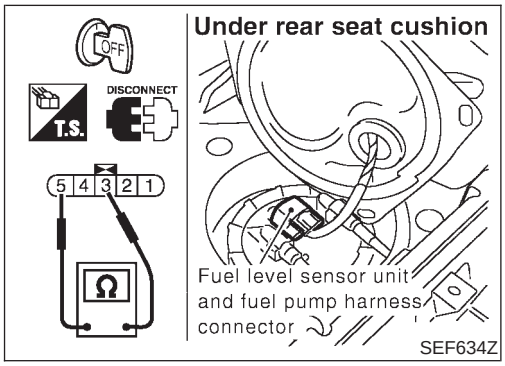
8	CHECK FUEL PUMP RELAY
Refer to "Component Inspection", EC-522.	
OK or NG	
OK ▶	GO TO 9.
NG ▶	Replace fuel pump relay.

9	CHECK FUEL PUMP
Refer to "Component Inspection", EC-522.	
OK or NG	
OK ▶	GO TO 10.
NG ▶	Replace fuel pump.

10	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**



SEF145X



SEF634Z

Component Inspection

FUEL PUMP RELAY

NLEC0449

NLEC0449S01

Check continuity between terminals 3 and 5.

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

If NG, replace relay.

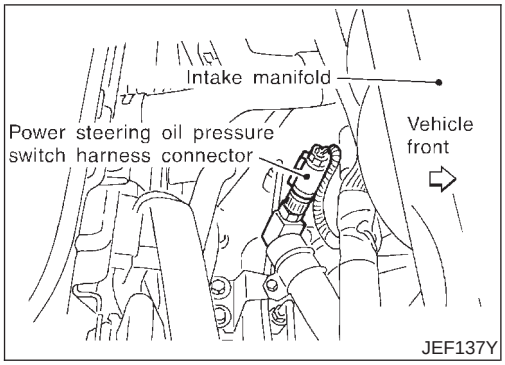
FUEL PUMP

NLEC0449S02

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between terminals 3 and 5.

   Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]

   If NG, replace fuel pump.



Component Description

NLEC0451

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

NLEC0452

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

ECM Terminals and Reference Value

NLEC0453

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

CAUTION:

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

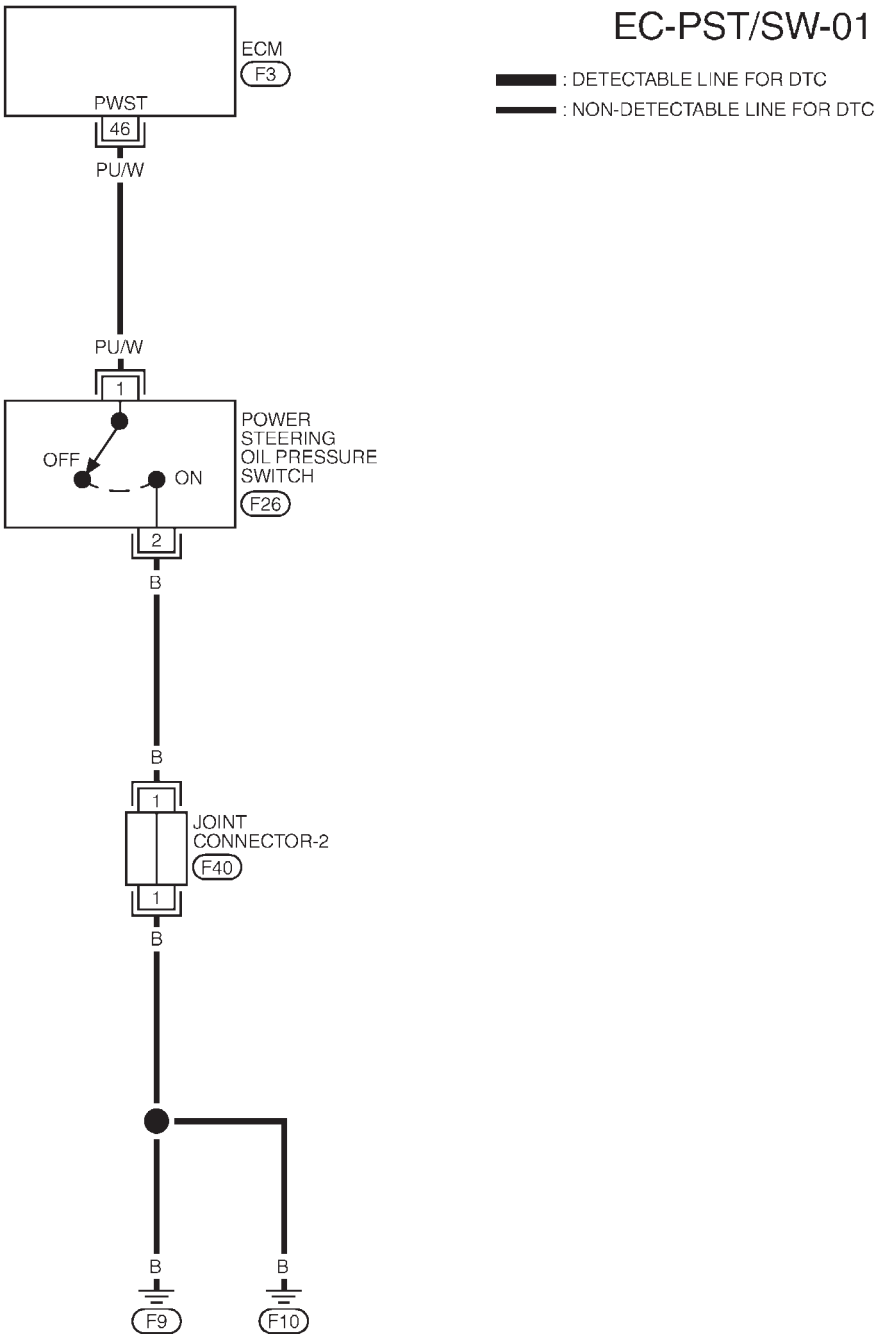
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	PU/W	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is fully turned	Approximately 0V
			[Engine is running] ● Steering wheel is not turned	Approximately 5V

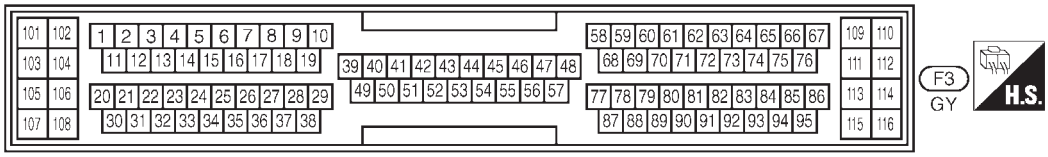
Wiring Diagram

NLEC0450

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0450S01





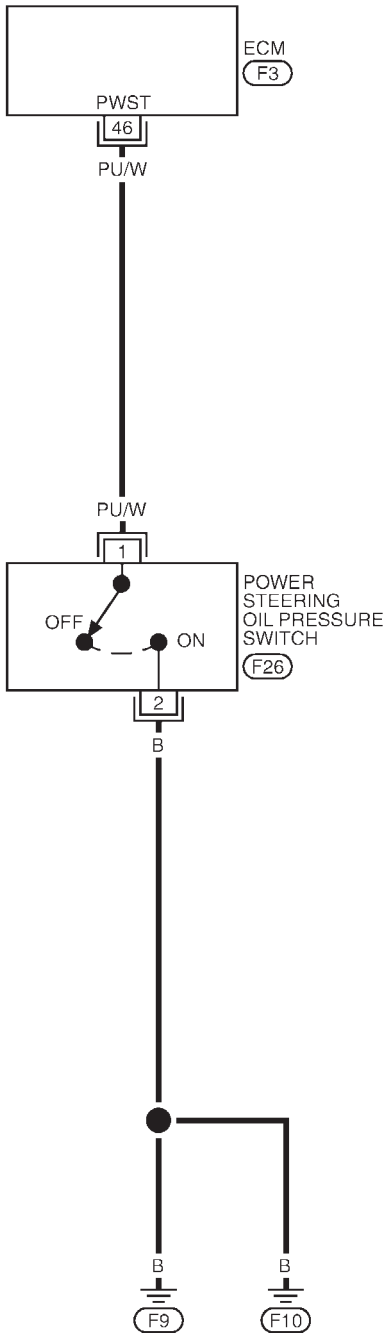
YEC658

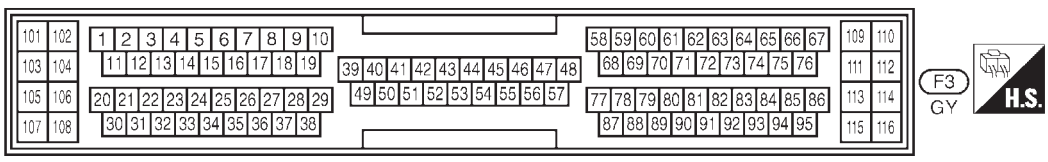
MODELS WITH ECM IN CABIN

NLEC0450S02

EC-PST/SW-01

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





YEC905

Diagnostic Procedure

=NLEC0454

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

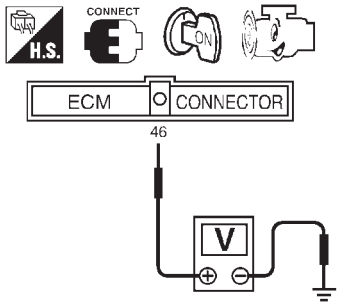
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 46 and ground under the following conditions.



Condition	Voltage
When steering wheel is turned quickly	Approximately 0V
Except above	Approximately 5V

SEF614Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	CHECK GROUND CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect power steering oil pressure switch harness connector. 3. Check harness continuity between power steering oil pressure switch harness 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 5.
NG ▶	Repair open circuit or short to power in harness or connectors.

5	CHECK INPUT SIGNAL CIRCUIT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 46 and power steering oil pressure switch harness 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 7.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the harness for open or short between ECM and power steering oil pressure switch.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK POWER STEERING OIL PRESSURE SWITCH
Refer to "Component Inspection", EC-527. **OK or NG**	
OK ▶	GO TO 8.
NG ▶	Replace power steering oil pressure switch.

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.	
▶	**INSPECTION END**

Component Inspection

NLEC0455

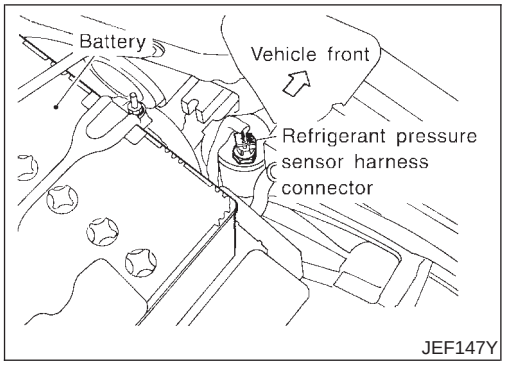
POWER STEERING OIL PRESSURE SWITCH

NLEC0455S01

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals 1 and 2.
   Refer to wiring diagram.

Conditions	Continuity
Steering wheel is being fully turned.	Yes
Steering wheel is not being turned.	No

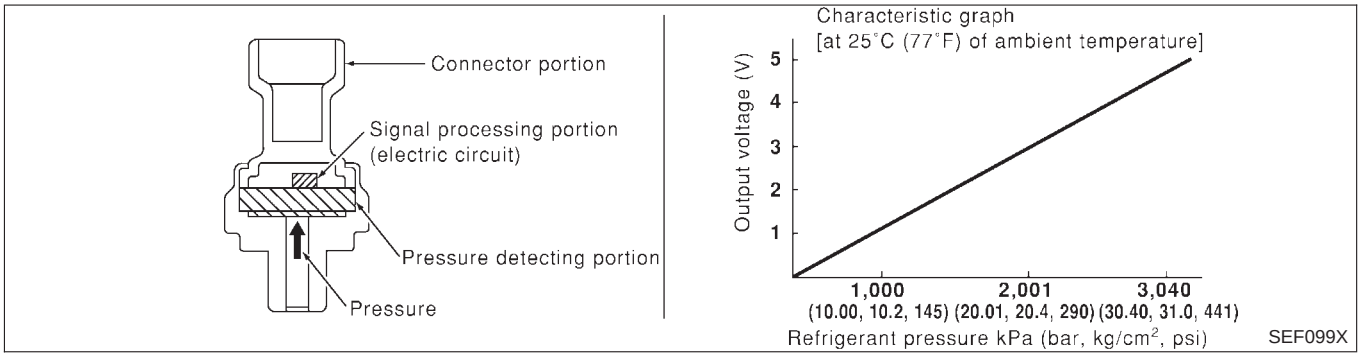
If NG, replace power steering oil pressure switch.



Description

NLEC0580

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.



ECM Terminals and Reference Value

NLEC0581

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.

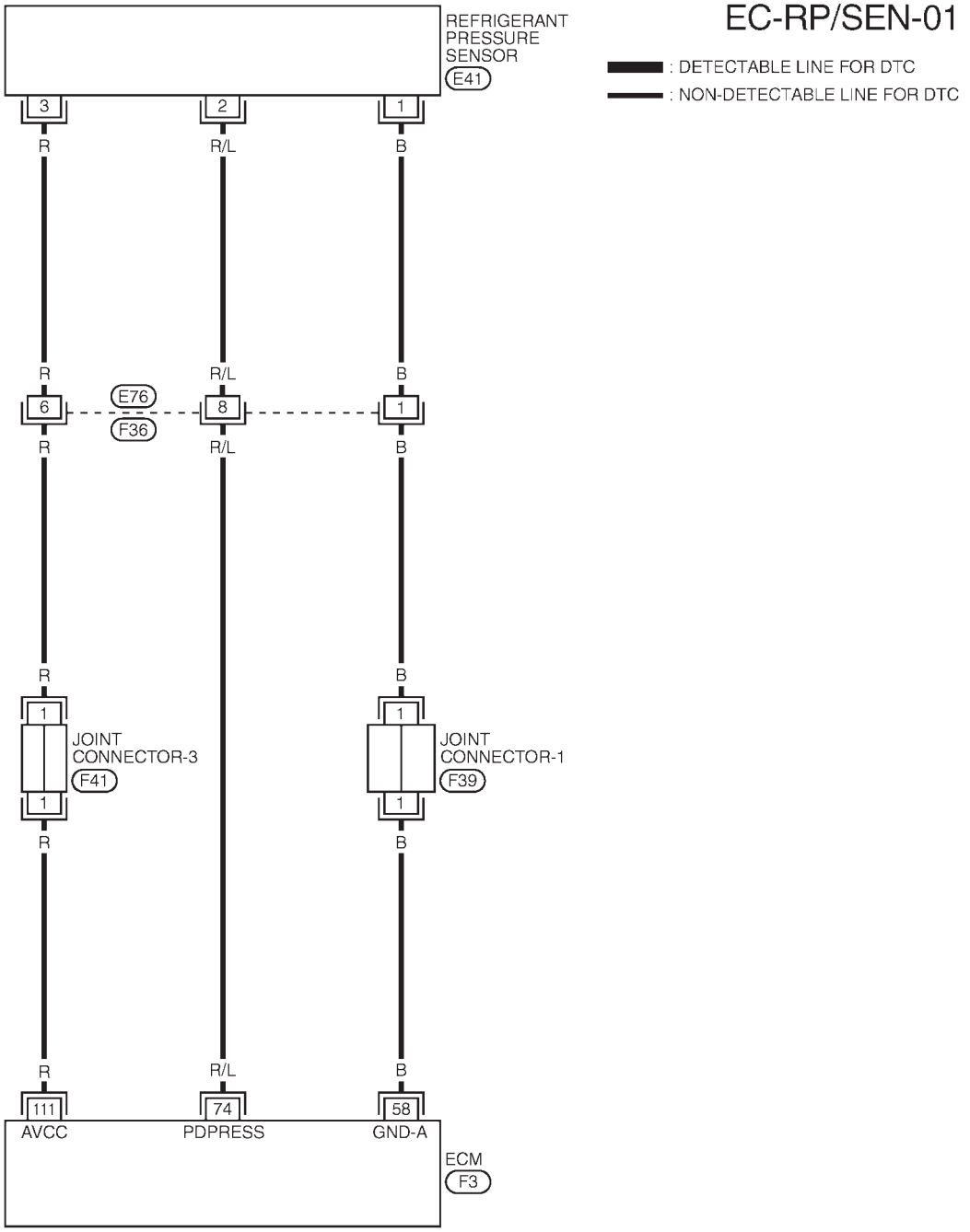
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	R/L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON" (Compressor operates.)	1.0 - 4.0V
111	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V

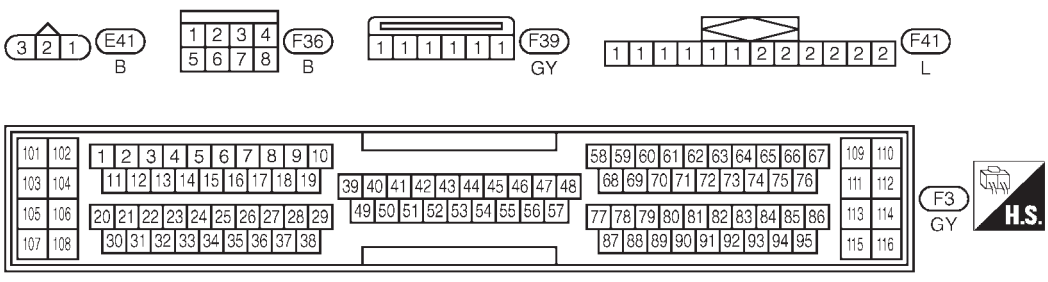
Wiring Diagram

NLEC0582

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0582S03

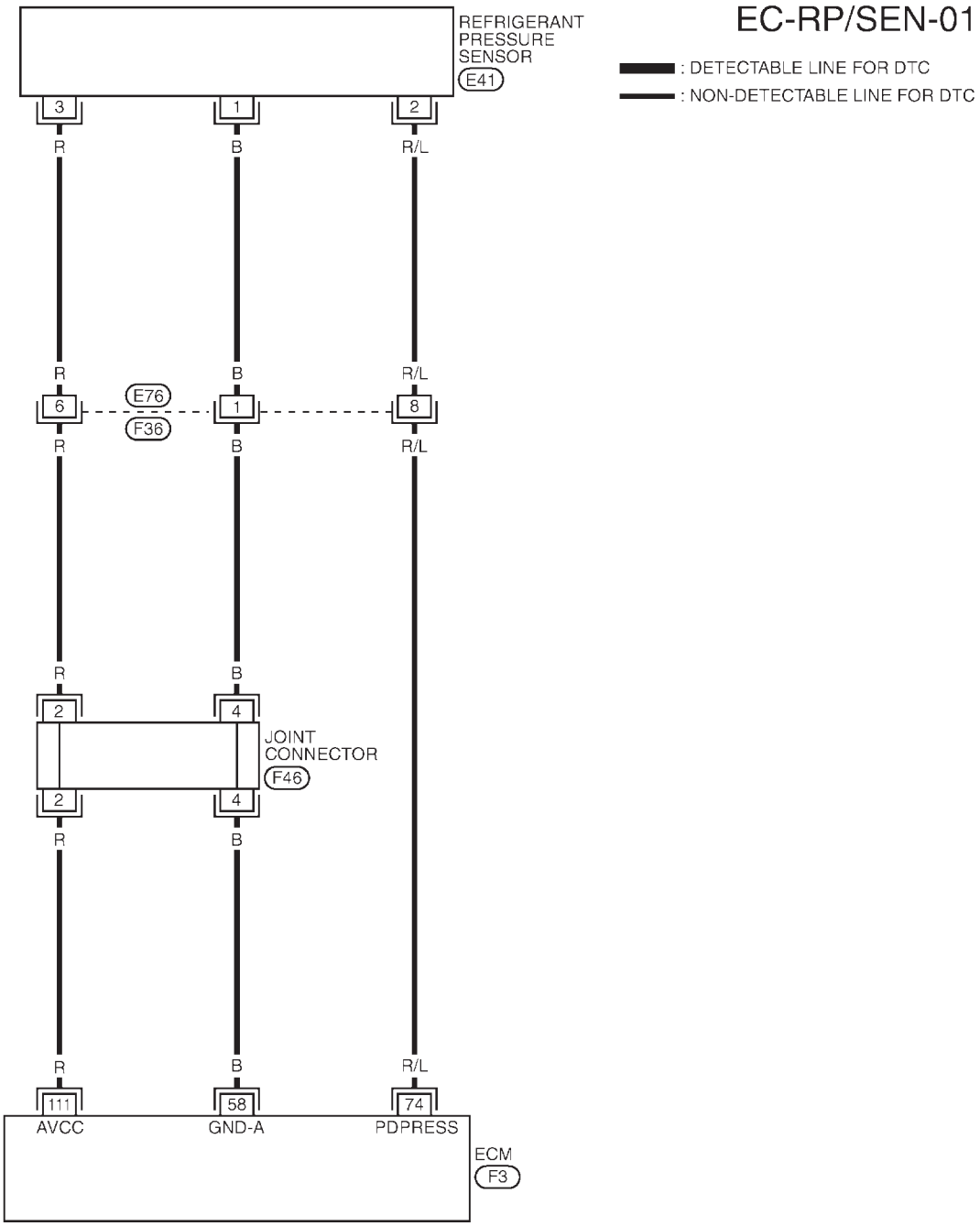


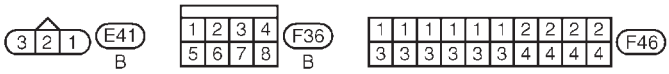


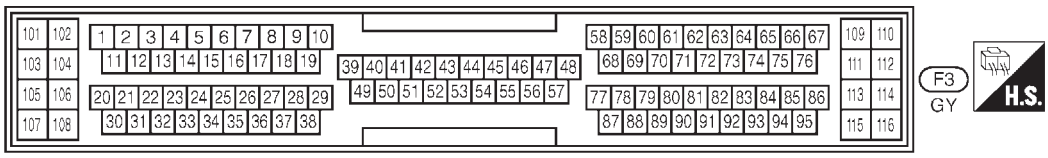
YEC683

MODELS WITH ECM IN CABIN

NLEC0582S04







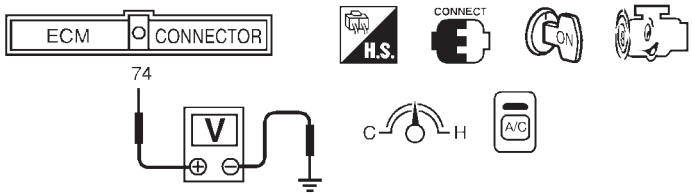
YEC906

Diagnostic Procedure

NLEC0590

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 74 and ground with CONSULT-II or tester.



Voltage: 1.0 - 4.0V

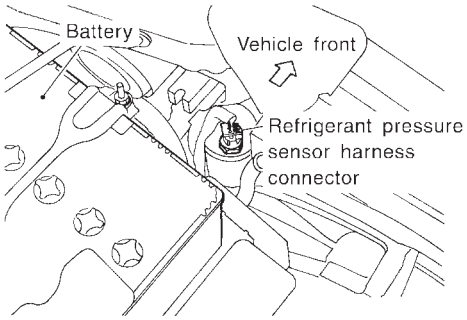
SEF952XA

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

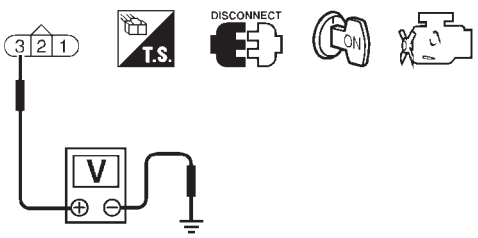
2	CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.



JEF147Y

4. Turn ignition switch “ON”.
5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF953X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E76, F36 ● Joint connector-3 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between ECM and refrigerant pressure sensor	
▶	Repair harness or connectors.

4	CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT	
1. Turn ignition switch "OFF". 2. Check harness continuity between refrigerant pressure 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 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E76, F36 ● Joint connector-1 ● Harness for open or short between ECM and refrigerant pressure sensor	
▶	Repair open circuit or short to power in harness or connectors.

6	CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 74 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 E76, F36 ● Harness for open or short between ECM and refrigerant pressure sensor	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK REFRIGERANT PRESSURE SENSOR	
Refer to HA-12 or HA-74, "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-145.	
▶	**INSPECTION END**

CONSULT-II Reference Value in Data Monitor Mode

NLEC0548

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger is operating and/or lighting switch is on.	ON
		Rear window defogger is not operating and lighting switch is not on.	OFF
HEATER FAN SW	● Ignition switch: ON	Heater fan motor is operating.	ON
		Heater fan motor is not operating.	OFF

ECM Terminals and Reference Value

NLEC0549

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.

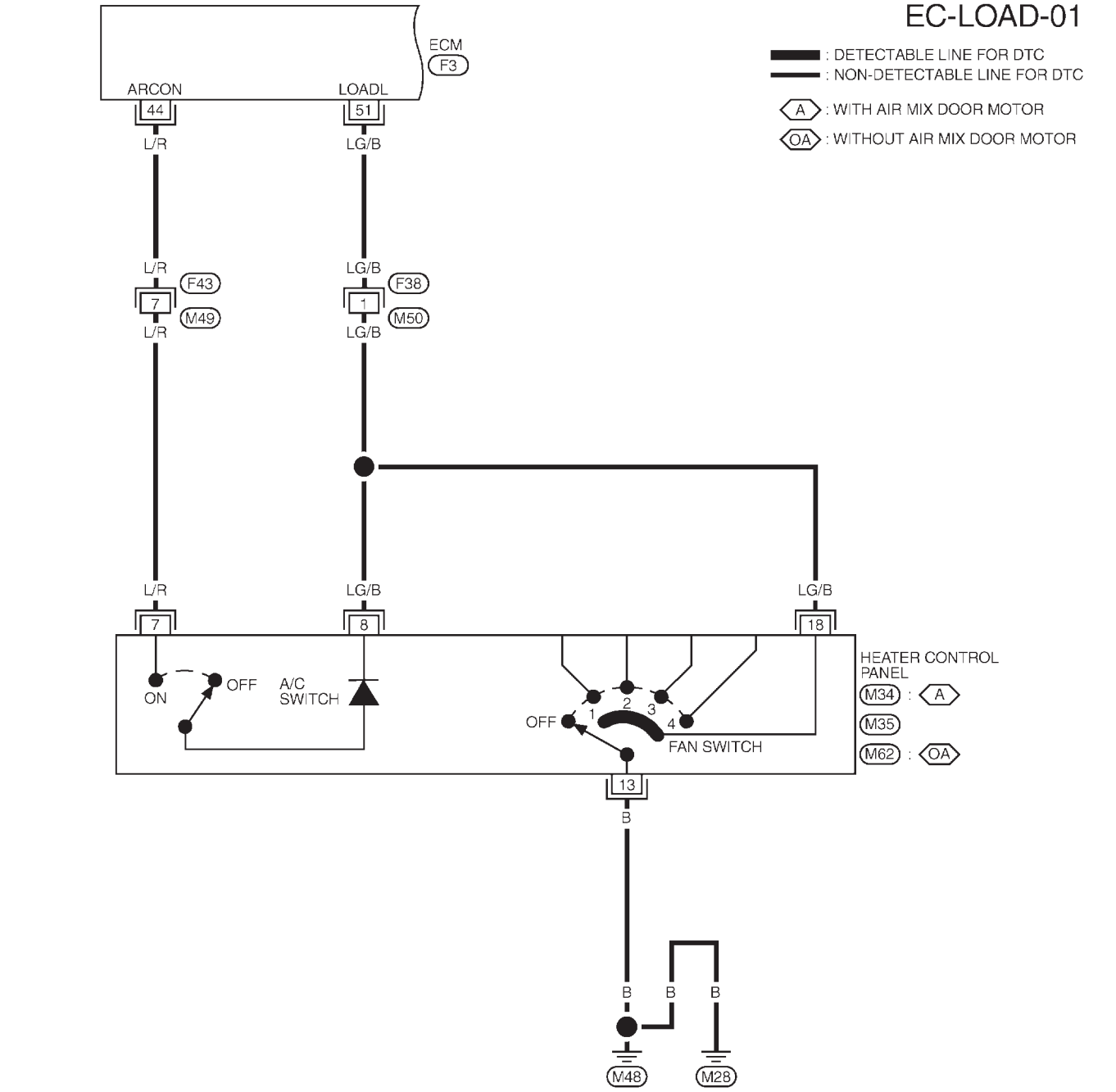
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
50	L/B	Electric load signal (Load switch)	**[Engine is running]** ● Rear window defogger is operating and/or lighting switch is on	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Rear window defogger is not operating and lighting switch is not on	Approximately 0V
51	LG/B	Heater fan motor switch	**[Engine is running]** ● Heater fan motor is operating	Approximately 0V
			[Engine is running] ● Heater fan motor is not operating	Approximately 5V

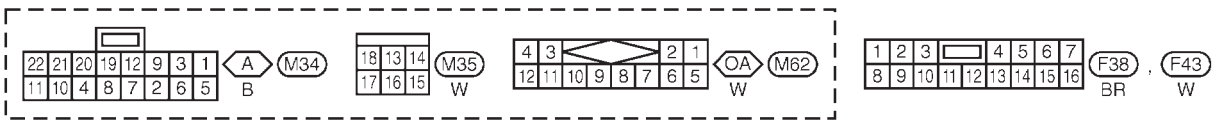
Wiring Diagram

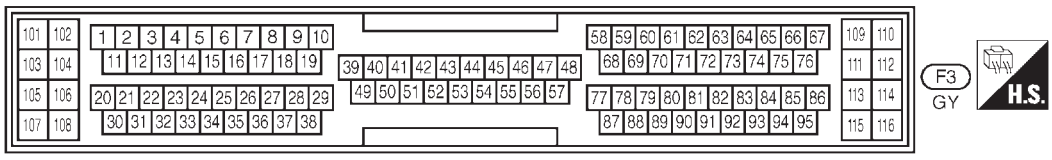
NLEC0550

MODELS WITH ECM IN ENGINE COMPARTMENT

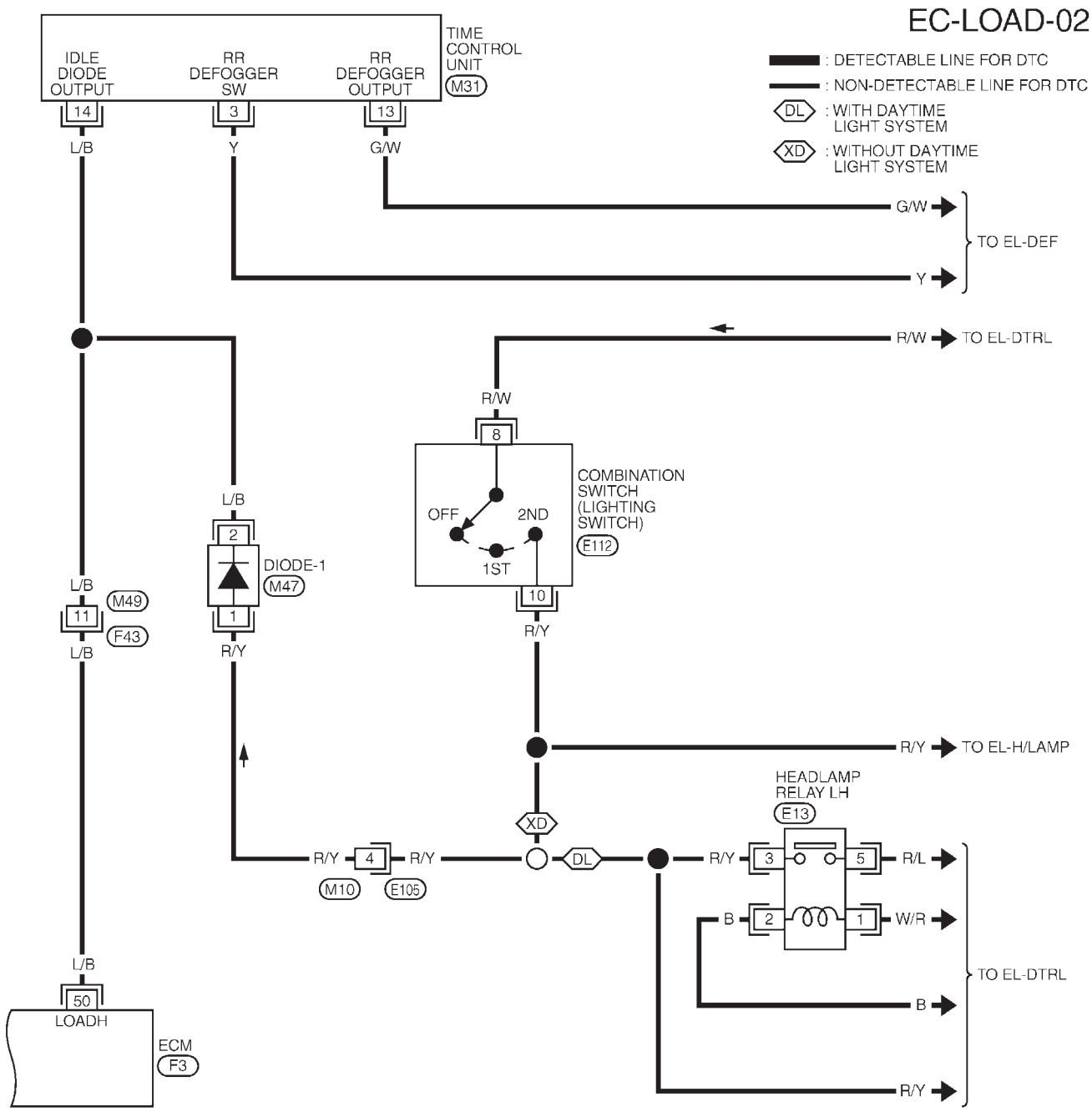
NLEC0550S04

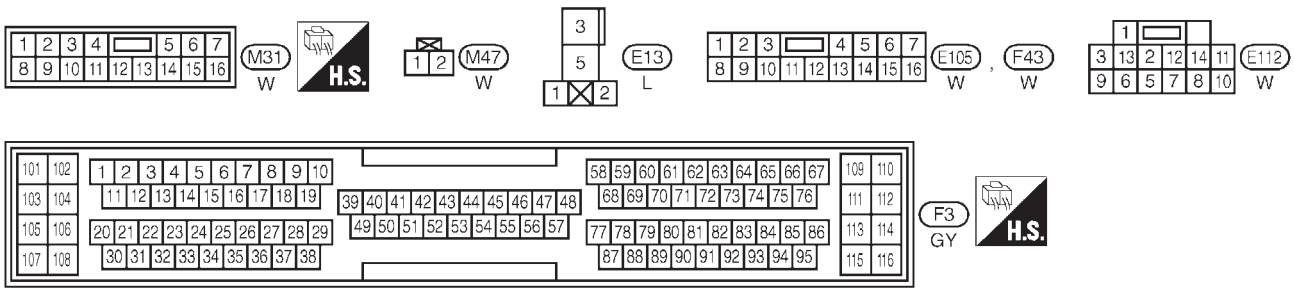






YEC716

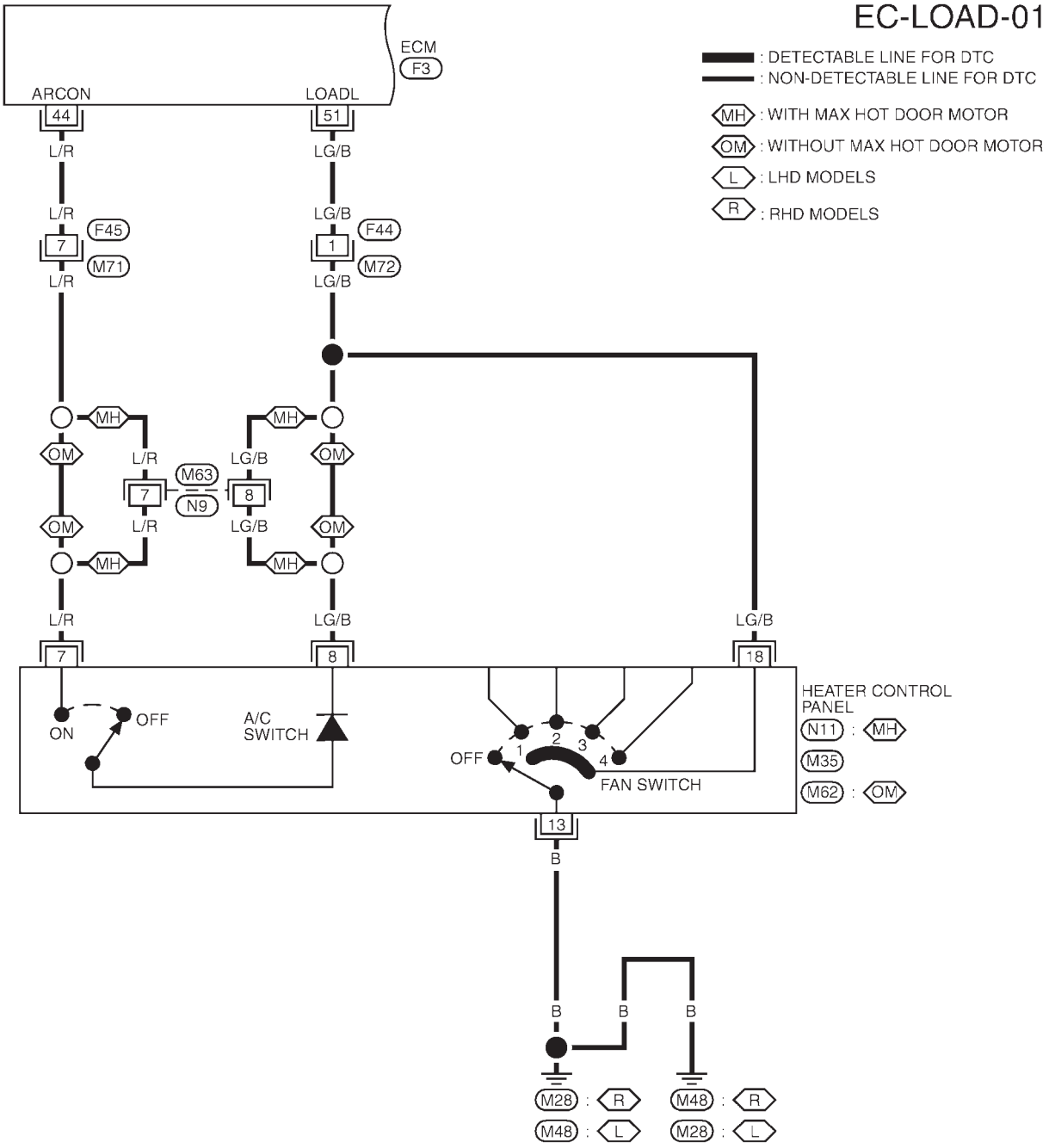

EC-LOAD-02
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
DL : WITH DAYTIME LIGHT SYSTEM
XD : WITHOUT DAYTIME LIGHT SYSTEM
TIME CONTROL UNIT
M31
IDLE DIODE OUTPUT
RR DEFOGGER SW
RR DEFOGGER OUTPUT
14
3
13
L/B
Y
G/W
G/W
Y
TO EL-DEF
R/W
TO EL-DTRL
R/W
8
COMBINATION SWITCH (LIGHTING SWITCH)
E112
OFF
2ND
1ST
10
R/Y
L/B
2
DIODE-1
M47
1
R/Y
L/B
11
M49
F43
L/B
R/Y
TO EL-H/LAMP
HEADLAMP RELAY LH
E13
XD
R/Y
4
R/Y
M10
E105
DL
R/Y
3
5
R/L
B
2
1
W/R
TO EL-DTRL
B
R/Y
L/B
50
LOADH
ECM
F3

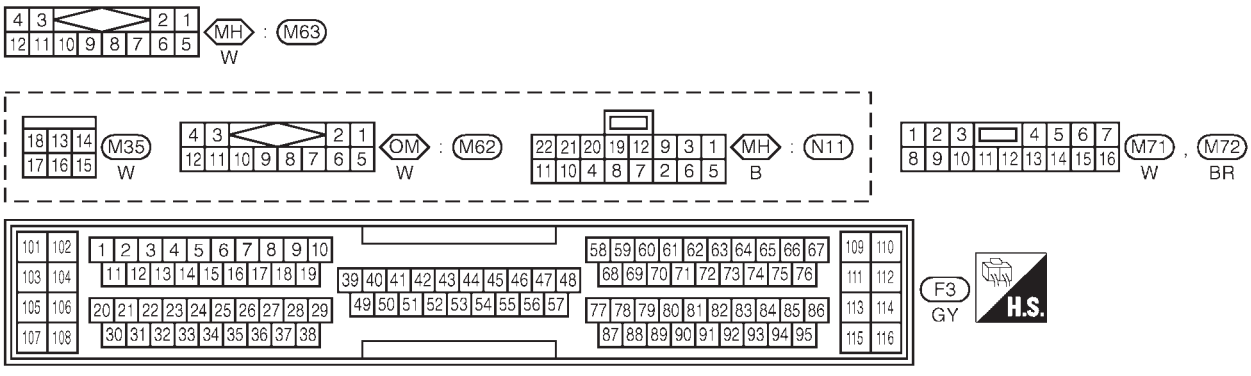

M31
W
H.S.
M47
W
3
5
1
2
E13
L
E105
W
F43
W
E112
W
F3
GY
H.S.

YEC678

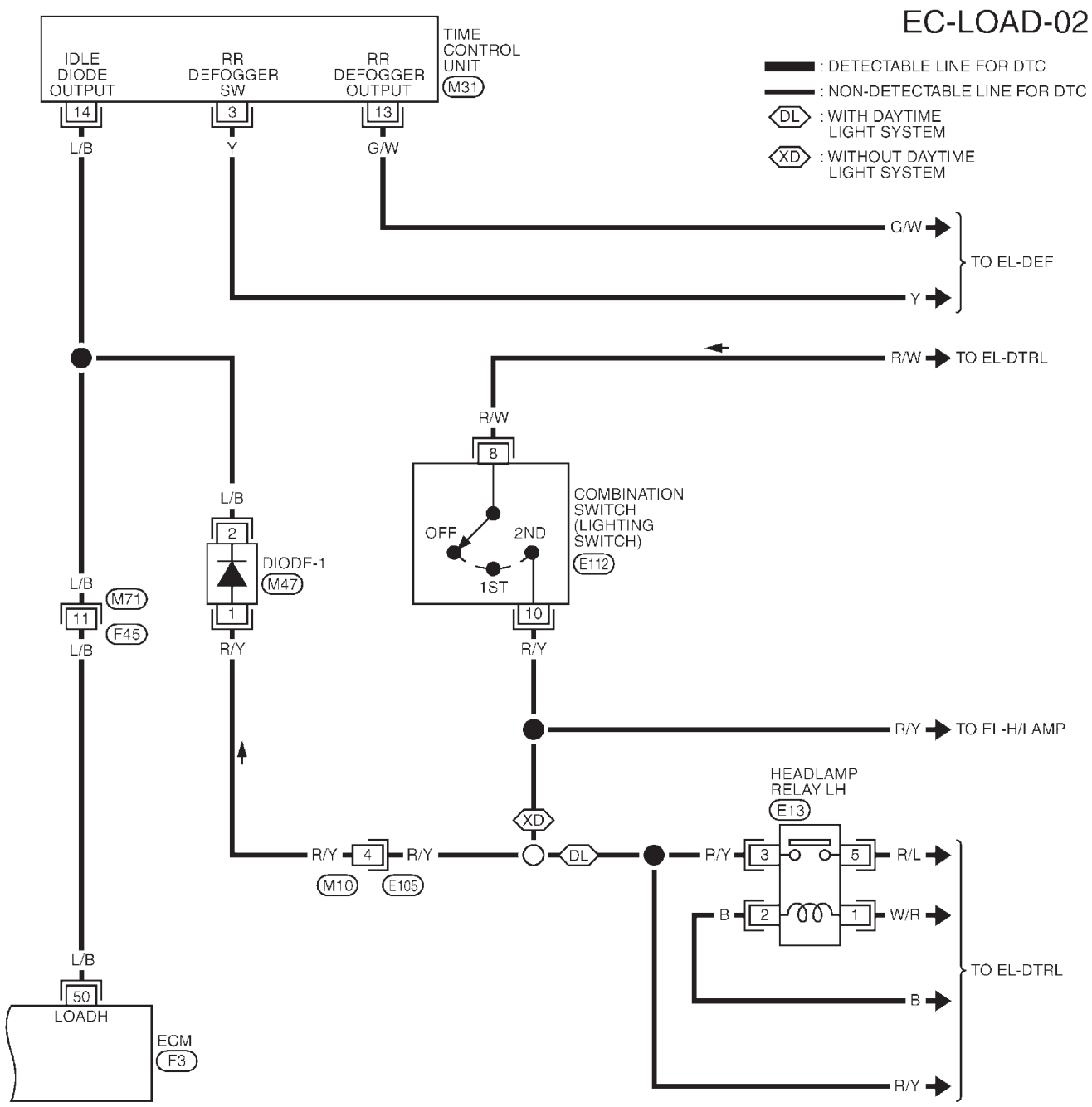
MODELS WITH ECM IN CABIN

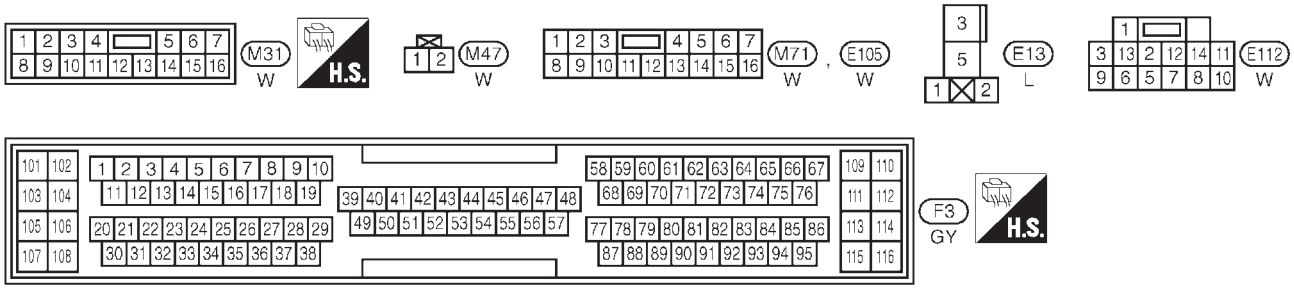
NLEC0550S05





YEC907


EC-LOAD-02
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
DL : WITH DAYTIME LIGHT SYSTEM
XD : WITHOUT DAYTIME LIGHT SYSTEM
TIME CONTROL UNIT
M31
IDLE DIODE OUTPUT
RR DEFOGGER SW
RR DEFOGGER OUTPUT
14
3
13
L/B
Y
G/W
G/W
Y
TO EL-DEF
R/W
TO EL-DTRL
R/W
8
COMBINATION SWITCH (LIGHTING SWITCH)
E112
OFF
2ND
1ST
10
R/Y
L/B
2
DIODE-1
M47
1
R/Y
L/B
M71
11
F45
L/B
R/Y
TO EL-H/LAMP
HEADLAMP RELAY LH
E13
XD
R/Y
4
R/Y
M10
E105
DL
R/Y
3
5
R/L
B
2
1
W/R
TO EL-DTRL
B
R/Y
L/B
50
LOADH
ECM
F3


M31
W
H.S.
M47
W
M71
W
E105
W
3
5
1
2
E13
L
1
3
13
2
12
14
11
9
6
5
7
8
10
E112
W
F3
GY
H.S.

YEC908

Diagnostic Procedure — Load Signal —

NLEC0584

1	INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes	▶	GO TO 2.
No	▶	GO TO 4.

2	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
LOAD SIGNAL	ON

Rear window defogger switch "ON"	ON
Rear window defogger switch "OFF"	OFF

SEF954X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 6.

3	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
LOAD SIGNAL	ON

Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF

SEF955X

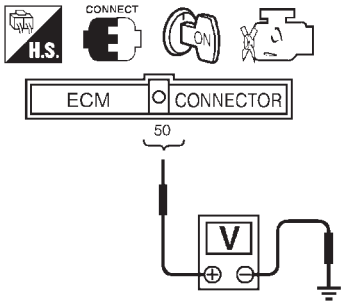
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 9.

4	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 50 and ground under the following conditions.



Condition	Voltage
Rear window defogger switch "ON"	BATTERY VOLTAGE
Rear window defogger switch "OFF"	0V

SEF956X

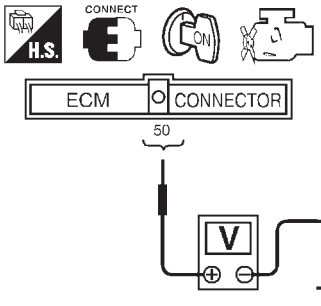
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 6.

5	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 50 and ground under the following conditions.



Condition	Voltage
Lighting switch "ON" at 2nd position	BATTERY VOLTAGE
Lighting switch "OFF"	0V

SEF957X

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 10.

6	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 7.
No	▶	Refer to EL-198, "Rear Window Defogger".

7	CHECK REAR WINDOW DEFOGGER INPUT SIGNAL CIRCUIT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect time control unit harness connector.
4. Check harness continuity between ECM terminal 50 and time control unit harness connector terminal 14. Refer to wiring diagram.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	Refer to EL-326, "TIME CONTROL UNIT".
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M49, F43 (where fitted)
- Harness connectors M71, F45 (where fitted)
- Harness open and short between ECM and time control unit connectors

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

9	CHECK HEADLAMP FUNCTION

1. Start engine.
2. Turn the lighting switch "ON".
3. Check that headlamps are illuminated.

Do the headlamps illuminate in both "High" and "Low" positions?

Yes or No

Yes	▶	GO TO 11.
No	▶	Refer to EL-69, "HEADLAMP SYSTEM".

10	CHECK HEADLAMP FUNCTION

1. Start engine.
2. Turn the lighting switch "ON".
3. Check that headlamps are illuminated.

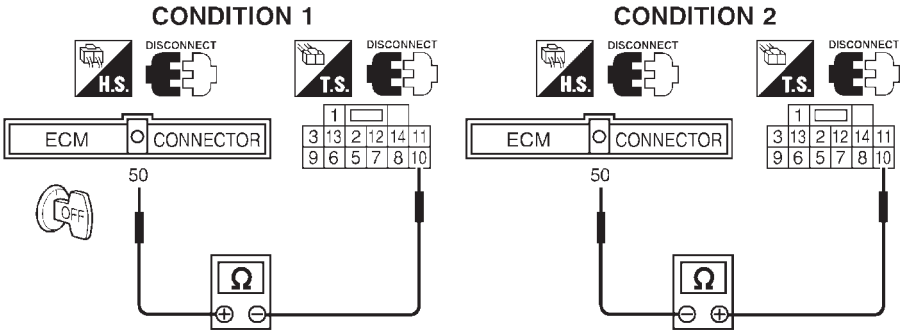
OK or NG

OK	▶	GO TO 11.
NG	▶	Refer to EL-69, "HEADLAMP SYSTEM".

11	CHECK HEADLAMP INPUT SIGNAL CIRCUIT

Without Daytime Light system

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch connector.
4. Check harness continuity between ECM terminal 50 and lighting switch connector terminal 10 under the following conditions.



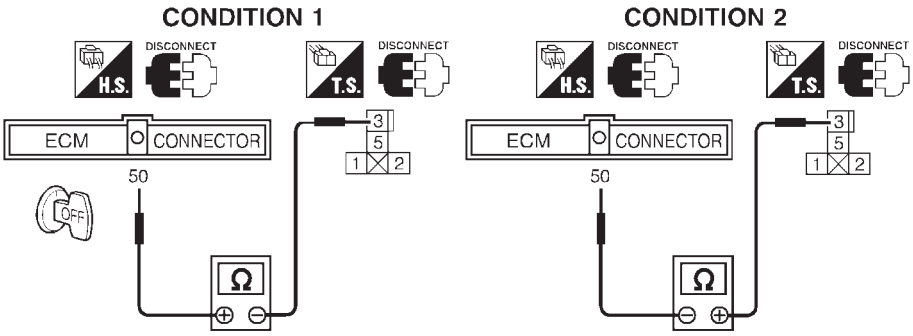
CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF161Z

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

With Daytime Light system

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect headlamp relay LH connector.
4. Check harness continuity between ECM terminal 50 and headlamp relay LH connector terminal 3 under the following conditions.



CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF445Z

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

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M49, F43 (where fitted)
- Harness connectors M71, F45 (where fitted)
- Harness connectors M10, E105
- Diode 1
- Harness for open and short between ECM and lighting switch connector

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

13	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-145.

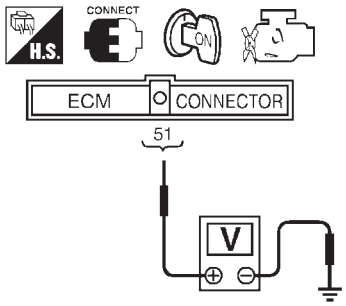
	▶	**INSPECTION END**

Diagnostic Procedure — Heater Control Panel (Fan Switch) —

NLEC0585

1	CHECK CIRCUIT OVERALL FUNCTION

1. Start engine.
2. Heater fan motor switch “ON”.
3. Check voltage between ECM terminal 51 and ground under the following conditions.



Condition	Voltage
Heater fan motor switch “ON”	0V
Heater fan motor switch “OFF”	Approximatly 5V

SEF620Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect heater control panel fan switch harness connector.
4. Check harness continuity between ECM terminal 51 and heater fan switch harness connector terminal 18. Refer to wiring diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	Refer to HA-55, HA-61, “BLOWER MOTOR”.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F38, M50 (where fitted)
- Harness connectors F44, M72 (where fitted)
- Harness for open and short between ECM and heater fan motor switch

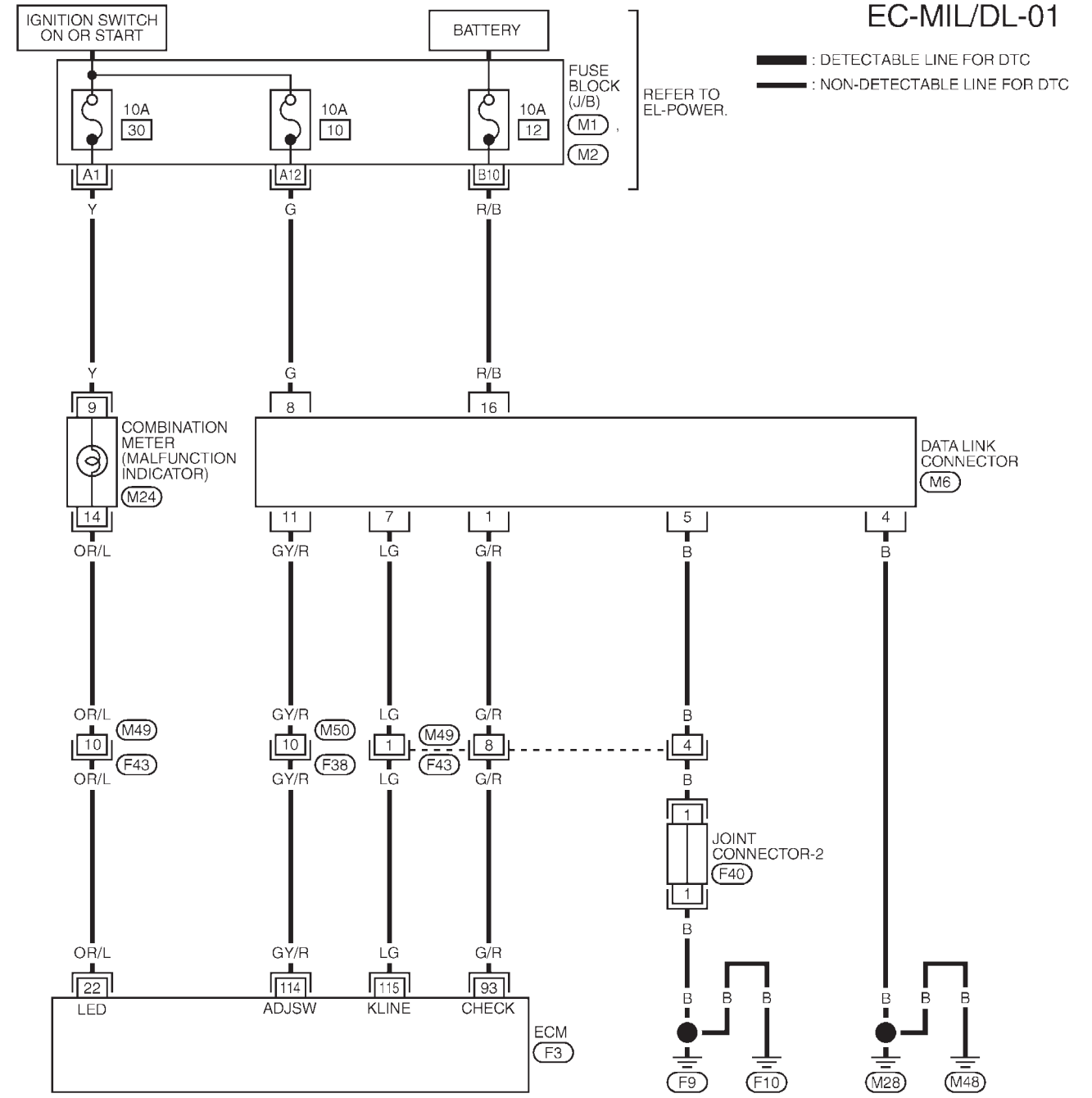
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

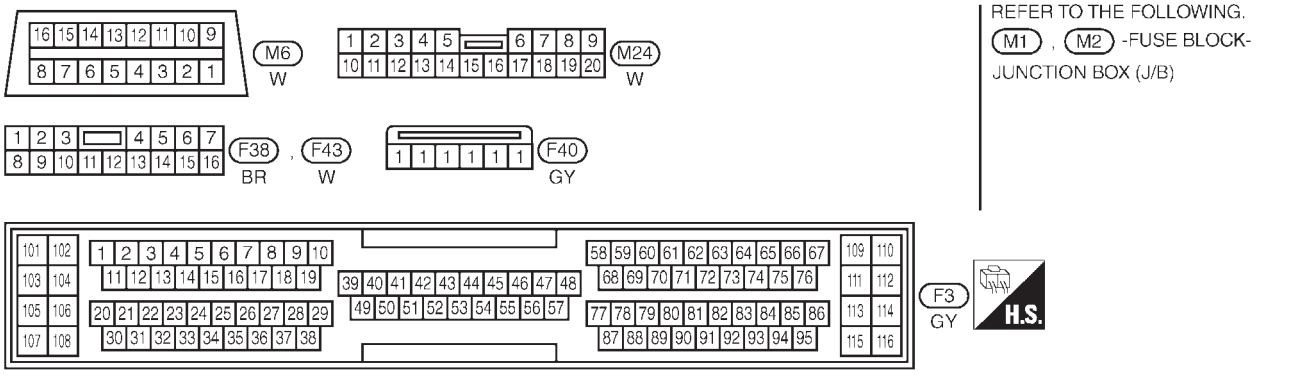
Wiring Diagram

NLEC0466

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0466S01



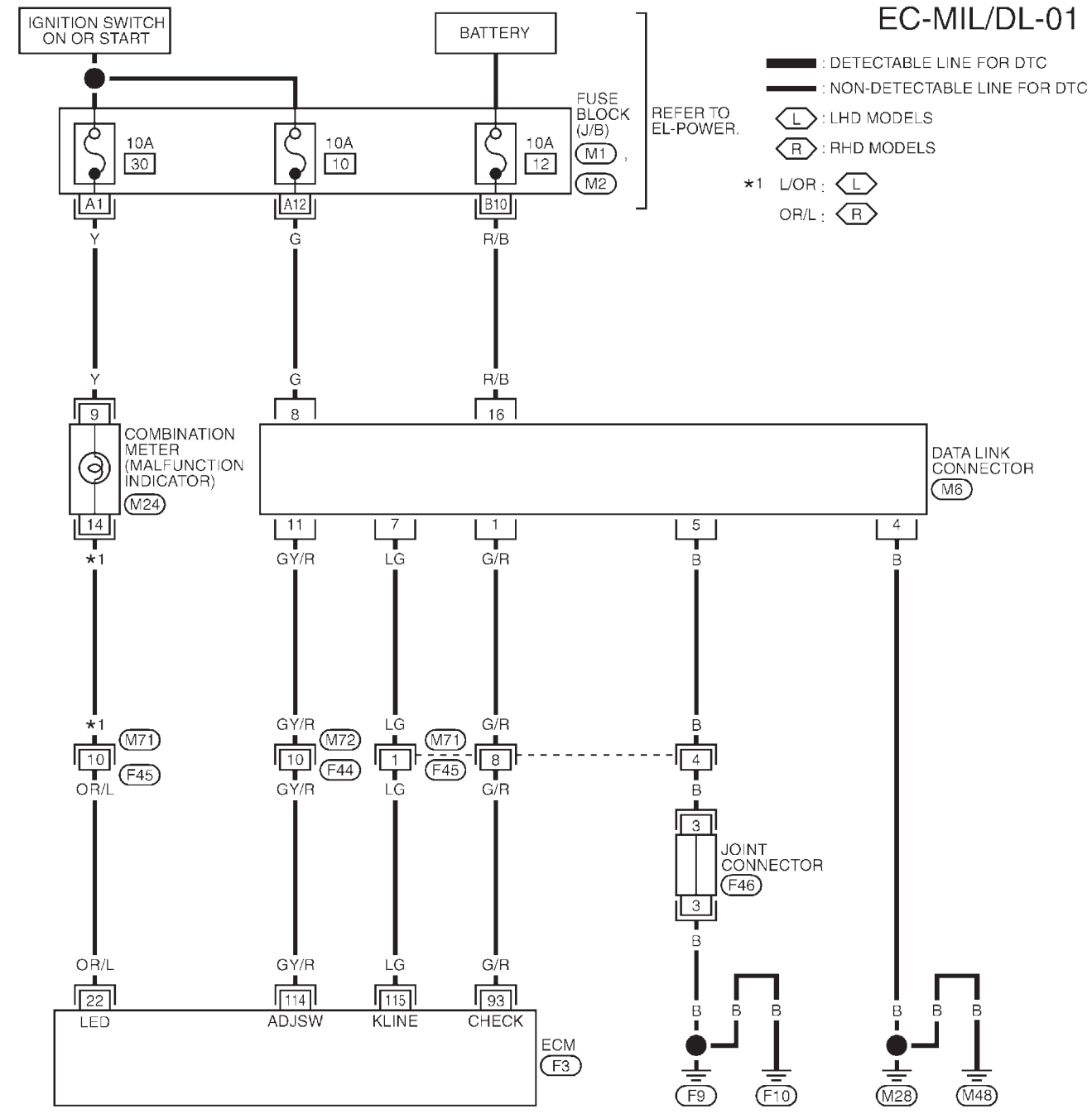


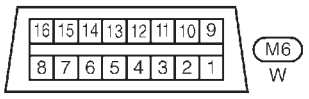
REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

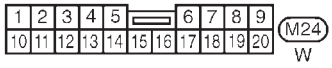
YEC679

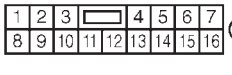
MODELS WITH ECM IN CABIN

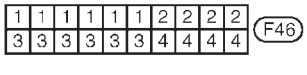
NLEC0466S02



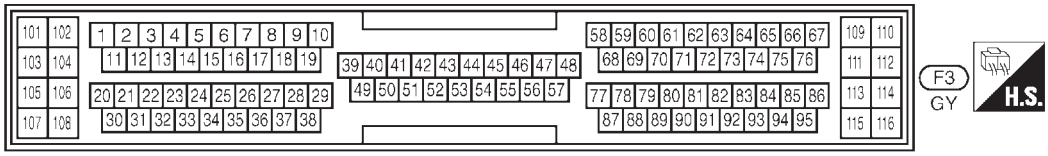








REFER TO THE FOLLOWING.
M1, M2 -FUSE BLOCK-
JUNCTION BOX (J/B)



YEC909

Fuel Pressure Regulator

NLEC0467

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

NLEC0468

Target idle speed* rpm	700±50
Air conditioner: ON rpm	825 or more
Ignition timing	8±2° BTDC
Throttle position sensor idle position V	0.15 - 0.85

*: Under the following conditions:

- Air conditioner switch: OFF
- Electrical load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Mass Air Flow Sensor

NLEC0470

Supply voltage (Heater) V	Battery voltage (11 - 14)
Supply voltage (Sensor) V	Approximately 5
Output voltage V	1.0 - 1.7*
Mass air flow (Using CONSULT-II or GST) g·m/sec	1.0 - 4.0 at idle* 5.0 - 10.0 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and idling under no-load.

Intake Air Temperature Sensor

NLEC0480

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

Engine Coolant Temperature Sensor

NLEC0471

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

Throttle Position Sensor

NLEC0477

Throttle valve conditions	Voltage (V)
Completely closed	0.15 - 0.85
Completely open	3.5 - 4.7

Heated Oxygen Sensor 1 Heater (Front)

NLEC0478

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

Heated Oxygen Sensor 2 Heater (Rear)

NLEC0483

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

EGR Volume Control Valve (where fitted)

NLEC0560

Terminal No.	Resistance Ω [at 20°C (68°F)]
1 - 2	20 - 24
2 - 3	
4 - 5	
5 - 6	

EGR Temperature Sensor (where fitted)

NLEC0472

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

EVAP Canister Purge Volume Control Valve

NLEC0481

Resistance [at 20°C (68°F)] Ω	31 - 35

IACV-AAC Valve

NLEC0474

Terminal No.	Resistance Ω [at 20°C (68°F)]
1 - 2	20 - 24
2 - 3	
4 - 5	
5 - 6	

Injector

NLEC0475

Resistance [at 25°C (77°F)] Ω	13.5 - 17.5

Ignition Coil with Power Transistor

NLEC0561

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 2 (−)	Except 0 or ∞
1 (+) - 3 (−)	Except 0
1 (+) - 2 (−)	

Condenser

NLEC0587

Resistance [at 25°C (77°F)] MΩ	Above 1

Fuel Pump

NLEC0473

Resistance [at 25°C (77°F)] Ω	0.2 - 5.0

Crankshaft Position Sensor (POS)

NLEC0558

Refer to “Component Inspection”, EC-301.

Camshaft Position Sensor (PHASE)

NLEC0559

Refer to “Component Inspection”, EC-308.

Alphabetical & P No. Index for DTC

NLEC1330

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

Type approval number	Model
Available	With Euro-OBD system
Not available	Without Euro-OBD system

MODELS WITH EURO-OBD SYSTEM
Alphabetical Index for DTC

NLEC1330S01

NLEC1330S0101

Items (CONSULT-II screen terms)	DTC*1	Reference page
Unable to access ECM	—	EC-647
AIR TEMP SEN/CIRC	P0110	EC-687
A/T DIAG COMM LINE	P1605	EC-928
ATF TEMP SEN/CIRC	P0710	AT-73
CMP SEN/CIRCUIT	P0340	EC-825
CLOSED TP SW/CIRC	P0510	EC-872
COOLANT T SEN/CIRC*3	P0115	EC-694
CKP SEN/CIRCUIT	P0335	EC-819
CKP SENSOR (COG)	P1336	EC-909
CYL 1 MISFIRE	P0301	EC-808
CYL 2 MISFIRE	P0302	EC-808
CYL 3 MISFIRE	P0303	EC-808
CYL 4 MISFIRE	P0304	EC-808
ECM	P0605	EC-880
EGR SYSTEM (where fitted)	P0400	EC-834
EGR SYSTEM (where fitted)	P1402	EC-921
EGR TEMP SEN/CIRC (where fitted)	P1401	EC-915
EGR VOL CON/V CIR (where fitted)	P0403	EC-841
ENGINE SPEED SIG	P0725	AT-90
ENG OVER TEMP	P1217*2	EC-882
FUEL SYS-LEAN/BK1	P0171	EC-792
FUEL SYS-RICH/BK1	P0172	EC-800
HO2S1 HTR (B1)	P0135	EC-746
HO2S1 (B1)	P0130	EC-709
HO2S1 (B1)	P0131	EC-717
HO2S1 (B1)	P0132	EC-723
HO2S1 (B1)	P0133	EC-729
HO2S1 (B1)	P0134	EC-739
HO2S2 (B1)	P0137	EC-752

Items (CONSULT-II screen terms)	DTC*1	Reference page
HO2S2 (B1)	P0138	EC-761
HO2S2 (B1)	P0139	EC-770
HO2S2 (B1)	P0140	EC-779
HO2S2 HTR (B1)	P0141	EC-786
IACV/AAC VLV/CIRC	P0505	EC-863
IN PY SPD SEN/CIRC	P0715	AT-79
KNOCK SEN/CIRC-B1	P0325*2	EC-815
LINE PRESS SEN	P1791	AT-119
L/PRESS SOL/CIRC	P0745	AT-99
MAF SEN/CIRCUIT*3	P0100	EC-679
MULTI CYL MISFIRE	P0300	EC-808
NATS MALFUNCTION	P1610 - P1615*2	EL-334
NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED	**P0000**	**—**
O/R CLTCH SOL/CIRC	P1760	—
PNP SW/CIRC	P0705	AT-66
P-N POS SW/CIRCUIT	P1706	EC-931
PURG VOLUME CONT/V	P0443	EC-852
STEP MOTR CIRC	P1777	AT-112
STEP MOTR FNC	P1778	AT- 117
TCC SOLENOID/CIRC	P0740	AT-192
THRTL POS SEN/CIRC*3	P0120	EC-700
TP SEN/CIRC A/T	P1705	AT-104
TW CATALYST SYS-B1	P0420	EC-848
VEH SPD SEN/CIR AT	P0720	AT-84
VEH SPEED SEN/CIRC*4	P0500	EC-858

*1: These numbers are prescribed by ISO 15031-6. 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 the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

P No. Index for DTC

NLEC1330S0102

DTC*1	Items (CONSULT-II screen terms)	Reference page
—	Unable to access ECM	EC-647
—	**NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED.**	—
P0100	MAF SEN/CIRCUIT*3	EC-679
P0110	AIR TEMP SEN/CIRC	EC-687
P0115	COOLANT T SEN/CIRC*3	EC-694

DTC*1	Items (CONSULT-II screen terms)	Reference page
P0120	THRTL POS SEN/CIRC*3	EC-700
P0130	HO2S1 (B1)	EC-709
P0131	HO2S1 (B1)	EC-717
P0132	HO2S1 (B1)	EC-723
P0133	HO2S1 (B1)	EC-729
P0134	HO2S1 (B1)	EC-739
P0135	HO2S1 HTR (B1)	EC-746
P0137	HO2S2 (B1)	EC-752
P0138	HO2S2 (B1)	EC-761
P0139	HO2S2 (B1)	EC-770
P0140	HO2S2 (B1)	EC-779
P0141	HO2S2 HTR (B1)	EC-786
P0171	FUEL SYS-LEAN/BK1	EC-792
P0172	FUEL SYS-RICH/BK1	EC-800
P0300	MULTI CYL MISFIRE	EC-808
P0301	CYL 1 MISFIRE	EC-808
P0302	CYL 2 MISFIRE	EC-808
P0303	CYL 3 MISFIRE	EC-808
P0304	CYL 4 MISFIRE	EC-808
P0325*2	KNOCK SEN/CIRC-B1	EC-815
P0335	CKP SEN/CIRCUIT	EC-819
P0340	CMP SEN/CIRCUIT	EC-825
P0400	EGR SYSTEM (where fitted)	EC-834
P0403	EGR VOL CON/V CIR (where fitted)	EC-841
P0420	TW CATALYST SYS-B1	EC-848
P0443	PURG VOLUME CONT/V	EC-852
P0500	VEH SPEED SEN/CIRC*4	EC-858
P0505	IACV/AAC VLV/CIRC	EC-863
P0510	CLOSED TP SW/CIRC	EC-872
P0605	ECM	EC-880
P0705	PNP SW/CIRC	AT-66
P0710	ATF TEMP SEN/CIRC	AT-73
P0715	IN PY SPD SEN/CIRC	AT-79
P0720	VEH SPD SEN/CIR AT	AT-84
P0725	ENGINE SPEED SIG	AT-90
P0740	TCC SOLENOID/CIRC	AT-94
P0745	L/PRESS SOL/CIRC	AT-99

DTC*1	Items (CONSULT-II screen terms)	Reference page
P1217	ENG OVER TEMP	EC-882
P1336	CKP SENSOR (COG)	EC-909
P1401	EGR TEMP SEN/CIRC (where fitted)	EC-915
P1402	EGR SYSTEM (where fitted)	EC-921
P1605	A/T DIAG COMM LINE	EC-928
P1610 - 1615*2	NATS MALFUNCTION	EL-334
P1705	TP SEN/CIRC A/T	AT-104
P1706	P-N POS SW/CIRCUIT	EC-931
P1760	O/R CLTCH SOL/CIRC	—
P1777	STEP MOTR CIRC	AT-112
P1778	STEP MOTR FNC	AT-117
P1791	LINE PRESS SEN	AT-119

*1: These numbers are prescribed by ISO 15031-6. 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 the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

MODELS WITHOUT EURO-OBD SYSTEM

Alphabetical Index for DTC

NLEC1330S02

NLEC1330S0201

Items (CONSULT-II screen terms)	DTC*6		Reference page
	CONSULT-II*2	ECM*1	
Unable to access ECM	—	—	EC-647
CMP SEN/CIRCUIT	P0340	0340	EC-825
CLOSED TP SW/CIRC	P0510	0510	EC-872
COOLANT T SEN/CIRC*3	P0115	0115	EC-694
EGR VOL CON/V CIR	P0403	0403	EC-841
ENG OVER TEMP	P1217	1217	EC-882
HO2S1 (B1)	P0130	0130	EC-709
IGN SIGNAL-PRIMARY	P1320	1320	EC-900
KNOCK SEN/CIRC-B1	P0325	0325	EC-815
MAF SEN/CIRCUIT*3	P0100	0100	EC-679
NATS MALFUNCTION	P1610 - P1615	—	EL-334
NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED	**—**	**0000**	**—**
NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED	—	Flashing*5	EC-598
THRTL POS SEN/CIRC*3	P0120	0120	EC-700
VEH SPEED SEN/CIRC*4	P0500	0500	EC-858

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by ISO 15031-6.
*3: When the fail-safe operation occurs, the MI illuminates.

*4: The MI illuminates when the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.
*5: While engine is running.
*6: 1st trip DTC No. is the same as DTC No.

P No. Index for DTC

NLEC1330S0202

DTC*6		Items (CONSULT-II screen terms)	Reference page
CONSULT-II*2	ECM*1		
—	—	Unable to access ECM	EC-647
—	Flashing*5	NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED.	EC-598
—	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAYBE REQUIRED.**	**—**
P0100	0100	MAF SEN/CIRCUIT*3	EC-679
P0115	0115	COOLANT T SEN/CIRC*3	EC-694
P0120	0120	THRTL POS SEN/CIRC*3	EC-700
P0130	0130	HO2S1 (B1)	EC-709
P0325	0325	KNOCK SEN/CIRC-B1	EC-815
P0340	0340	CMP SEN/CIRCUIT	EC-825
P0403	0403	EGR VOL CON/V CIR (where fitted)	EC-841
P0500	0500	VEH SPEED SEN/CIRC*4	EC-858
P0510	0510	CLOSED TP SW/CIRC	EC-872
P1217	1217	ENG OVER TEMP	EC-882
P1320	1320	IGN SIGNAL-PRIMARY	EC-900
P1610 - 1615	—	NATS MALFUNCTION	EL-334

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by ISO 15031-6
*3: When the fail-safe operation occurs, the MI illuminates.
*4: The MI illuminates when the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.
*5: While engine is running.
*6: 1st trip DTC No. is the same as DTC No.

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

NLEC1745

The Supplemental Restraint System “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
In addition to the supplemental air bag modules for a frontal collision, the supplemental side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The supplemental side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (one of components of supplemental air bags for a frontal collision), wiring harness, warning lamp (one of components of supplemental 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 must 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.**
- **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 and CVT

NLEC1332

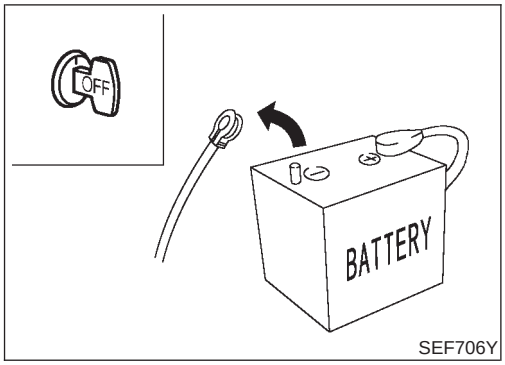
The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

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 connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission Control Module) before returning the vehicle to the customer.**

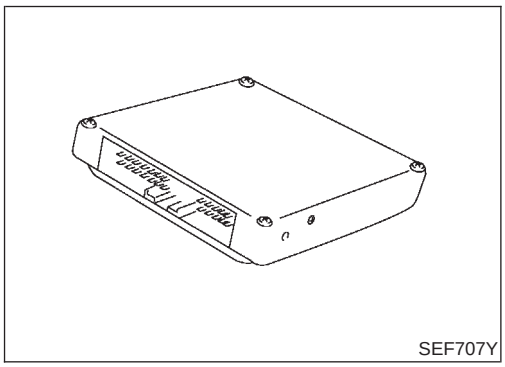
Engine Fuel & Emission Control System

=NLEC1333

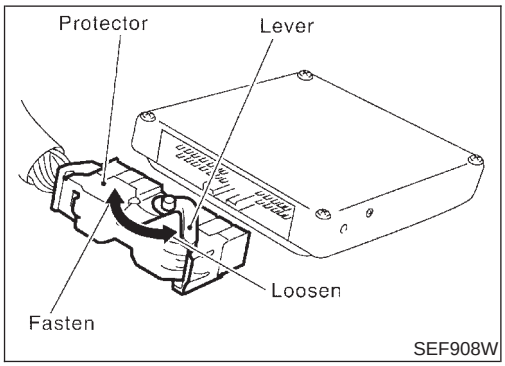


SEF706Y

- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect 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.

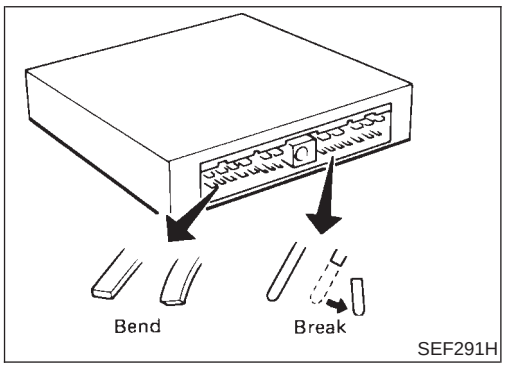

SEF707Y

- Do not disassemble ECM.
- 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.



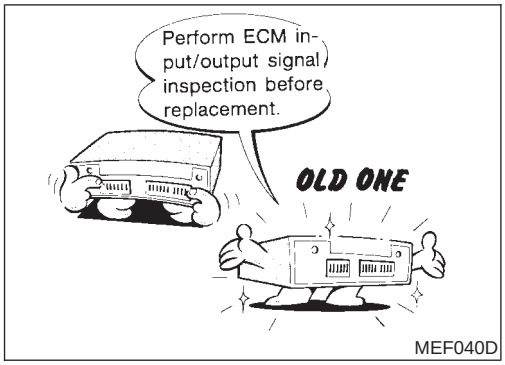
SEF908W

- When connecting or disconnecting ECM harness connector, use lever as shown.
  When connecting, fasten connector securely with lever moved until it stops.



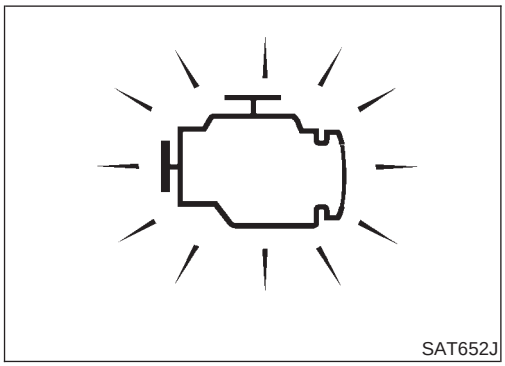
SEF291H

- 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 terminals when connecting pin connectors.
- Securely connect ECM harness connectors.
  A Poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (4 in) away from adjacent harness, to prevent an ECM system malfunctions due to receiving external noise, degraded operation of ICs, etc.
- Keep ECM parts and harness dry.

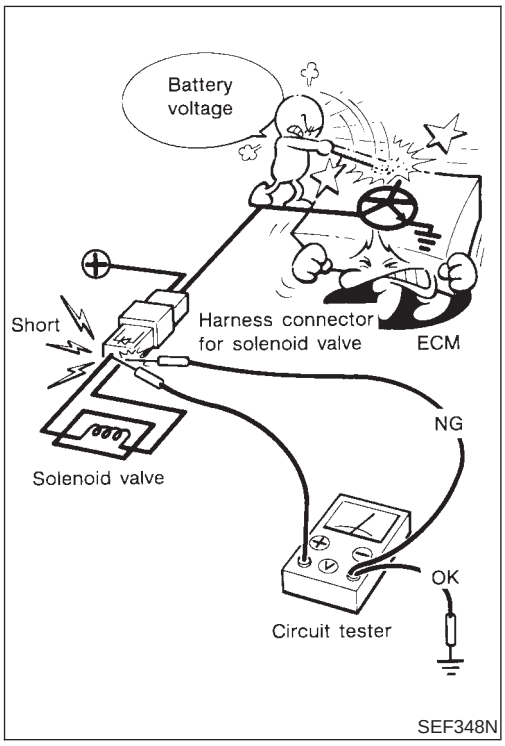


MEF040D

- **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 IAC valve-AAC valve.**
- **Even a slight leak in the air intake system can cause serious problems.**
- **Do not shock or jar the camshaft position sensor and crankshaft position sensor.**
- **Before replacing ECM, perform refer to "ECM Terminals and Reference Value" inspection and make sure ECM functions properly, EC-657.**

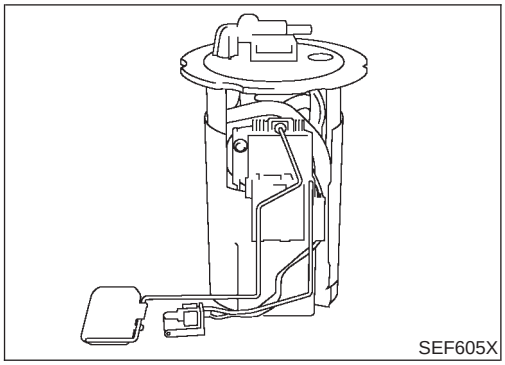

SAT652J

- **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.



SEF348N

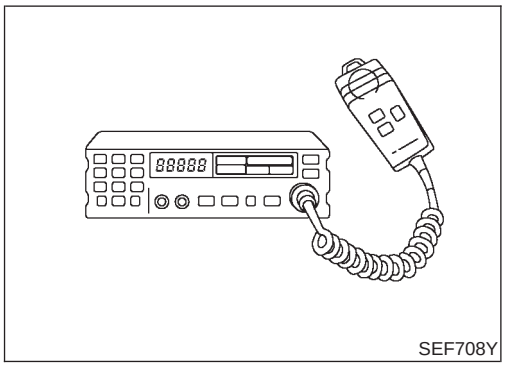
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**


SEF605X

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


SEF709Y

- **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.**


SEF708Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**

1) **Keep the antenna as far as possible from the electronic control units.**
2) **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
   Do not let them run parallel for a long distance.
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.**

Wiring Diagrams and Trouble Diagnosis

NLEC1334

When you read Wiring diagrams, refer to the following:

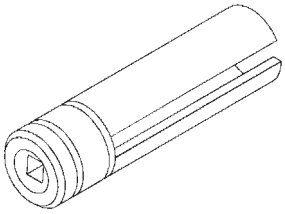
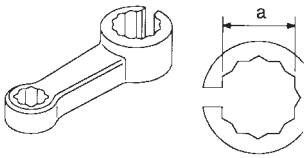
- GI-11, "HOW TO READ WIRING DIAGRAMS"
- EL-10, "POWER SUPPLY ROUTING" for power distribution circuit

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"

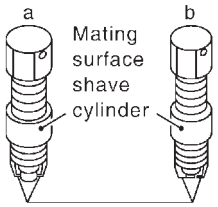
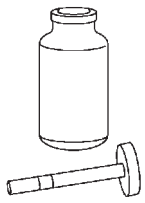
Special Service Tools

NLEC1335

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 NT379	Loosening or tightening heated oxygen sensor 1 (front) with 22 mm hexagon nut
KV10114400 Heated oxygen sensor wrench	 NT636	Loosening or tightening heated oxygen sensor 2 (rear) **a: 22 mm**

Commercial Service Tools

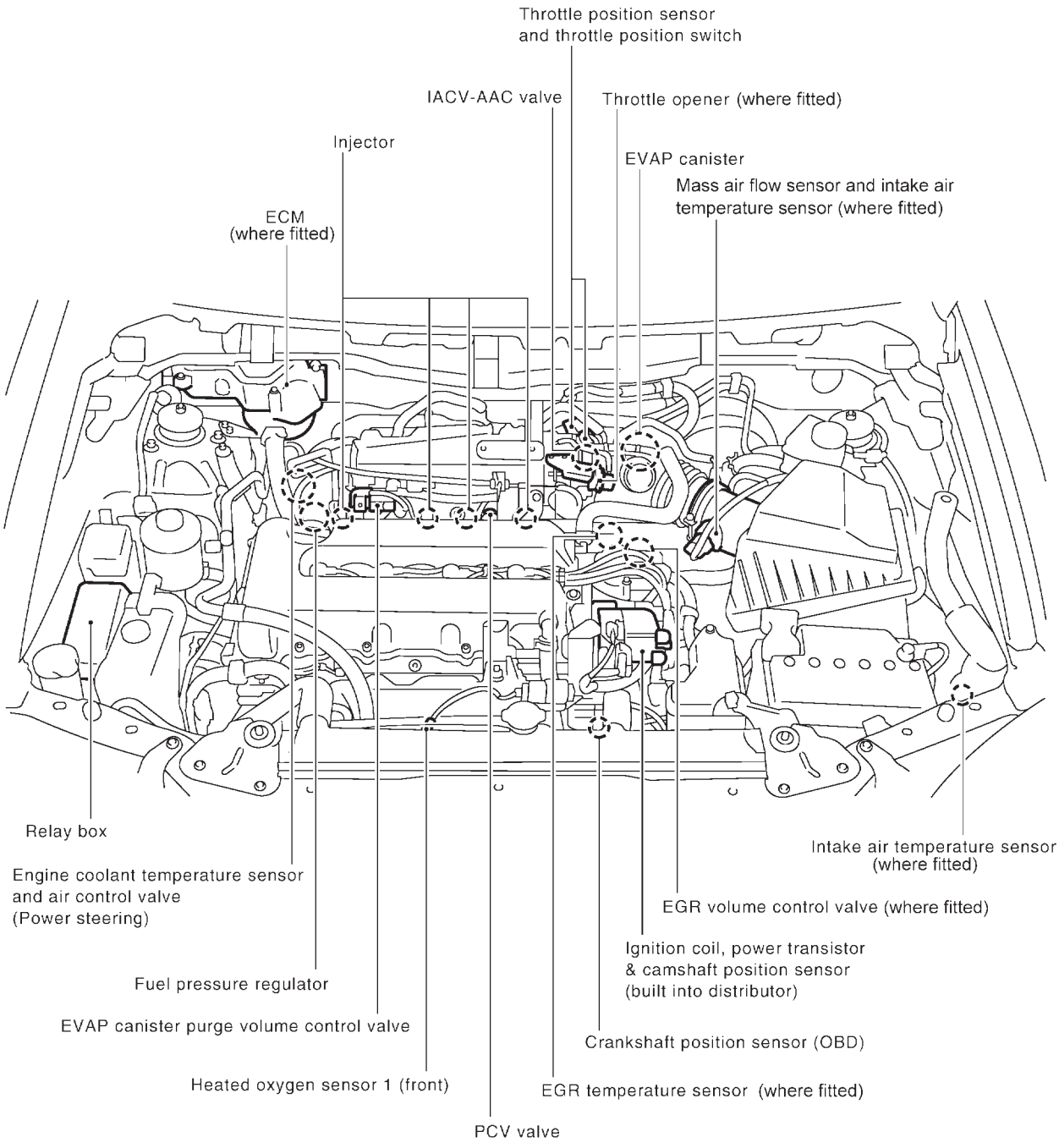
NLEC1336

Tool name	Description	
Fuel filler cap adapter	 NT653	Checking fuel tank vacuum relief valve opening pressure
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**
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.

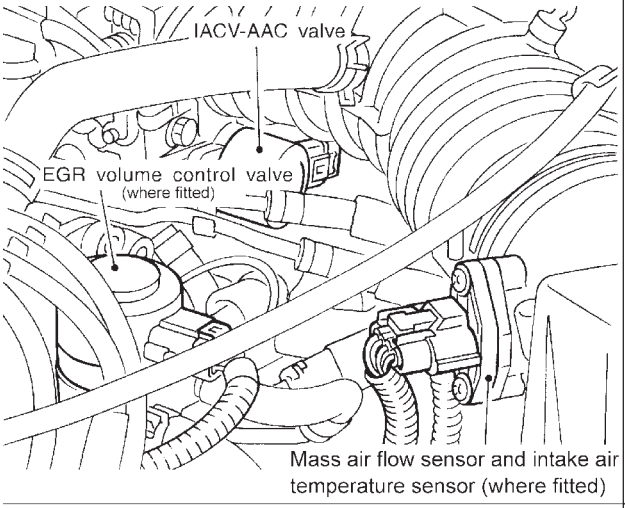
Engine Control Component Parts Location

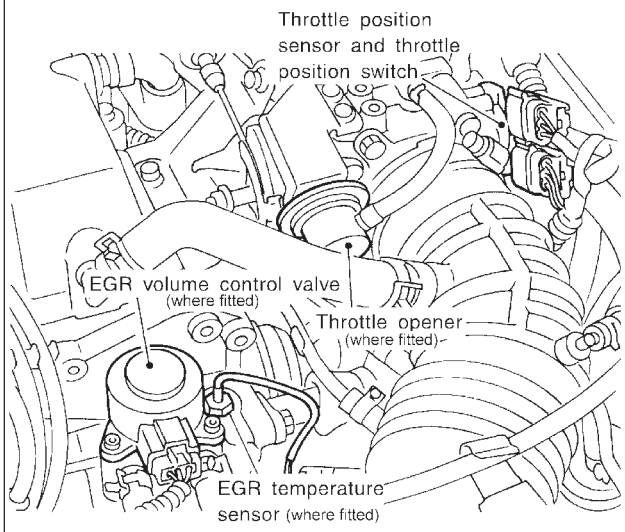
NLEC1337

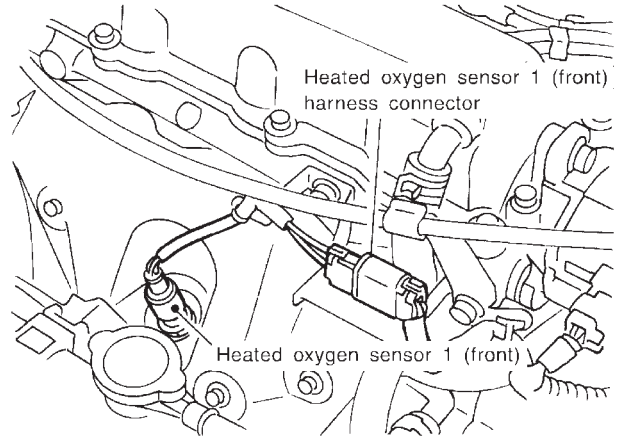
For more details of ECM location, refer to “ELECTRICAL UNIT LOCATION” in EL section.

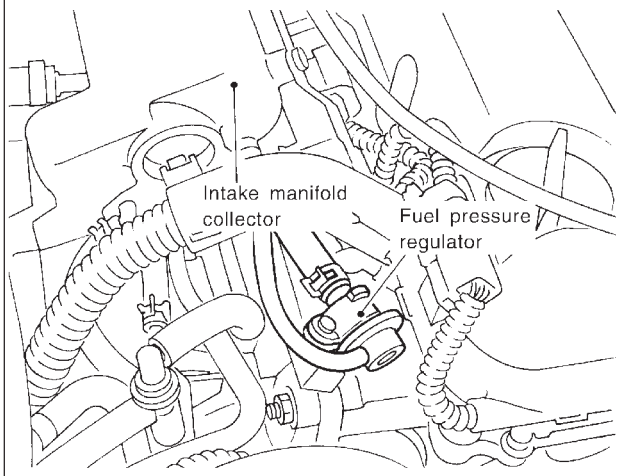


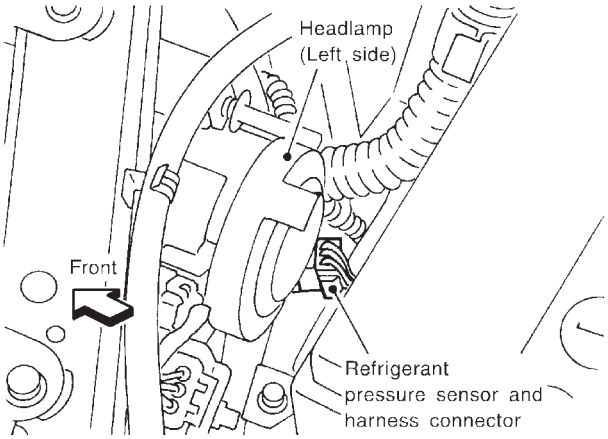
NEF317A

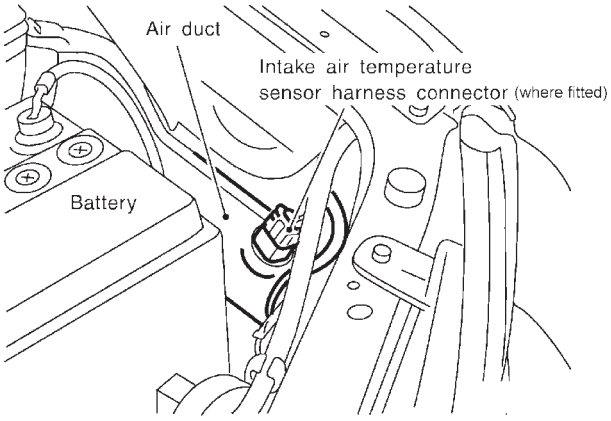

IACV-AAC valve
EGR volume control valve
(where fitted)
Mass air flow sensor and intake air
temperature sensor (where fitted)


Throttle position
sensor and throttle
position switch
EGR volume control valve
(where fitted)
Throttle opener
(where fitted)
EGR temperature
sensor (where fitted)


Heated oxygen sensor 1 (front)
harness connector
Heated oxygen sensor 1 (front)

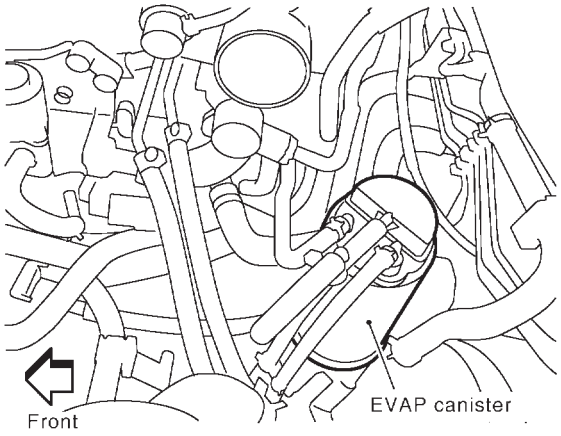

Intake manifold
collector
Fuel pressure
regulator


Headlamp
(Left side)
Front
Refrigerant
pressure sensor and
harness connector

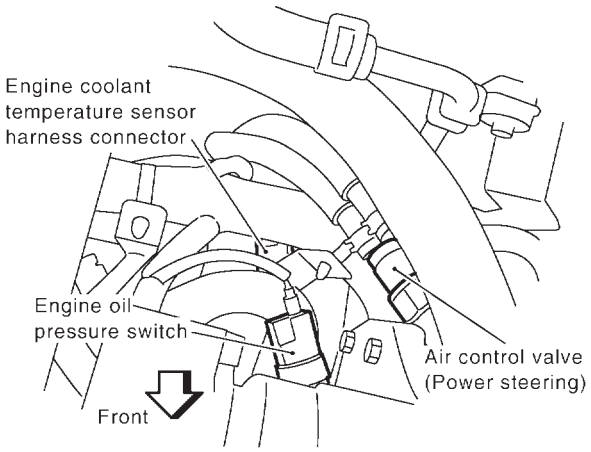

Air duct
Intake air temperature
sensor harness connector (where fitted)
Battery

NEF318A

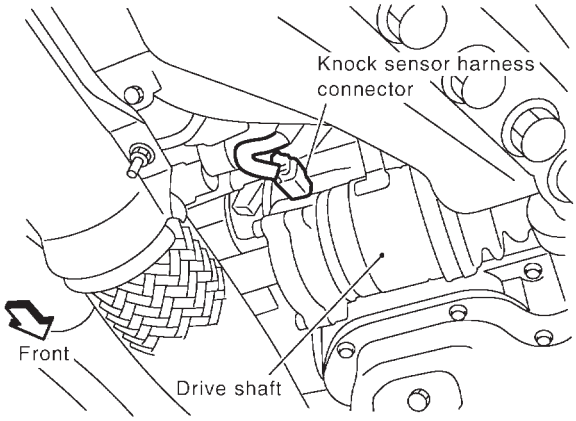
View with intake air duct removed



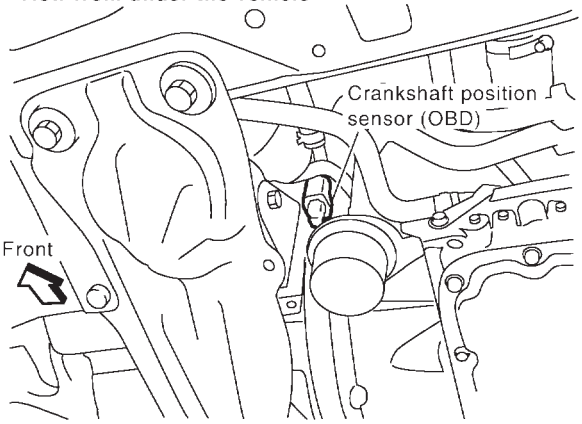
View from under the vehicle



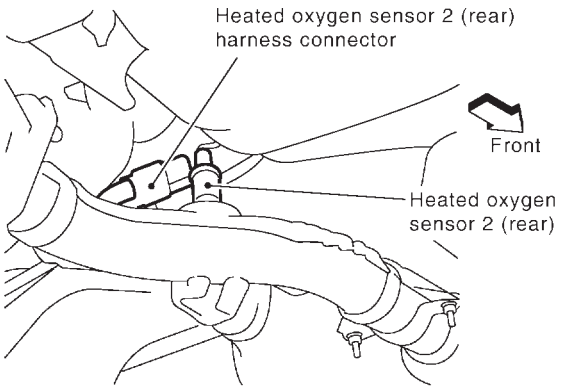
View from under the vehicle



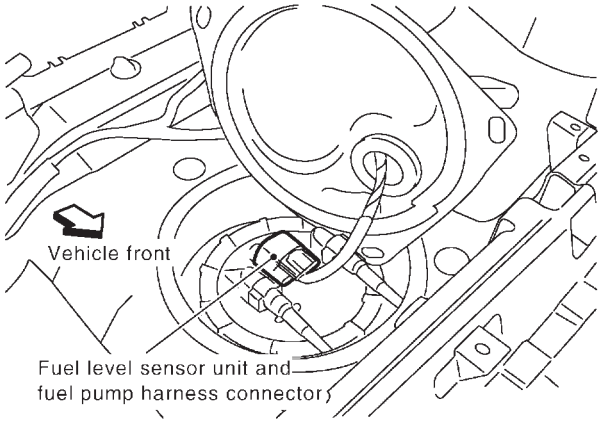
View from under the vehicle



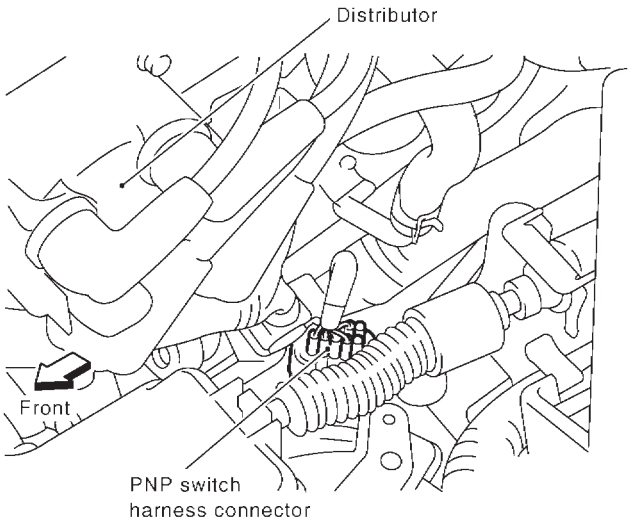
View from under the vehicle

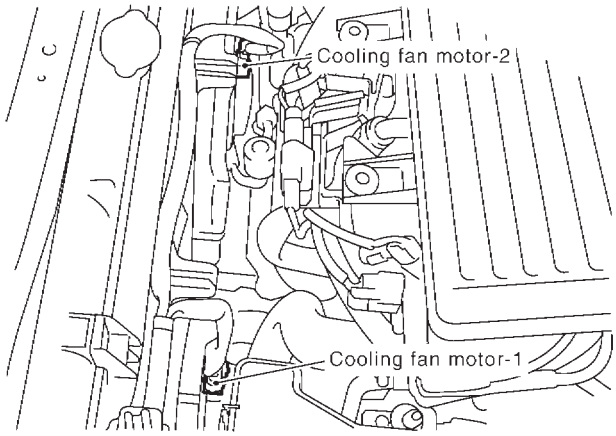


Under rear seat cushion

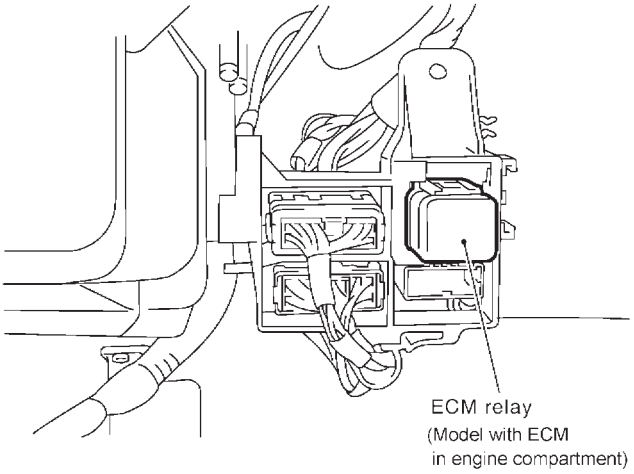


SEF764Z

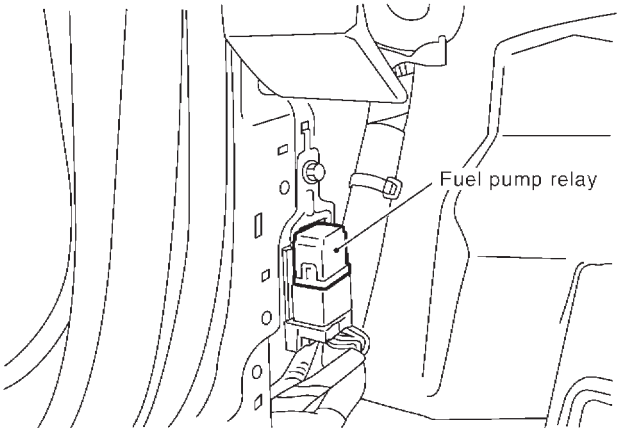


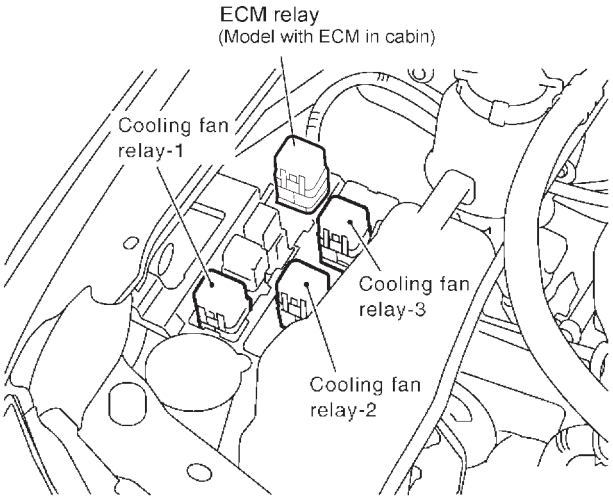


View with glove box and box cover removed

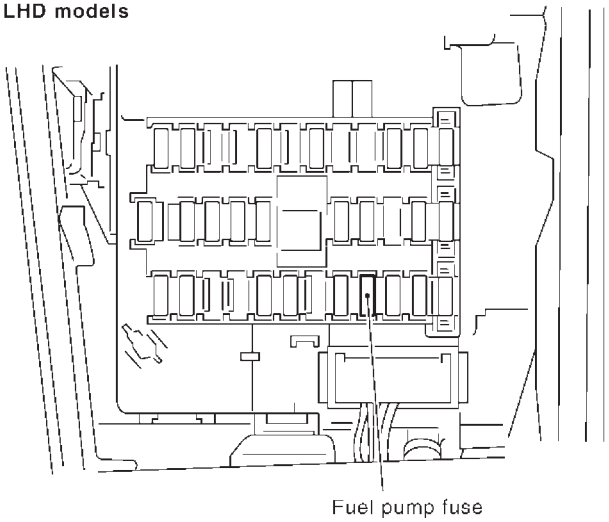


Dash side lower LH
(LHD models)





View with fuse box cover removed
LHD models



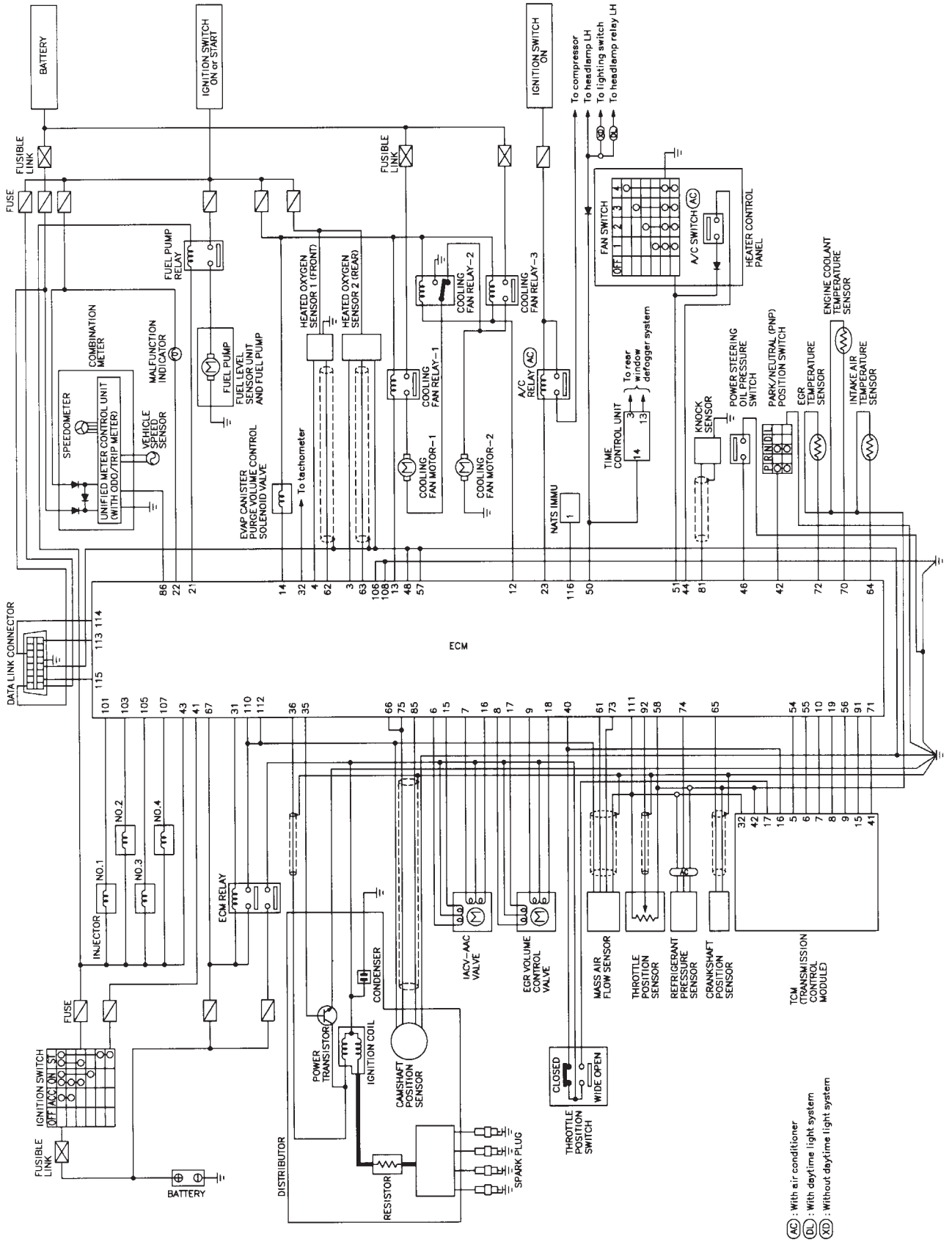
NEF319A

Circuit Diagram

NLEC1338

MODELS WITH EGR SYSTEM

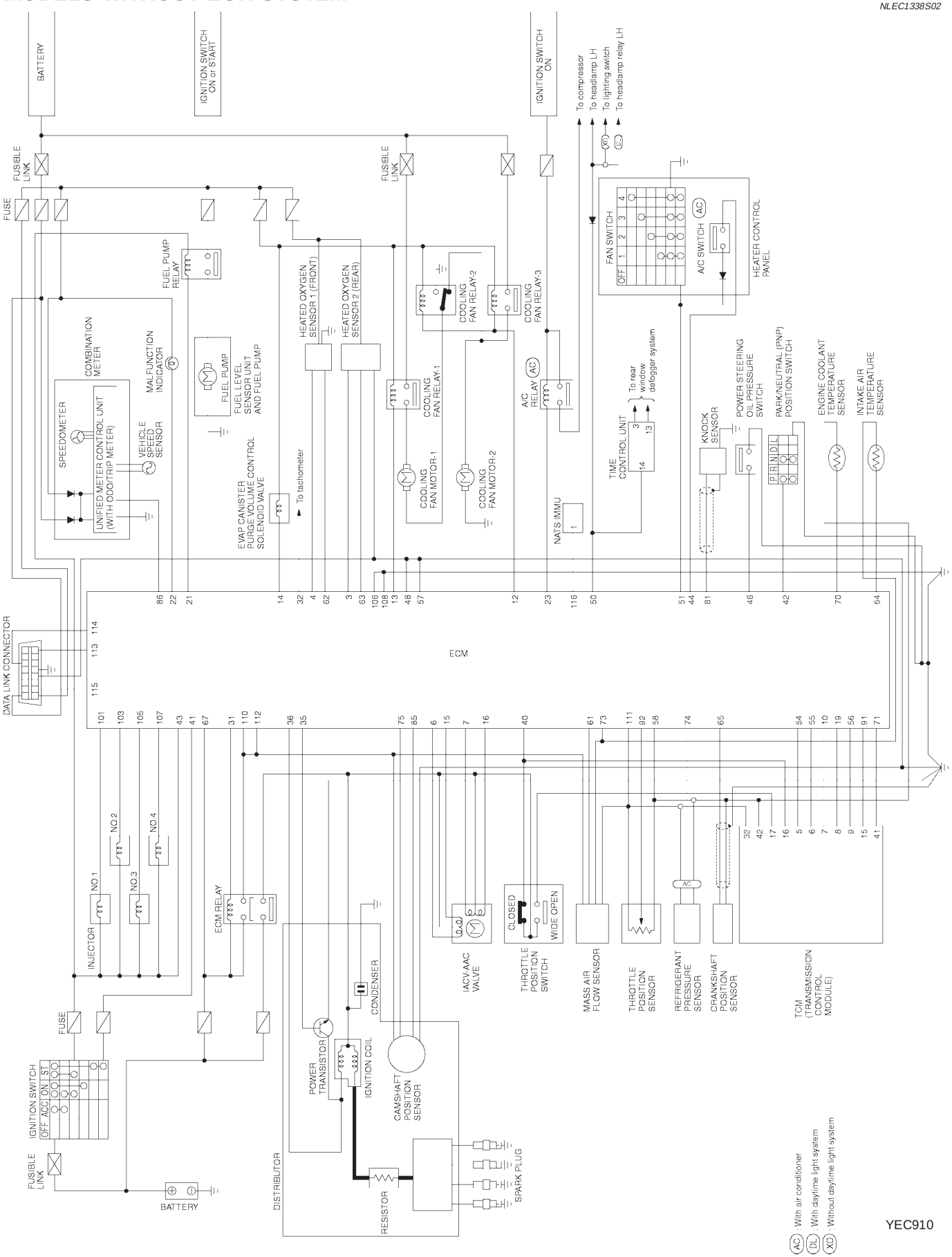
NLEC1338S01



YEC685

MODELS WITHOUT EGR SYSTEM

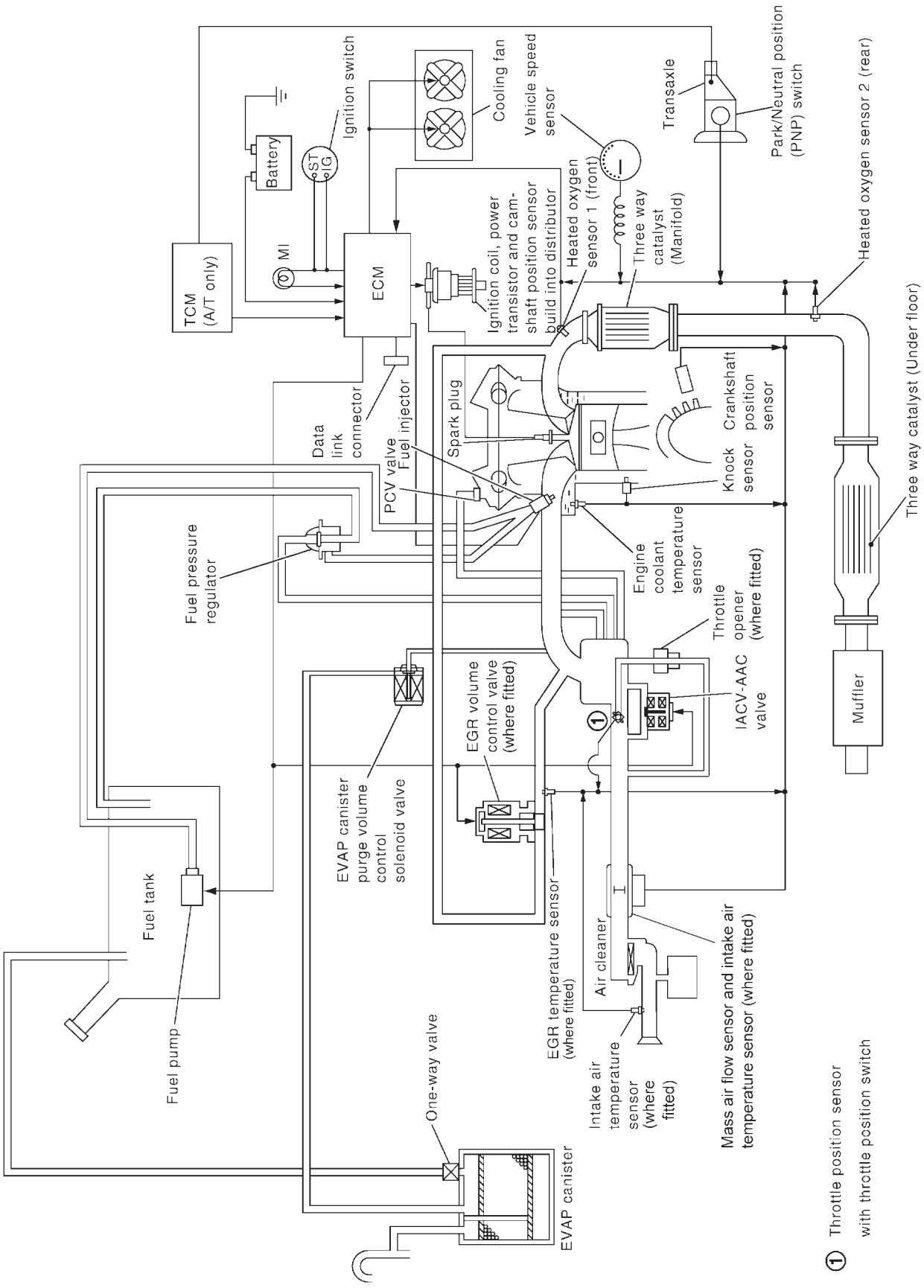
NLEC1338S02



YEC910

System Diagram

NLEC1339

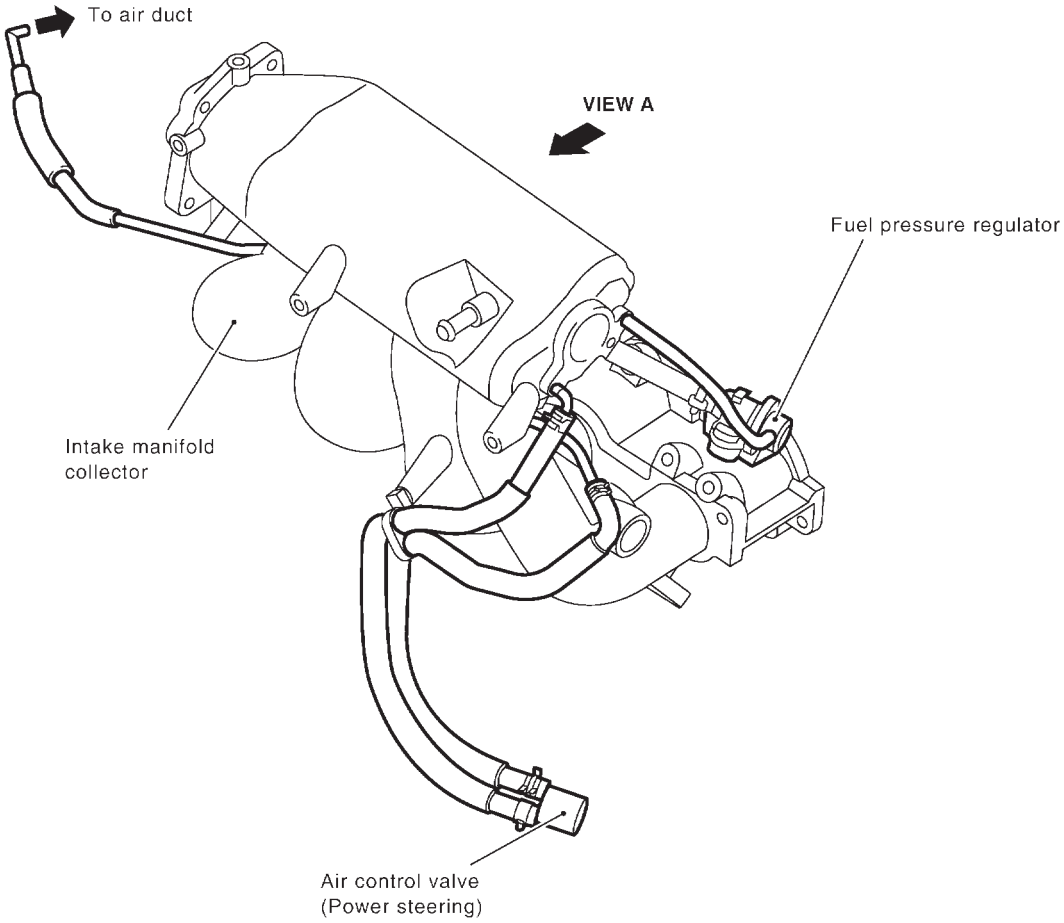


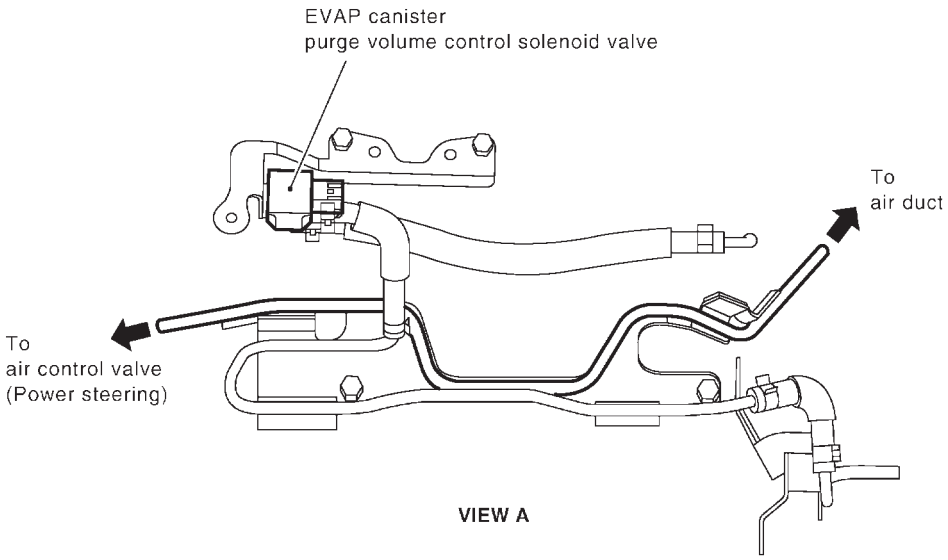
NEF320A

Vacuum Hose Drawing

NLEC1340

Refer to “System Diagram” on EC-566 for vacuum control system.





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

SEF766Z

System Chart

NLEC1341

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor ● Crankshaft position sensor (OBD) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 (front) ● Ignition switch ● Throttle position sensor ● PNP switch ● Air conditioner switch ● Knock sensor ● EGR temperature sensor*1 (where fitted) ● Battery voltage ● Power steering oil pressure switch ● Vehicle speed sensor ● Intake air temperature sensor ● Heated oxygen sensor 2 (rear)*2 ● TCM (Transmission Control Module)*3 ● Closed throttle position switch ● Electrical load ● Refrigerant pressure sensor	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	Malfunction indicator (On the instrument panel)
	EGR control (where fitted)	EGR volume control valve (where fitted)
	Heated oxygen sensor 1/2 heater (front/ rear) control	Heated oxygen sensor 1/2 heater (front/rear)
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Cooling fan control	Cooling fan relay
	Air conditioning cut control	Air conditioner relay

*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.
*2: Under normal conditions, this sensor is not for engine control operation.
*3: The DTC related to CVT will be sent to ECM.

Multiport Fuel Injection (MFI) System

DESCRIPTION

NLEC1342

Input/Output Signal Chart

NLEC1342S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed and piston position	Fuel injection & mixture ratio control	Injector
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		
PNP switch	Gear position		
Vehicle speed sensor	Vehicle speed		
Ignition switch	Start signal		
Air conditioner switch	Air conditioner operation		
Knock sensor	Engine knocking condition		
Electrical load	Electrical load signal		
Battery	Battery voltage		
Power steering oil pressure switch	Power steering operation		
Heated oxygen sensor 2 (rear)*	Density of oxygen in exhaust gas		

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

Basic Multiport Fuel Injection System

NLEC1342S02

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 camshaft position sensor and the mass air flow sensor.

Various Fuel Injection Increase/Decrease Compensation

NLEC1342S03

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

<Fuel increase>

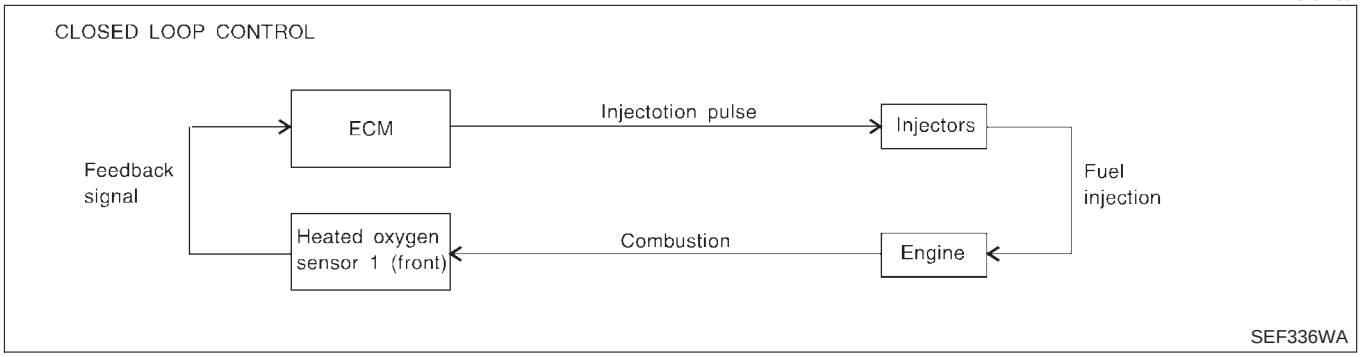
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D”
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation
- Extremely high engine coolant temperature

Mixture Ratio Feedback Control (Closed loop control)

NLEC1342S04



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst 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-709. 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. 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

NLEC1342S05

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
- When starting the engine

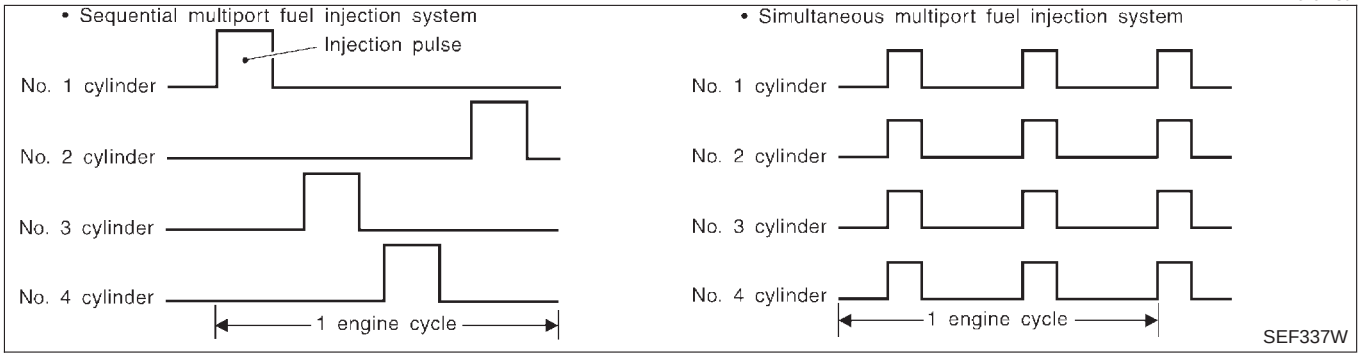
Mixture Ratio Self-learning Control

NLEC1342S06

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

NLEC1342S07



Two types of systems are used.

Sequential Multiport Fuel Injection System

NLEC1342S0701

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

NLEC1342S0702

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

Fuel Shut-off

NLEC1342S08

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

Electronic Ignition (EI) System

DESCRIPTION

NLEC1343

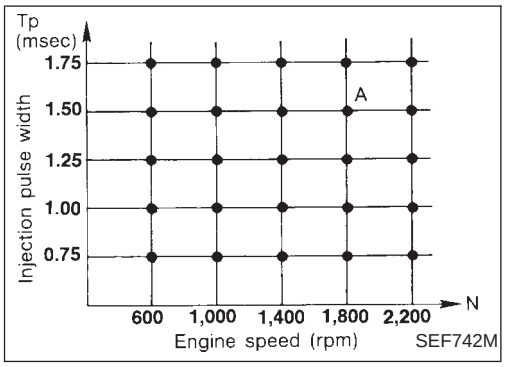
Input/Output Signal Chart

NLEC1343S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position Throttle valve idle position		
Vehicle speed sensor	Vehicle speed		
Ignition switch	Start signal		
Knock sensor	Engine knocking		
PNP switch	Gear position		
Battery	Battery voltage		

System Description

NLEC1343S02



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 above.
The ECM receives information such as the injection pulse width, crankshaft position sensor signal 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
- 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

NLEC1344

Input/Output Signal Chart

NLEC1344S01

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

System Description

NLEC1344S02

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

- When the accelerator pedal is fully depressed.
- When cranking the engine.

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

Fuel Cut Control (at no load & high engine speed)

DESCRIPTION

NLEC1345

Input/Output Signal Chart

NLEC1345S01

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Fuel cut control	Injectors
PNP switch	Neutral position		
Throttle position sensor	Throttle position		
Engine coolant temperature sensor	Engine coolant temperature		
Camshaft position sensor	Engine speed		

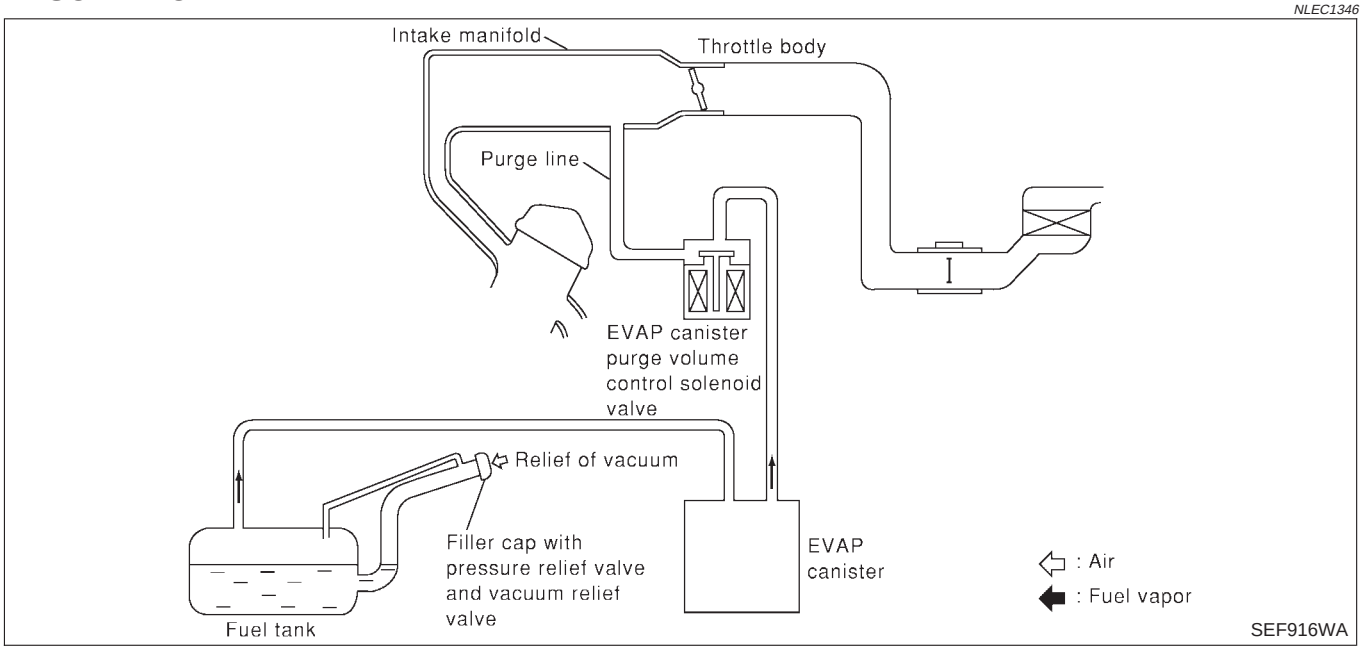
If the engine speed is above 3,950 rpm with no load, (for example, in Neutral and engine speed over 4,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,150 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-569.

Evaporative Emission System

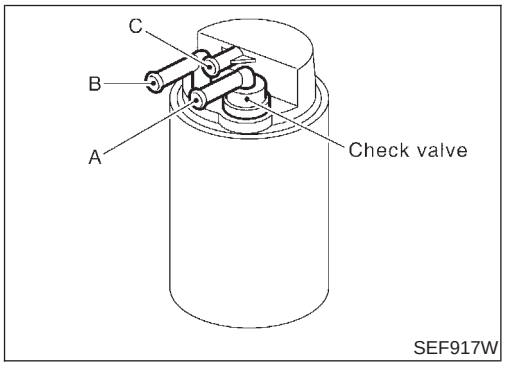
DESCRIPTION

NLEC1346

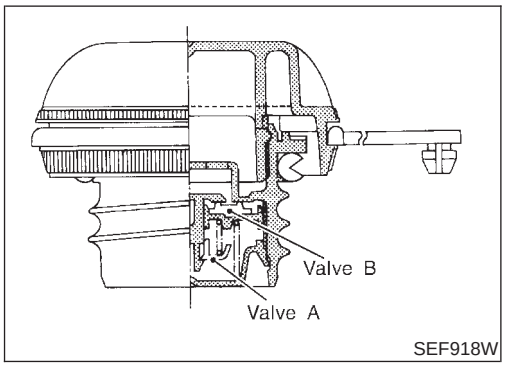


The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon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



SEF917W



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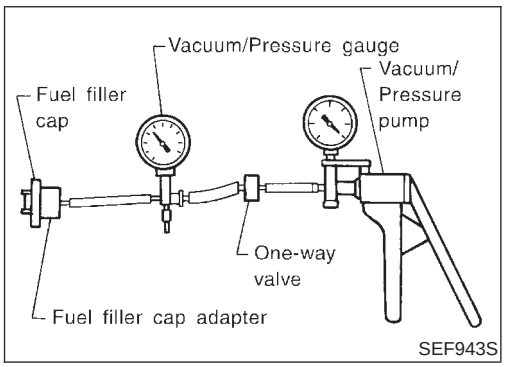


SEF943S

INSPECTION

NLEC1347

EVAP Canister

NLEC1347S01

Check EVAP canister as follows:

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

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

NLEC1347S02

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

   Pressure:

   15.3 - 20.0 kPa (0.15 - 0.20 bar, 0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)

   Vacuum:

   −6.0 to −3.4 kPa (−0.060 to −0.034 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.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve

NLEC1347S03

Refer to EC-857.

Checking EVAP Vapour Lines

NLEC1347S05

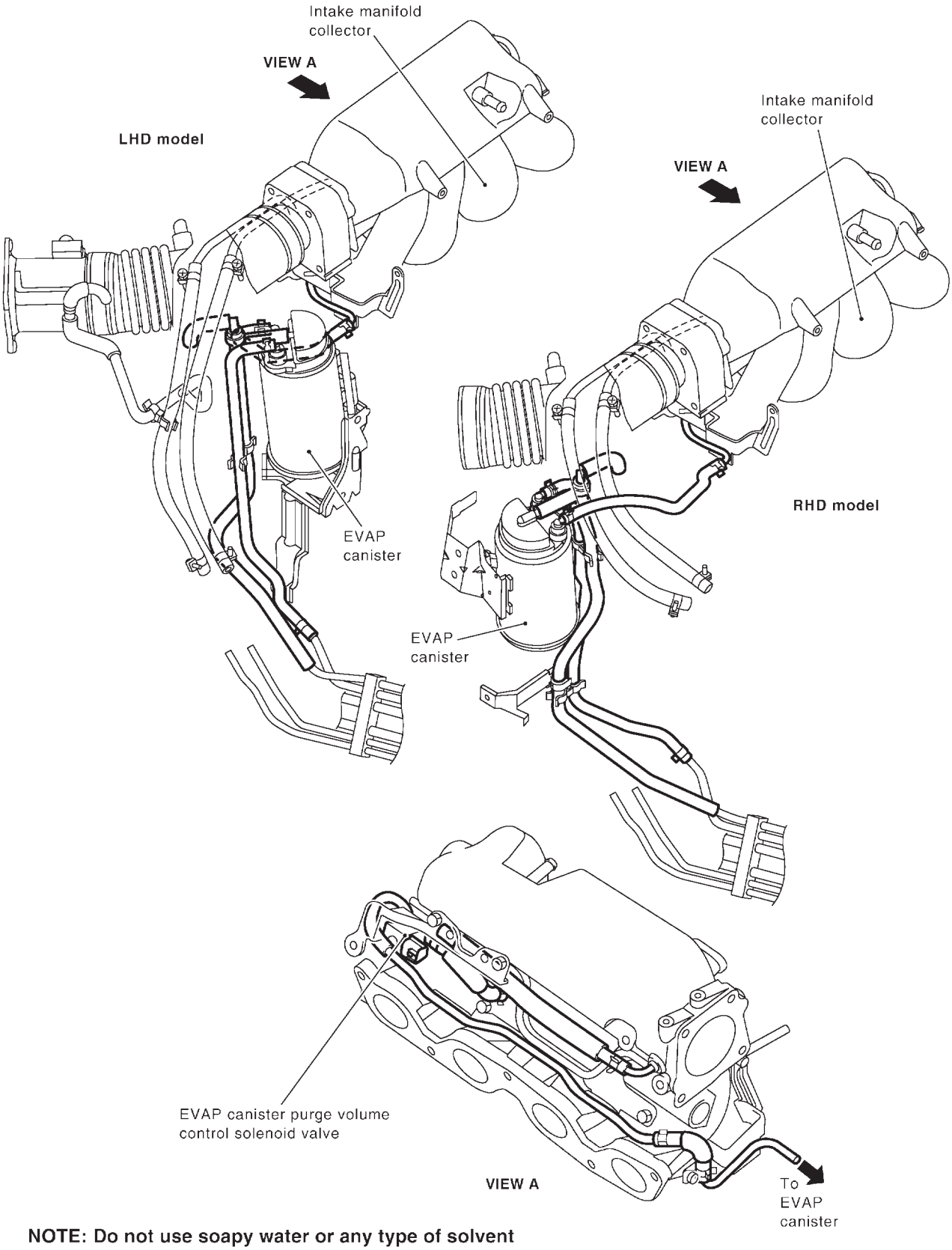
1. Visually inspect vapor lines for leaks, cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc. Refer to next page.

EVAPORATIVE EMISSION LINE DRAWING

=NLEC1348

NOTE:

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



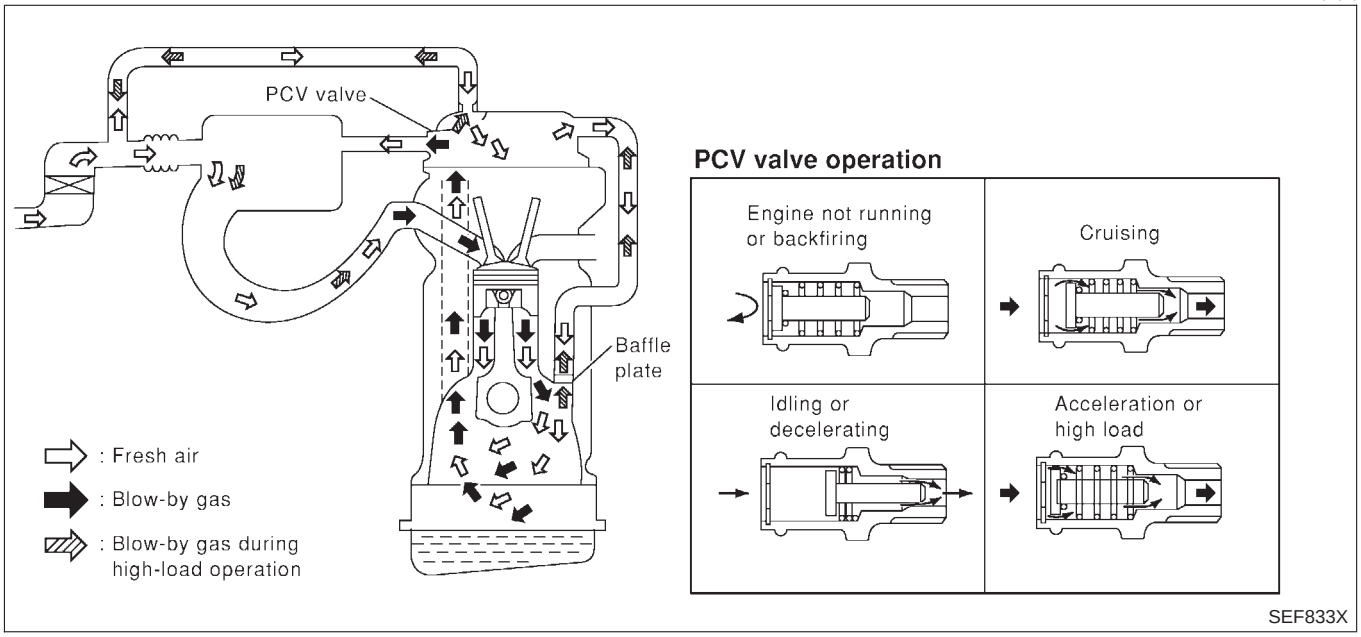
NOTE: Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

SEF767Z

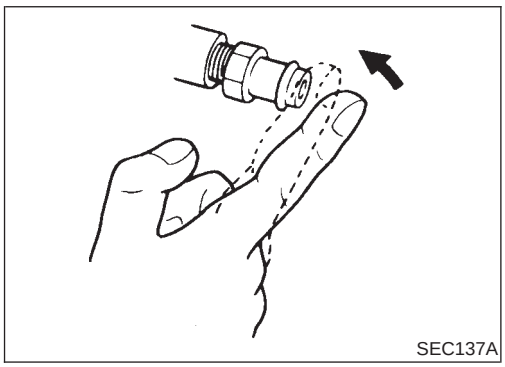
Positive Crankcase Ventilation

DESCRIPTION

NLEC1349



This system returns blow-by gas to the intake collector.
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 duct 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 intake collector under all conditions.



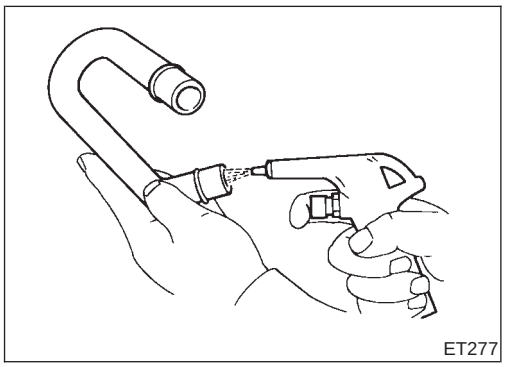
INSPECTION

NLEC1350

PCV (Positive Crankcase Ventilation) Valve

NLEC1350S01

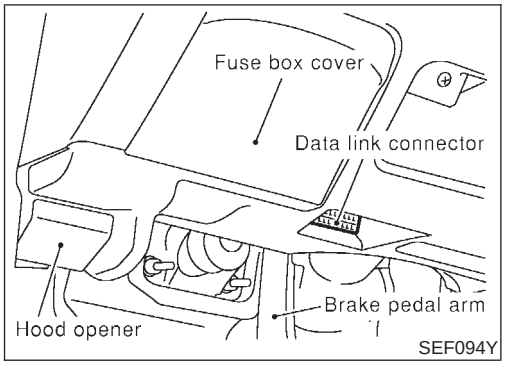
With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.



Ventilation Hose

NLEC1350S02

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.



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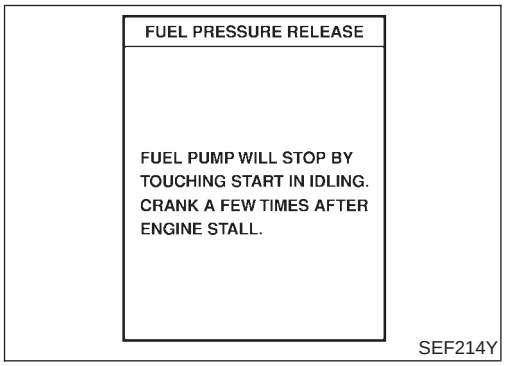


SEF214Y

Fuel Pressure Release

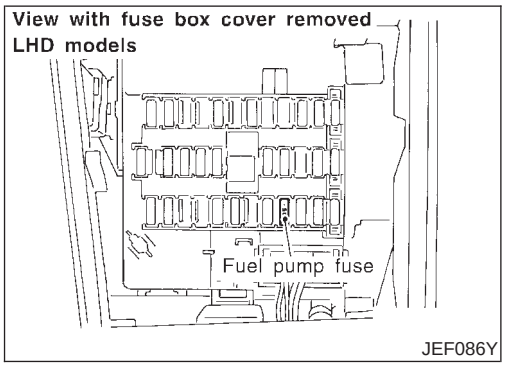
NLEC1351

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

WITH CONSULT-II

NLEC1351S01

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

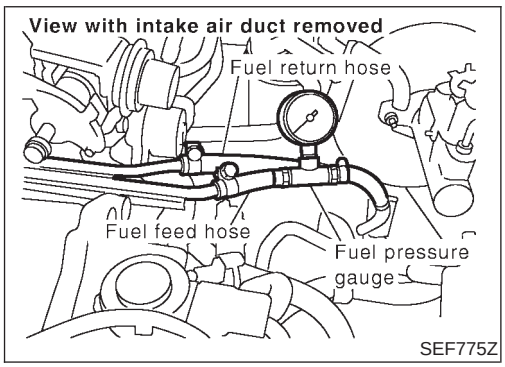


JEF086Y

WITHOUT CONSULT-II

NLEC1351S02

1. Remove fuse for fuel pump. Refer to fuse block cover for fuse location.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF and reconnect fuel pump fuse.



SEF775Z

Fuel Pressure Check

NLEC1352

- **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 hose from fuel feed tube (engine side).
3. Install pressure gauge between fuel hose and fuel feed tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

At idle speed:

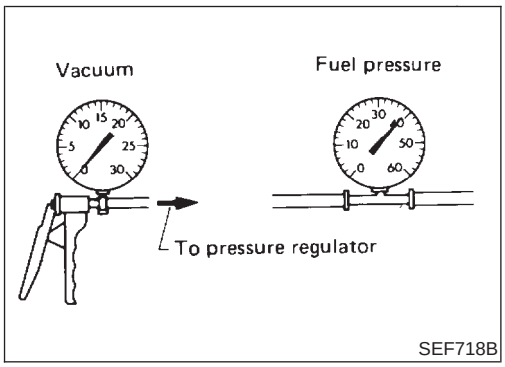
With vacuum hose connected

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, EC-578.



Fuel Pressure Regulator Check

NLEC1353

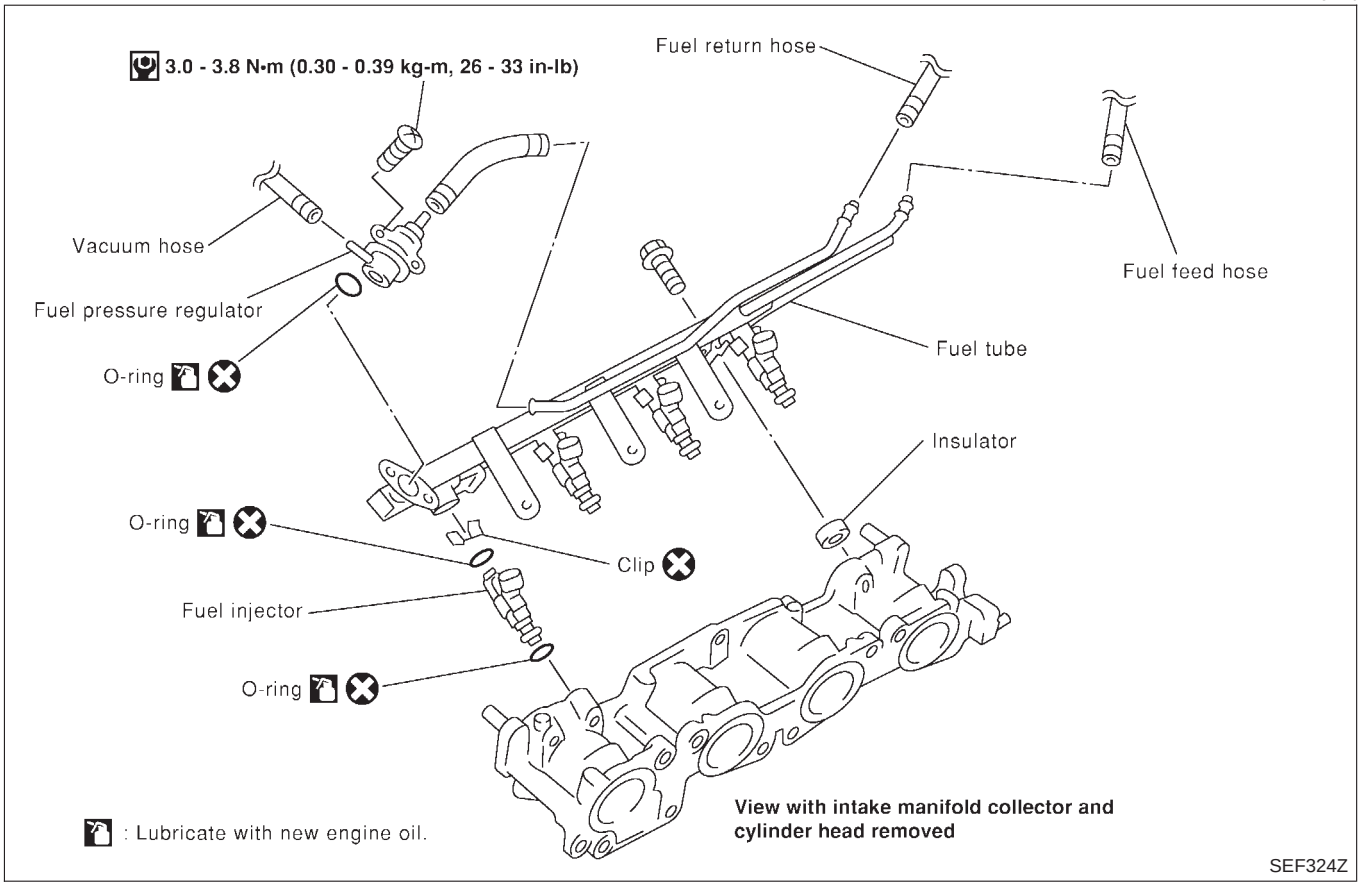
1. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold collector.
2. Plug intake manifold collector with a rubber cap.
3. Connect variable vacuum source to fuel pressure regulator.
4. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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

Injector

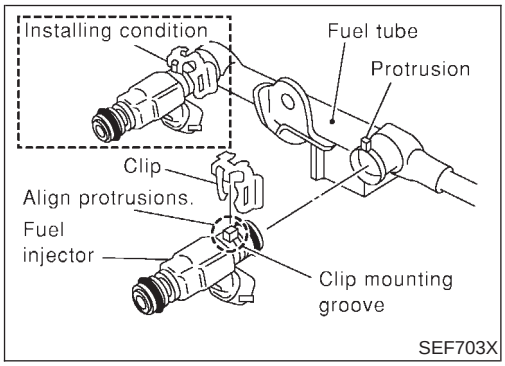
REMOVAL AND INSTALLATION

NLEC1746



1. Release fuel pressure to zero.
2. Remove accelerator wire bracket.
3. Remove EVAP canister purge volume control solenoid valve and the bracket.

4. Remove ventilation hose.
5. Disconnect injector harness connectors.
6. Disconnect fuel pressure regulator vacuum hose from intake manifold collector.
7. Disconnect fuel hoses from fuel tube assembly.
8. Remove injectors with fuel tube assembly.



9. Expand and remove clips securing fuel injectors.
10. Extract fuel injectors straight from fuel tubes.

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

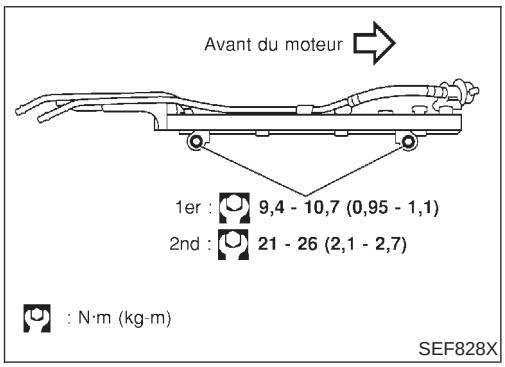
11. Carefully install O-rings, including the one used with the pressure regulator.

- **Lubricate O-rings with a smear of engine oil.**
- **Be careful not to damage O-rings with service tools or finger nails or clips. Do not expand or twist O-rings.**
- **Discard old clips; replace with new ones.**

12. Position clips in grooves on fuel injectors.

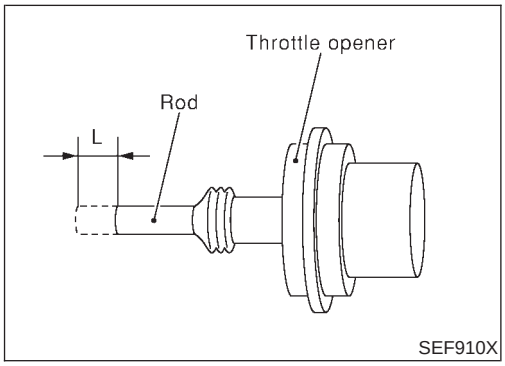
- **Make sure that protrusions of fuel injectors are aligned with cutouts of clips after installation.**

13. Align protrusions of fuel tubes with those of fuel injectors.
14. 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.



15. Tighten fuel tube assembly mounting nuts in two stages.
    : Tightening torque N·m (kg-m, ft-lb)
    1st stage:
    9.4 - 10.7 (0.95 - 1.1, 6.9 - 7.9)
    2nd stage:
    21 - 26 (2.1 - 2.7, 16 - 19)
16. Install all removed parts in the reverse order of removal.

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



THROTTLE OPENER (WHERE FITTED)

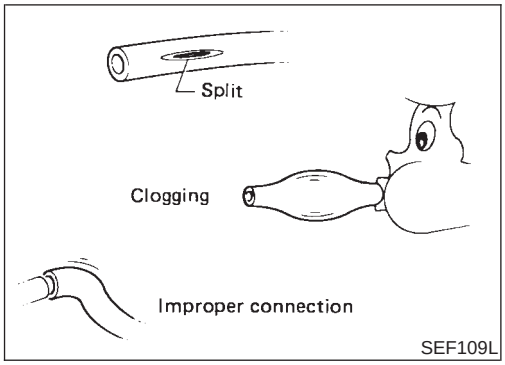
NLEC1747

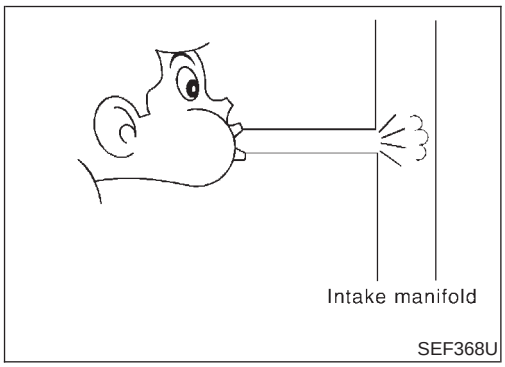
Inspection

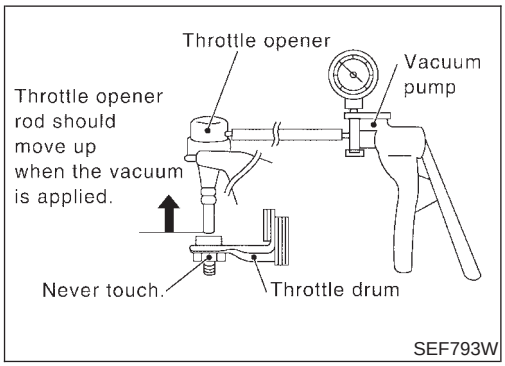
NLEC1747S01

1. Start engine and let it idle.
2. Confirm the amount of the rod moves "L" more than 3.0 mm (0.118 in), the throttle drum becomes free from the rod of the throttle opener.
   If NG, go to next step.
   If OK, inspection is complete.

Injector (Cont'd)







3. Turn ignition switch "OFF".
4. Check vacuum source to throttle opener.

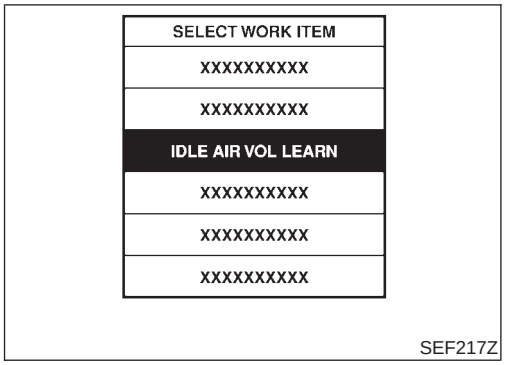
a. Check vacuum hose for disconnection or improper connection.
b. Remove vacuum hose connected to throttle opener.
c. Attach a vacuum gauge to vacuum hose, which is disconnected.
d. Start engine and let it idle.
e. Make sure that the vacuum is more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg).
f. Remove the vacuum gauge.
If NG, go to next step.
If OK, go to step 7.

5. Check vacuum hose for clogging and cracks.
If NG, replace or clean vacuum hose.
If OK, go to next step.
6. Blow air into the throttle chamber and make sure air flows freely.
If NG, replace or clean throttle chamber.
If OK, go to next step.

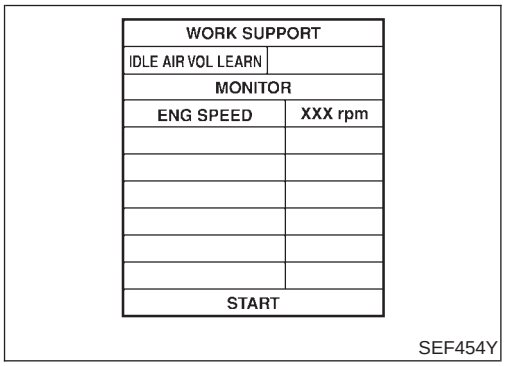
7. Check throttle opener.

a. Connect suitable vacuum hose to vacuum pump as shown at left.
b. Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
c. Confirm the amount of the rod moves more than 3.0 mm (0.118 in), and also the throttle drum becomes free from the rod of the throttle opener.
If NG, go to next step.

8. Check visually for cracking and/or distortion of throttle opener and rod.
If NG, replace throttle opener.
If OK, install the vacuum hose and repeat from step 1 to 2.



SEF217Z



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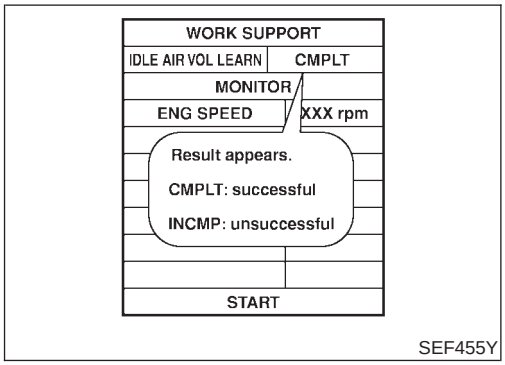


SEF455Y

Idle Air Volume Learning

NLEC1358

DESCRIPTION

NLEC1358S01

"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

NLEC1358S02

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

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)

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

- Cooling fan motor: Not operating
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For models with CONSULT-II, drive vehicle until "FLUID TEMPSE" in "DATA MONITOR" mode of "CVT" indicates less than 0.9V.
  For models without CONSULT-II, drive vehicle for 10 minutes.

OPERATION PROCEDURE

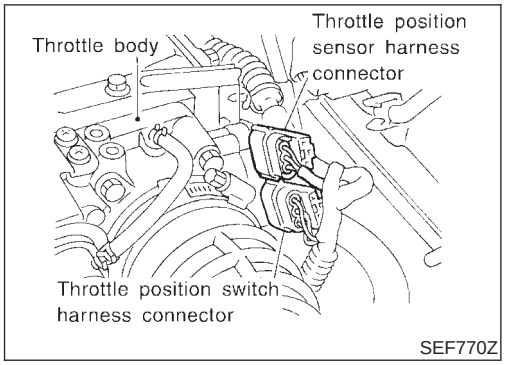
NLEC1358S03

With CONSULT-II

NLEC1358S0301

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 15 seconds.
7. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
8. Touch "START" and wait 15 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	750±50 rpm (in "P" or "N" position)
Ignition timing	15±2° BTDC (in "P" or "N" position)



⊗ Without CONSULT-II

NLEC1358S0302

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 15 seconds.
7. Disconnect throttle position sensor harness connector (brown), then reconnect it within 5 seconds.
8. Wait 15 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	750±50 rpm (in "P" or "N" position)
Ignition timing	15±2° 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 that downstream of throttle valve is free from air leakage.**
3) **Adjust closed throttle position switch and reset memory. (Refer to Basic Inspection, EC-623.)**
4) **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
5) **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

NLEC1359

MODELS WITH EURO-OBD SYSTEM

NLEC1359S01

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
ECM*3	X	X*1	—	—	—	—
CONSULT-II	X	X	X	X	X	—
GST	X	X*2	X	—	X	X

*1: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.
*2: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.
*3: In diagnostic test mode II (Self-diagnostic results), DTC is displayed on MI. DTC uses a set of four digit numbers.

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-647.)

MODELS WITHOUT EURO-OBD SYSTEM

NLEC1359S02

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*1	X	X*2	—	—

*1: In diagnostic test mode II (Self-diagnostic results), (1st trip) DTC is displayed on the MI by a set of four digit numbers.
*2: 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

NLEC1360

MODELS WITH EURO-OBD SYSTEM

NLEC1360S01

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>.

Two Trip Detection Logic (Cont'd)

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.

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 - P0304 is being detected	X	—	—	—	—	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	X	—	—	X	—	—
Fail-safe items (Refer to EC-647.)	—	X	—	—	X*1	—	X*1	—
Except above	—	—	—	X	—	X	X	—

*1: Except "ECM".

MODELS WITHOUT EURO-OBD SYSTEM

NLEC1360S02

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-647), the DTC is stored in the ECM memory even in the 1st trip.

Emission-related Diagnostic Information

NLEC1361

MODELS WITH EURO-OBD SYSTEM

NLEC1361S01

DTC and 1st Trip DTC

NLEC1361S0101

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-594.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-592. 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-621. 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/GST 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]".

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
IACV-AAC VALVE [P0505]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
IACV-AAC VALVE [P0505]	1t

SEF698X

Freeze Frame Data and 1st Trip Freeze Frame Data

NLEC1361S0102

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-610.
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 (0300 - 0304) Fuel Injection System Function — DTC: P0171 (0171), P0172 (0172)
2		Except the above items (Includes CVT 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-594.

System Readiness Test (SRT) Code

NLEC1361S0103

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15031-5.
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

NLEC1361S0104

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
O2 SENSOR	3	Heated oxygen sensor 1 (front) (circuit)	P0130
		Heated oxygen sensor 1 (front) (lean shift monitoring)	P0131
		Heated oxygen sensor 1 (front) (rich shift monitoring)	P0132
		Heated oxygen sensor 1 (front) (response monitoring)	P0133
		Heated oxygen sensor 1 (front) (high voltage)	P0134
		Heated oxygen sensor 2 (rear) (min. voltage monitoring)	P0137
		Heated oxygen sensor 2 (rear) (max. voltage monitoring)	P0138
		Heated oxygen sensor 2 (rear) (response monitoring)	P0139
		Heated oxygen sensor 2 (rear) (high voltage)	P0140
O2 SEN HEATER	3	Front heated oxygen sensor 1 heater (front)	P0135
		Rear heated oxygen sensor 1 heater (rear)	P0141
EGR SYSTEM	3	EGR function (close)	P0400
	1	EGR function (open)	P1402

*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

=NLEC1361S0105

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

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

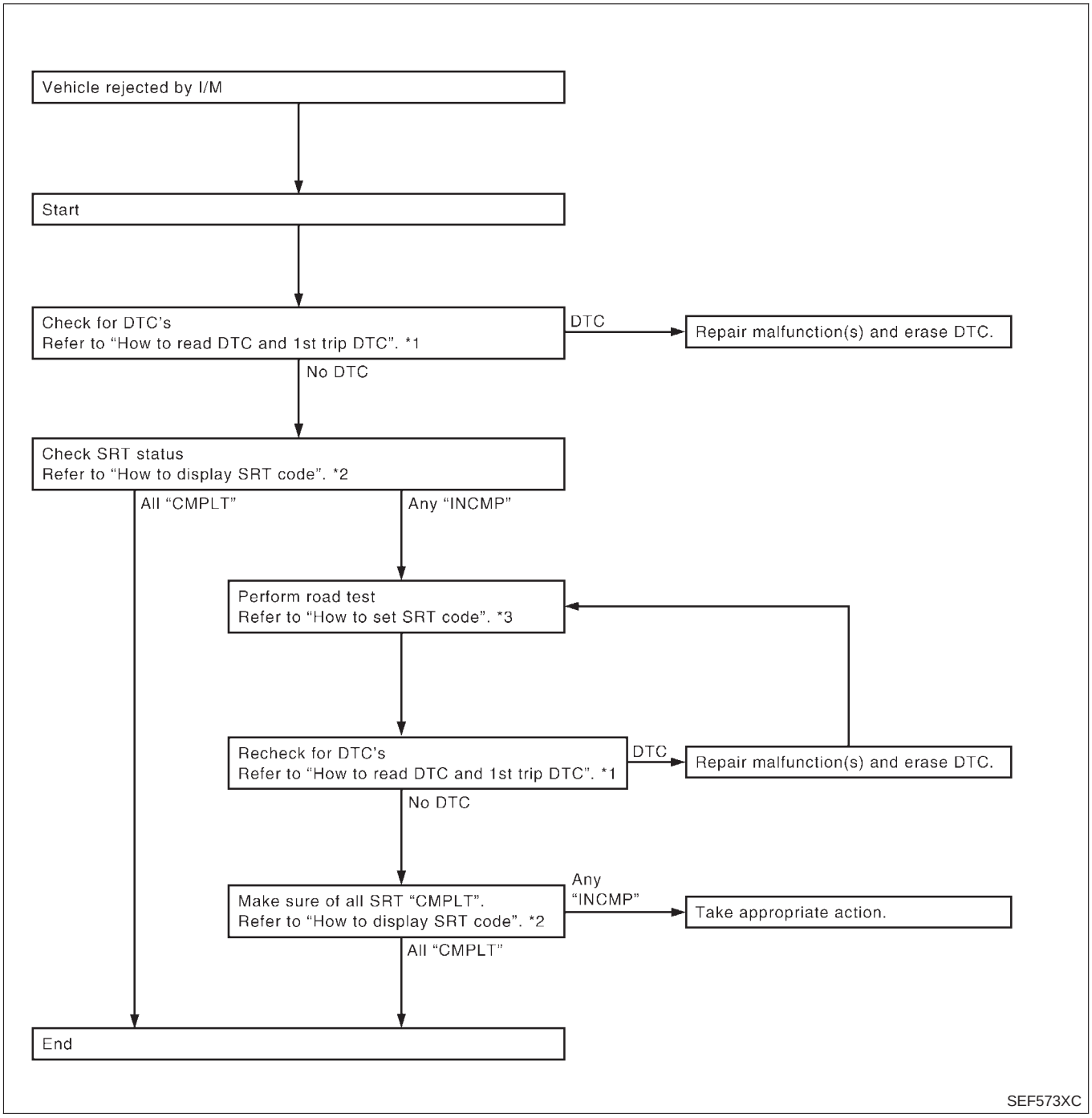
- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory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

NLEC1361S0106

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.

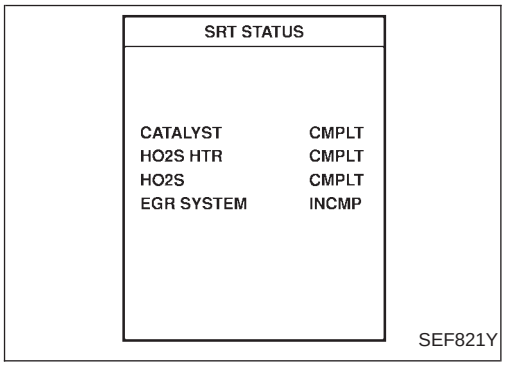


*1 EC-584 *2 EC-588 *3 EC-589

How to Display SRT Code

NLEC1361S0107

1. **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.



2. **With GST**
   Selecting Mode 1 with GST (Generic Scan Tool)

How to Set SRT Code

NLEC1361S0108

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-646.

Without CONSULT-II

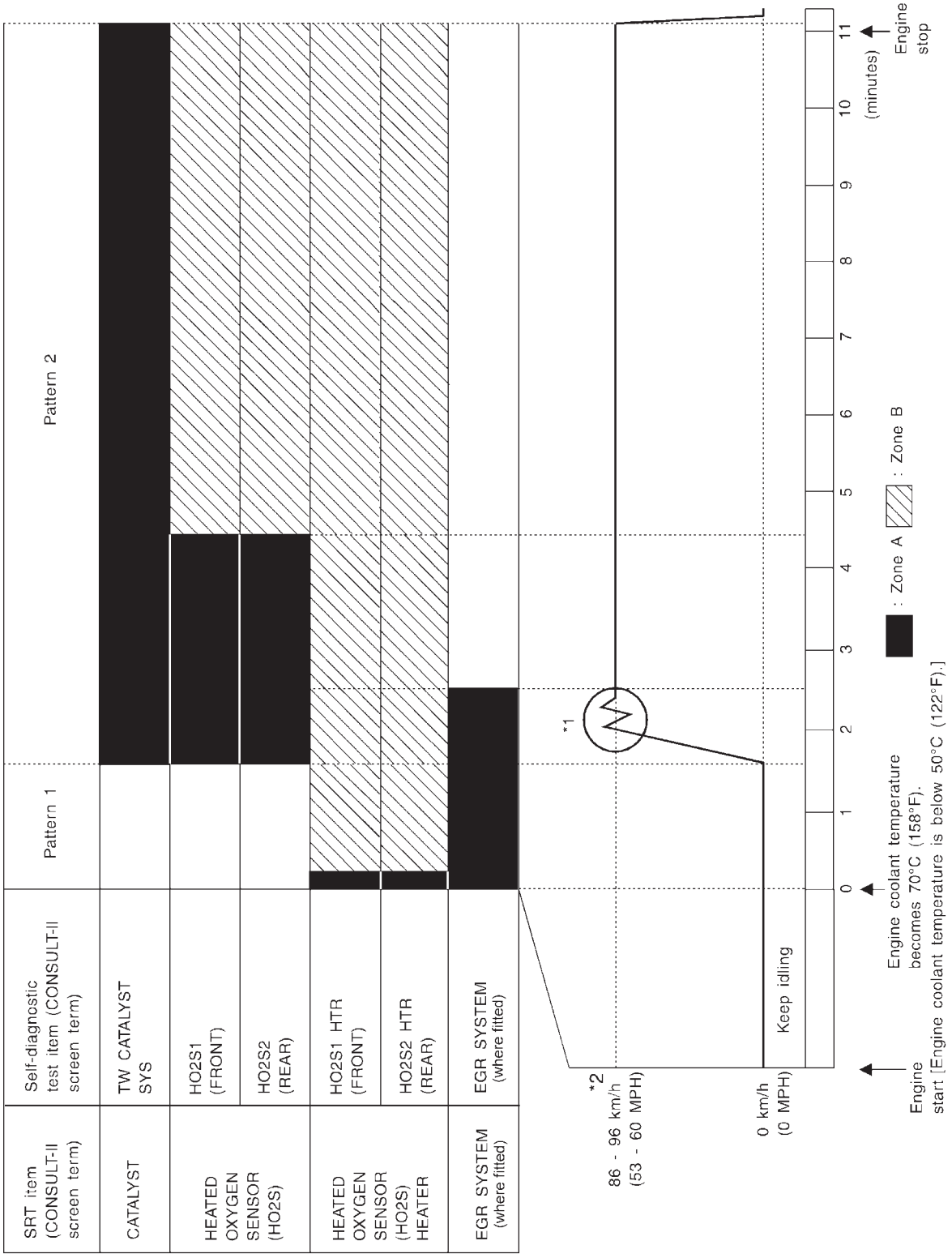
The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern

=NLEC1361S0109

Driving pattern

Note: Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws.
Refer to next page for more information and explanation of chart.



NEF321A

- 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).**

Pattern 2:

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

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.
*2: Checking the vehicle speed with GST is advised.
Suggested transmission gear position for CVT models
Set the selector lever in the "D" position with "SPORTS MODE SW" ON.

Test Value and Test Limit (GST only — not applicable to CONSULT-II)

NLEC1361S0110

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 (14 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	01H	01H	Max.	X
		02H	81H	Min.	X
HO2S	Heated oxygen sensor 1 (front)	09H	04H	Max.	X
		0AH	84H	Min.	X
		0BH	04H	Max.	X
		0CH	04H	Max.	X
		0DH	04H	Max.	X
	Heated oxygen sensor 2 (rear)	19H	86H	Min.	X
		1AH	86H	Min.	X
		1BH	06H	Max.	X
		1CH	06H	Max.	X

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
HO2S HTR	Heated oxygen sensor 1 heater (front)	29H	08H	Max.	X
		2AH	88H	Min.	X
	Heated oxygen sensor 2 heater (rear)	2DH	0AH	Max.	X
		2EH	8AH	Min.	X
EGR SYSTEM (where fitted)	EGR function (where fitted)	31H	8CH	Min.	X
		32H	8CH	Min.	X
		33H	8CH	Min.	X
		34H	8CH	Min.	X
		35H	0CH	Max.	X

Emission-related Diagnostic Information Items

NLEC1361S0111

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 SELF DIAGNOSTIC FAILURE INDICATED	**P0000**	—	—	—	—
MAF SEN/CIRCUIT	P0100	—	—	X	EC-679
AIR TEMP SEN/CIRC	P0110	—	—	X	EC-687
COOLANT T SEN/CIRC	P0115	—	—	X	EC-694
THRTL POS SEN/CIRC	P0120	—	—	X	EC-700
HO2S1 (B1)	P0130	X	X	X*2	EC-709
HO2S1 (B1)	P0131	X	X	X*2	EC-717
HO2S1 (B1)	P0132	X	X	X*2	EC-723
HO2S1 (B1)	P0133	X	X	X*2	EC-729
HO2S1 (B1)	P0134	X	X	X*2	EC-739
HO2S1 HTR (B1)	P0135	X	X	X*2	EC-746
HO2S2 (B1)	P0137	X	X	X*2	EC-752
HO2S2 (B1)	P0138	X	X	X*2	EC-761
HO2S2 (B1)	P0139	X	X	X*2	EC-770
HO2S2 (B1)	P0140	X	X	X*2	EC-779
HO2S2 HTR (B1)	P0141	X	X	X*2	EC-786
FUEL SYS-LEAN/BK1	P0171	—	—	X	EC-792
FUEL SYS-RICH/BK1	P0172	—	—	X	EC-800
MULTI CYL MISFIRE	P0300	—	—	X	EC-808
CYL 1 MISFIRE	P0301	—	—	X	EC-808
CYL 2 MISFIRE	P0302	—	—	X	EC-808
CYL 3 MISFIRE	P0303	—	—	X	EC-808
CYL 4 MISFIRE	P0304	—	—	X	EC-808

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/Test limit (GST only)	1st trip DTC*1	Reference page
KNOCK SEN/CIRC-B1	P0325	—	—	—	EC-815
CKP SEN/CIRCUIT	P0335	—	—	X	EC-819
CMP SEN/CIRCUIT	P0340	—	—	X	EC-825
EGR SYSTEM (where fitted)	P0400	X	X	X*2	EC-834
EGR VOL CONT/V CIRC (where fitted)	P0403	—	—	X	EC-841
TW CATALYST SYS-B1	P0420	X	X	X*2	EC-848
PURG VOLUME CONT/V	P0443	—	—	X	EC-852
VEH SPEED SEN/CIRC	P0500	—	—	X	EC-858
IACV/AAC VLV/CIRC	P0505	—	—	X	EC-863
CLOSED TP SW/CIRC	P0510	—	—	X	EC-872
ECM	P0605	—	—	X	EC-880
PNP SW/CIRC	P0705	—	—	X	Refer to AT section.
ATF TEMP SEN/CIRC	P0710	—	—	X	Refer to AT section.
IN PY SPD SEN/CIRC	P0715	—	—	X	Refer to AT section.
VEH SPD SEN/CIR AT	P0720	—	—	X	Refer to AT section.
ENGINE SPEED SIG	P0725	—	—	X	Refer to AT section.
TCC SOLENOID/CIRC	P0740	—	—	X	Refer to AT section.
L/PRESS SOL/CIRC	P0745	—	—	X	Refer to AT section.
ENG OVER TEMP	P1217	—	—	X	EC-882
CKP SENSOR (COG)	P1336	—	—	X	EC-909
EGR TEMP SEN/CIRC (where fitted)	P1401	—	—	X	EC-915
EGR SYSTEM (where fitted)	P1402	X	X	X*2	EC-921
A/T DIAG COMM LINE	P1605	—	—	X	EC-928
TP SEN/CIRC A/T	P1705	—	—	X	Refer to AT section.
P-N POS SW/CIRCUIT	P1706	—	—	X	EC-931
O/R CLTCH SOL/CIRC	P1760	—	—	X	Refer to AT section.
STEP MOTR CIRC	P1777	—	—	X	Refer to AT section.
STEP MOTR FNC	P1778	—	—	X	Refer to AT section.

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/Test limit (GST only)	1st trip DTC*1	Reference page
LINE PRESS SEN	P1791	—	—	X	Refer to AT section.

*1: 1st trip DTC No. is the same as DTC No.
*2: These are not displayed with GST.

How to Erase Emission-related Diagnostic Information

NLEC1361S0112

How to Erase DTC (With CONSULT-II)

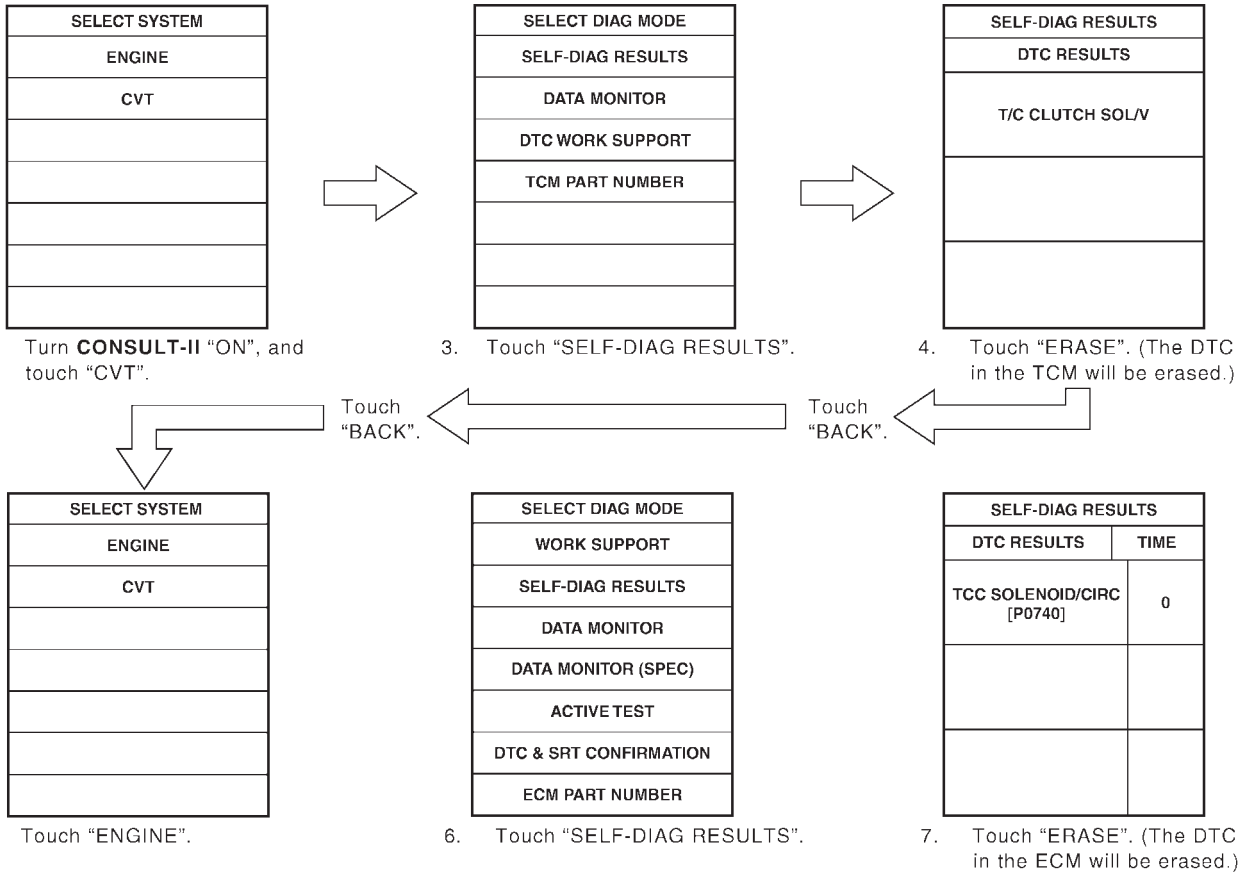
NOTE:
If the DTC is not for CVT related items (see EC-550), skip steps 2 through 4.

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 "CVT".
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.



SEF905Z

The emission-related diagnostic information 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 CVT related items (see EC-550), 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 can be erased by selecting Mode 4 with GST (Generic Scan Tool).

NOTE:

- **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 or GST is easier and quicker than switching the 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) 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

NLEC1361S02

DTC and 1st Trip DTC

NLEC1361S0201

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-596.

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-621. 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

NLEC1361S0202

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-610.
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-596.

How to Erase Emission-related Diagnostic Information

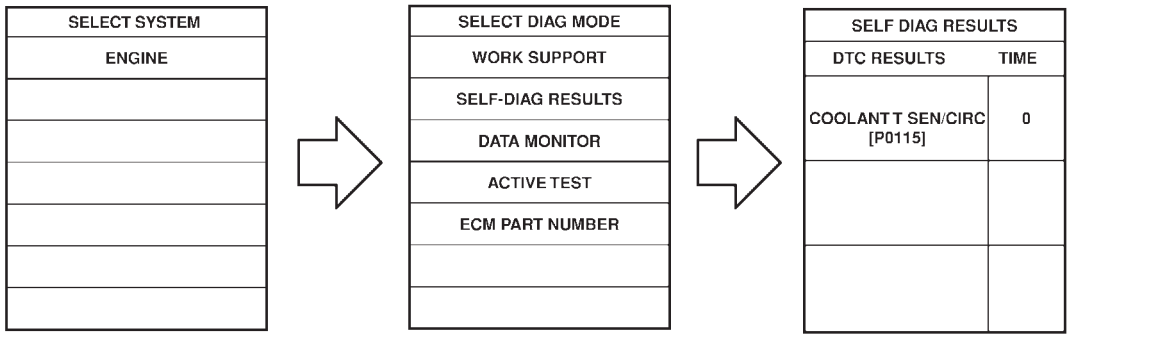
NLEC1361S0203

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.)

SEF993X

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)

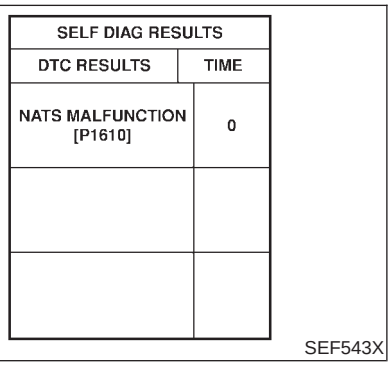
1) If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
2) Change the diagnostic test mode from Mode II to Mode I by using the data link connector. (See EC-600.)

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.



SEF543X

NATS (Nissan Anti-theft System)

NLEC1362

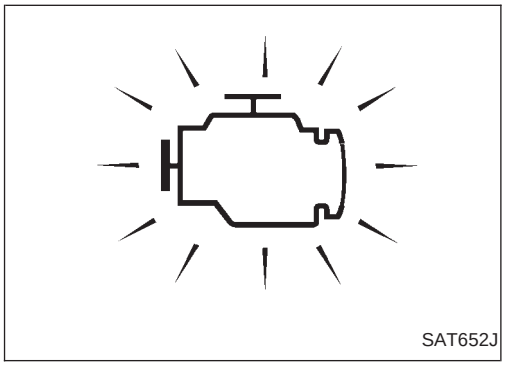
- **If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to NATS (Nissan Anti-Theft System) in EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and**

registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.
Therefore, be sure to receive all keys from vehicle owner.
Regarding the procedure of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

Malfunction Indicator (MI)

DESCRIPTION

NLEC1363


SAT652J

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-156, "WARNING LAMPS" or see EC-1060.
2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.

On Board Diagnostic System Function

NLEC1363S01

The on board diagnostic system has the following four functions.

Diagnostic Test Mode I

1. BULB CHECK:
   This function checks the MI bulb for damage (blown, open circuit, etc.).
   If the MI does not come on, check MI circuit and ECM test mode selector. (See the following page.)
2. MALFUNCTION WARNING:

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

Diagnostic Test Mode II

3. SELF-DIAGNOSTIC RESULTS:
   This function allows DTCs and 1st trip DTCs to be read.
4. 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

NLEC1363S0101

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM test mode following "How to Switch Diagnostic Test Modes".
How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-600.)

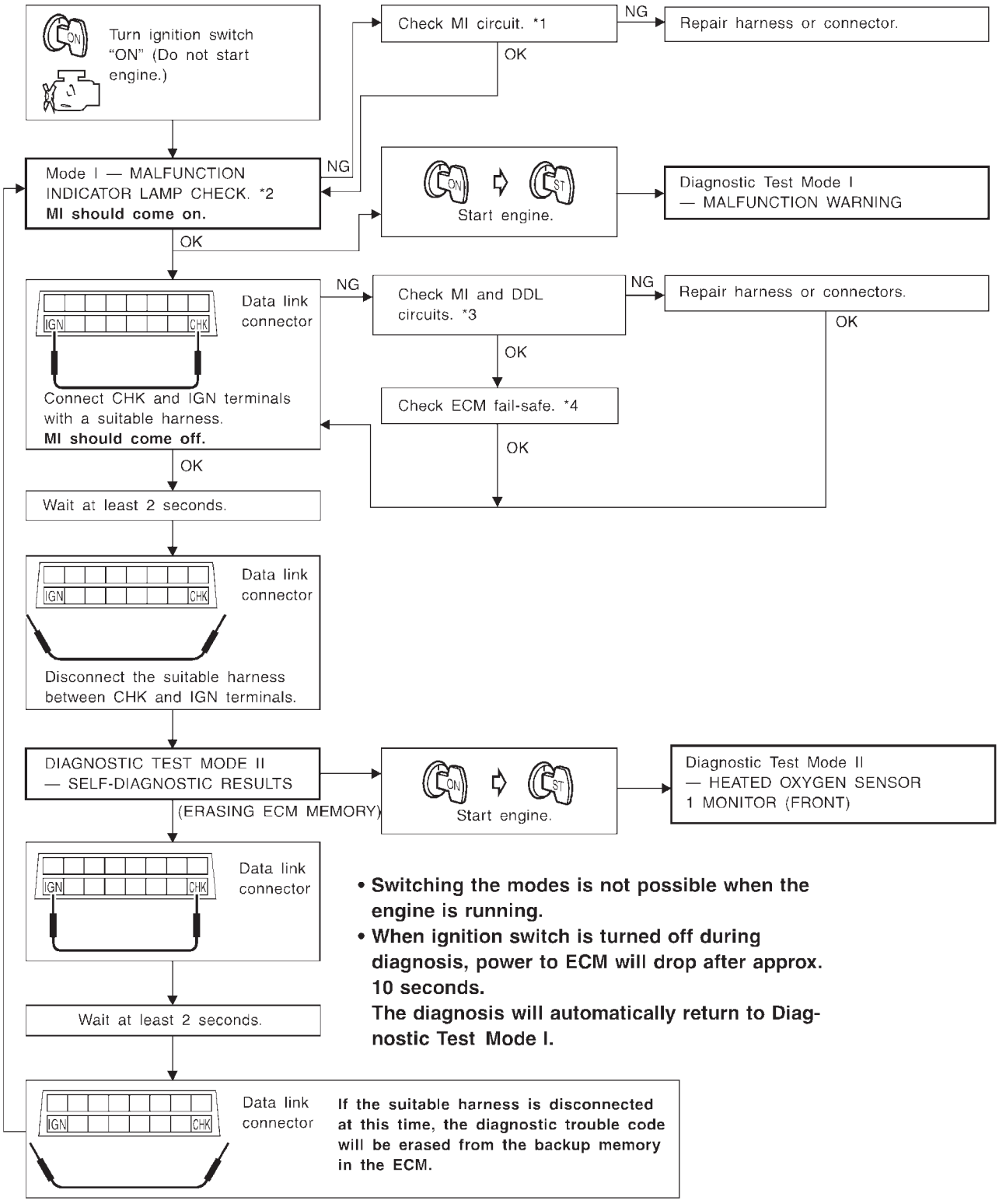
Condition		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in "ON" position 	Engine stopped 	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running 	MALFUNCTION WARNING	HEATED OXYGEN SENSOR 1 MONITOR (FRONT)

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

How to Switch Diagnostic Test Modes

NLEC1363S02



- **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.

SEF951WC

*1: EC-1060
*2: EC-598
*3: EC-1060
*4: EC-647

Diagnostic Test Mode I — Bulb Check

NLEC1363S03

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the MI bulb. Refer to EL-10, "WARNING LAMPS" or see EC-1060.

Diagnostic Test Mode I — Malfunction Warning

NLEC1363S04

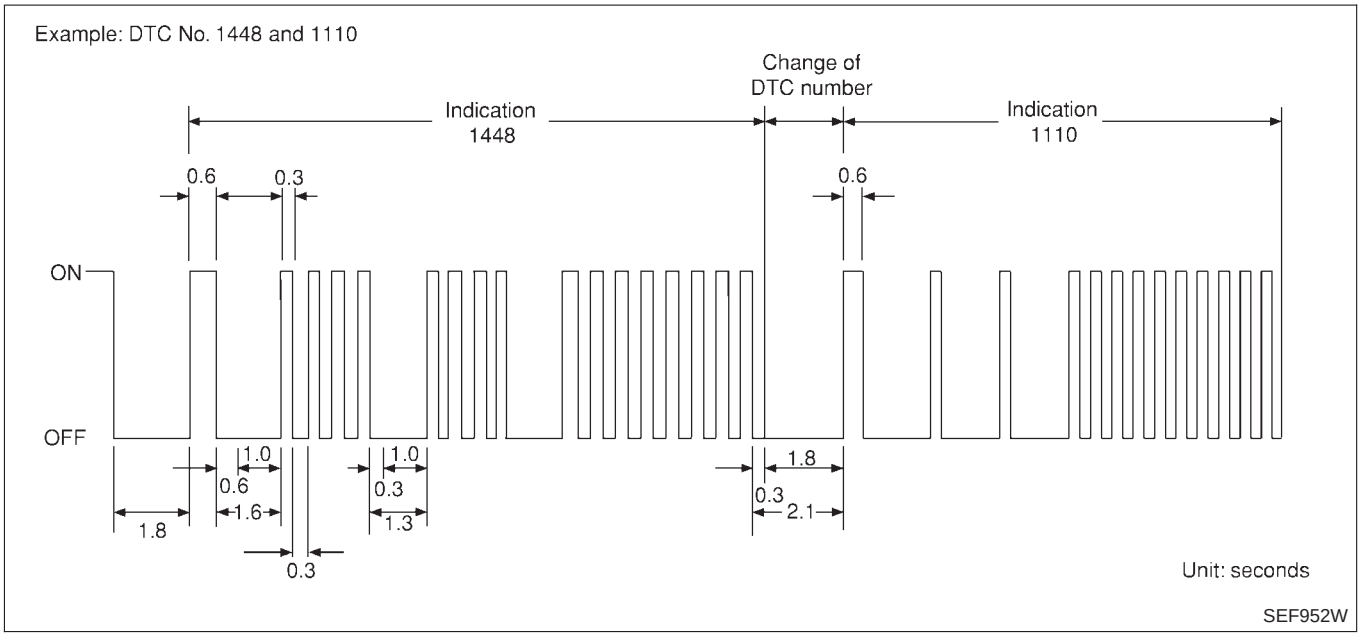
MI	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

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

Diagnostic Test Mode II — Self-diagnostic Results

NLEC1363S05

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 trouble code can be identified by the number of four-digit numeral flashes. The "zero" is indicated by the number of ten flashes. The length of time the 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 trouble code to another occurs at an interval of 1.8 second off.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0000" refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-550.)

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

NLEC1363S0501

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-600.)

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

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

NLEC1363S06

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	

Malfunction Indicator (MI) (Cont'd)

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
*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.

OBD System Operation Chart (With Euro-OBD Models Only)

NLEC1364

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

NLEC1364S01

- 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-583.
- 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

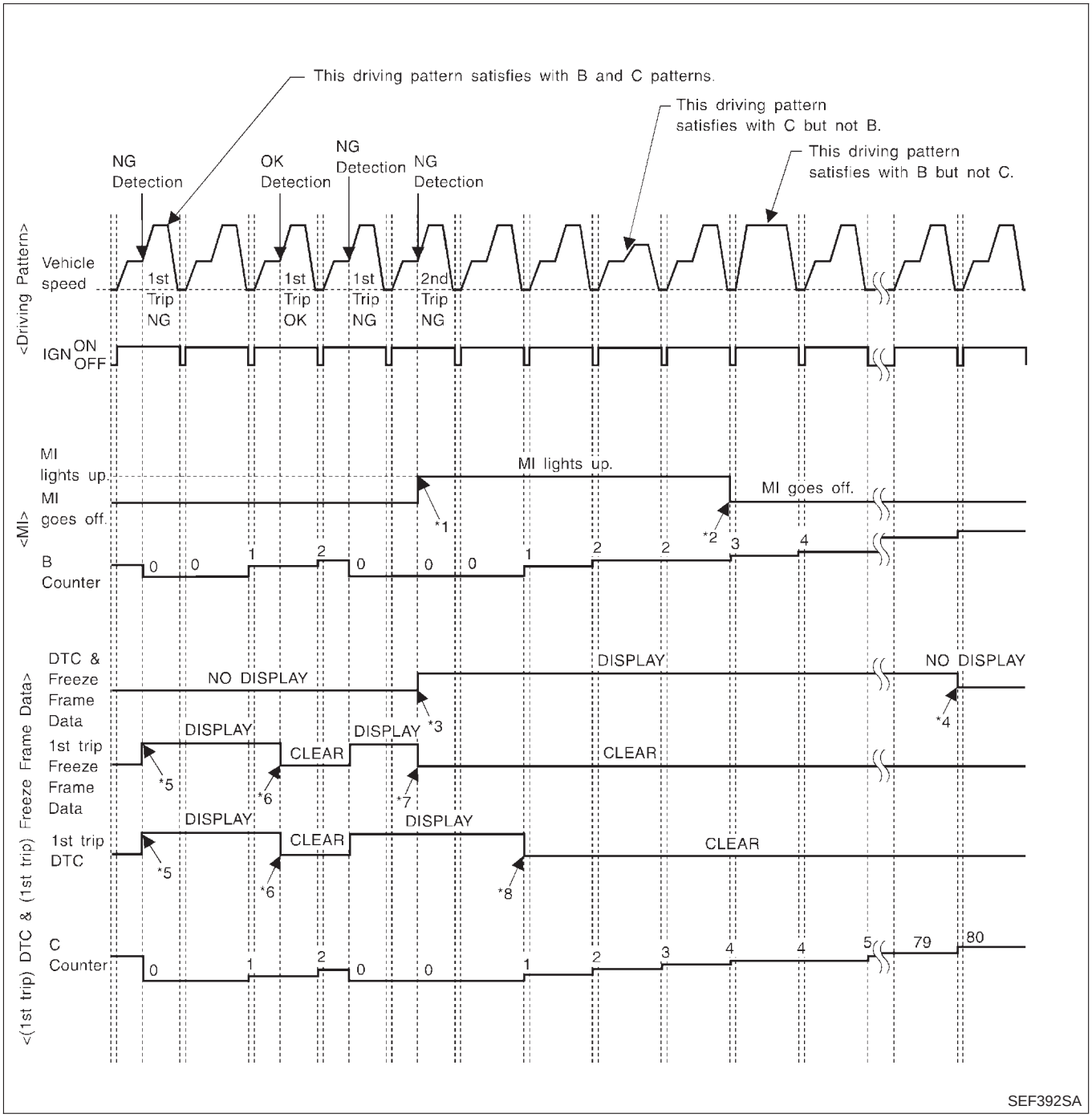
NLEC1364S02

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-604.
For details about patterns "A" and "B" under "Other", see EC-606.
*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"

NLEC1364S03



*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"

NLEC1364S04

Driving Pattern B

NLEC1364S0401

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-603)

Driving Pattern C

NLEC1364S0402

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:

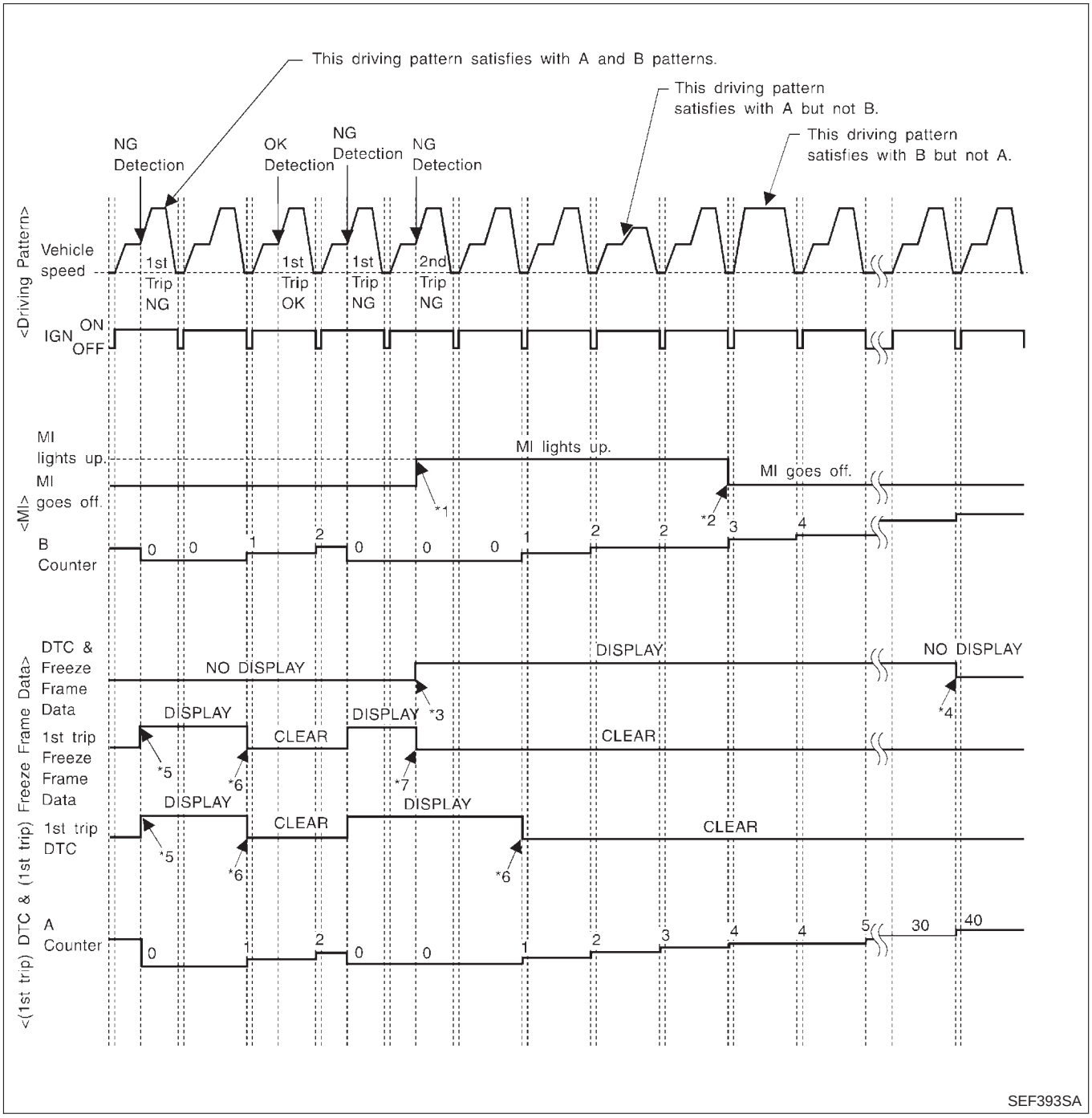
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

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.

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

NLEC1364S05



*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.

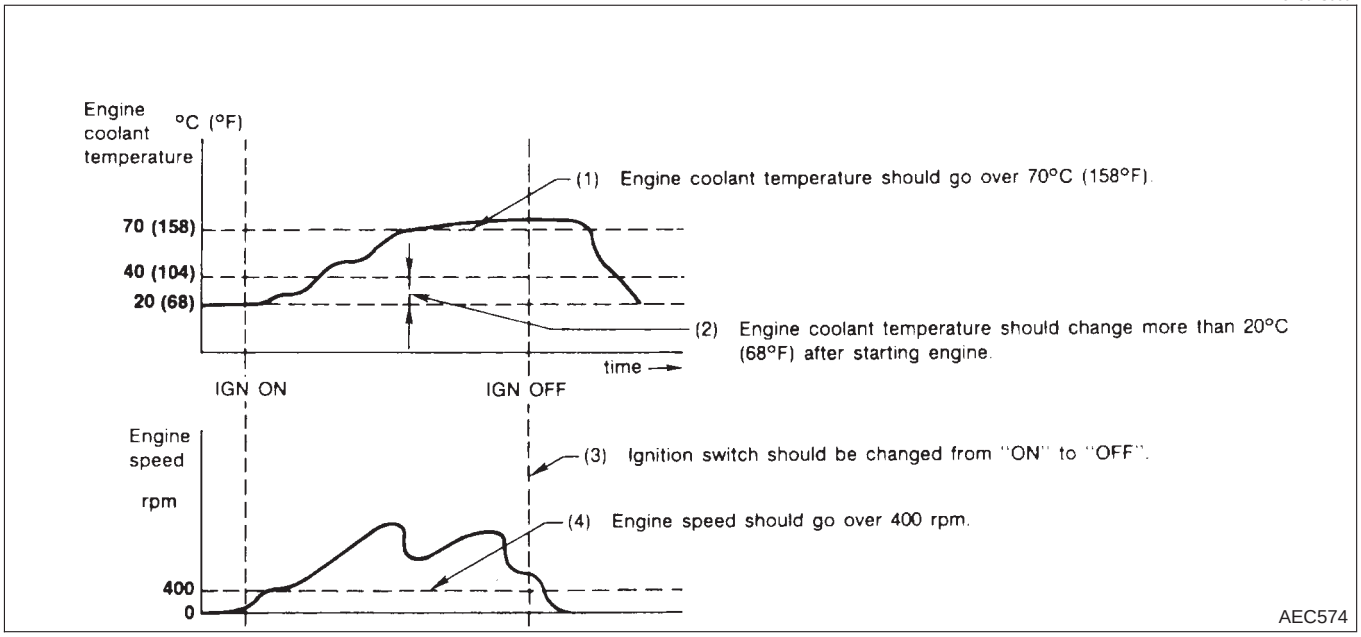
*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

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

NLEC1364S06

Driving Pattern A

NLEC1364S0601



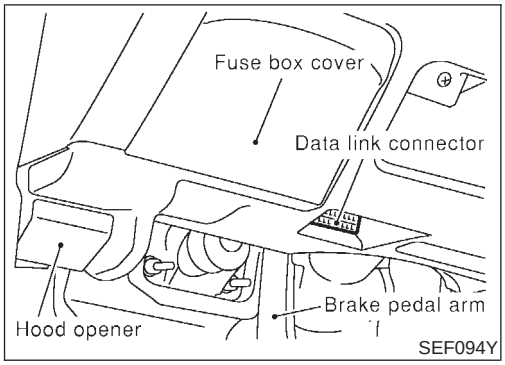
- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

Driving Pattern B

NLEC1364S0602

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-605).



SEF094Y

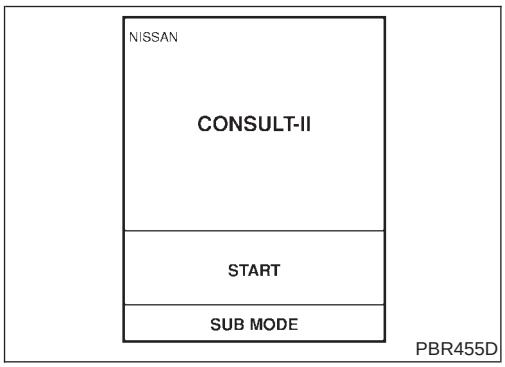
CONSULT-II

=NLEC1365

CONSULT-II INSPECTION PROCEDURE

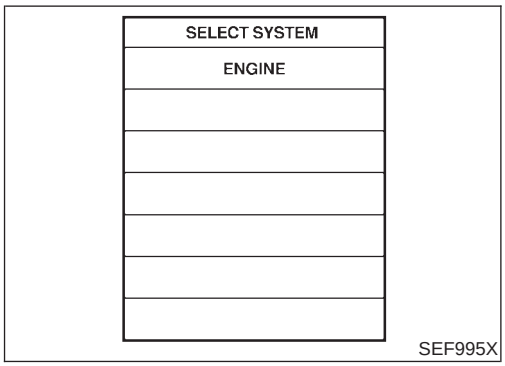
NLEC1365S01

1. Turn ignition switch OFF.
2. Connect “CONSULT-II” to data link connector which is located under lower dash panel near the fuse box cover.



PBR455D

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



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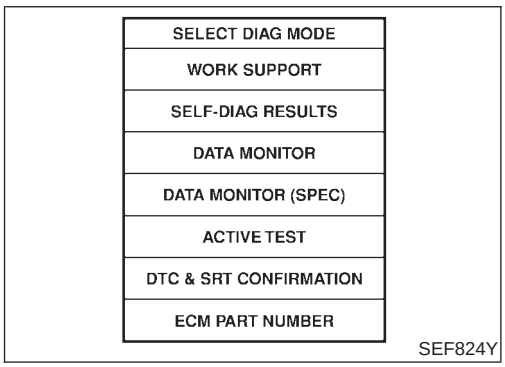
5. Touch “ENGINE”.



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

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

CONSULT-II (Cont'd)

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

NLEC1365S02

		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 STA-TUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Camshaft position sensor		X	Engine speed X	Engine speed X	Engine speed X			
		Crankshaft position sensor (OBD)		X*3						
		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*3	X*3
		Heated oxygen sensor 2 (rear)		X*3		X	X		X*3	X*3
		Vehicle speed sensor		X	X	X	X			
		Throttle position sensor		X		X	X			
		EGR temperature sensor (where fitted)		X*3		X	X			
		Intake air temperature sensor		X*3	X	X	X			
		Knock sensor		X						
		Ignition switch (start signal)				X	X			
		Closed throttle position switch		X						
		Closed throttle position switch (throttle position sensor signal)				X	X			
		Air conditioner switch				X	X			
		Park/Neutral position (PNP) switch		X*3		X	X			
		Power steering oil pressure switch				X	X			
		Electrical load				X	X			
		Heater fan switch				X	X			
		Battery voltage				X	X			

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 STA-TUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	OUT-PUT	Injectors				X	X	X		
		Power transistor (Ignition timing)		X*3 (misfire)		X	X	X		
		IACV-AAC valve	X	X*3		X	X	X		
		EVAP canister purge volume control solenoid valve		X*3		X	X	X		
		Air conditioner relay				X	X			
		Fuel pump relay	X			X	X	X		
		EGR volume control valve (where fitted)		X		X	X	X		X*3
		Heated oxygen sensor 1 heater (front)		X*3		X	X		X*3	
		Heated oxygen sensor 2 heater (rear)		X*3		X	X		X*3	
		Cooling fan		X		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-585, EC-596.

*3: Not applicable for models without Euro-OBD system

FUNCTION

NLEC1365S03

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 and SRT 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

CONSULT-II (Cont'd)

7) Distance traveled while MI is activated.
8) Others

WORK SUPPORT MODE

NLEC1365S04

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
IGNITION TIMING ADJ	● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.	When adjusting initial ignition timing
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-learning control value
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed

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

SELF DIAGNOSTIC MODE

NLEC1365S05

DTC and 1st Trip DTC

NLEC1365S0501

Regarding items of "DTC and 1st trip DTC", refer to "TROUBLE DIAGNOSIS — INDEX", EC-550.

Freeze Frame Data and 1st Trip Freeze Frame Data

NLEC1365S0502

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	● Engine Control component part/control system has a trouble code, it is displayed as "PXXXX". (Refer to "Alphabetical & P No. Index for DTC", EC-550.)
FUEL SYS-B1	● "Fuel injection system status" at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. "MODE 2": Open loop due to detected system malfunction "MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control "MODE 5": Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● "Long-term fuel trim" at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● "Short-term fuel trim" at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH·P/S [%]	● The throttle valve opening angle at the moment a malfunction is detected is displayed.

Freeze frame data item*	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.

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

DATA MONITOR MODE

NLEC1365S06

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	○	○	● Indicates the engine speed computed from the REF signal (180° signal) of the camshaft position sensor.	
MAS A/F SE-B1 [V]	○	○	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		○	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		○	● Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	○	○	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	○	○	● The signal voltage of the heated oxygen sensor 1 (front) is displayed.	
HO2S2 (B1) [V]	○	○	● The signal voltage of the heated oxygen sensor 2 (rear) is displayed.	
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.
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.
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.	

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.	
EGR TEMP SEN [V] (where fitted)	○	○	● The signal voltage of the EGR temperature sensor is displayed.	
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 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 conditioning signal.	
P/N POSI SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the PNP switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure switch signal.	
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.	
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.
IGN TIMING [BTDC]		○	● Indicates the ignition timing computed by ECM according to the input signals.	
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 [gm/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	
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 computed by the ECM according to the inpuct signals. ● The opening becomes larger as the value increases.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
EGR VOL CON/V [step] (where fitted)		○	● Indicates the EGR volume control valve computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
AIR COND RLY [ON/OFF]		○	● Indicates the air conditioner relay control condition determined by ECM according to the input signals.	
FUEL PUMP RLY [ON/OFF]		○	● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
COOLING FAN [HIGH/LOW/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.	
HO2S2 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater (rear) determined by ECM according to the input signals.	
IDL A/V LEARN			● 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.	
TRVL AFTER MIL [km] or [Mile]			● Distance traveled while MI is activated	
VOLTAGE [V]			● Voltage measured by the voltage probe.	
PULSE [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.

DATA MONITOR (SPEC) MODE

NLEC1365S07

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.

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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.

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

ACTIVE TEST MODE

NLEC1365S08

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)
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.
IACV-AAC/V OPENING	● Engine: After warming up, idle the engine. ● Change the IACV-AAC valve opening steps using CONSULT-II.	Engine speed changes according to the opening steps.	● Harness and connector ● IACV-AAC valve
POWER BALANCE	● Engine: After warming up, idle the engine. ● Air conditioner 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 coil ● Ignition wires
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan "HIGH", "LOW" and "OFF" using CONSULT-II.	Cooling fan moves at high speed or low speed and stops.	● Harness and connector ● Cooling fan motors ● Cooling fan relays
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature indication using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay "ON" and "OFF" using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connector ● Fuel pump relay
EGR VOL CONT/V (where fitted)	● Engine: After warming up, idle the engine. ● Change the EGR volume control valve opening step using CONSULT-II.	EGR volume control valve maks an operating sound.	● Harness and connector ● EGR volume control valve

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
PURG VOL CONT/V	● Engine: After warming up, idle the engine. ● 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 ● EVAP canister purge volume control solenoid valve

DTC AND SRT CONFIRMATION MODE

NLEC1365S09

This mode is not available for models without Euro-OBD system.

SRT STATUS Mode

NLEC1365S0901

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-586.

SRT Work Support Mode

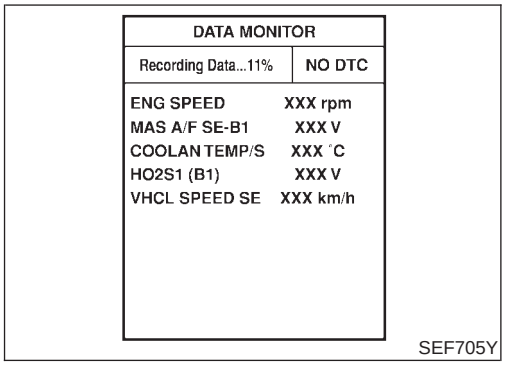
NLEC1365S0902

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

DTC Work Support Mode

NLEC1365S0903

TEST MODE	TEST ITEM	CONDITION	REFERENCE PAGE
HEATED OXYGEN SENSOR 1 (FRONT)	HO2S1 (B1) P0130	Refer to corresponding trouble diagnosis for DTC.	EC-709
	HO2S1 (B1) P0131		EC-717
	HO2S1 (B1) P0132		EC-723
	HO2S1 (B1) P0133		EC-729
HEATED OXYGEN SENSOR 2 (REAR)	HO2S2 (B1) P0137		EC-752
	HO2S2 (B1) P0138		EC-761
	HO2S2 (B1) P0139		EC-770
EGR SYSTEM (where fitted)	EGR SYSTEM P0400		EC-834
	EGR SYSTEM P1402		EC-921



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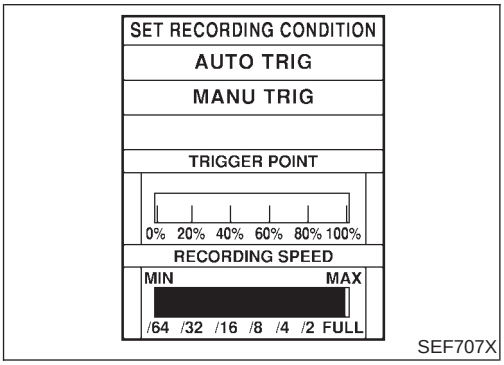

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REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

NLEC1365S10

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.

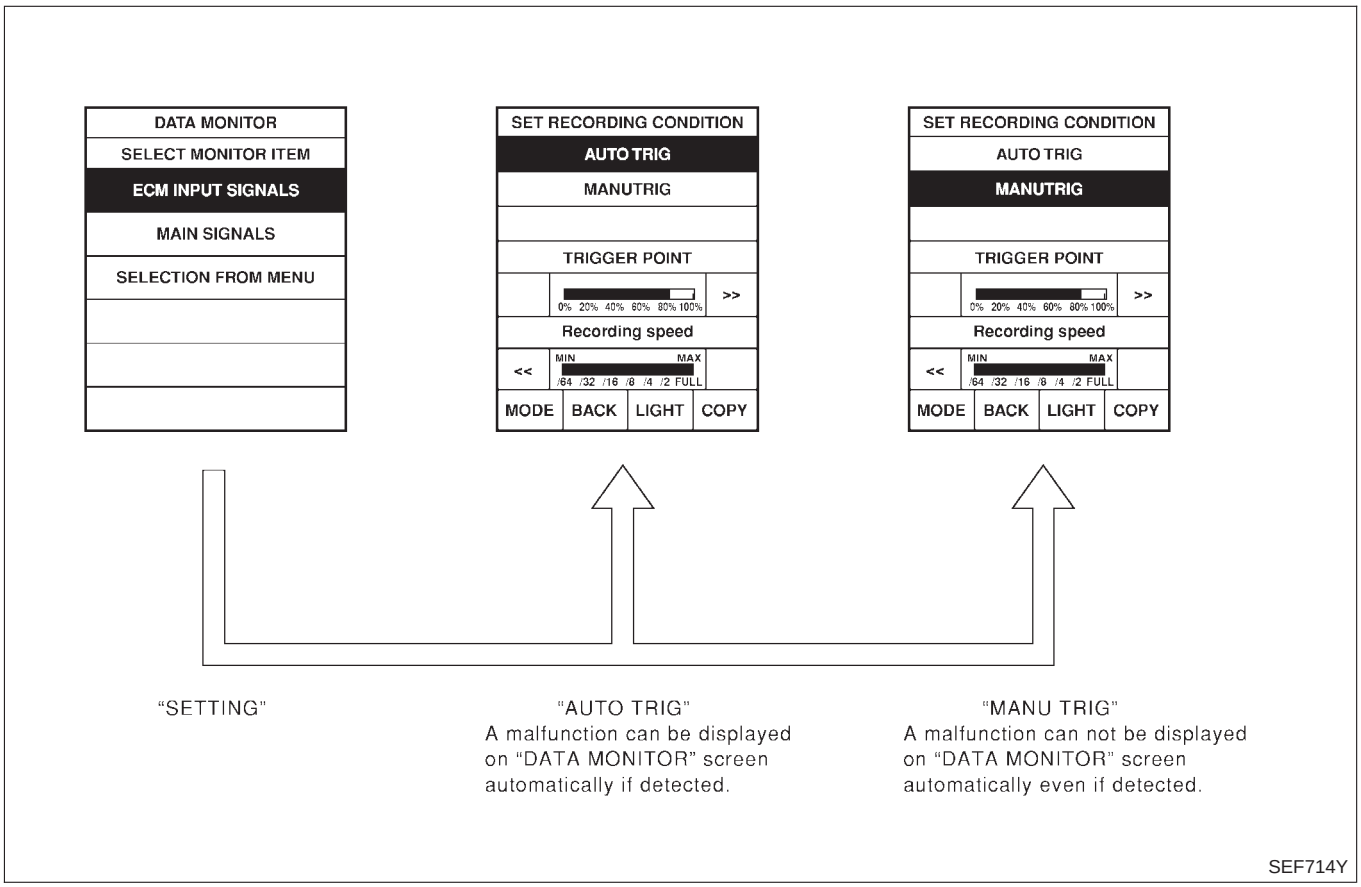
Use these triggers as follows:

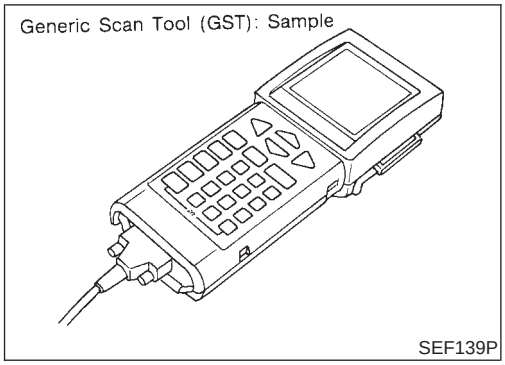
1) "AUTO TRIG"

- 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.





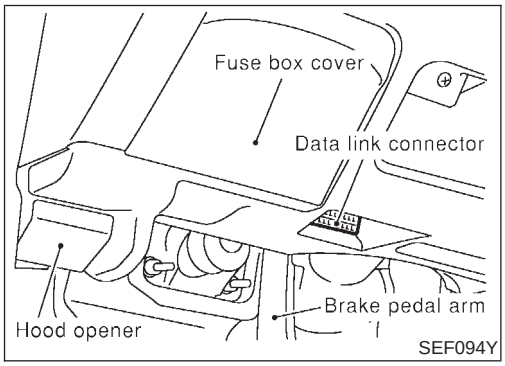
Generic Scan Tool (GST)

=NLEC1366

DESCRIPTION

NLEC1366S01

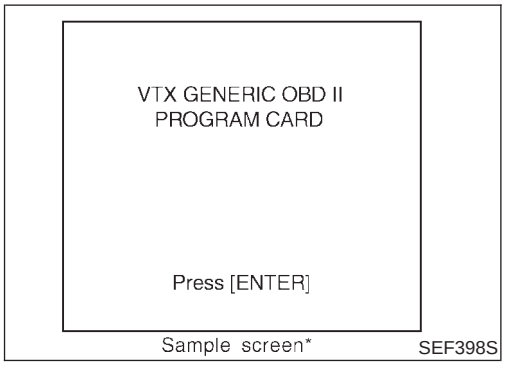
Generic Scan Tool (OBDII scan tool) complying with ISO 15031-4 has 9 different functions explained on the next page.
ISO 9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



GST INSPECTION PROCEDURE

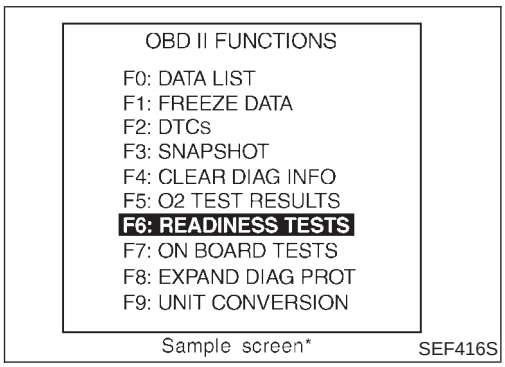
NLEC1366S02

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



3. Turn ignition switch ON.
4. Enter the program according to instruction on the screen or in the operation manual.

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



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

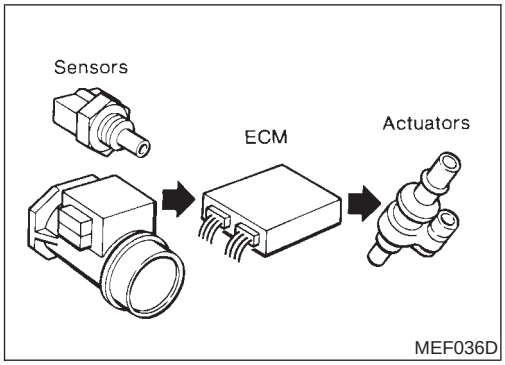
For further information, see the GST Operation Manual of the tool maker.

Generic Scan Tool (GST) (Cont'd)

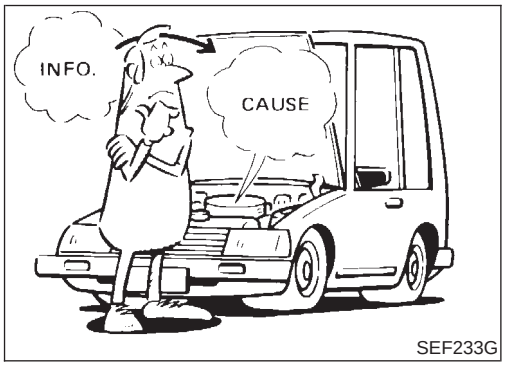
FUNCTION

NLEC1366S03

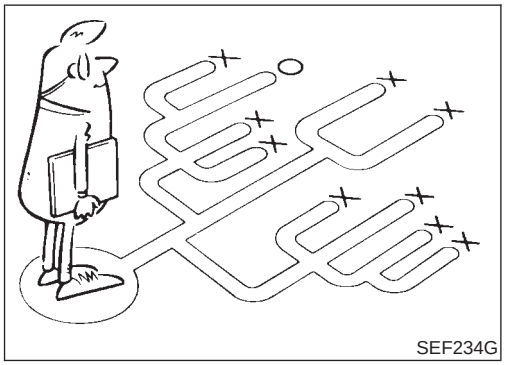
Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, distance traveled while MI is activated and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. (For details, refer to "Freeze Frame Data", EC-610.)
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

NLEC1367

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 GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-621.

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

NLEC1367S01

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.

Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected.

Example:

Vehicle ran out of fuel, which caused the engine to misfire.

Worksheet Sample

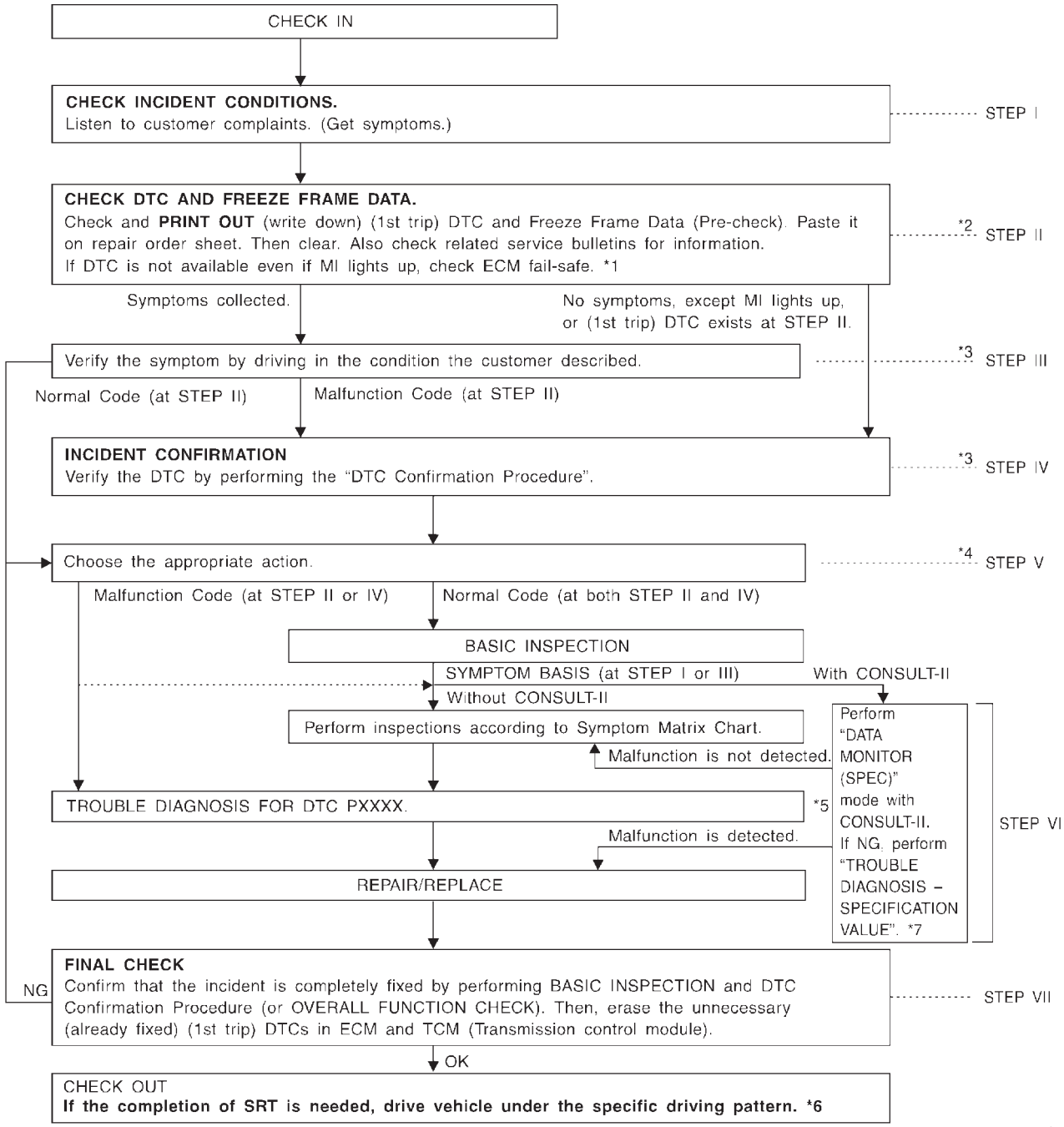
NLEC1367S0101

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 lamp		☐ Turned on ☐ Not turned on	

MTBL0311

Work Flow

NLEC1368



SEF510ZD

*1 EC-647

*2 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

*3 If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

*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-671.

*5 If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

*6 EC-590

*7 EC-666

Work Flow (Cont'd)

DESCRIPTION FOR WORK FLOW

NLEC1368S01

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-620.
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-594, EC-596.) 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-670. 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-648.) 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-670. 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-670. 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-623. If CONSULT-II is available, perform "DATA MONITOR (SPEC)" mode with CONSULT-II and proceed to the "TROUBLE DIAGNOSIS-SPECIFICATION VALUE", EC-666. (If malfunction is detected, proceed to "REPAIR/REPLACE". Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-648.)
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-657. 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 section ("HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT", "Circuit Inspection"). Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.
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-594, EC-596.)

Basic Inspection (Models with Throttle Opener)

NLEC1369

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

- Headlamp switch is OFF,

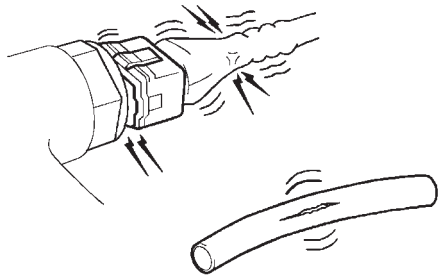
On vehicle equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.

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

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 OPENER OPERATION

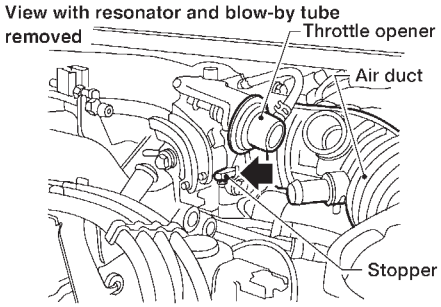
1. Start engine and let it idle.
2. Confirm that the throttle drum becomes free from the rod of the throttle opener.

OK or NG

OK	▶	GO TO 3.
NG	▶	Check throttle opener. Refer to “INSPECTION”, EC-579.

3	CHECK THROTTLE DRUM OPERATION

Confirm that throttle drum moves to contact the stopper.



LEC267

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 4.

4	CHECK ACCELERATOR WIRE INSTALLATION

1. Stop engine.
2. Check accelerator wire for slack.

OK or NG

OK	▶	GO TO 5.
NG	▶	Adjust accelerator wire. Refer to FE-3, "Adjusting Accelerator Wire".

5	CHECK THROTTLE VALVE OPERATION

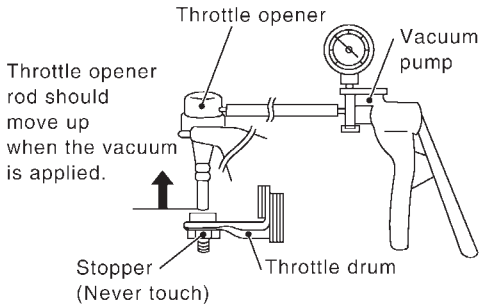
1. Remove intake air ducts.
2. Check throttle valve operation when moving throttle drum by hand.

OK or NG

OK	▶	Retighten the throttle drum fixing nuts.
NG	▶	Clean the throttle body and throttle valve.

6	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-I

NOTE:
Always check ignition timing before performing the following.
1. Warm up engine to normal operating temperature.
2. Stop engine.
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to vacuum pump as shown below.



SEF793WA

5. Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum is free from the throttle opener rod.

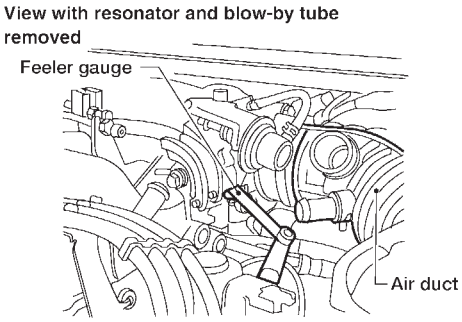
With CONSULT-II	▶	GO TO 7.
Without CONSULT-II	▶	GO TO 13.

7	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-II

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "CVT", then select "CLOSED THL/SW" in "DATA MONITOR" mode with CONSULT-II.
3. Read "CLOSED THL/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.



LEC270

DATA MONITOR	
MONITOR	NO DTC
CLOSED THL/SW	ON

SEF059Y

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

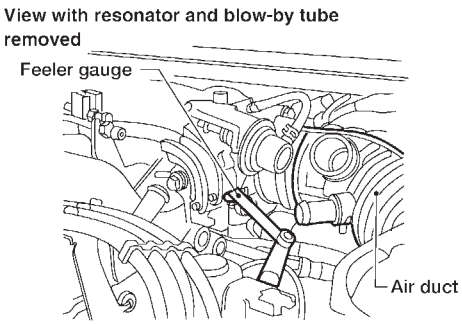
OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 8.

8	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

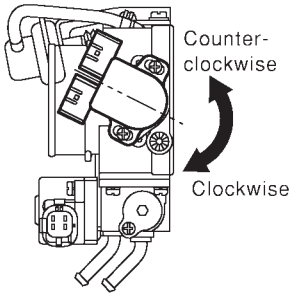
With CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Confirm that proper vacuum is applied. Refer to test No. 6. During adjustment, vacuum should be applied.
3. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.



LEC270

4. Turn throttle position sensor body counterclockwise until "CLOSED THL/SW" signal switches to "OFF".



SEF867X

DATA MONITOR	
MONITOR	NO DTC
CLOSED THL/SW	OFF

SEF060Y

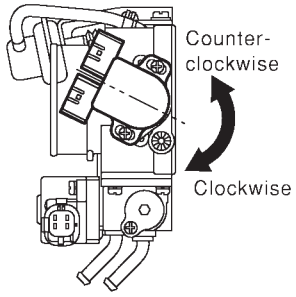
▶	GO TO 9.

9	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 "CLOSED THL/SW" signal switches from "OFF" to "ON", then temporarily tighten sensor body fixing bolts.**



SEF867X

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 "CLOSED THL/SW" signal again.

The signal remains "OFF" while closing throttle valve.

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 8.

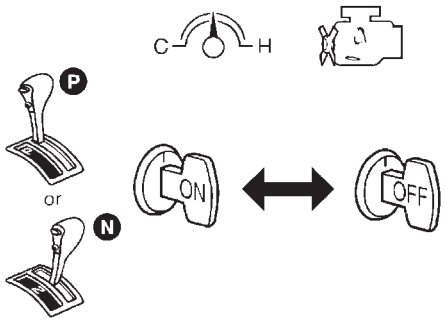
10	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

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. Confirm that proper vacuum is applied. Refer to Test No. 6.
2. Attach blind cap to vacuum port from which vacuum hose to throttle opener was disconnected.
3. Start engine.
4. Warm up engine to normal operating temperature.
5. Select "ENGINE" and then select "CLSD THL POS" in "DATA MONITOR" mode.
6. Stop engine. (Turn ignition switch "OFF".)
7. Turn ignition switch "ON" and wait at least 10 seconds.



SEF864V

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

DATA MONITOR	
MONITOR	NO DTC
CLSD THL POS	ON

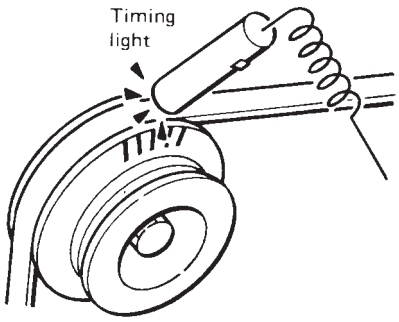
SEF061Y

▶	GO TO 11.

11	CHECK IGNITION TIMING-I

With CONSULT-II

1. Turn ignition switch "OFF".
2. Release vacuum from throttle opener.
3. Remove vacuum pump and vacuum hose from throttle opener.
4. Reinstall original vacuum hose to throttle opener securely.
5. Start engine and warm it up to normal operating temperature.
6. Select "IGNITION TIMING ADJ" in "WORK SUPPORT" mode with CONSULT-II.
7. Touch "START".
8. Check ignition timing at idle using a timing light.



SEF284G

Ignition timing:
15°±2° BTDC (in "P" or "N" position)

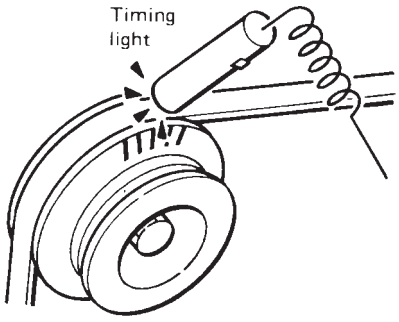
OK or NG

OK	▶	GO TO 12.
NG	▶	1. Adjust ignition timing by turning distributor. 2. GO TO 12.

12	CHECK IGNITION TIMING-II

With CONSULT-II

Touch "MODE" or "BACK". (Cancel "IGNITION TIMING ADJ" in "WORK SUPPORT" mode.)
Check ignition timing at idle using a timing light.



SEF284G

Ignition timing:
15°±2° BTDC (in "P" or "N" position)

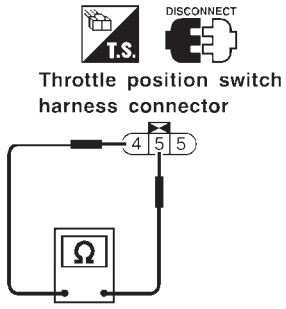
OK or NG

OK	▶	GO TO 26.
NG	▶	GO TO 19.

13	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-II

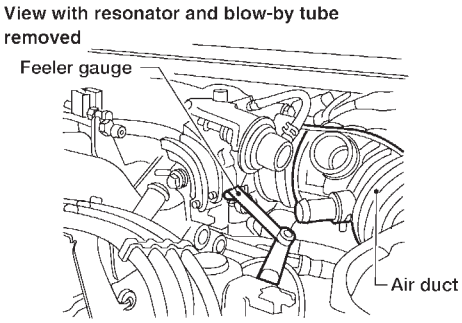
Without CONSULT-II

1. Disconnect closed throttle position switch harness connector.
2. Check continuity between closed throttle position switch terminals **5** and **6** under the following conditions.



SEF769Z

- 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.



LEC270

"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.

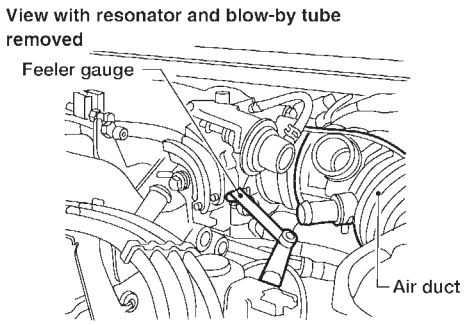
OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 14.

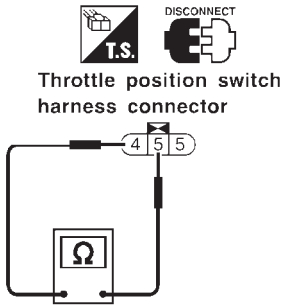
14	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

Without CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Confirm that proper vacuum is applied. Refer to Test No. 6. During adjustment, vacuum should be applied.
3. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.

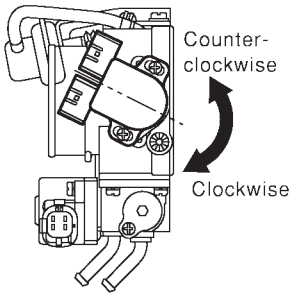


LEC270



SEF769Z

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



SEF867X

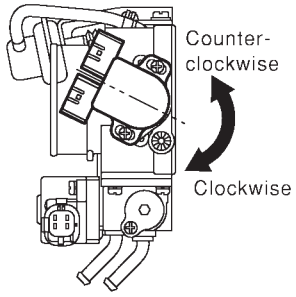
▶	GO TO 15.

15	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.**



SEF867X

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 16.
NG	▶	GO TO 14.

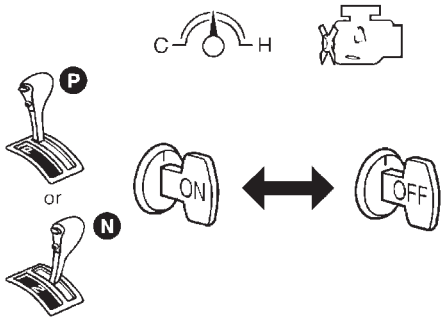
16	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

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. Confirm that proper vacuum is applied. Refer to Test No. 6.
2. Attach blind cap to vacuum port from which vacuum hose to throttle opener was disconnected.
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

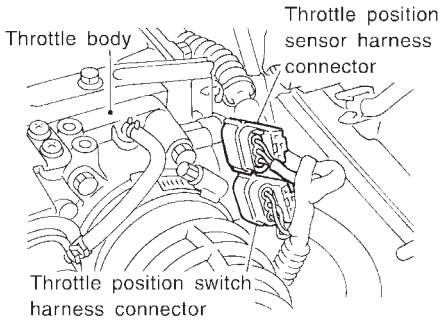
7. Turn ignition switch "OFF" and wait at least 10 seconds.
8. Repeat steps 6 and 7, 20 times.

	▶	GO TO 17.

17	CHECK IGNITION TIMING-I

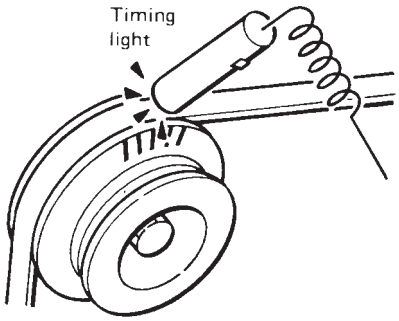
Without CONSULT-II

1. Turn ignition switch "OFF".
2. Release vacuum from throttle opener.
3. Remove vacuum pump and vacuum hose from throttle opener.
4. Reinstall original vacuum hose to throttle opener securely.
5. Start engine and warm it up to normal operating temperature.
6. Stop engine and disconnect throttle position sensor harness connector.



SEF770Z

7. Start engine.
8. Check ignition timing at idle using a timing light.



SEF284G

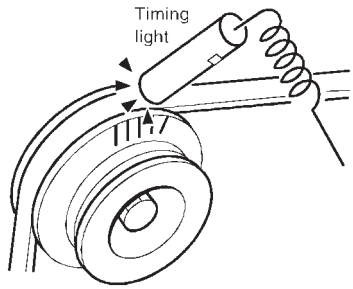
Ignition timing:
15°±2° BTDC (in "P" or "N" position)

OK or NG

OK	▶	GO TO 18.
NG	▶	1. Adjust ignition timing by turning distributor. 2. GO TO 18.

18	CHECK IGNITION TIMING-II

1. Stop engine.
2. Reconnect throttle position sensor harness connector.
3. Start engine and let it idle.
4. Check ignition timing at idle using a timing light.



SEF984U

Ignition timing:
15°±2° BTDC (in "P" or "N" position)

OK or NG

OK	▶	GO TO 29.
NG	▶	GO TO 19.

19	PERFORM IDLE AIR VOLUME LEARNING

Refer to "Idle Air Volume Learning", EC-581.
Is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT	▶	GO TO 20.
INCMP	▶	Follow the instruction of "Idle Air Volume Learning".

20	CHECK IGNITION TIMING AGAIN

Check ignition timing again. Refer to Test No. 12 (With CONSULT-II) or 18 (Without CONSULT-II).

OK or NG

OK (With CONSULT-II)	▶	GO TO 26.
OK (Without CONSULT-II)	▶	GO TO 29.
NG	▶	GO TO 21.

21	CHECK FOR INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an air leak from PCV hose and after IACV-AAC valve.

OK or NG

OK	▶	GO TO 23.
NG	▶	GO TO 22.

22	REPAIR MALFUNCTION

1. Stop engine.
2. Repair or replace malfunctioning part.

	▶	GO TO 19.

23	DETECT MALFUNCTIONING PART	
Check the IACV-AAC valve circuit and function. Refer to EC-863 (Models with Euro-OBD system) or EC-995 (Models without Euro-OBD system).		
OK or NG		
OK	▶	GO TO 25.
NG	▶	GO TO 24.

24	REPAIR MALFUNCTION	
Repair or replace malfunction part following the "Diagnostic Procedure" corresponding the detected malfunction.		
	▶	GO TO 19.

25	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 NATS system and registration of NATS ignition key IDs. Refer to "NATS (Nissan Anti-theft System)", EC-597.		
	▶	GO TO 19.

26	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. 3. Check idle speed. **750±50 rpm (in "P" or "N" position)**		
OK or NG		
OK	▶	GO TO 32.
NG	▶	GO TO 27.

27	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-581. **Is the result CMPLT or INCMP?**		
CMPLT or INCMP		
CMPLT	▶	GO TO 28.
INCMP	▶	Follow the instruction of "Idle Air Volume Learning".

28	CHECK TARGET IDLE SPEED AGAIN	
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. **750±50 rpm (in "P" or "N" position)**		
OK or NG		
OK	▶	GO TO 32.
NG	▶	GO TO 21.

29	CHECK TARGET IDLE SPEED
⊗ **Without CONSULT-II** 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **750±50 rpm (in "P" or "N" position)**	
OK or NG	
OK ▶	GO TO 32.
NG ▶	GO TO 30.

30	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-581. **Is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	GO TO 31.
INCMP ▶	Follow the instruction of "Idle Air Volume Learning".

31	CHECK TARGET IDLE SPEED AGAIN
1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **750±50 rpm (in "P" or "N" position)**	
OK or NG	
OK ▶	GO TO 32.
NG ▶	GO TO 21.

32	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-594, 596 and "HOW TO ERASE DTC", AT-19 .	
▶	**INSPECTION END**

Basic Inspection (Models without Throttle Opener)

=NLEC1930

Precaution:

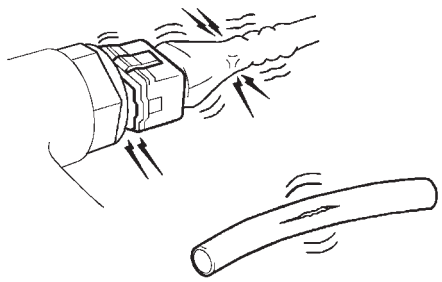
Perform Basic Inspection without electrical or mechanical loads applied;

- Headlamp switch is OFF,
- On vehicles equipped with daytime running light system, set lighting switch to the 1st position to light only small lamps.
- Air conditioner switch is OFF,
- Rear window defogger switch is OFF,
- Steering wheel is in the straight-ahead position, etc.

1	INSPECTION START

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

- Harness connectors for improper connections
- Vacuum hoses for splits, kinks, or improper connections
- Wiring for improper connections, pinches, or 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.		
OK or NG		
OK (with CONSULT-II)	▶	GO TO 5.
OK (without CONSULT-II)	▶	GO TO 8.
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 section, “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 CLOSED THROTTLE POSITION SWITCH IDLE POSITION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Turn ignition switch "ON".
4. Select "THRTL POS SEN" and "CLSD THL POS" in "DATA MONITOR" mode with CONSULT-II.
5. Make sure that "THRTL POS SEN" indicates 0.35 to 0.65V, and "CLSD THL POS" indicates "ON". (Accelerator pedal is fully released).

DATA MONITOR	
MONITOR	NO DTC
THRTL POS SEN	XXX V
CLSD THL POS	ON

NEF238A

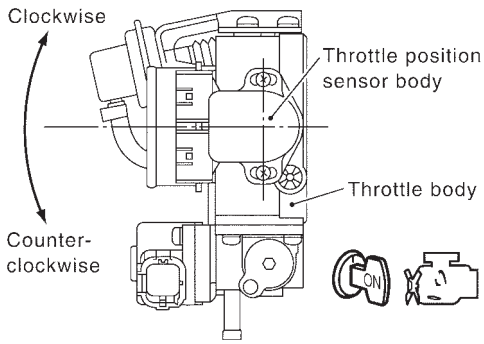
OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 6.

6	ADJUSTMENT THROTTLE POSITION SENSOR IDLE POSITION

With CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Turn throttle position sensor body clockwise or counterclockwise until "THRTL POS SEN" indication becomes 0.35 to 0.65V.



SEF964W

3. Tighten the throttle position sensor fixing bolts.

	▶	GO TO 7.

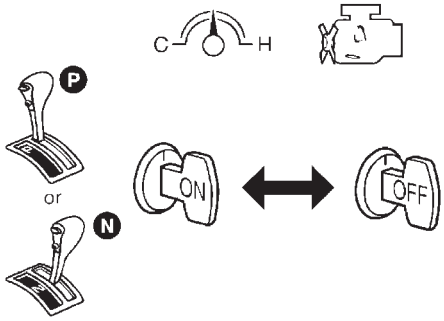
7	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

With CONSULT-II

NOTE:

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

1. Start engine and warm it up to normal operating temperature.
2. Select "CLSD THL POS" in "DATA MONITOR" mode with CONSULT-II.
3. Stop engine. (Turn ignition switch "OFF".)
4. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

5. Turn ignition switch "OFF" and wait at least 5 seconds.
6. Repeat steps 4 and 6 until "CLSD THL POS" indication changes to "ON".

DATA MONITOR	
MONITOR	NO DTC
CLSD THL POS	ON

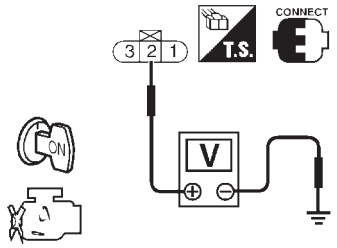
SEF061Y

	▶	GO TO 11.

8	CHECK THROTTLE POSITION SENSOR IDLE POSITION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Turn ignition switch "ON".
4. Check voltage between ECM terminal 92 and ground with accelerator pedal fully released.



NEF239A

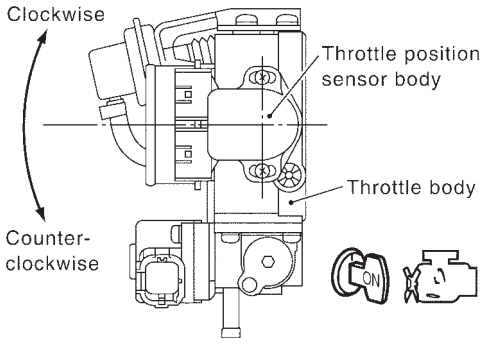
Voltage: 0.35 to 0.65V

OK	▶	GO TO 6.
NG	▶	GO TO 9.

9	ADJUST THROTTLE POSITION SENSOR IDLE POSITION

Without CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Turn throttle position sensor body clockwise or counterclockwise until the voltage between ECM terminal 92 and ground becomes 0.35 to 0.65V.0



SEF964W

3. Tighten the throttle position sensor fixing bolts.

▶	GO TO 10.

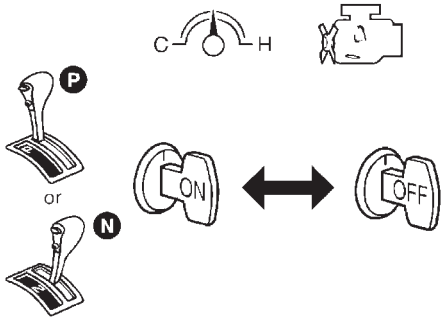
10	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

Without CONSULT-II

NOTE:

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

1. Start engine and warm it up to normal operating temperature.
2. Stop engine. (Turn ignition switch "OFF").
3. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

4. Turn ignition switch "OFF" and wait at least 9 seconds.
5. Repeat steps 4 and 6, 20 times.

▶	GO TO 11.

11	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 GST or Diagnostic Test Mode II (Self-diagnostic Results).

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	REPAIR MALFUNCTION

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

▶	GO TO 11.

13	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. **700±50 rpm** **Without CONSULT-II** 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **700±50 rpm**	
OK or NG	
OK ▶	GO TO 22.
NG ▶	GO TO 14.

14	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-57 **Which is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	GO TO 15.
INCMP ▶	1. Follow the instruction of "Idle Air Volume Learning". 2. GO TO 14.

15	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. **700±50 rpm** **Without CONSULT-II** 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **700±50 rpm**	
OK or NG	
OK ▶	GO TO 20.
NG ▶	GO TO 16.

16	REPLACE IACV-AAC VALVE
Replace IACV-AAC valve.	
▶	GO TO 17.

17	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-581 **Which is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	GO TO 18.
INCMP ▶	1. Follow the instruction of "Idle Air Volume Learning". 2. GO TO 14.

18	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.

750±50 rpm

Without CONSULT-II

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

750±50 rpm

OK or NG

OK	▶	GO TO 20.
NG	▶	GO TO 19.

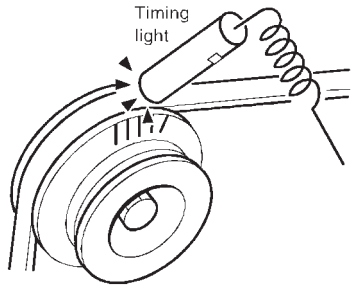
19	CHECK ECM FUNCTION

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 NATS system and registration of NATS ignition key IDs. Refer to "NATS (Nissan Anti-Theft system)", EC-597

	▶	GO TO 14.

20	CHECK IGNITION TIMING

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



SEF984U

Ignition timing
15°±2° BTDC

OK or NG

OK	▶	GO TO 28.
NG	▶	GO TO 21.

21	CHECK TIMING CHAIN INSTALLATION

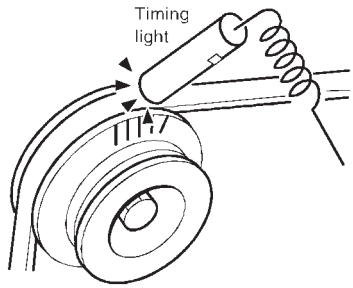
Check timing chain installation. Refer to EM section.

OK or NG

OK	▶	GO TO 19.
NG	▶	1. Repair the timing chain installation. 2. GO TO 14.

22	CHECK IGNITION TIMING

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



SEF984U

Ignition timing:
15°±2° BTDC

OK or NG

OK	▶	GO TO 28.
NG	▶	GO TO 23.

23	PERFORM IDLE AIR VOLUME LEARNING

Refer to "Idle Air Volume Learning", EC-581.
Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT	▶	GO TO 24.
INCMP	▶	GO TO 23.

24	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.
   750±50 rpm

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   750±50 rpm

OK or NG

OK	▶	GO TO 26.
NG	▶	GO TO 15.

25	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 NATS system and registration of NATS ignition key IDs. Refer to "NATS (Nissan Anti-Theft System)", EC-597.

	▶	GO TO 23.

26	CHECK IGNITION TIMING AGAIN	
Check ignition timing again. Refer to Test No. 22.		
OK or NG		
OK	▶	GO TO 28.
NG	▶	GO TO 27.

27	CHECK TIMING CHAIN INSTALLATION	
Check timing chain installation. Refer to EM section.		
OK or NG		
OK	▶	GO TO 25.
NG	▶	1. Repair the timing chain installation. 2. GO TO 23.

28	ERASE UNNECESSARY DTC	
After this inspection, unnecessary DTC No. might be displayed. Erase the stored memory in ECM. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-594.		
	▶	**INSPECTION END**

DTC Inspection Priority Chart

NLEC1370

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 ● P0325 Knock sensor ● P0340 Camshaft position sensor ● P0403 EGR volume control valve (where fitted) ● P0500 Vehicle speed sensor ● P0605 ECM ● P0335, P1336 Crankshaft position sensor (OBD) ● P1320 Ignition signal ● P1605 A/T diagnostic communication line ● P1706 Park/Neutral position switch
2	● P0130 - P0134 Heated oxygen sensor 1 (front) ● P0135 Heated oxygen sensor 1 heater (front) ● P0137 - P0140 Heated oxygen sensor 2 (rear) ● P0141 Heated oxygen sensor 2 heater (rear) ● P0443 EVAP canister purge volume control solenoid valve ● P0510 Closed throttle position switch ● P0705 - P0725, P0740 - P1791 CVT related sensors, solenoid valves and switches ● P1217 Overheat (Cooling system) ● P1401 EGR temperature sensor (where fitted)
3	● P0171, P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0400, P1402 EGR function (where fitted) ● P0420 Three way catalyst function ● P0505 IACV-AAC valve ● P1778 CVT step motor function

Fail-safe Chart

=NLEC1371

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, the MI illuminates.

<table>
<tr><th colspan="2">DTC No.</th><th rowspan="2">Detected items</th><th rowspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><th>CONSULT-II GST</th><th>ECM*1</th></tr>
<tr><td>P0100</td><td>0100</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>P0115</td><td>0115</td><td>Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.
The radiator fan operates.</td></tr>
<tr><td></td><td></td><td></td><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td></td><td></td><td></td><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td></td><td></td><td></td><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td></td><td></td><td></td><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td>P0120</td><td>0120</td><td>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></td><td></td><td></td><td>Condition</td><td>Driving condition</td></tr>
<tr><td></td><td></td><td></td><td>When engine is idling</td><td>Normal</td></tr>
<tr><td></td><td></td><td></td><td>When accelerating</td><td>Poor acceleration</td></tr>
<tr><td>Unable to access ECM</td><td>Unable to access Diagnostic Test Mode II</td><td>ECM</td><td colspan="2">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 and IACV-AAC valve operation are controlled under certain limitations.</td></tr>
<tr><td></td><td></td><td></td><td></td><td>ECM fail-safe operation</td></tr>
<tr><td></td><td></td><td></td><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td></td><td></td><td></td><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td></td><td></td><td></td><td>Ignition timing</td><td>Ignition timing is fixed at the preset value</td></tr>
<tr><td></td><td></td><td></td><td>Fuel pump</td><td>Fuel pump relay is “ON” when engine is running and “OFF” when engine stalls</td></tr>
<tr><td></td><td></td><td></td><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">Replace ECM, if ECM fail-safe condition is confirmed.</td></tr>
</table>

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

Symptom Matrix Chart

SYSTEM — ENGINE CONTROL SYSTEM

NLEC1372

NLEC1372S01

		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-1032
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-578
	Injector circuit	1	1	2	3	2		2	2			2			EC-1021
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-573
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-576
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-623
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-863, 995
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-623
	Ignition circuit	1	1	2	2	2		2	2			2			EC-900, 1004
EGR (where fitted)	EGR volume control valve circuit		2	2	3	3						3			EC-841
	EGR system	2	1	2	3	3	3	2	2	3		3			EC-834, 841, 921
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3		2	EC-671
Air conditioner circuit		2	2	3	3	3	3	3	3	3		3		2	HA section

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

(continued on next page)

	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	
Crankshaft position sensor (OBD) circuit	2	2												EC-819, 969
Camshaft position sensor circuit	3	2									3			EC-825
Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-679
Heated oxygen sensor 1 (front) circuit		1	2	3	2		2	2			2			EC-709, 944
Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-694
Throttle position sensor circuit		1	2		2	2	2	2	2		2			EC-700
Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-623
Vehicle speed sensor circuit		2	3		3						3			EC-858
Knock sensor circuit			2								3			EC-815
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-880, 647
Start signal circuit	2													EC-1027
PNP switch circuit			3		3		3	3			3			EC-931
Power steering oil pressure switch circuit		2					3	3						EC-1039
Electrical load signal circuit							3	3						EC-1050

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

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE MECHANICAL & OTHER

NLEC1372S02

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FE 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													
	Drive plate	6													EM section

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

(continued on next page)

		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	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			EM section
	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 and LC sections
	Oil level (Low)/Filthy oil														
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			LC section
	Thermostat									5					
	Water pump														
	Water gallery														
	Cooling fan									5					EC-882
	Coolant level (low)/Contaminated coolant														MA section

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

CONSULT-II Reference Value in Data Monitor Mode

NLEC1373

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. Specification data might be displayed even when ignition timing is not adjusted to specification. This IGN TIMING monitors the data calculated by the ECM according to the input signals from the crankshaft 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	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.1V
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.4 - 2.8 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	53 - 155%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
HO2S1 MNTR (B1)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH
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: Idle	Throttle valve fully closed	0.15 - 0.85V
	● Ignition switch: ON (Engine stopped)	Throttle valve fully opened	3.5 - 4.7V
EGR TEMP SEN (where fitted)	● Engine: After warming up		Less than 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Engine: Idle	Throttle valve: Idle position	ON
	● Ignition switch: ON (Engine stopped)	Throttle valve: Slightly open	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch “OFF”	OFF
		A/C switch “ON” (Compressor operates)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever “P” or “N”	ON
		Except above	OFF

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 turned	ON
LOAD SIGNAL	● Engine: running	Rear window defogger or headlamp "ON"	ON
		Except the above	OFF
IGNITION SW	● Ignition switch: ON → OFF		ON → OFF
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
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	15° BTDC
		2,000 rpm	Approx. 40° BTDC
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	Not used
		2,500 rpm	Not used
ABSOL TH·P/S	● Engine: Idle	Throttle valve fully closed	0.0°
	● 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	2.5 - 5.0 g·m/s
		2,500 rpm	7.1 - 12.5 g·m/s
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	5 - 25 steps
		2,000 rpm	—
PURG VOL C/V	● Engine: After warming up ● No-load	Idle	0%
		Revving engine	—
EGR VOL CON/V (where fitted)	● Engine: After warming up ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 steps
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 1 second) ● Engine running and cranking ● When engine is stopped (stops in 1.5 seconds)		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

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

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 HTR (B1)	● Engine speed: Below 3,200 rpm		ON
	● Engine speed: Above 3,200 rpm		OFF
HO2S2 HTR (B1)	● Engine speed	Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
		Above 3,600 rpm	OFF
	● Ignition switch ON (Engine stopped)		OFF
TRVL AFTER MI	● Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,535 km (0 - 40,722 miles)

Major Sensor Reference Graph in Data Monitor Mode

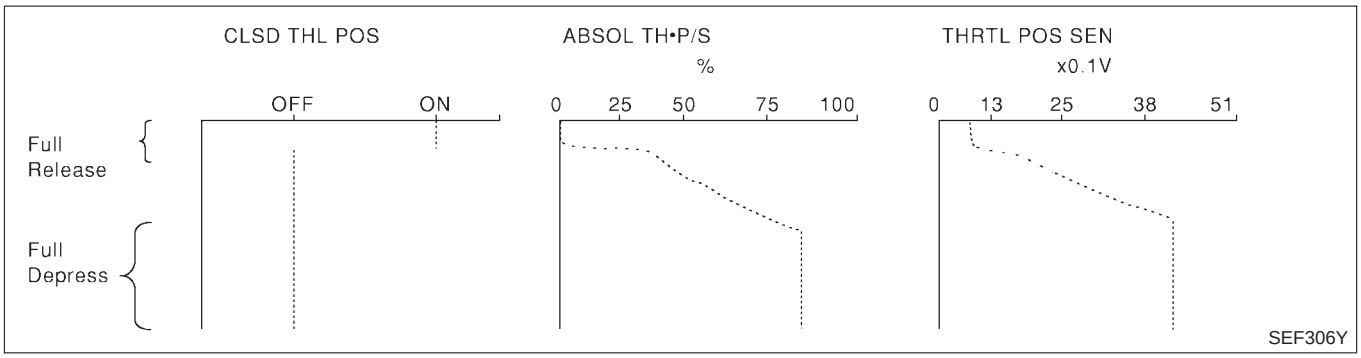
NLEC1374

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

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

NLEC1374S01

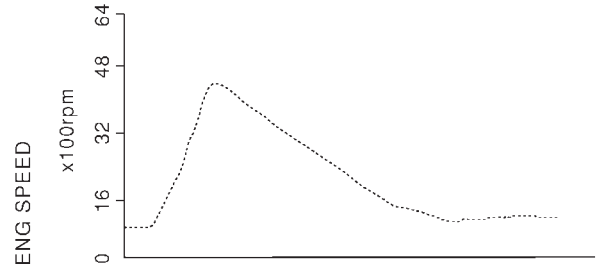
Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL POS" when depressing the accelerator pedal with the ignition switch "ON".
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL POS" is changed from "ON" to "OFF".



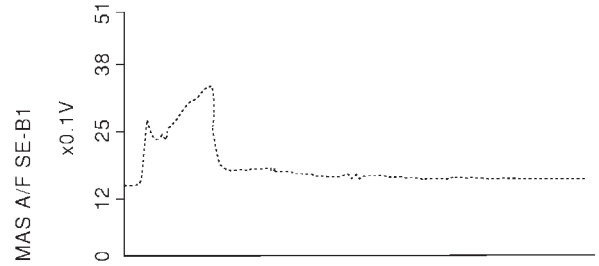
ENG SPEED, MAS A/F SE-B1, THRTL POS SEN, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

NLEC1374S02

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 to normal operating temperature.
Each value is for reference, the exact value may vary.

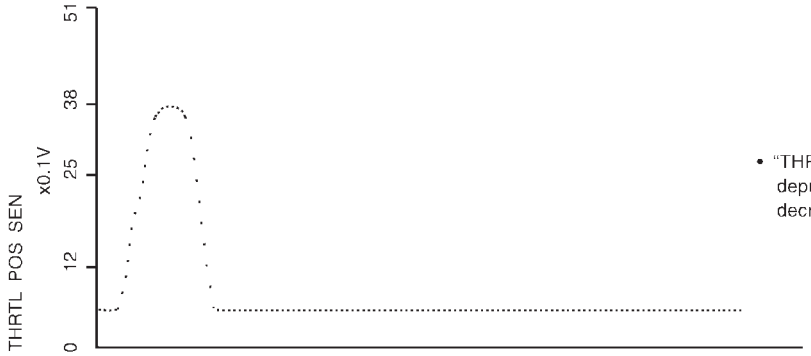


• "ENG SPEED" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intemittent drop or rise.

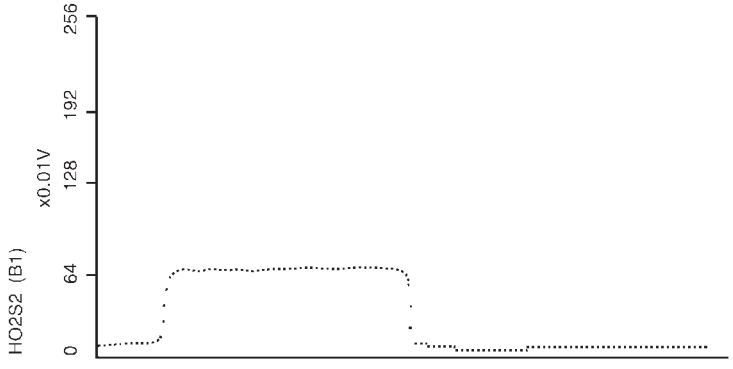


• "MAS A/F SE-B1" should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).

SEF241Y



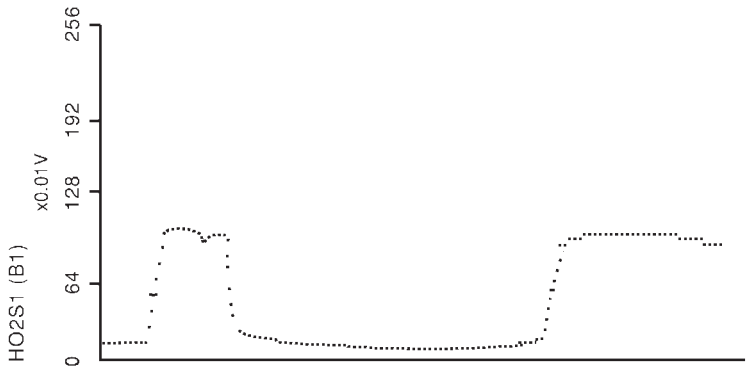
• "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



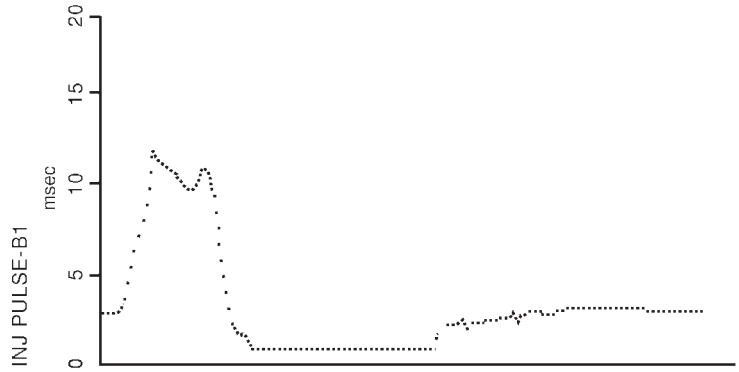
• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.

SEF601Y

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

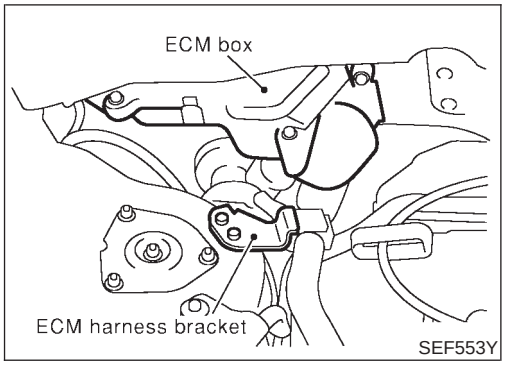


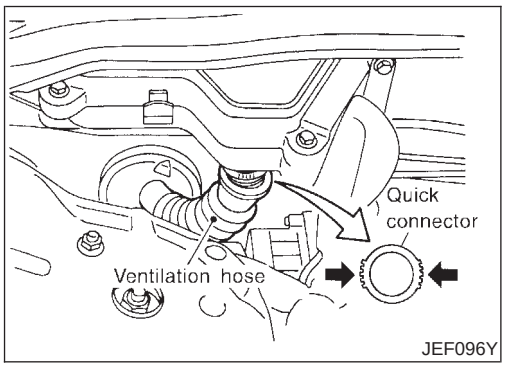
"HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.

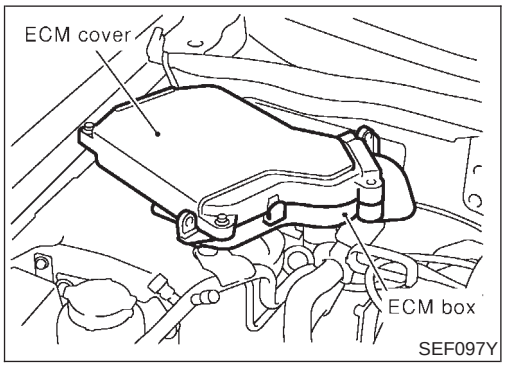


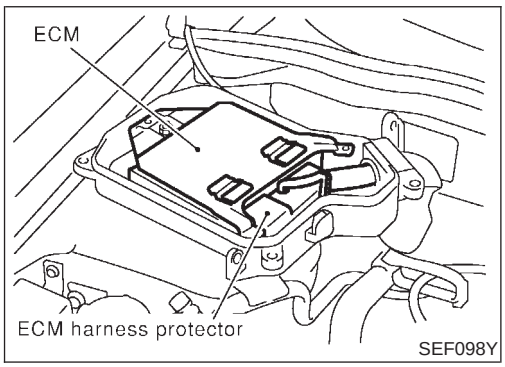
"INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

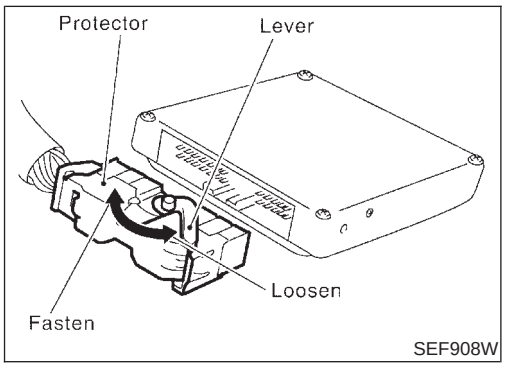
SEF170YA











ECM Terminals and Reference Value

NLEC1375

PREPARATION

NLEC1375S01

Models with ECM in Engine Compartment

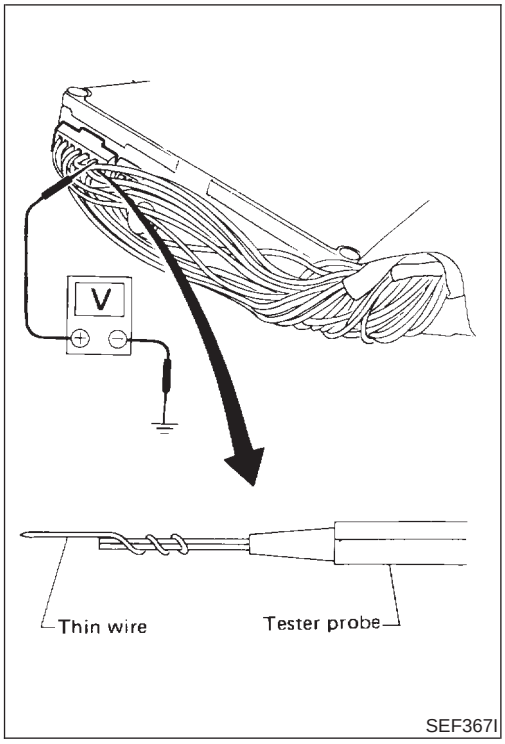
NLEC1375S0101

1. The ECM is located under the cowl panel on the passenger side (behind the strut tower). Remove it from the engine room side.

- Remove the bracket fixing ECM harness.
- Remove the quick connector of the ventilation hose in the ECM compartment room by pressing in the direction of the arrow.
- Pull the ECM box out from under the cowl panel by removing the two ECM box attaching bolts.
- Remove the five bolts on ECM box installation cover.
  : 3.9 - 6.9 N·m (0.39 - 0.71 kg-m, 34 - 61 in-lb)
- Remove the three ECM installation bolts.
  : 4.1 - 6.8 N·m (0.41 - 0.70 kg-m, 36 - 60 in-lb)

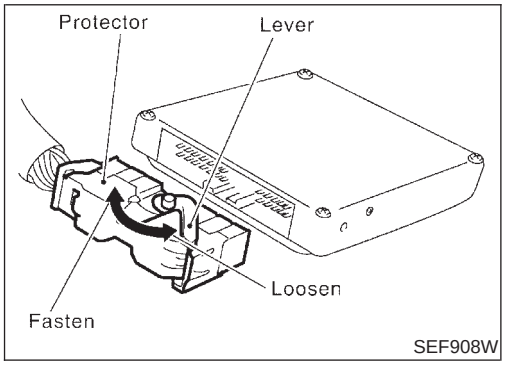
2. Remove ECM harness protector.

- **When connecting or disconnecting ECM harness connector, use lever as shown.**
  When connecting, fasten connector securely with lever moved until it stops.



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.

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.

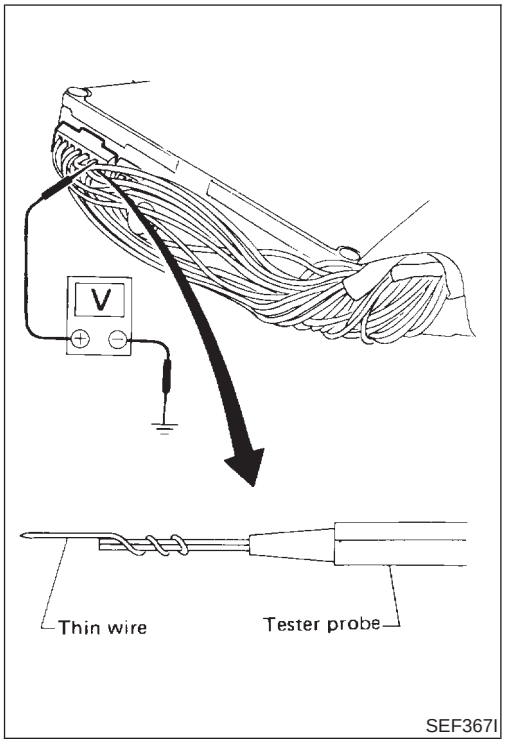


Models with ECM in cabin

NLEC1375S0102

ECM is locating beside of blower unit.

1. Remove the ECM bracket fixing.
2. Remove ECM harness protector.
- **When connecting or disconnecting ECM harness connector, use lever as shown.**
  When connecting, fasten connector securely with lever moved until it stops.

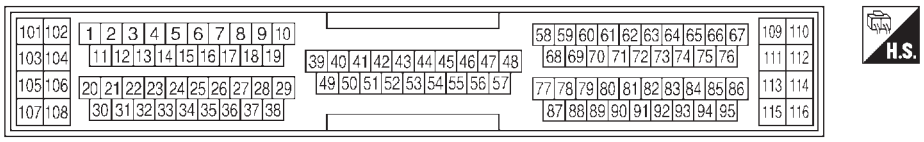


3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
- Open harness securing clip to make testing easier.
- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.

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.

ECM HARNESS CONNECTOR TERMINAL LAYOUT

NLEC1375S02



SEF970W

ECM INSPECTION TABLE

NLEC1375S03

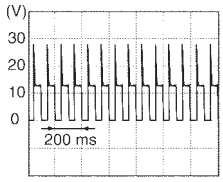
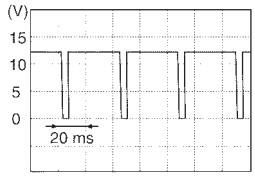
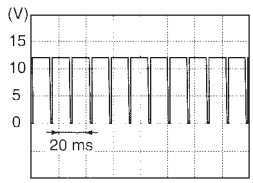
Specification data are reference values and are measured between each terminal and ground.

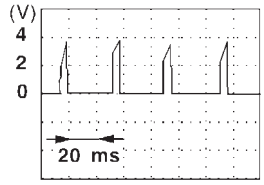
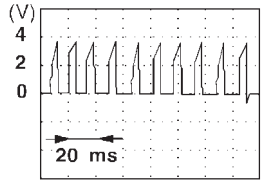
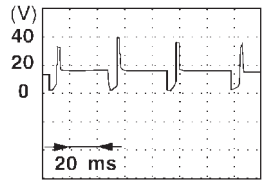
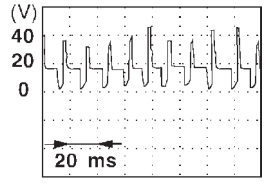
CAUTION:

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

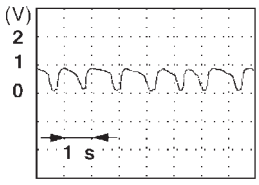
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	W/R	Heated oxygen sensor 2 heater (rear)	**[Engine is running]** ● Engine speed is below 3,600 rpm ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	Approximately 0.7V
			[Ignition switch "ON"] ● Engine stopped ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
4	L	Heated oxygen sensor 1 heater (front)	**[Engine is running]** ● Engine speed is below 3,200 rpm	Approximately 0V
			[Engine is running] ● Engine speed is above 3,200 rpm	BATTERY VOLTAGE (11 - 14V)
6 7 15 16	BR LG GY/L OR	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V
8 9 17 18	SB W/B R/W G/R	EGR volume control valve (where fitted)	**[Engine is running]** ● **Warm-up condition** ● Rev engine from 2,000 to 4,000 rpm	0 - 14V
10	Y/L	CVT signal No. 3	**[Engine is running]** ● Idle speed	Approximately 0V
12	LG/RB	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan (High) is operating	0 - 0.6V
13	LG/R	Cooling fan relay	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	Approximately 0V

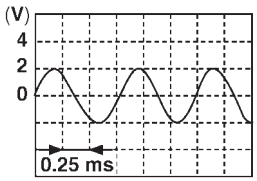
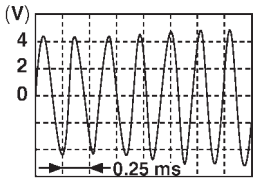
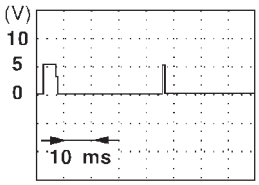
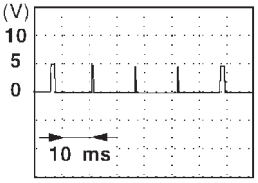
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	P	EVAP canister purge volume control valve (ON/OFF duty)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● Engine speed is about 2,000 rpm	5 - 12V  SEF975W
19	BR/W	CVT signal No. 5	**[Engine is running]** ● Idle speed	Approximately 7.5V
21	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
22	OR/L	Malfunction indicator	**[Ignition switch "ON"]**	0 - 1V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
23	L	Air conditioner relay	**[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)
31	W/G	ECM relay (Self shut-off)	**[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
32	L/OR	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 10.5V  SEF973W
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 10.5V  SEF974W

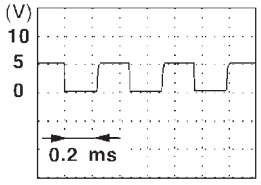
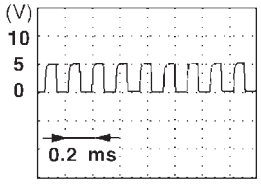
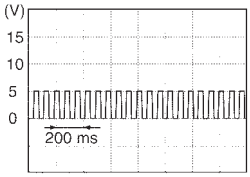
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W/B	Ignition signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.3V  SEF996V
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 0.5V  SEF997V
36	G	Ignition check	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 13V  SEF998V
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 13V  SEF999V
40	Y/PU	Throttle position switch (Closed position)	**[Engine is running]** ● Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Accelerator pedal depressed	Approximately 0V
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V
42	G/OR	PNP switch	**[Ignition switch "ON"]** ● Gear position is "P" or "N"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)
43	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

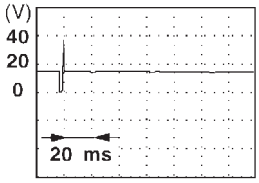
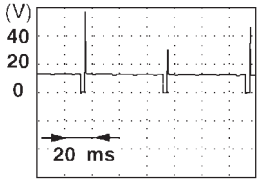
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
44	L/R	Air conditioner switch	**[Engine is running]** ● Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			[Engine is running] ● Air conditioner switch is "OFF"	Approximately 5V
46	PU/W	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is fully turned	Approximately 0V
			[Engine is running] ● Steering wheel is not turned	Approximately 5V
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
50	L/B	Electrical load signal (Headlamp and Rear defogger)	**[Engine is running]** ● Headlamp switch or rear defogger switch is "ON"	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Headlamp switch and rear defogger switch are "OFF"	Approximately 0V
51	LG/B	Blower fan SW	**[Ignition switch "ON"]** ● Blower fan switch is "ON"	Approximately 0V
			[Ignition switch "ON"] ● Blower fan switch is "OFF"	Approximately 5V
54	Y/R	CVT signal No. 1	**[Engine is running]** ● Idle speed	Approximately 0 - 3.5V
55	Y/G	CVT signal No. 2	**[Engine is running]** ● Idle speed	Approximately 0 - 3.5V
56	G/Y	CVT signal No. 4	**[Engine is running]** ● Idle speed ● "R" position	Approximately 0 - 3.5V
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
61	G	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.3 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.8 - 2.4V
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 3,000 rpm	0 - Approximately 1.0V
64	W/R	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature
65	W	Crankshaft position sensor (OBD)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 1.3V (AC range)  SEF814Z
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 2.0V (AC range)  SEF815Z
66 75	L L	Camshaft position sensor (Reference signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 0.4V  SEF006W
			[Engine is running] ● Engine speed is 2,000 rpm	0.1 - 0.4V  SEF007W
67	W/L	Power supply for ECM (Back-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
70	BR/Y	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
71	GY	Throttle position sensor signal output	**[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

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
72	PU	EGR temperature sensor (where fitted)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Less than 4.5V
			[Engine is running] ● **Warm-up condition** ● EGR system is operating	0 - 1.0V
73	B	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	R/L	Refrigerant pressure sensor	**[Engine is running]** ● Air conditioner switch is "ON" (Compressor operates)	1.0 - 4.0V
			[Engine is running] ● Warm-up condition ● Idle speed ● Air conditioner switch is turned from "ON" to "OFF"	Voltage is gradually decreasing.
81	W	Knock sensor	**[Engine is running]** ● Idle speed	2.0 - 3.0V
85	B/W	Camshaft position sensor (Position signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V  SEF004W
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 2.4V  SEF005W
86	OR/W	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● Vehicle speed is 40 km/h (25 MPH)	0 - Approximately 5V  SEF976W
91	PU	CVT check signal	**[Engine is running]** ● Idle speed	0 - Approximately 5V
92	Y	Throttle position sensor	**[Engine is running]** ● Accelerator pedal released	0.15 - 0.85V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.5 - 4.7V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101 103 105 107	R/B Y/B G/B L/B	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF011W
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  SEF012W
106 108	B/Y B/Y	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
111	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
114	G/W	Data link connector	**[Engine is running]** ● Idle speed (CONSULT-II or GST is disconnected)	0V
115	LG	Data link connector	**[Engine is running]** ● Idle speed (CONSULT-II or GST is disconnected)	0 - 10V

Description

NLEC1748

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)

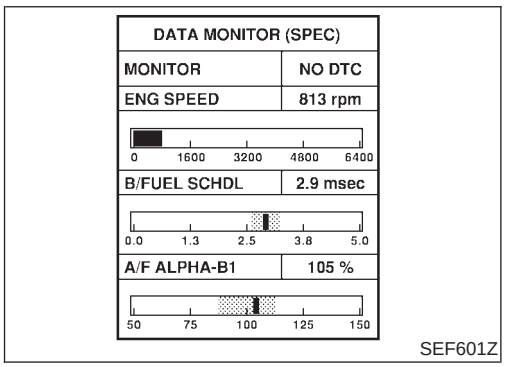
Testing Condition

NLEC1749

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.983 - 1.043 bar, 1.003 - 1.064 kg/cm^2, 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

*1: For after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (CVT fluid temperature sensor signal) indicates less than 0.9V.

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



SEF601Z

Inspection Procedure

NLEC1750

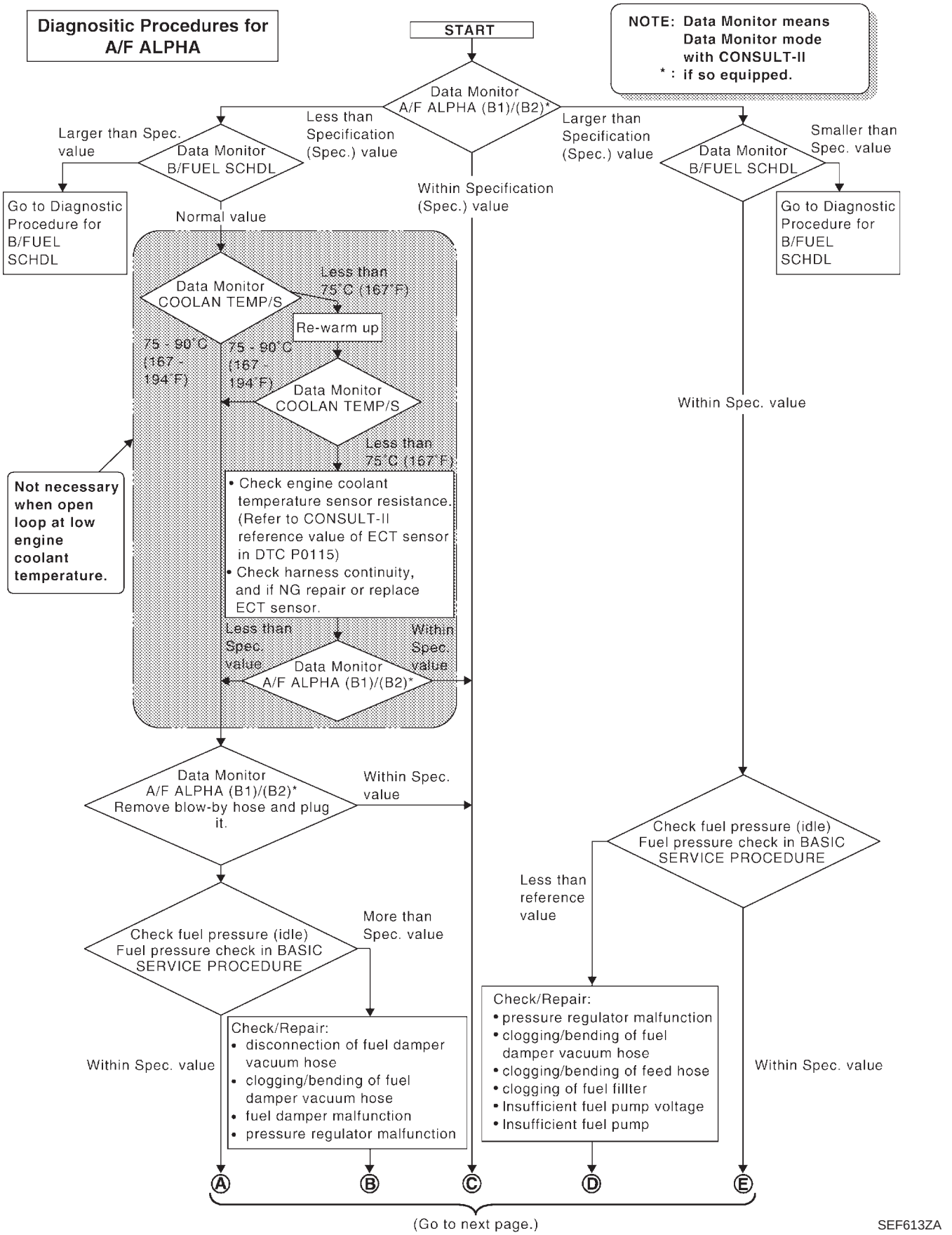
NOTE:

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

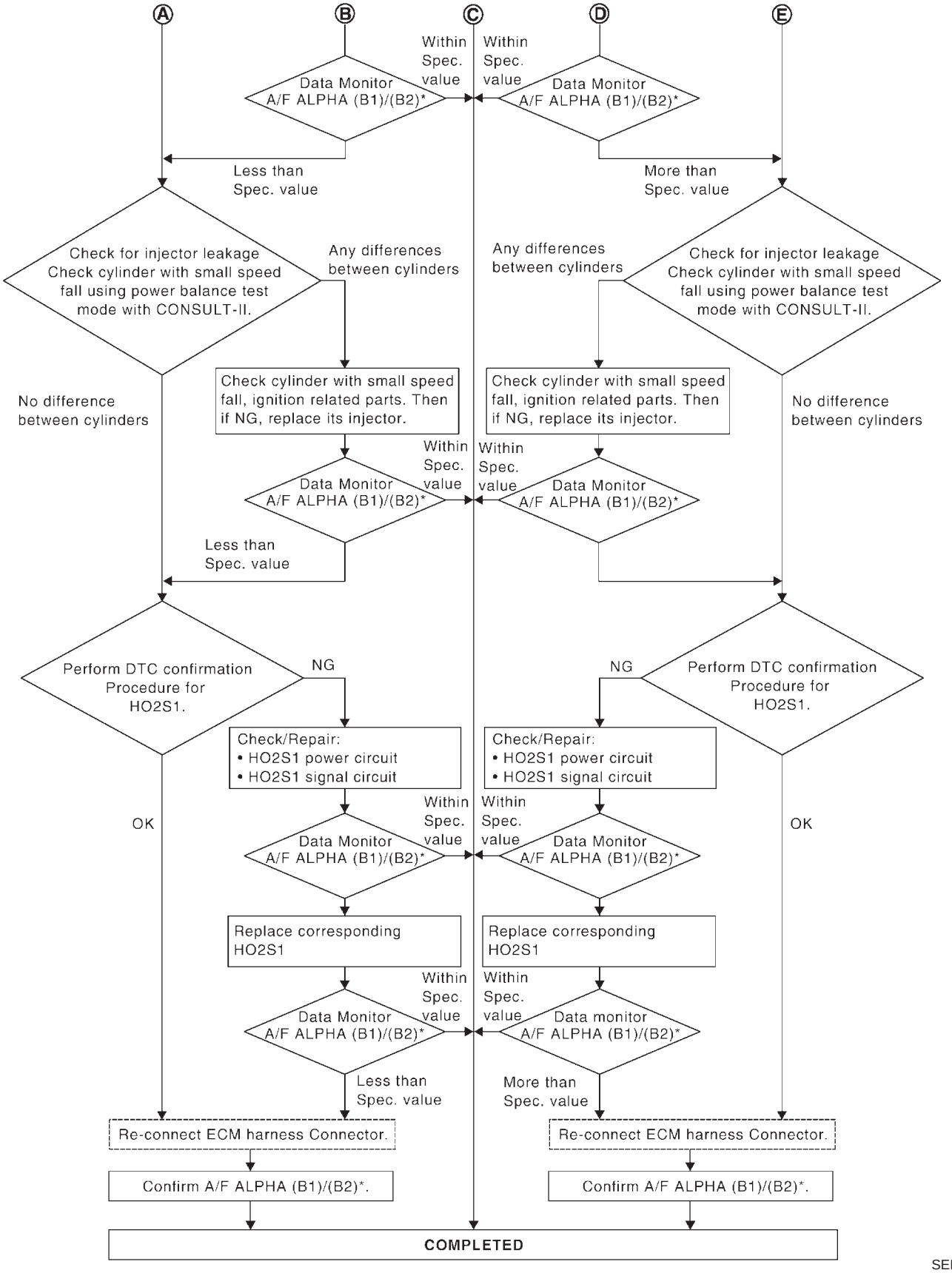
1. Perform “Basic Inspection”, EC-623.
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to “Diagnostic Procedure”, EC-667.

Diagnostic Procedure

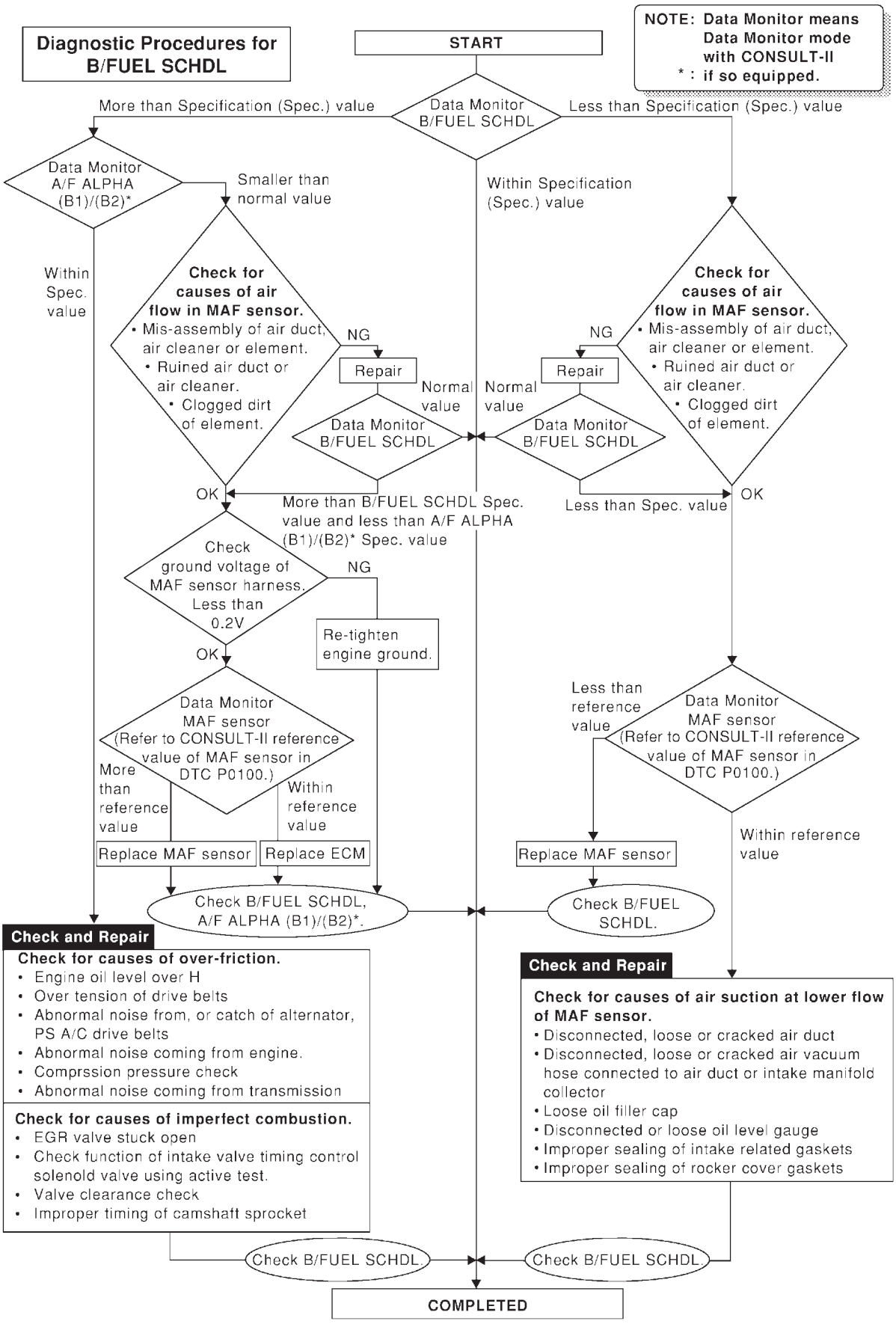
NLEC1751



SEF613ZA


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

SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
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 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

Description

NLEC1376

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 DTC (1st trip) 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

NLEC1376S01

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 data does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the problem area.

Diagnostic Procedure

NLEC1377

1	INSPECTION START	
Erase (1st trip) DTCs. Refer to "How to Erase Emission-related Diagnostic Information", EC-594, EC-596.		
	▶	GO TO 2.

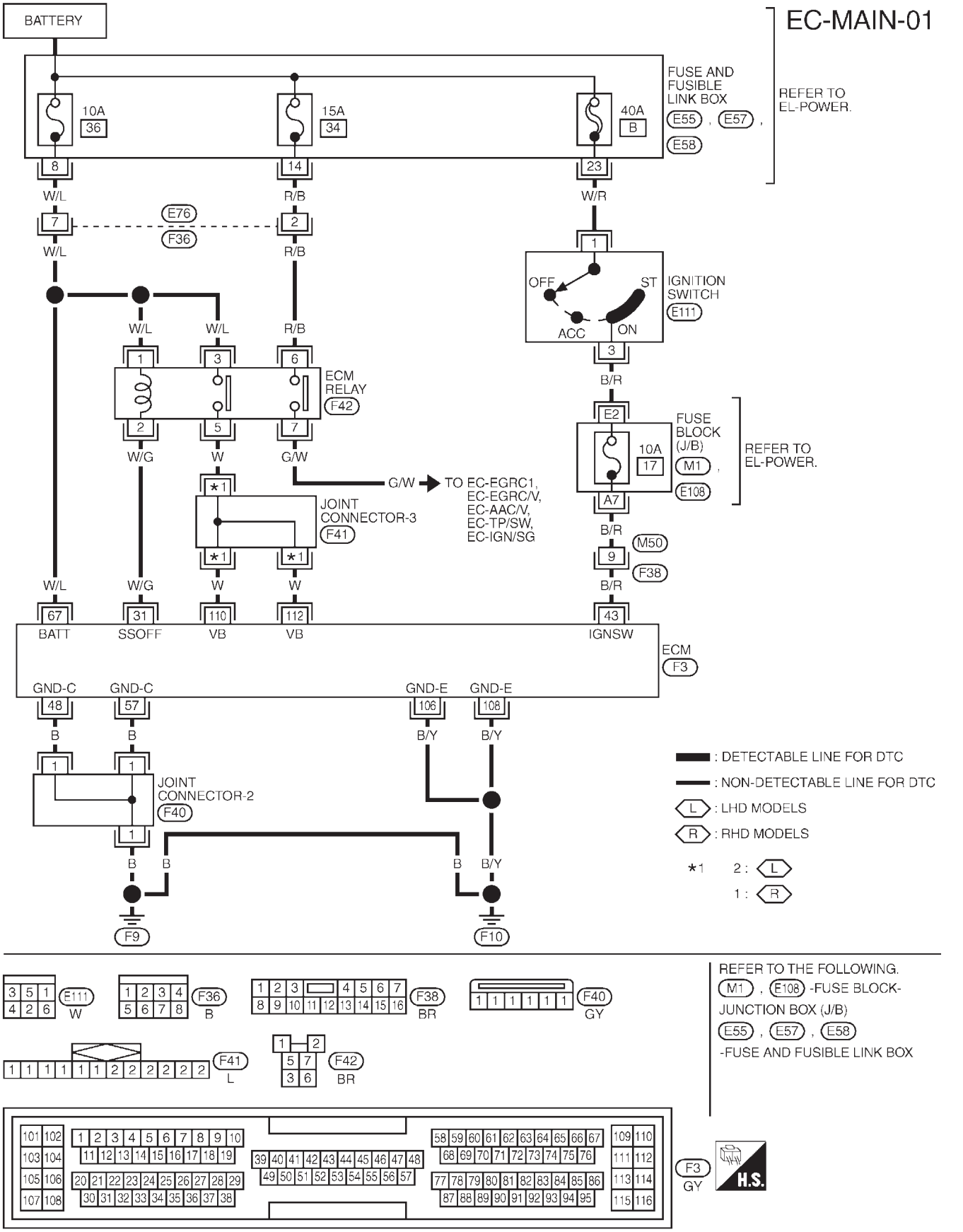
2	CHECK GROUND TERMINALS	
Check ground terminals for corroding or loose connection. Refer to GI-27, "GROUND INSPECTION".		
OK or NG		
OK	▶	GO TO 3.
NG	▶	Repair or replace.

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 (MODELS WITH ECM IN ENGINE COMPARTMENT)

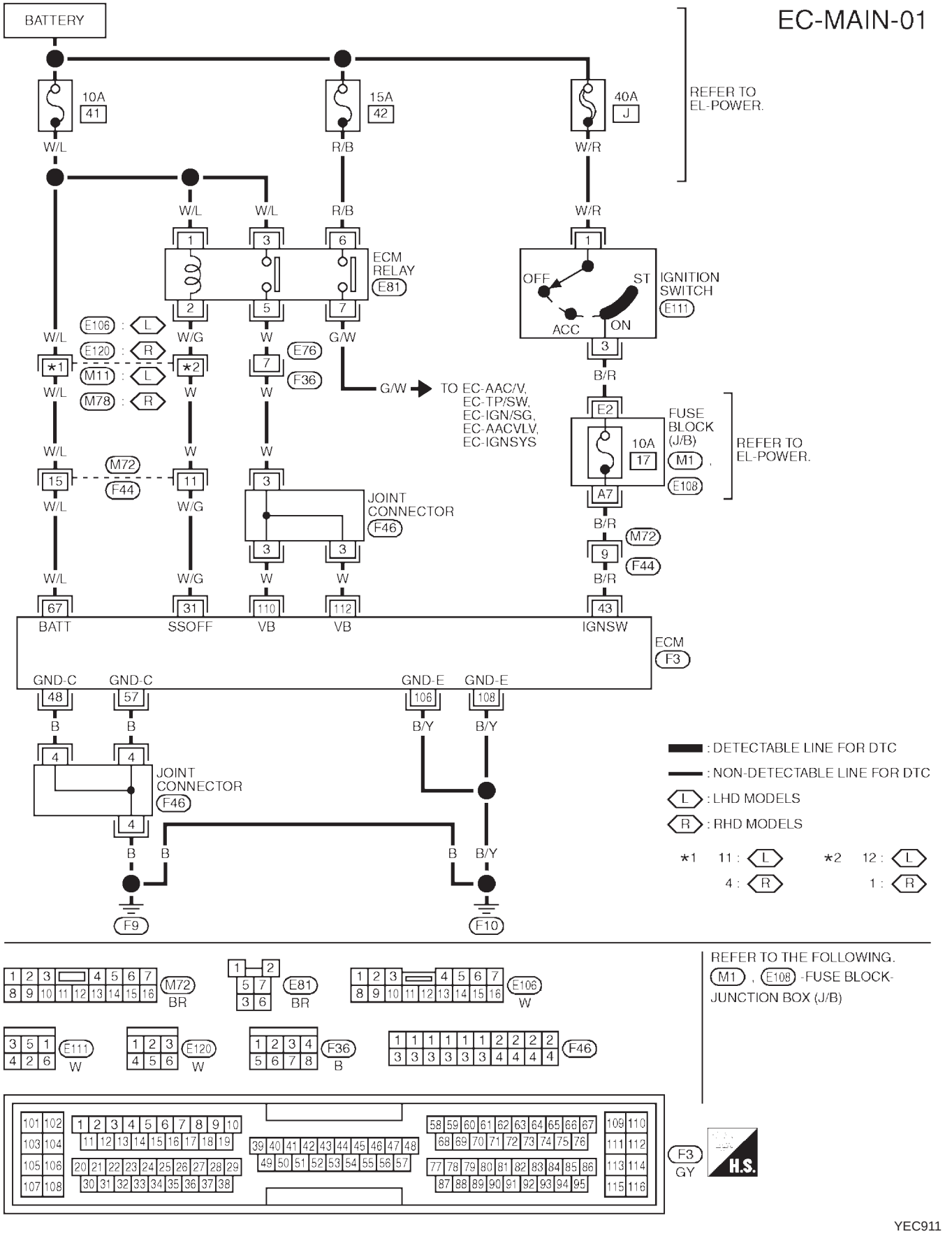
NLEC1378



YEC686

WIRING DIAGRAM (MODELS WITH ECM IN CABIN)

NLEC1931



YEC911

ECM TERMINALS AND REFERENCE VALUE

NLEC1379

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)
31	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
43	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
57	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
67	W/L	Power supply for ECM (Back-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
106 108	B/Y B/Y	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

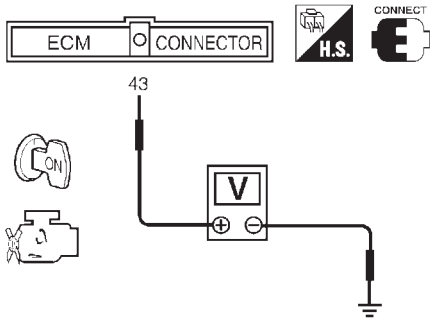
DIAGNOSTIC PROCEDURE

NLEC1380

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 M50, F38 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Fuse block (J/B) connector M1, E108 (where fitted)
- 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 6.
NG	▶	GO TO 5.

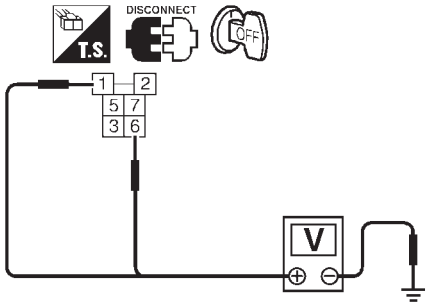
5	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-2 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open between ECM and engine ground

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

6	CHECK POWER SUPPLY-II

1. Disconnect ECM relay.
   (For ECM relay location, refer to "Engine Control Component Parts Location".)
2. Check voltage between ECM relay terminals 1, 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF101Y

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuse and 10A fuse
- Harness connectors E76, F36 (where fitted)
- 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.

8	CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

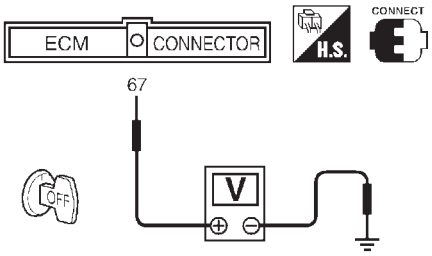
1. Check harness continuity between ECM terminal 31 and ECM relay terminal 2.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK (Models with Euro-OBD system)	▶	Go to "IGNITION SIGNAL", EC-1004.
OK (Models without Euro-OBD system)	▶	Go to "DTC P1320 IGNITION SIGNAL", EC-900.
NG	▶	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.

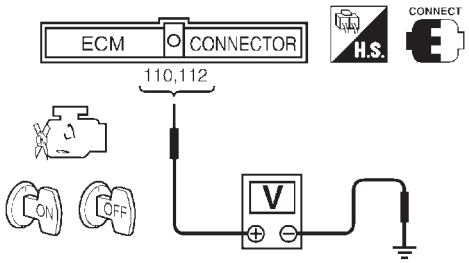
10	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F36 (where fitted)
- Harness connectors M11, E106 (LHD models) (where fitted)
- Harness connectors M78, E120 (RHD models) (where fitted)
- Harness connectors M72, F44 (where fitted)
- 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.

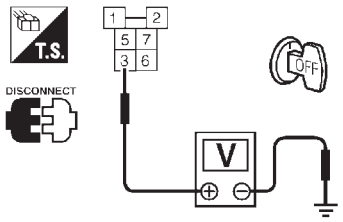
SEF294X

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.
   (For ECM relay location, refer to "Engine Control Component Parts Location".)
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 connectors E76, F36 (where fitted)
- Harness for open or short between ECM relay and 10A 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.

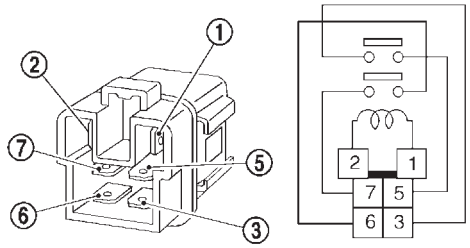
15	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3 (where fitted)
- Harness connectors E76, F36 (where fitted)
- Joint connector F46 (where fitted)
- 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 19.
NG	▶	GO TO 18.

18	DETECT MALFUNCTIONING PART

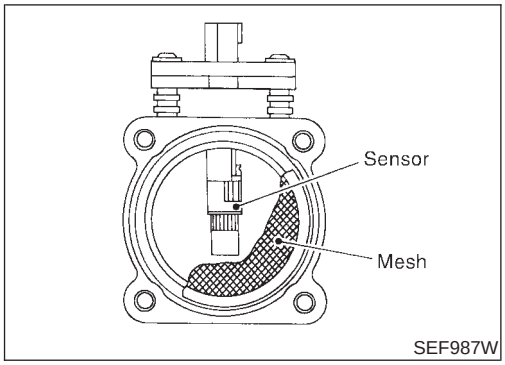
Check the following.
- Joint connector-2 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open between ECM and engine ground

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

19	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

	▶	**INSPECTION END**



Component Description

NLEC1381

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

NLEC1382

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	1.0 - 1.7V
		2,500 rpm	1.5 - 2.1V
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	2.5 - 5.0 g·m/s
		2,500 rpm	7.1 - 12.5 g·m/s

ECM Terminals and Reference Value

NLEC1383

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)
61	G	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.3 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.8 - 2.4V
73	B	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NLEC1384

DTC No.	Malfunction is detected when ...		Check Items (Possible Cause)
P0100 0100	A)	An excessively high voltage from the sensor is sent to ECM when engine is not running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor
	B)	An excessively low voltage from the sensor is sent to ECM* when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor

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

Fail-safe Mode

NLEC1385

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

DTC Confirmation Procedure

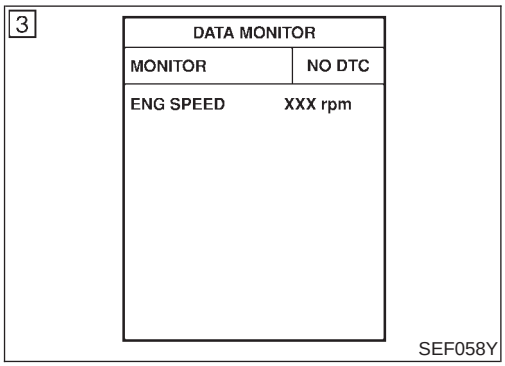
NLEC1386

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.



PROCEDURE FOR MALFUNCTION A

NLEC1386S01

With CONSULT-II

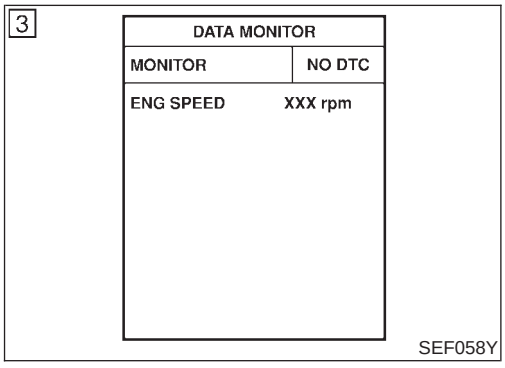
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 2 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-684.

With GST

Follow the procedure “With CONSULT-II” above.

No Tools

1) Turn ignition switch “ON”, and wait 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-684.



PROCEDURE FOR MALFUNCTION B

NLEC1386S02

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait 2 seconds at most.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-684.

With GST

Follow the procedure “With CONSULT-II” above.

No Tools

1) Start engine and wait 2 seconds at most.

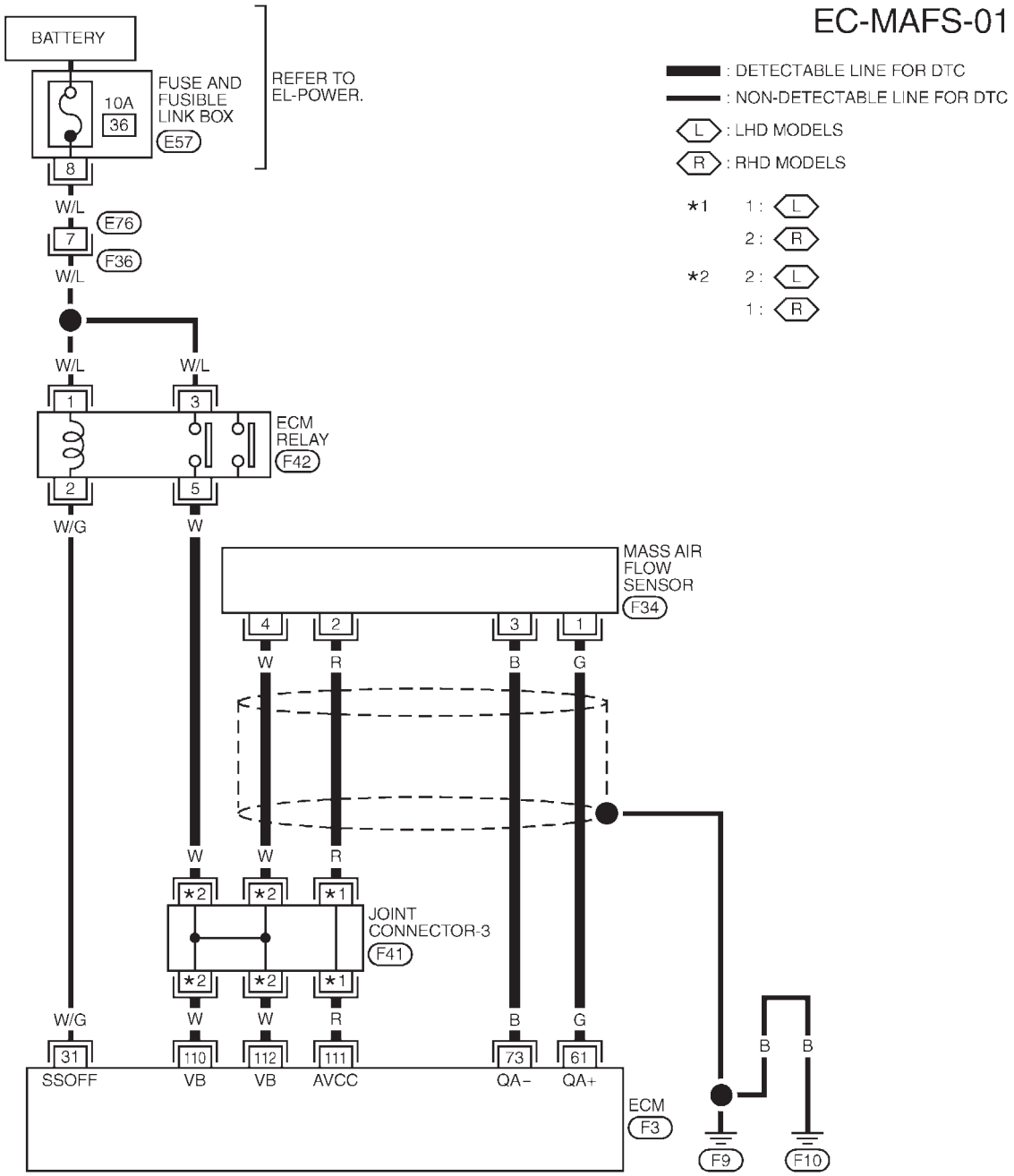
2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-684.

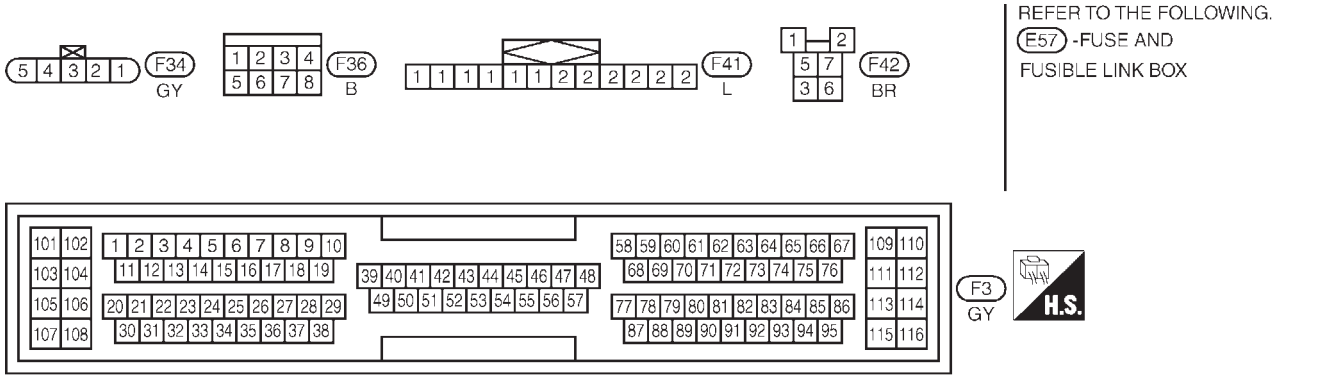
Wiring Diagram

NLEC1387

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1387S01



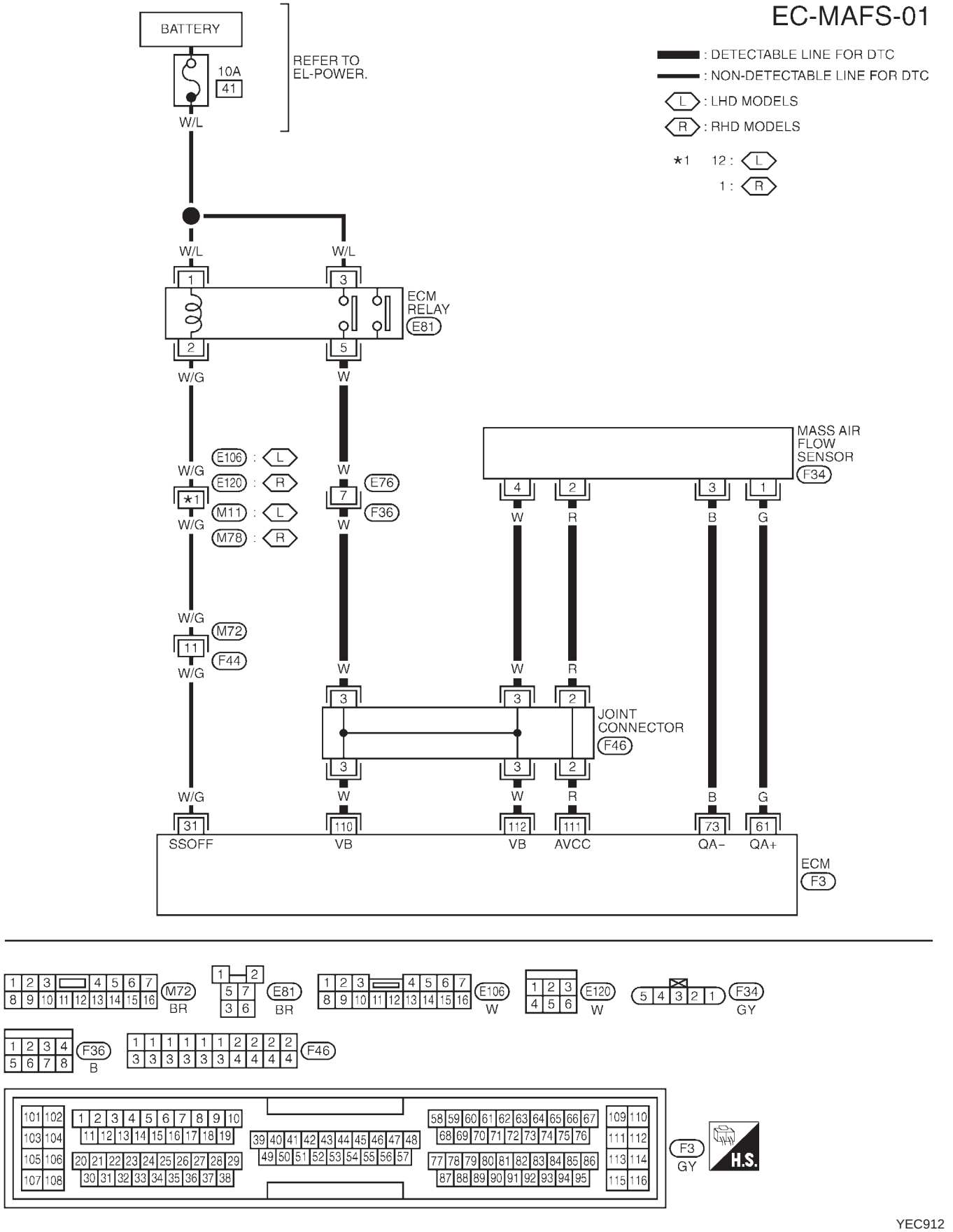


YEC687

MODELS WITH ECM IN CABIN

NLEC1387S02

EC-MAFS-01



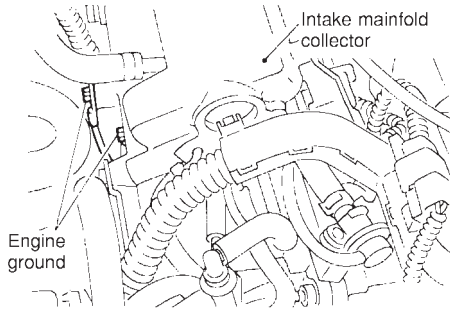
YEC912

Diagnostic Procedure

NLEC1388

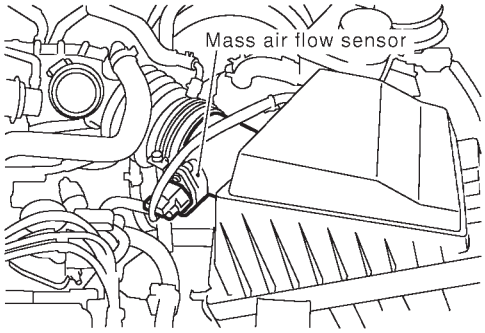
1	INSPECTION START	
Which malfunction (A, or B) is duplicated?		
Malfunction A or B		
A	▶	GO TO 3.
B	▶	GO TO 2.

2	CHECK INTAKE SYSTEM	
Check the following for connection. ● Air duct ● Vacuum hoses ● Intake air passage between air duct to 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.  SEF202X		
	▶	GO TO 4.

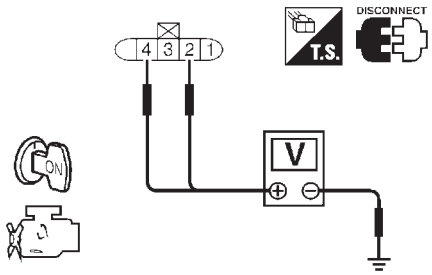
4	CHECK POWER SUPPLY

1. Disconnect mass air flow sensor harness connector.



SEF772Z

2. Turn ignition switch "ON".
3. Check voltage between terminal 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.
- Joint connector-3 (where fitted)
- Joint connector F46 (where fitted)
- 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 GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between mass air flow sensor 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

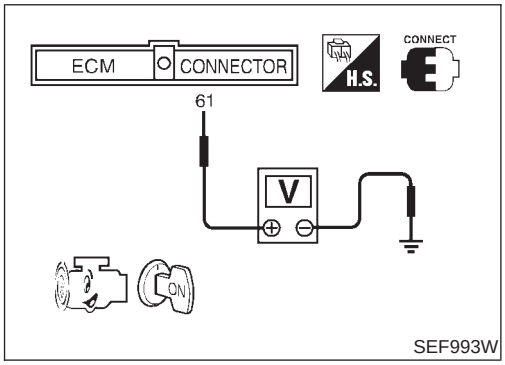
OK	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

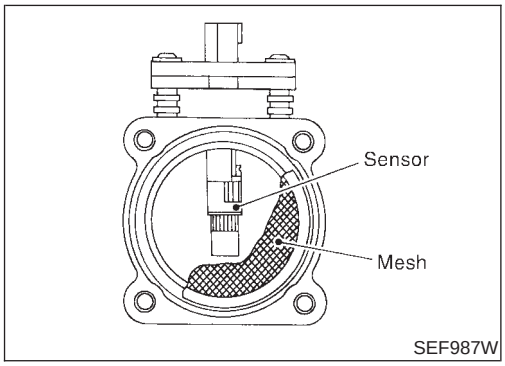
7	CHECK INPUT SIGNAL CIRCUIT	
1. Check harness continuity between mass air flow sensor terminal 1 and ECM terminal 61. Refer to wiring diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK MASS AIR FLOW SENSOR	
Refer to "Component Inspection", EC-686.		
OK or NG		
OK	▶	GO TO 9.
NG	▶	Replace mass air flow sensor.

9	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**



SEF993W



SEF987W

Component Inspection

NLEC1389

MASS AIR FLOW SENSOR

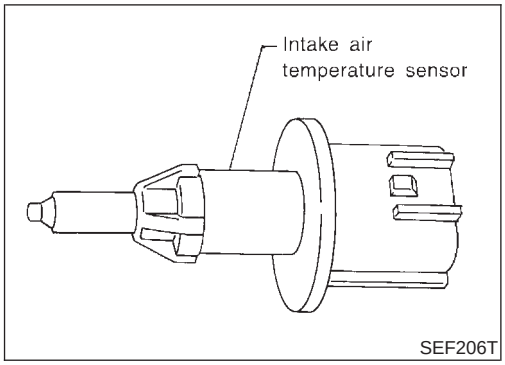
NLEC1389S01

1. Turn ignition switch "ON".
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.

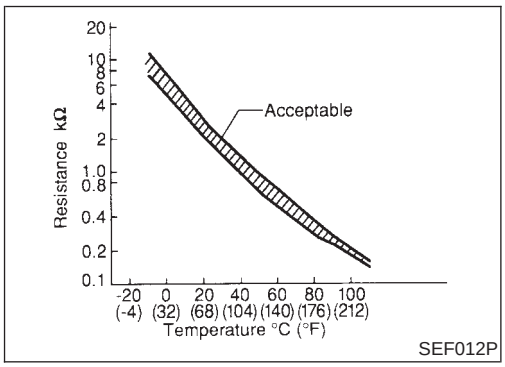
Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.2
Idle (Engine is warmed-up to normal operating temperature.)	1.3 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.8 - 2.4
Idle to about 4,000 rpm*	1.3 - 1.7 to Approx. 4.0

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

4. If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Repeat above check.
5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.



SEF206T



SEF012P

Component Description

NLEC1390

MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT

NLEC1390S01

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.

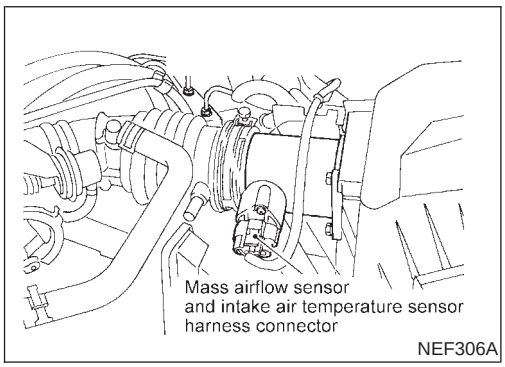
<Reference data>

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

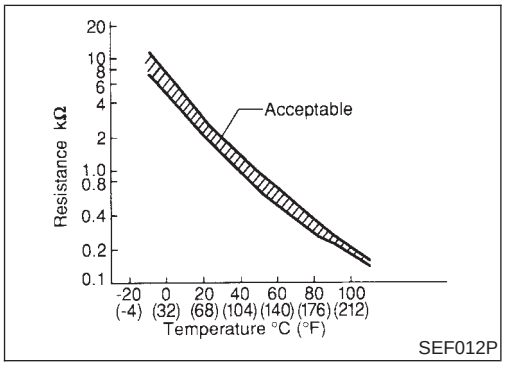
*: These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) and ground.

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.



NEF306A



SEF012P

MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR

NLEC1390S02

The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
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

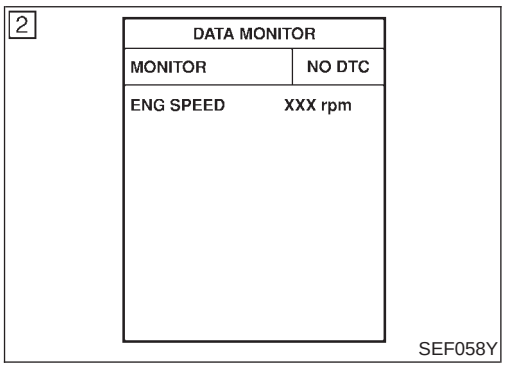
NLEC1391

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0110	An excessively low or high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor

DTC Confirmation Procedure

NLEC1392

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



With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-691.

With GST

Follow the procedure "With CONSULT-II" above.

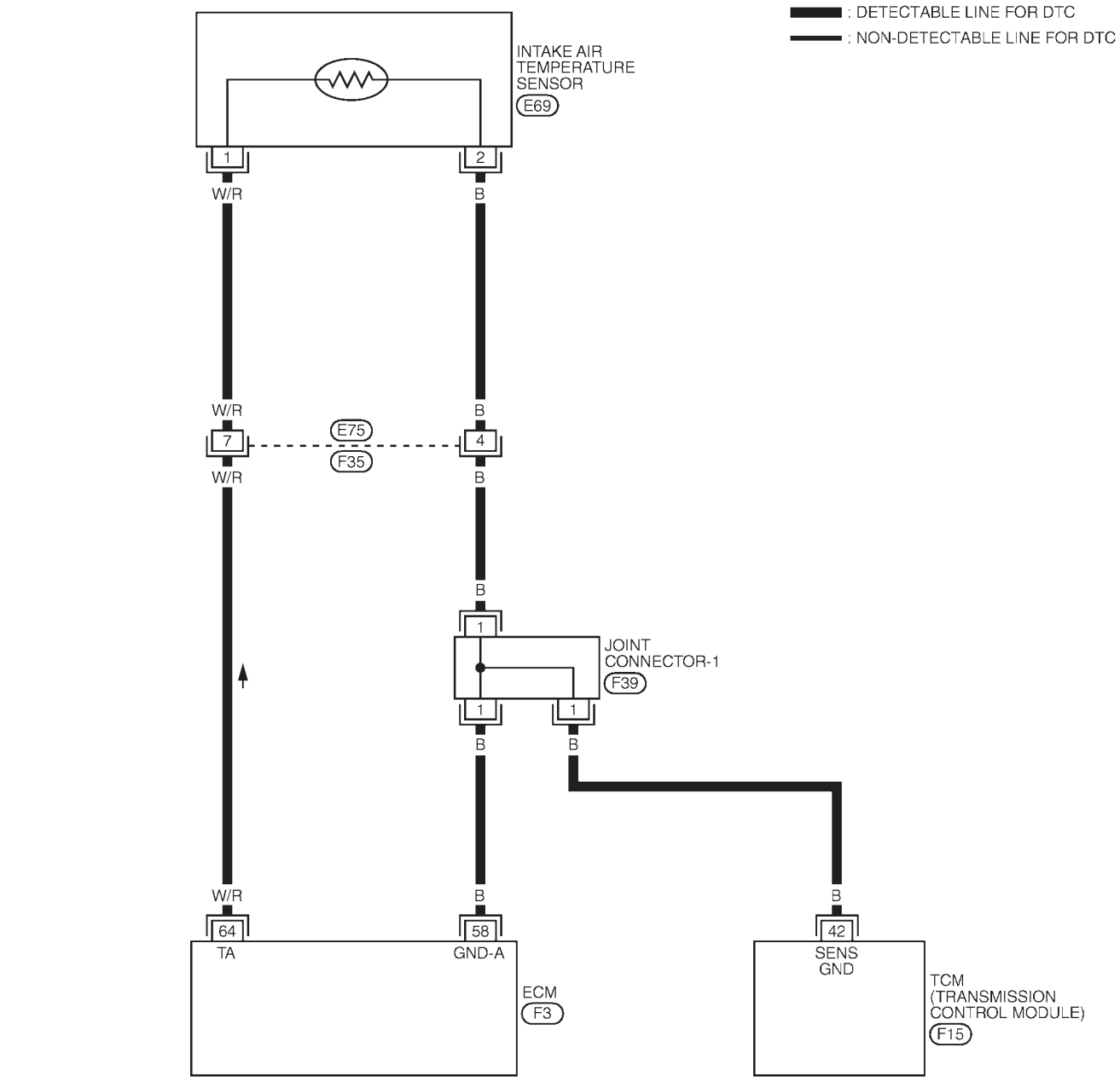
Wiring Diagram

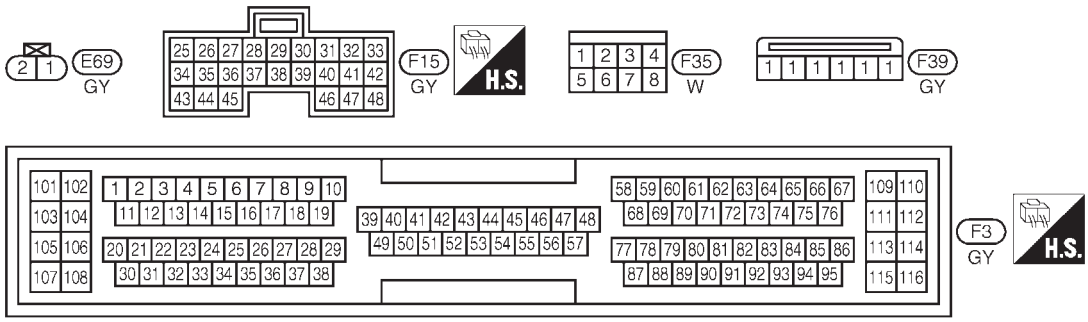
NLEC1393

MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT

NLEC1391S01

EC-IATS-01



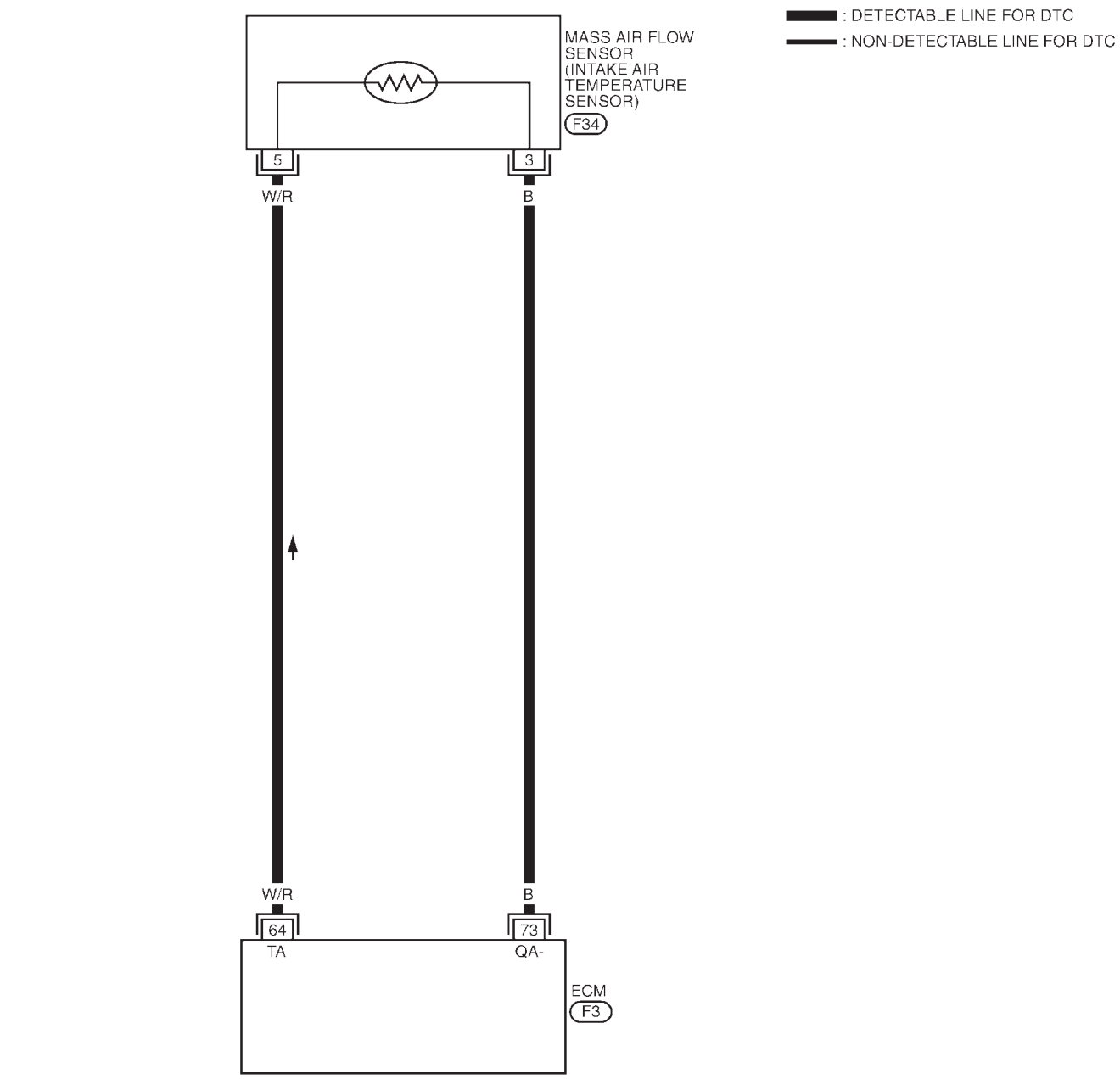


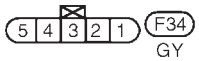
YEC688

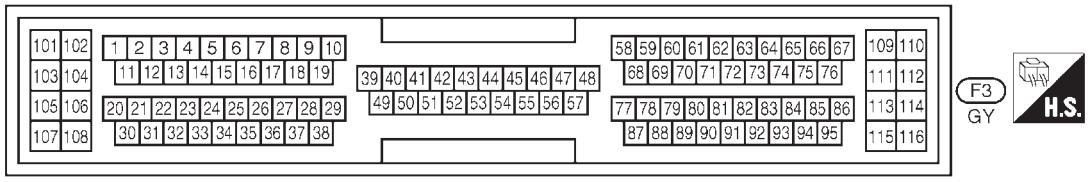
MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR

NLEC1391S02

EC-IATS-01







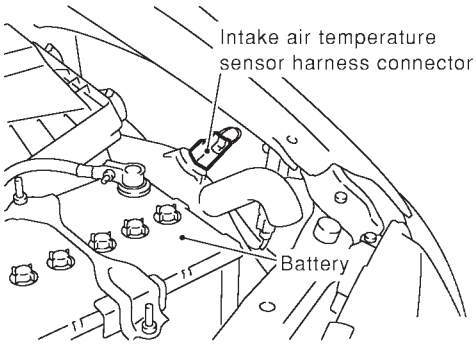
YEC913

Diagnostic Procedure

NLEC1394

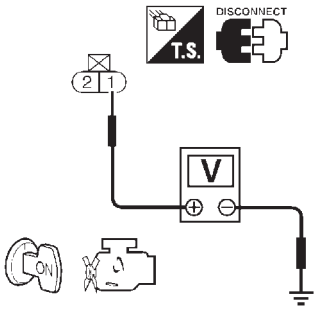
1	CHECK POWER SUPPLY (MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT)

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



SEF602Y

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



Voltage: Approximately 5V

SEF301X

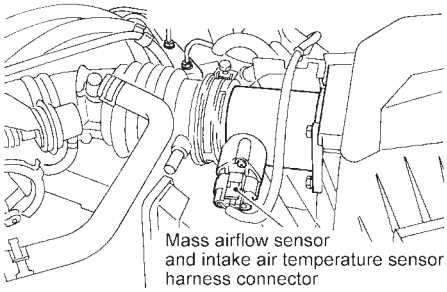
OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

Diagnostic Procedure (Cont'd)

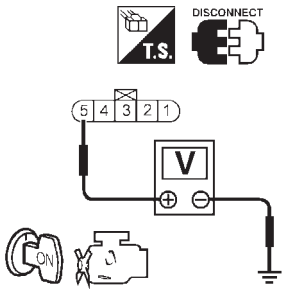
1	CHECK POWER SUPPLY (MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR)

1. Turn ignition switch "OFF".
2. Disconnect intake air temperature sensor (mass air flow sensor) harness connector.



NEF306A

3. Turn ignition switch "ON".
4. Check voltage between terminal 5 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

NEF307A

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E75, F35 (where fitted)
- Harness for open or short between ECM and intake air temperature sensor

	▶	Repair harness or connectors.

3	CHECK GROUND CIRCUIT

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

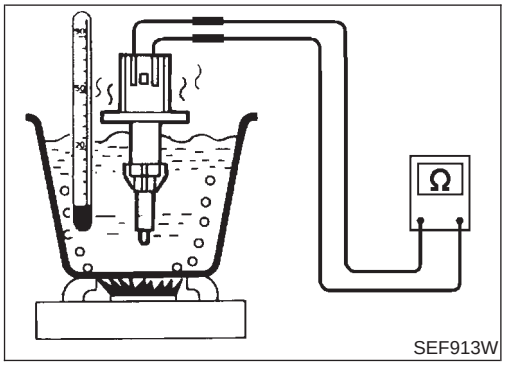
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

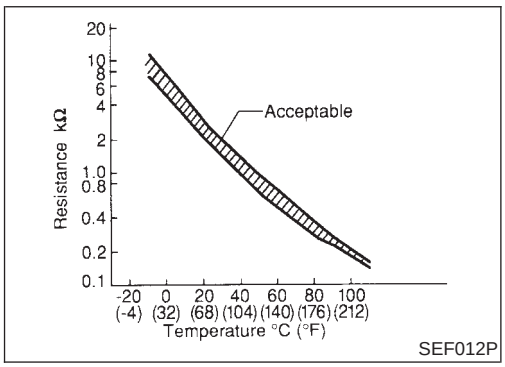
4	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-1 (where fitted) ● Harness connectors E75, F35 (where fitted) ● Harness for open or short between ECM and intake air temperature sensor ● Harness for open or short between TCM (Transmission Control Module) and intake air temperature sensor (where fitted)	
▶	Repair open circuit or short to power in harness or connectors.

5	CHECK INTAKE AIR TEMPERATURE SENSOR
Refer to "Component Inspection", EC-693.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace intake air temperature sensor.

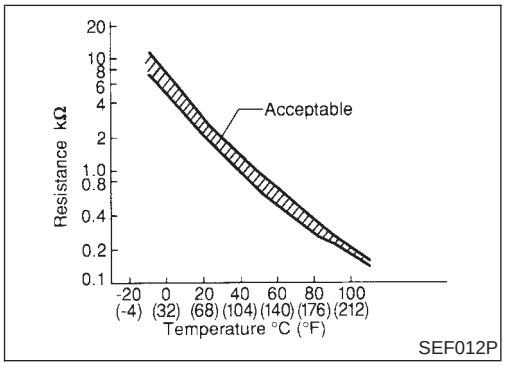
6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF913W



SEF012P



SEF012P

Component Inspection

NLEC1395

INTAKE AIR TEMPERATURE SENSOR

NLEC1395S01

Models with Intake Air Temperature Sensor on Intake Air Duct

NLEC1395S0101

Check resistance as shown in the figure.

<Reference data>

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

If NG, replace intake air temperature sensor.

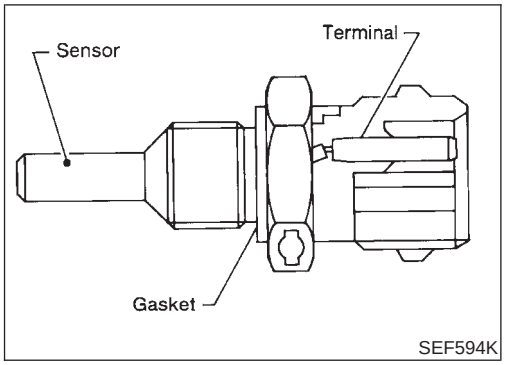
Models with Intake Air Temperature Sensor in Mass Air Flow Sensor

NLEC1395S0102

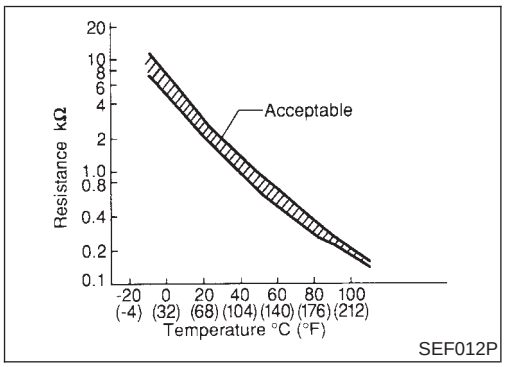
Check resistance between intake air temperature sensor (mass air flow sensor) terminal 3 and 5.
<Reference data>

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

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



SEF594K



SEF012P

Component Description

NLEC1396

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) 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.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1397

MONITOR ITEM	CONDITION	SPECIFICATION
COOLAN TEMP/S	● Engine: After warming up	More than 70°C (158°F)

On Board Diagnosis Logic

NLEC1398

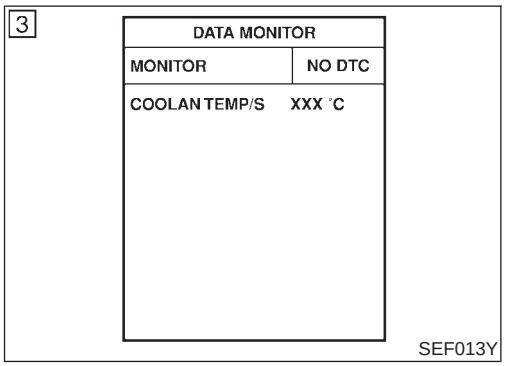
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0115 0115	● An excessively high or low voltage from the sensor is sent to ECM.*	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor

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

Fail-safe Mode

NLEC1399

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



DTC Confirmation Procedure

NLEC1400

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

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-698 .

With GST

Follow the procedure “With CONSULT-II” above.

No Tools

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-698.

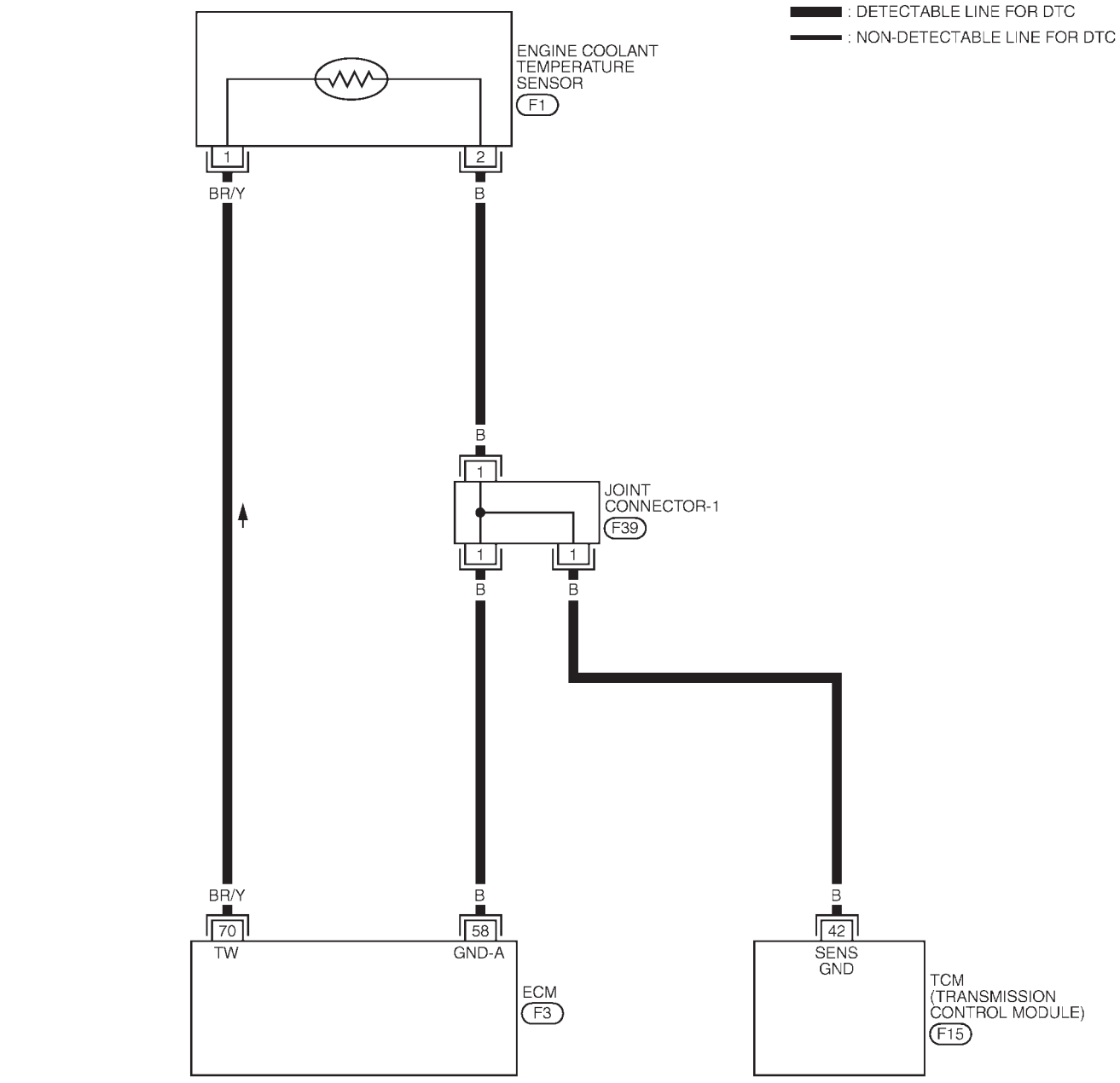
Wiring Diagram

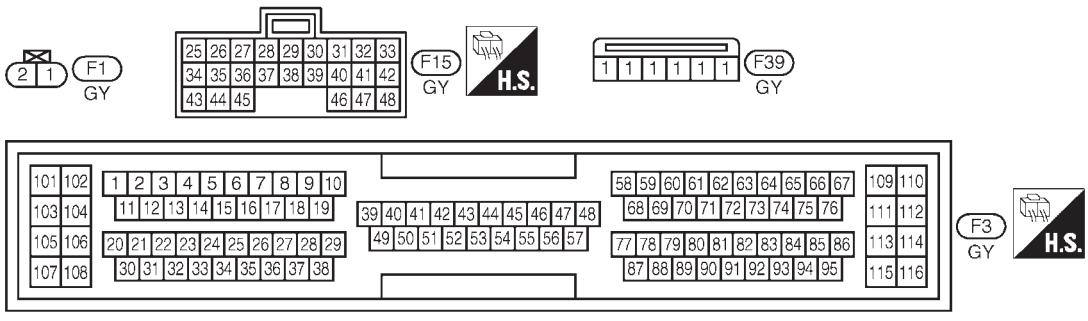
NLEC1401

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1401S01

EC-ECTS-01



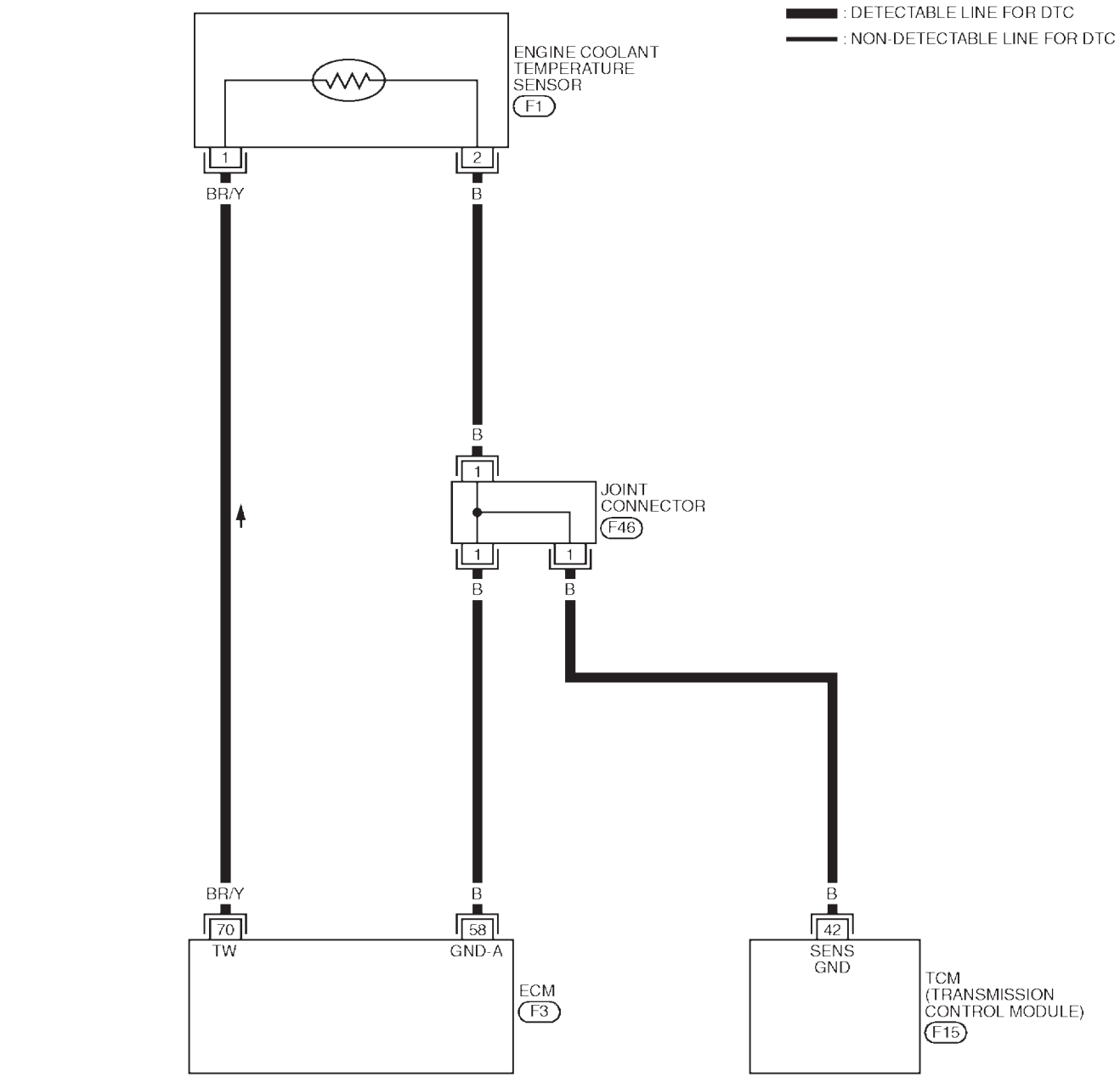


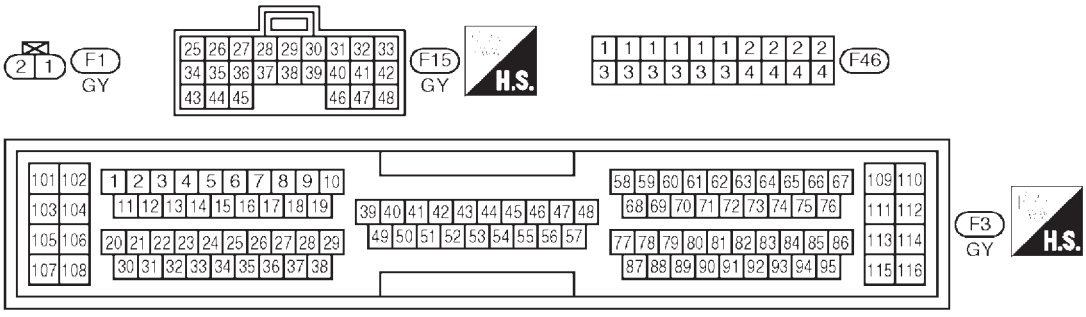
YEC689

MODELS WITH ECM IN CABIN

NLEC1401S02

EC-ECTS-01





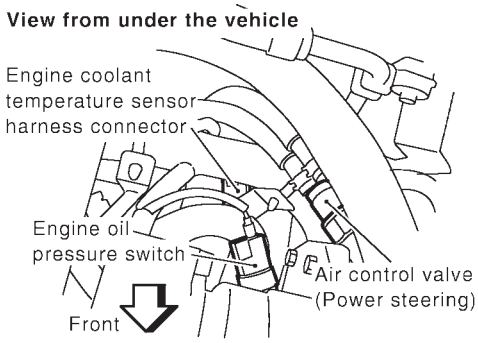
YEC914

Diagnostic Procedure

NLEC1402

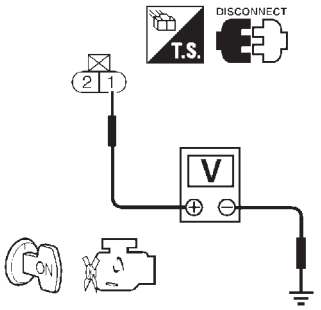
1	CHECK POWER SUPPLY

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



SEF773Z

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



Voltage: Approximately 5V

SEF301X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM and engine coolant temperature sensor.

	▶	Repair harness or connectors.

3	CHECK GROUND CIRCUIT

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

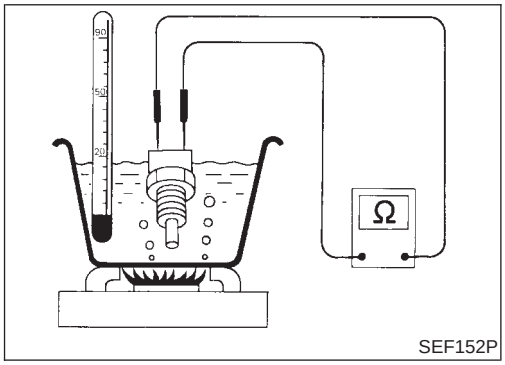
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

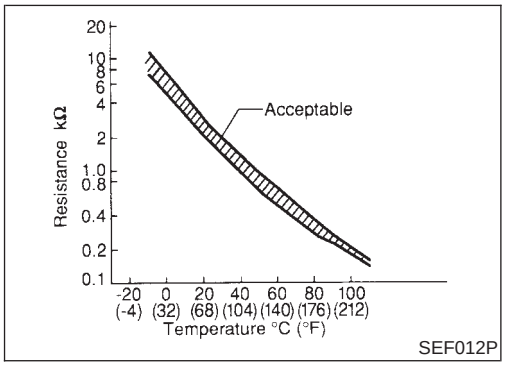
4	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-1 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between ECM and engine coolant temperature sensor ● Harness for open or short between engine coolant temperature sensor and TCM (Transmission Control Module)	
▶	Repair open circuit or short to power in harness or connectors.

5	CHECK ENGINE COOLANT TEMPERATURE SENSOR
Refer to "Component Inspection", EC-699. **OK or NG**	
OK ▶	GO TO 6.
NG ▶	Replace engine coolant temperature sensor.

6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF152P



SEF012P

Component Inspection

NLEC1403

ENGINE COOLANT TEMPERATURE SENSOR

NLEC1403S01

Check resistance 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

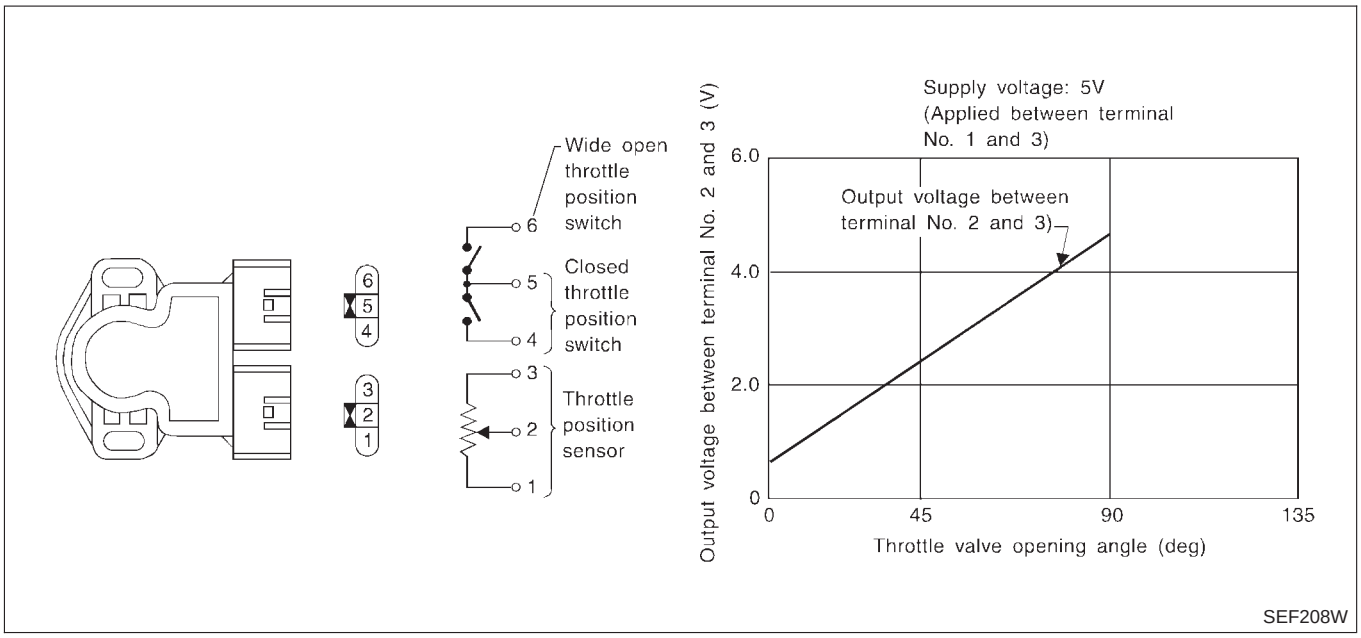
If NG, replace engine coolant temperature sensor.

Component Description

NLEC1404

NOTE:
If DTC P0120 (0120) is displayed with DTC P0510 (0510), first perform trouble diagnosis for DTC P0510, EC-872.

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.



SEF208W

CONSULT-II Reference Value in Data Monitor Mode

NLEC1405

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Engine: Idle	Throttle valve: fully closed	0.15 - 0.85V
	● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	3.5 - 4.7V
ABSOL TH·P/S	● Engine: Idle	Throttle valve: fully closed	0.0°
	● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	Approx. 80°

ECM Terminals and Reference Value

=NLEC1406

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)
58	B	Sensors' ground	**[Engine is running]** ● Warm up condition ● Idle speed	Approximately 0V
92	Y	Throttle position sensor	**[Engine is running]** ● Accelerator pedal fully released	0.15 - 0.85V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.5 - 4.7V
111	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V

On Board Diagnosis Logic

NLEC1407

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0120	An excessively low or high voltage from the sensor is sent to ECM* while driving.	● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor

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

Fail-safe Mode

NLEC1408

Detected items	Engine operating condition in fail-safe mode	
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

DTC Confirmation Procedure

NLEC1409

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.

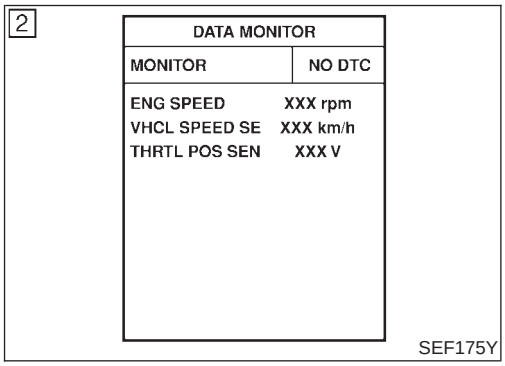
CAUTION:

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.



With CONSULT-II

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.

VHCL SPEED SE	More than 4 km/h (2 MPH)
Selector lever	Suitable position except "P" or "N" position

3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-705.

With GST

Follow the procedure "With CONSULT-II" above.

No Tools

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

Vehicle speed	More than 4 km/h (2 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-705.

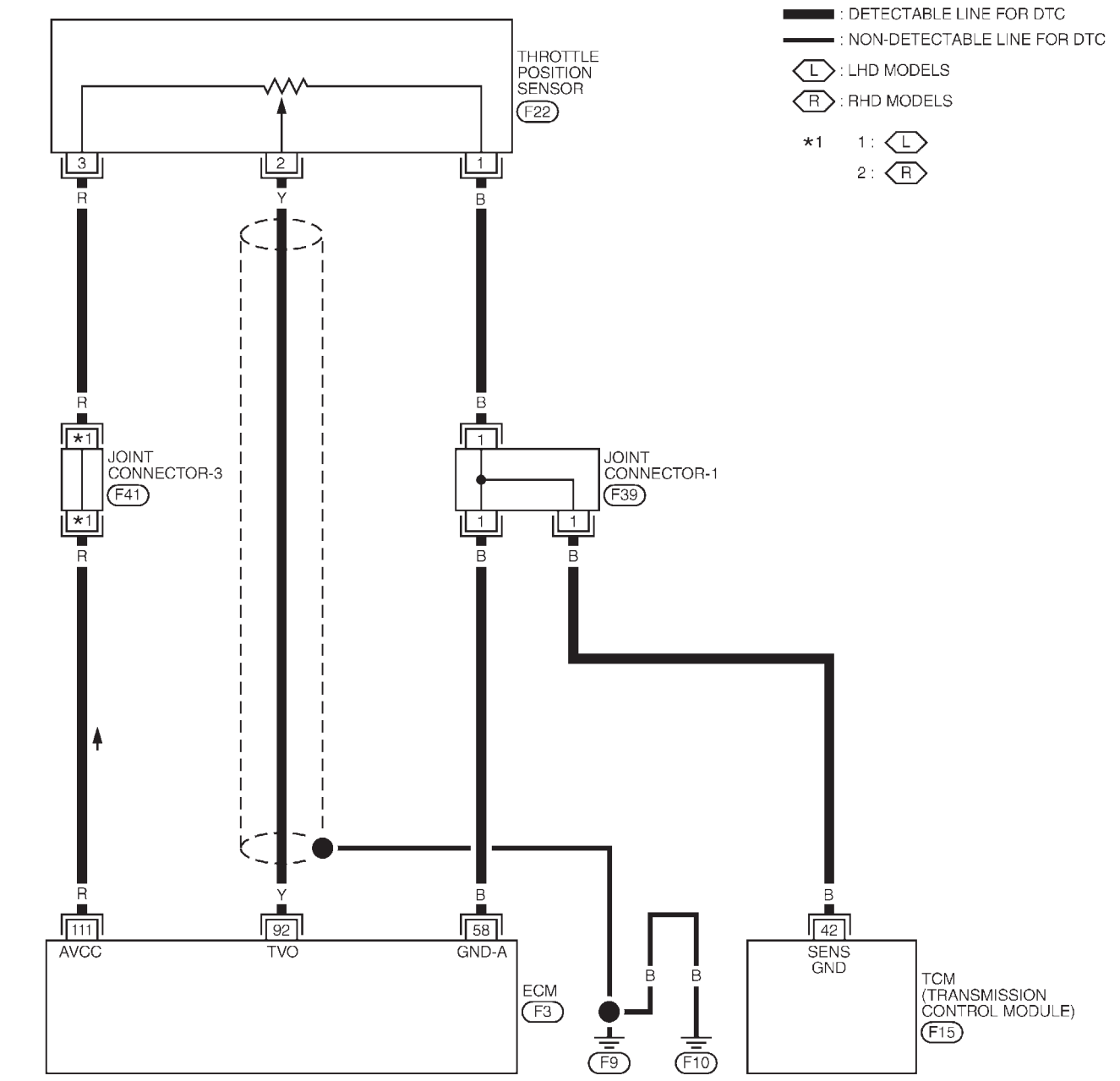
Wiring Diagram

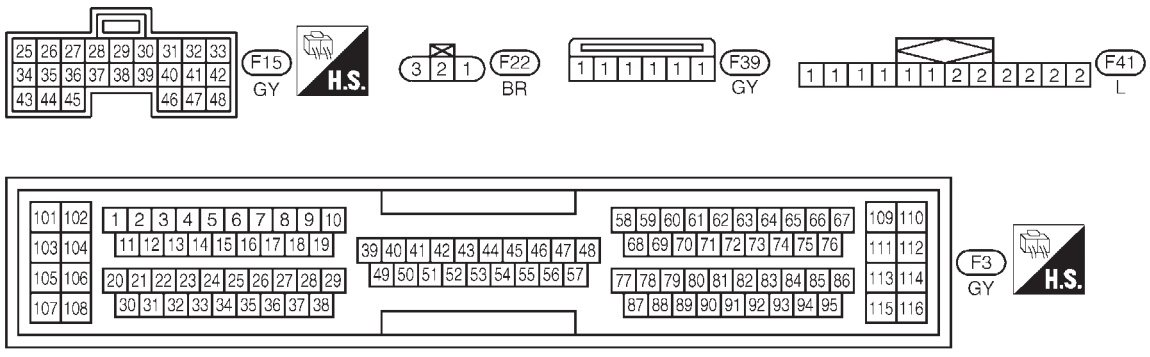
NLEC1410

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1410S01

EC-TPS-01



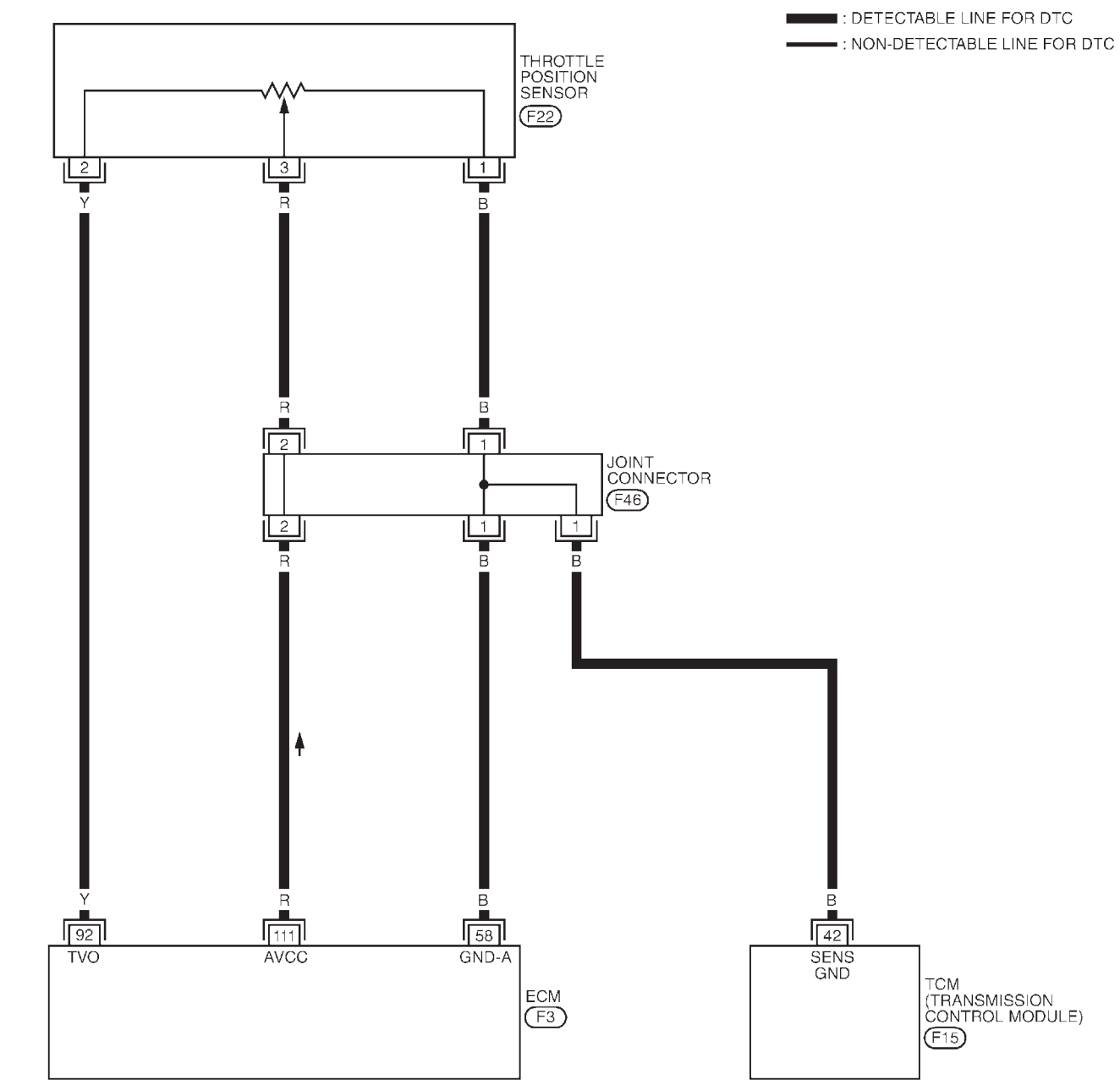


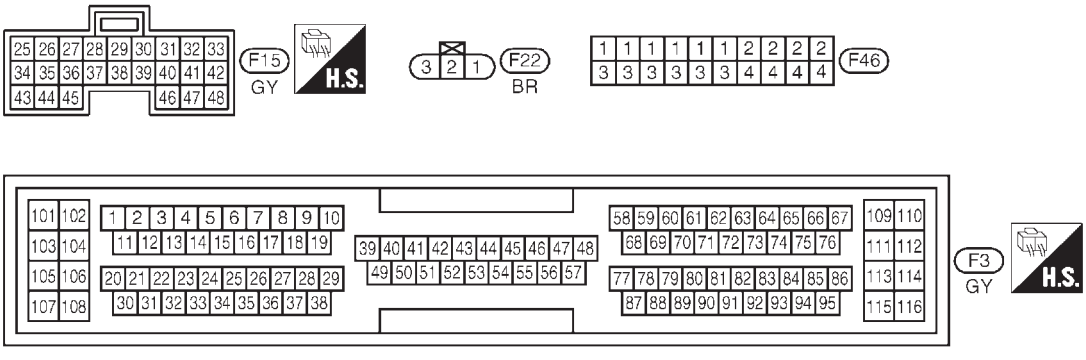
YEC690

MODELS WITH ECM IN CABIN

NLEC1410S02

EC-TPS-01





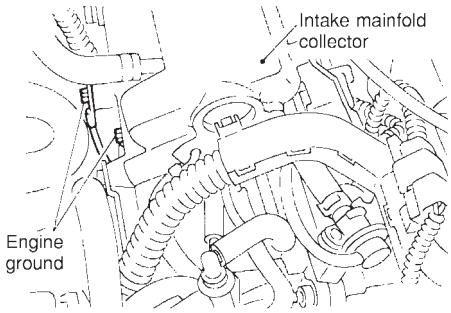
YEC915

Diagnostic Procedure

NLEC1411

1	RETIGHTEN GROUND SCREWS

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

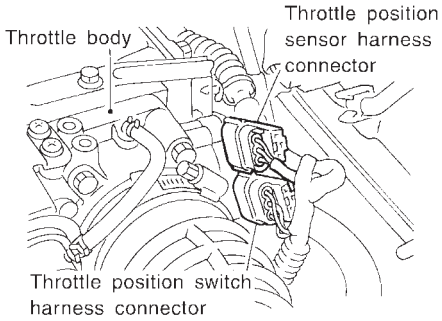


SEF202X

▶	GO TO 2.

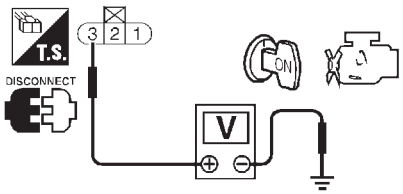
2	CHECK POWER SUPPLY

1. Disconnect throttle position sensor harness connector.



SEF770Z

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 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3
- Harness for open or short between throttle position sensor terminal 3 and ECM terminal 111

▶	Repair harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between throttle position 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 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-1 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between ECM terminal 58 and throttle position sensor
- Harness for open or short between ECM terminal 58 and TCM (Transmission Control Module)

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

6	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 92 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	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK THROTTLE POSITION SENSOR

Refer to "Component Inspection", EC-707.

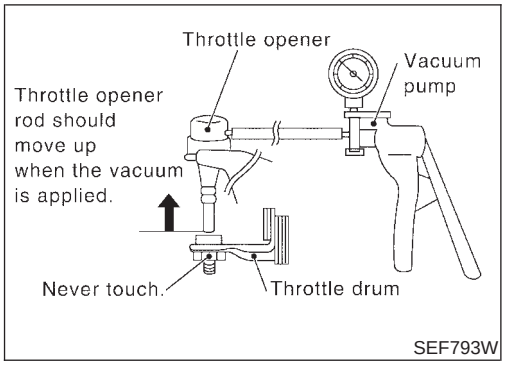
OK or NG

OK	▶	GO TO 8.
NG	▶	Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-623.

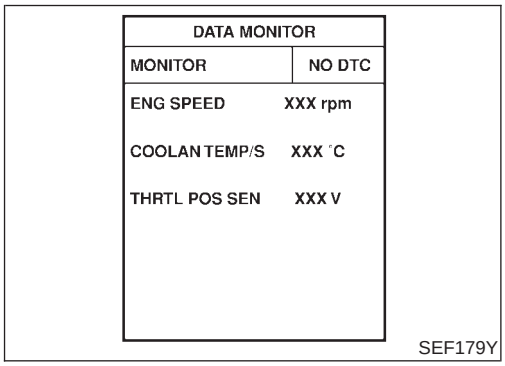
8	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

	▶	**INSPECTION END**



SEF793W



SEF179Y

Component Inspection

NLEC1412

THROTTLE POSITION SENSOR

NLEC1412S01

Models with Throttle Opener

NLEC1412S0101

With CONSULT-II

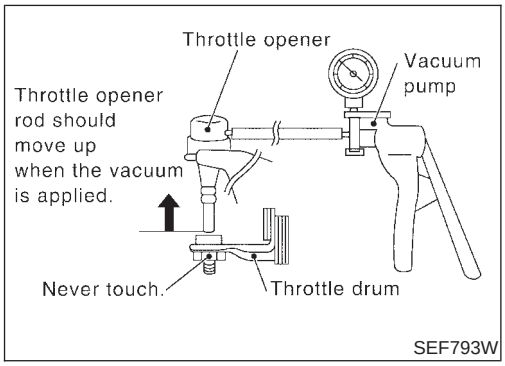
1) Start engine and warm it up to normal operating temperature.
2) Stop engine (ignition switch OFF).
3) Remove the vacuum hose connected to the throttle opener.
4) Connect suitable vacuum hose to the vacuum pump and the opener.
5) Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6) Turn ignition switch ON.
7) Select “DATA MONITOR” mode with CONSULT-II.
8) Check voltage of “THRTL POS SEN” under the following conditions.

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.

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

If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-623.

9) If it is impossible to adjust closed throttle position switch in “Basic Inspection”, replace throttle position sensor.



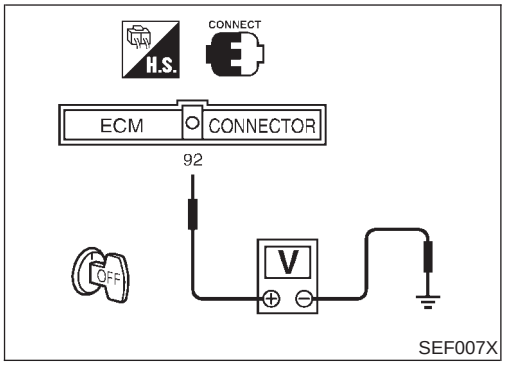
SEF793W

Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine (ignition switch OFF).
3) Remove the vacuum hose connected to the throttle opener.
4) Connect suitable vacuum hose to the vacuum pump and the opener.
5) Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6) Turn ignition switch ON.
7) Check voltage between ECM terminal 92 (Throttle position sensor signal) and ground under the following conditions.

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.

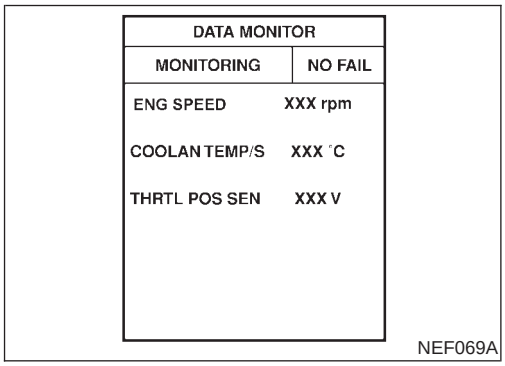
Throttle valve conditions	Voltage (V)
Completely closed	0.15 - 0.85 (a)
Partially open	Between (a) and (b)
Completely open	3.5 - 4.7 (b)



SEF007X

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-623.

8) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace throttle position sensor.



Models without Throttle Opener

NLEC1412S0102

With CONSULT-II

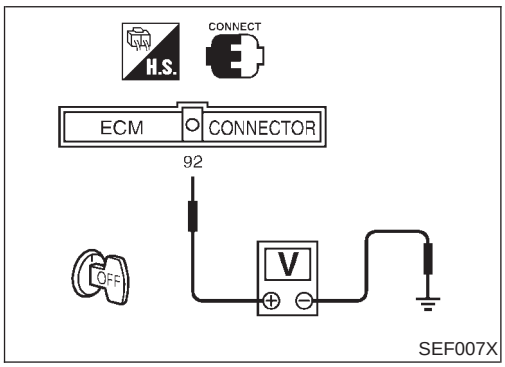
1) Start engine and warm it up to normal operating temperature.
2) Stop engine (ignition switch OFF).
3) Turn ignition switch ON.
4) Select "DATA MONITOR" mode with CONSULT-II.
5) Check voltage of "THRTL POS SEN" under the following conditions.

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.

Throttle valve conditions	Voltage (V)
Completely closed	0.35 - 0.65 (a)
Partially open	Between (a) and (b)
Completely open	3.5 - 4.5 (b)

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-638.

6) If it is impossible to adjust throttle position sensor idle position in "Basic Inspection", replace throttle position sensor.



Without CONSULT-II

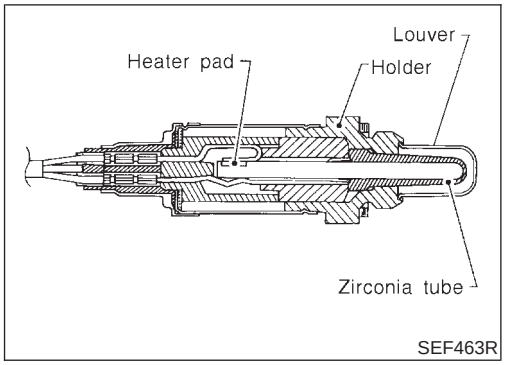
1) Start engine and warm it up to normal operating temperature.
2) Stop engine (ignition switch OFF).
3) Turn ignition switch ON.
4) Check voltage between ECM terminal 92 (Throttle position sensor signal) and ground under the following conditions.

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.

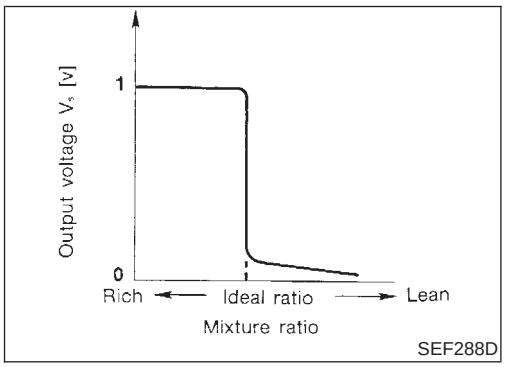
Throttle valve conditions	Voltage (V)
Completely closed	0.35 - 0.65 (a)
Partially open	Between (a) and (b)
Completely open	Approx. 4.0 (b)

If NG, adjust throttle position sensor idle position. Refer to "Basic Inspection", EC-638.

5) If it is impossible to adjust throttle position sensor idle position in "Basic Inspection", replace throttle position sensor.



SEF463R



SEF288D

Component Description

NLEC1413

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

NLEC1414

Specification data are reference values.

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

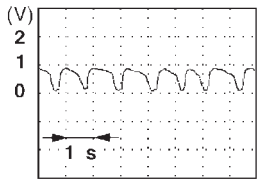
ECM Terminals and Reference Value

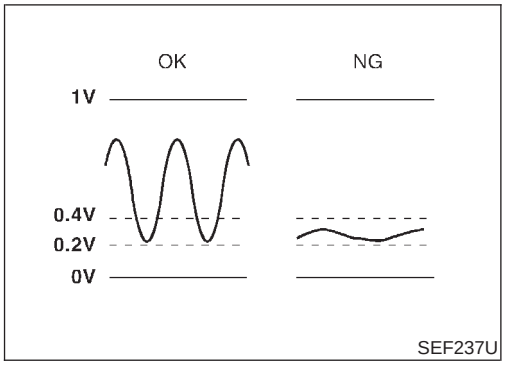
NLEC1415

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W



SEF237U

On Board Diagnosis Logic

NLEC1416

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.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0130	● The voltage from the sensor is constantly approx. 0.3V.	● 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

NLEC1417

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Select “HO2S1 (B1) P0130” of “HO2S1 (B1)” in “DTC WORK SUPPORT” mode with CONSULT-II.
3) Touch “START”.
4) Let it idle for at least 3.5 minutes.

NOTE:

Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 4.

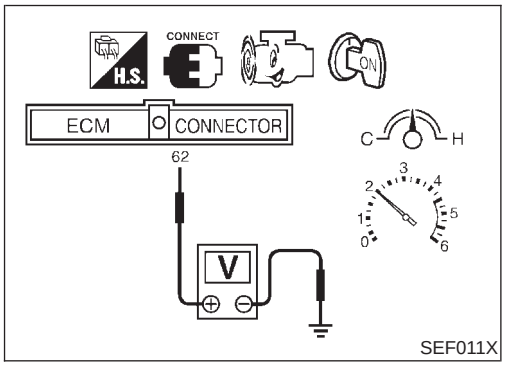
5) When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,250 - 3,200 rpm
Vehicle speed	64 - 130 km/h (40 - 81 MPH)
B/FUEL SCHDL	3.5 - 14.0 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-714.



Overall Function Check

NLEC1418

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

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

4) If NG, go to "Diagnostic Procedure", EC-714.

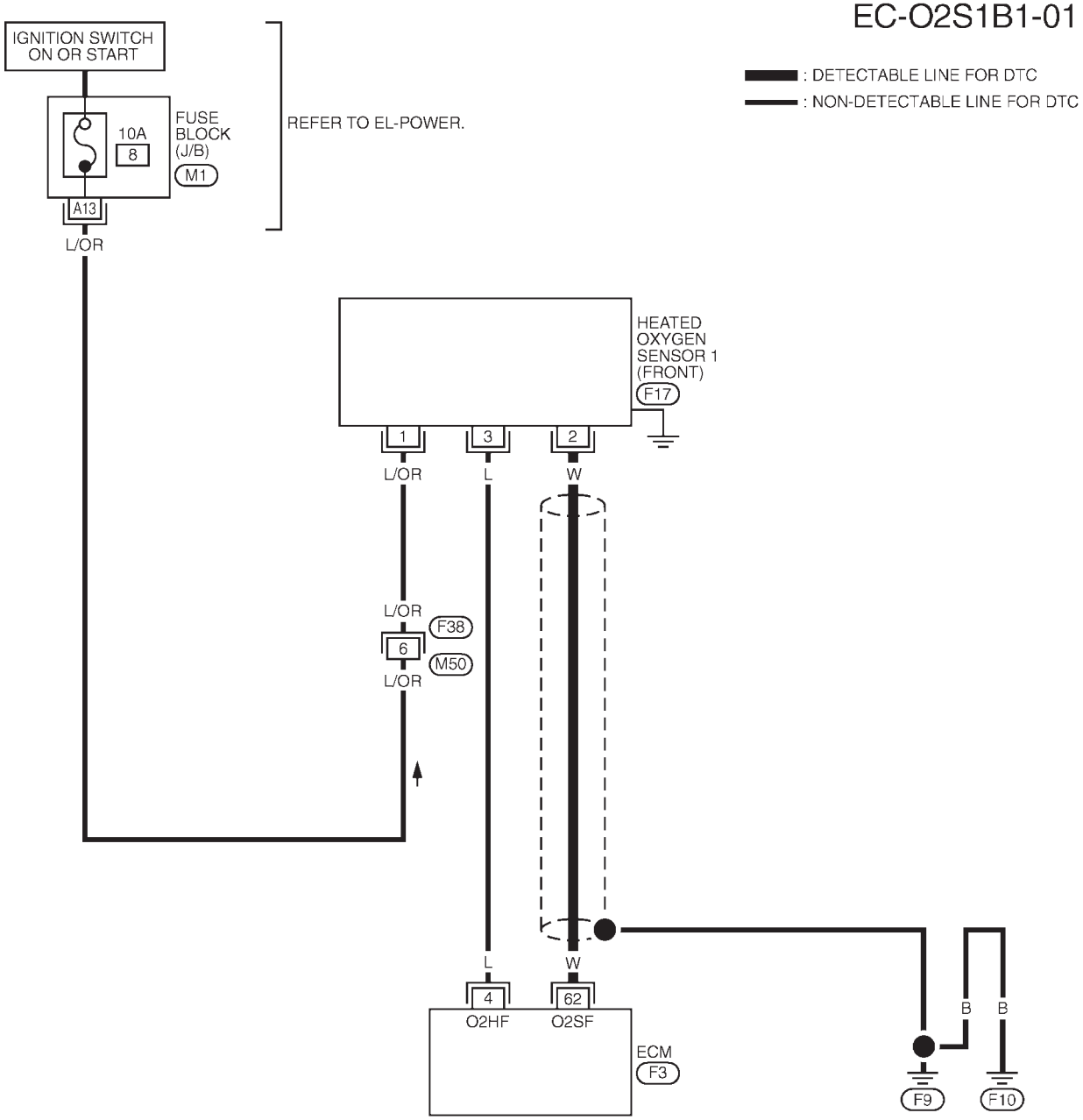
Wiring Diagram

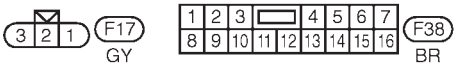
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1419

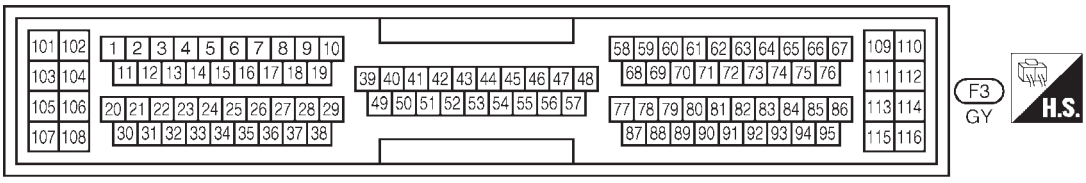
NLEC1419S03

EC-O2S1B1-01





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

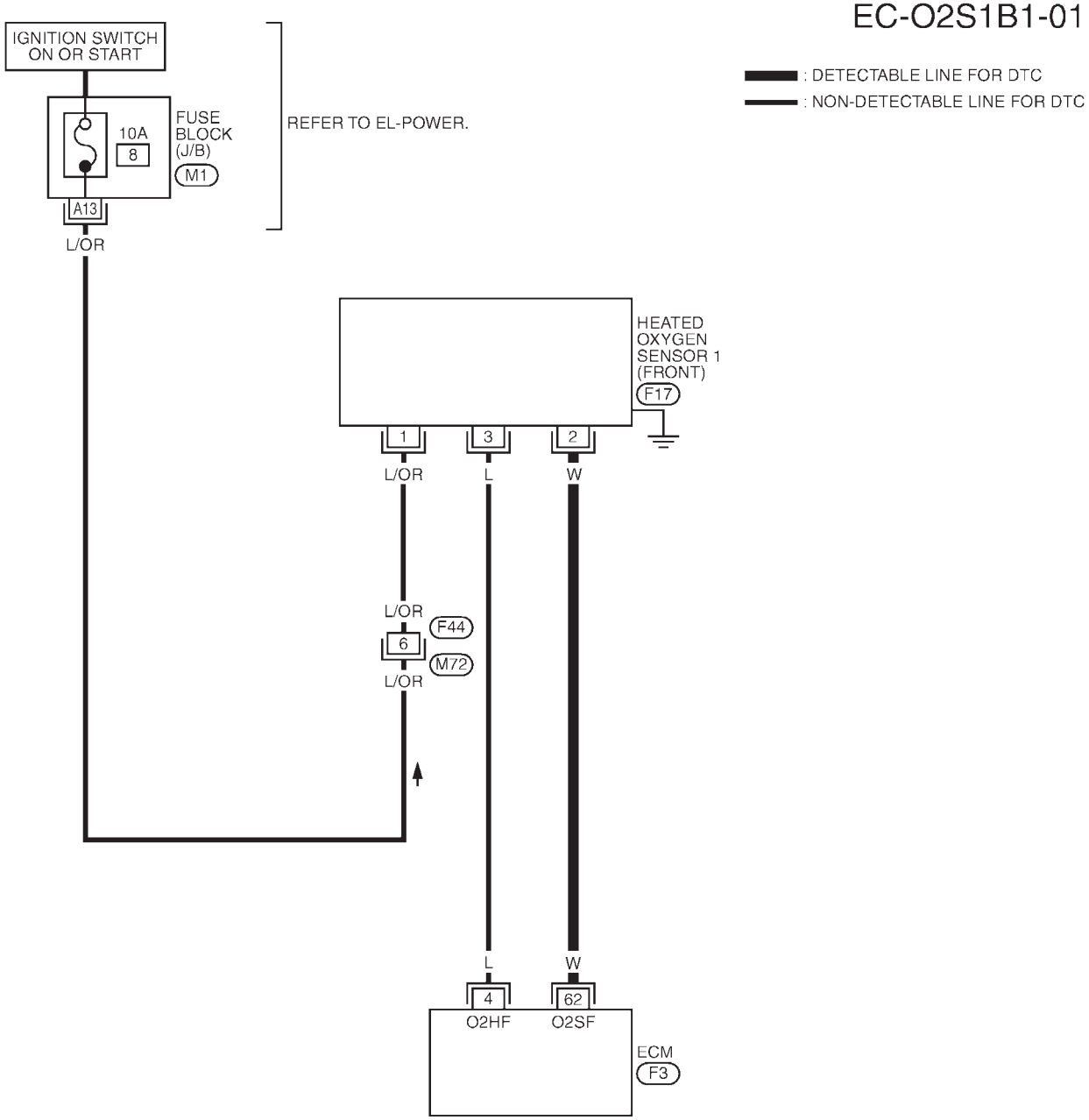


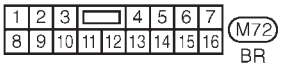
YEC691

MODELS WITH ECM IN CABIN

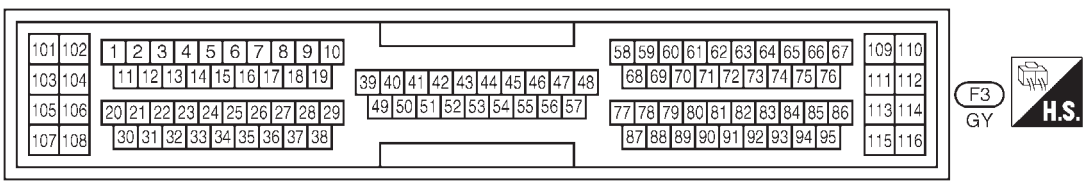
NLEC1419S04

EC-O2S1B1-01





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



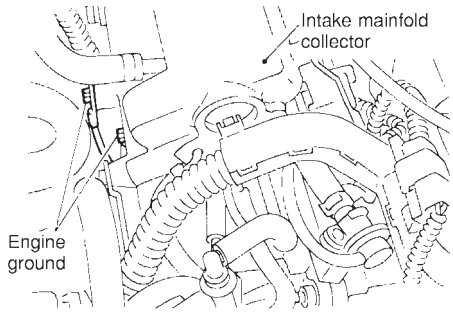
YEC916

Diagnostic Procedure

NLEC1420

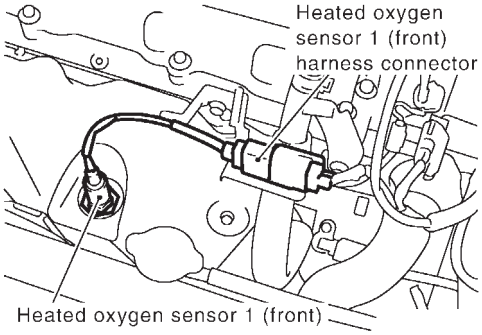
1	INSPECTION START

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



SEF202X

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



SEF774Z

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 62 and HO2S1 terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 62 (or HO2S1 terminal 2) and ground.
   Continuity should not exist.
4. 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 1 (FRONT)

Refer to “Component Inspection”, EC-715.

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace heated oxygen sensor 1 (front).

4	CHECK INTERMITTENT INCIDENT

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-670.

	▶	**INSPECTION END**

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

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

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

SEF217YA

Component Inspection

NLEC1421

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC1421S01

With CONSULT-II

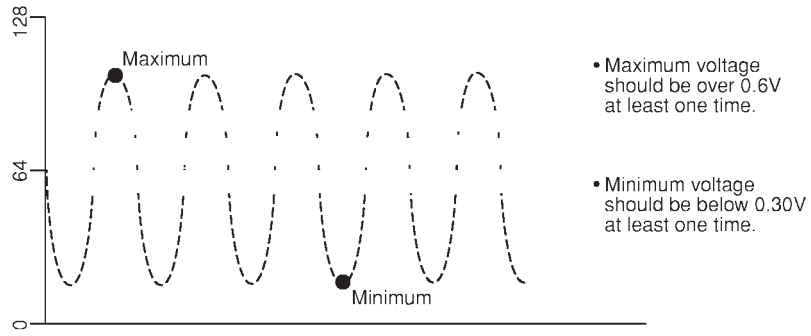
1) Start engine and warm it up to normal operating temperature.
2) Select “MANU TRIG” in “DATA MONITOR” mode, and select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch “RECORD” on CONSULT-II screen.
5) Check the following.

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

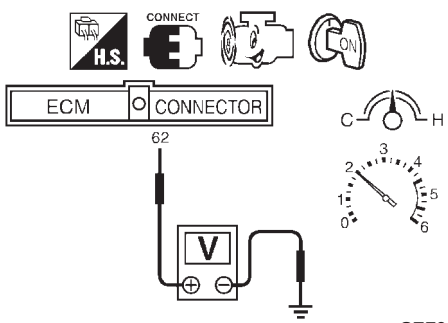
CAUTION:

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

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



SEF011X

Without CONSULT-II

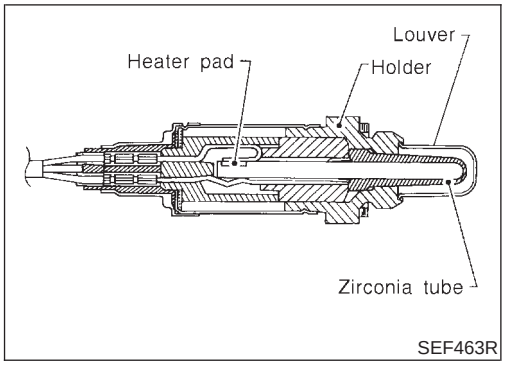
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times within 10 seconds.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

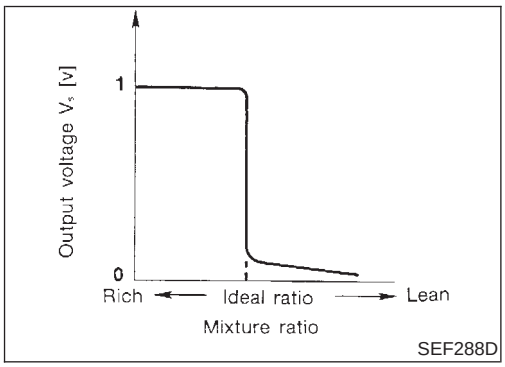
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

CAUTION:

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



SEF463R



SEF288D

Component Description

NLEC1422

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

NLEC1423

Specification data are reference values.

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

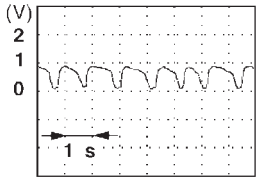
ECM Terminals and Reference Value

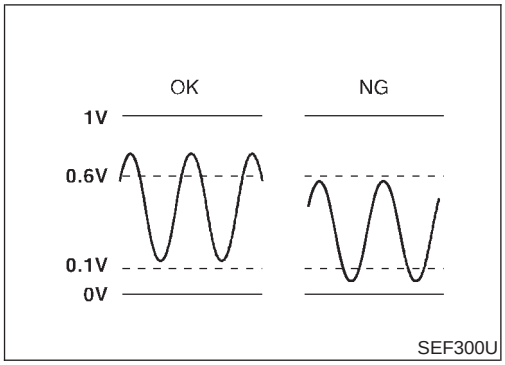
NLEC1424

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W



SEF300U

On Board Diagnosis Logic

NLEC1425

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.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0131	● The maximum and minimum voltages from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 (front) ● Heated oxygen sensor 1 heater (front) ● Fuel pressure ● Injectors ● Intake air leaks

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

DTC Confirmation Procedure

NLEC1426

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 10 seconds.
3) Turn ignition switch “ON” and select “HO2S1 (B1) P0131” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3.5 minutes.

NOTE:

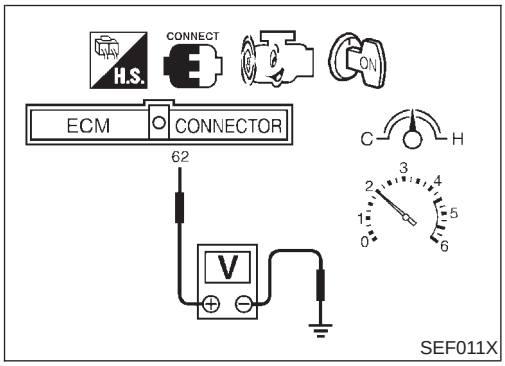
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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	1,150 - 2,500 rpm
Vehicle speed	50 - 100 km/h (31 - 62 MPH)
B/FUEL SCHDL	3.0 - 14.0 msec
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-719.



Overall Function Check

NLEC1427

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check 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-719.

Diagnostic Procedure

NLEC1428

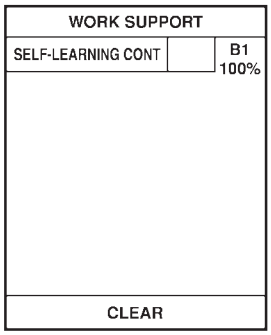
1	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
1. Turn ignition switch "OFF". 2. Loosen and retighten heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**	
▶	GO TO 2.

Diagnostic Procedure (Cont'd)

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "CLEAR".

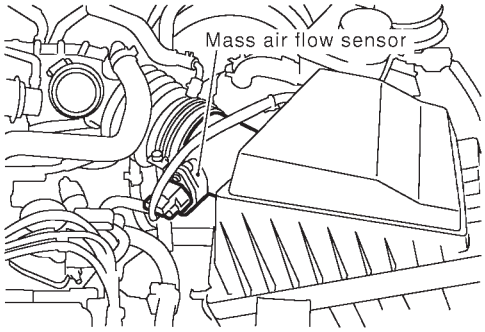


SEF215Z

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



SEF772Z

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-594.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171. Refer to EC-792.
No	▶	GO TO 3.

3	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

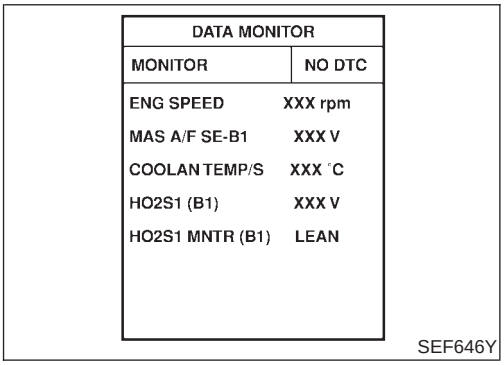
Refer to "Component Inspection", EC-751.

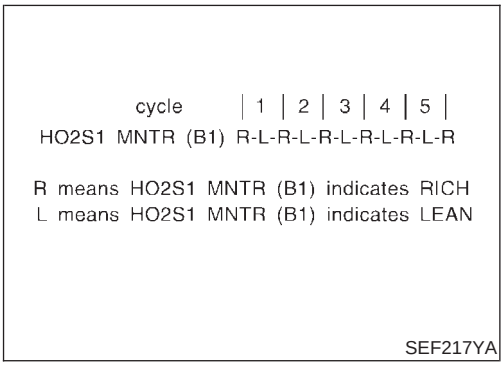
OK or NG

OK	▶	GO TO 4.
NG	▶	Replace heated oxygen sensor 1 (front).

4	CHECK HEATED OXYGEN SENSOR 1 (FRONT)	
Refer to "Component Inspection", EC-721.		
	OK or NG	
OK	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1 (front).

5	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670. Refer to "Wiring Diagram", EC-712, for circuit.		
	▶	**INSPECTION END**





Component Inspection

NLEC1429

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC1429S01

With CONSULT-II

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

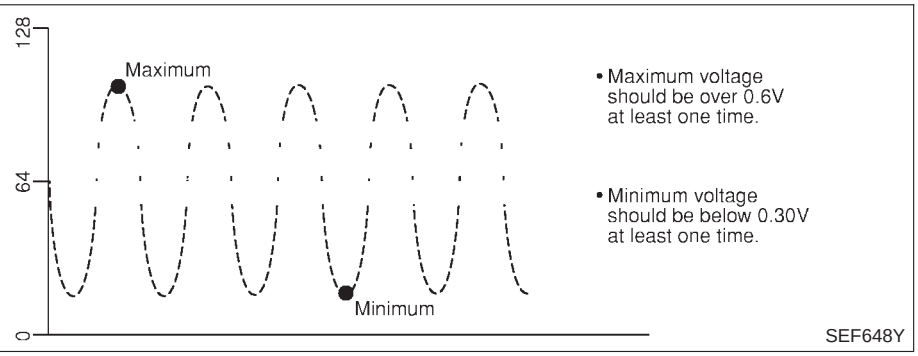
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "HO2S1 MNTR (B1)", "RICH"
  L = "HO2S1 MNTR (B1)", "LEAN"
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

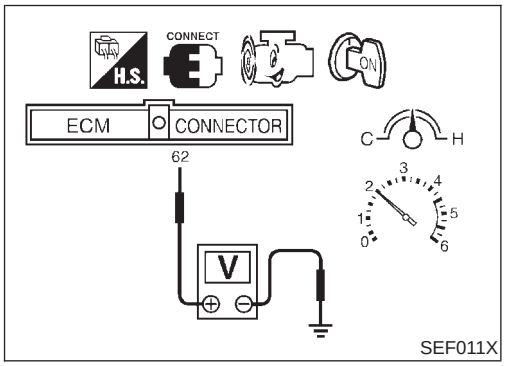
CAUTION:

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

Component Inspection (Cont'd)

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





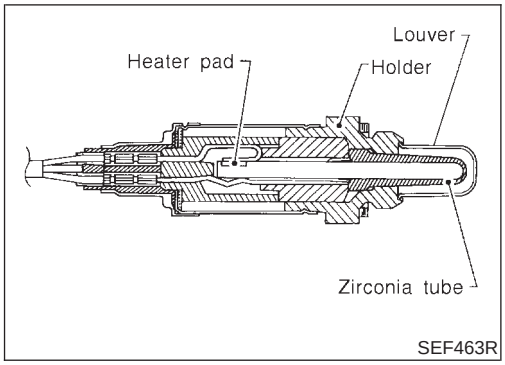
Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

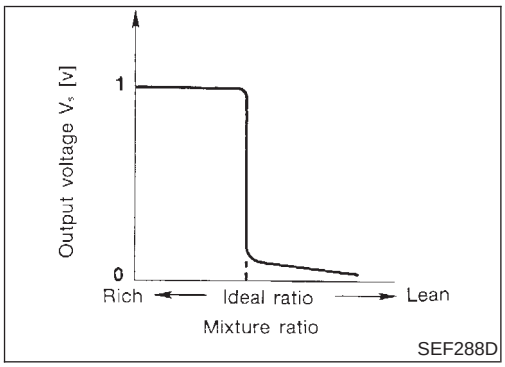
- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times within 10 seconds.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

CAUTION:

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



SEF463R



SEF288D

Component Description

NLEC1430

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

NLEC1431

Specification data are reference values.

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

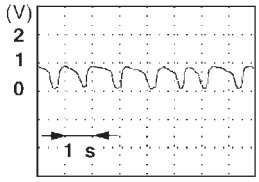
ECM Terminals and Reference Value

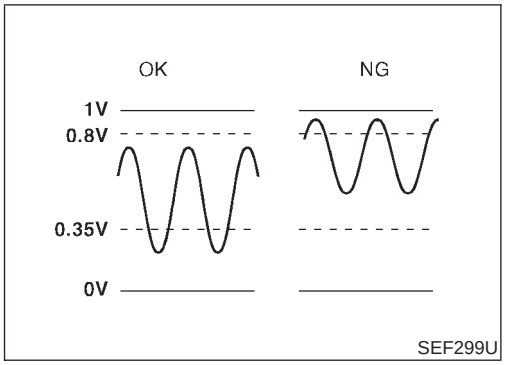
NLEC1432

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W



SEF299U

On Board Diagnosis Logic

NLEC1433

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.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0132	● The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 (front) ● Heated oxygen sensor 1 heater (front) ● Fuel pressure ● Injectors

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

DTC Confirmation Procedure

NLEC1434

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 10 seconds.
3) Turn ignition switch “ON” and select “HO2S1 (B1) P0132” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3.5 minutes.

NOTE:

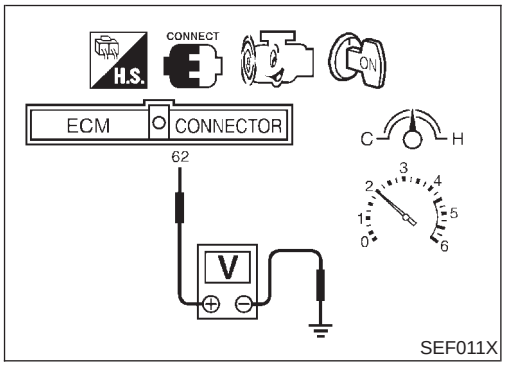
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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	1,150 - 2,500 rpm
Vehicle speed	50 - 100 km/h (31 - 62 MPH)
B/FUEL SCHDL	3.0 - 14.0 msec
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-725.



Overall Function Check

NLEC1435

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check 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-725.

Diagnostic Procedure

NLEC1436

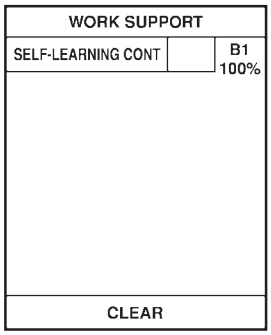
1	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
1. Turn ignition switch "OFF". 2. Loosen and retighten heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**	
▶	GO TO 2.

Diagnostic Procedure (Cont'd)

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "CLEAR".

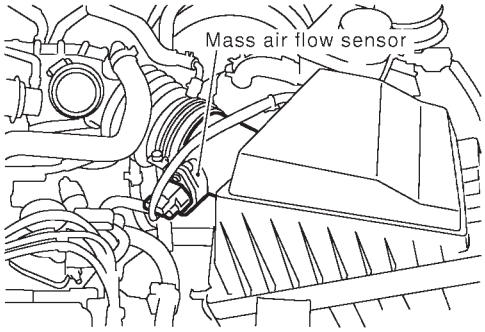


SEF215Z

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



SEF772Z

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-594.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-800.
No	▶	GO TO 3.

3	CHECK HARNESS CONNECTOR

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 1 (front) harness connector.
3. Check harness connector for water.
   Water should not exit.

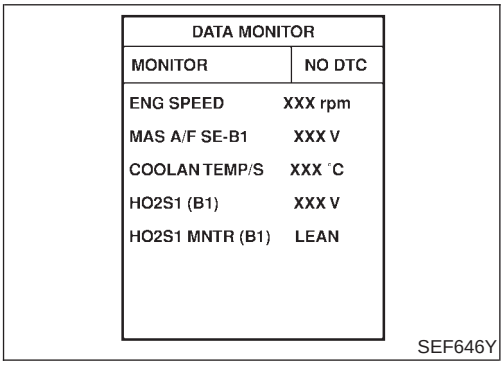
OK or NG

OK	▶	GO TO 4.
NG	▶	Repair or replace harness connector.

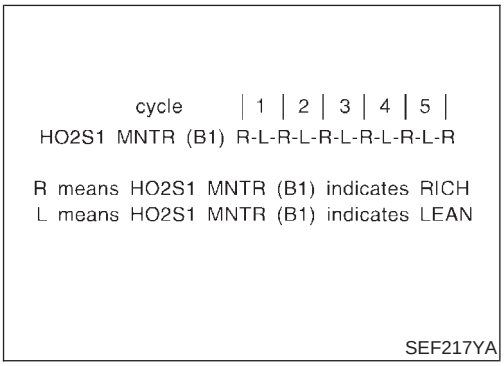
4	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)	
Refer to "Component Inspection", EC-751.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1 (front).

5	CHECK HEATED OXYGEN SENSOR 1 (FRONT)	
Refer to "Component Inspection", EC-727.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Replace heated oxygen sensor 1 (front).

6	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670. Refer to "Wiring Diagram", EC-712, for circuit.		
	▶	**INSPECTION END**



SEF646Y



SEF217YA

Component Inspection

NLEC1437

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC1437S01

With CONSULT-II

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

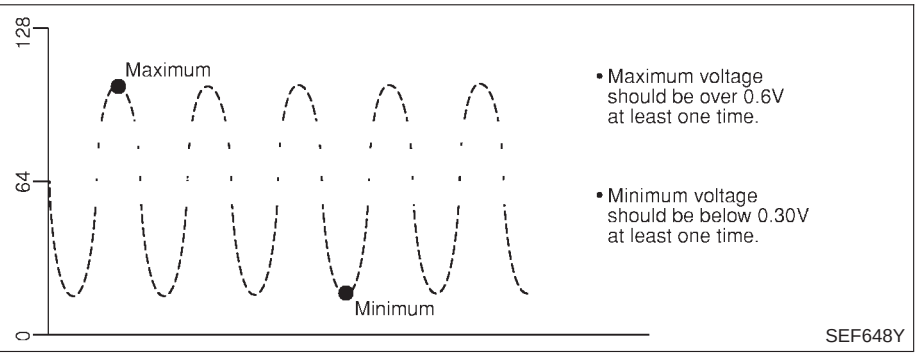
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "HO2S1 MNTR (B1)", "RICH"
  L = "HO2S1 MNTR (B1)", "LEAN"
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

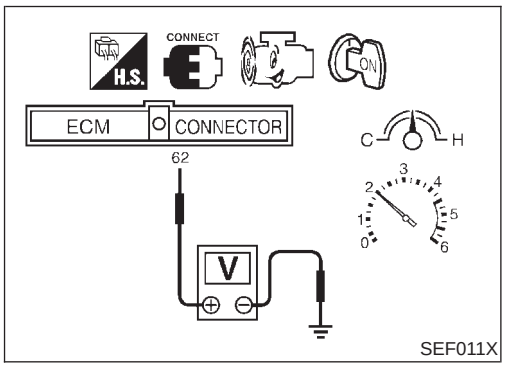
CAUTION:

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

Component Inspection (Cont'd)

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





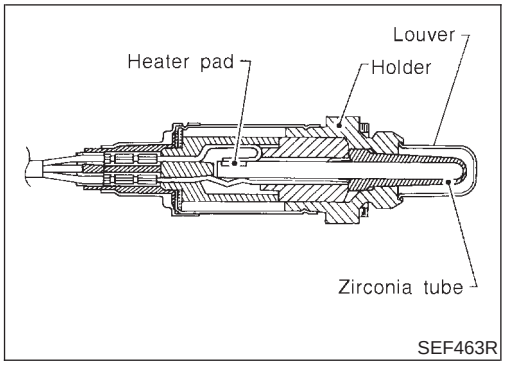
Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

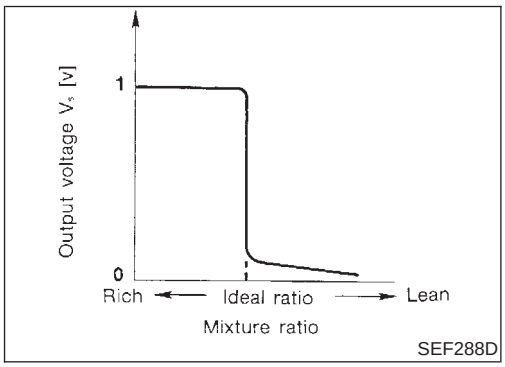
- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times within 10 seconds.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

CAUTION:

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



SEF463R



SEF288D

Component Description

NLEC1438

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

NLEC1439

Specification data are reference values.

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

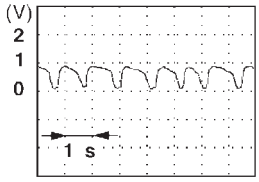
ECM Terminals and Reference Value

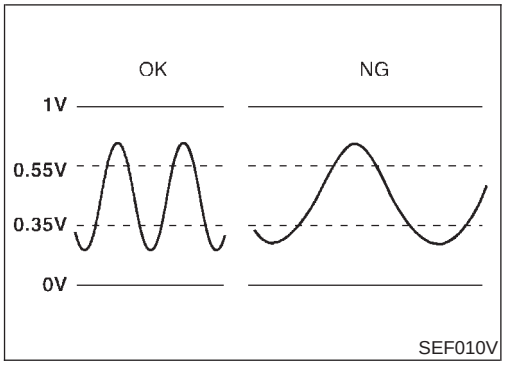
NLEC1440

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

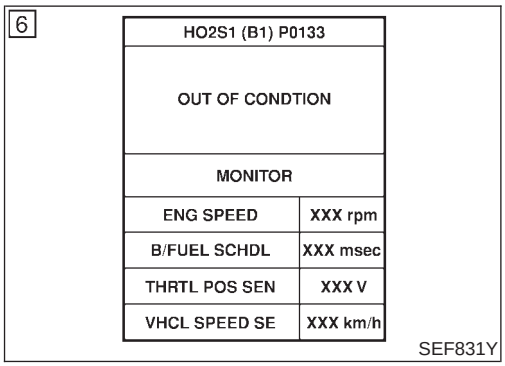


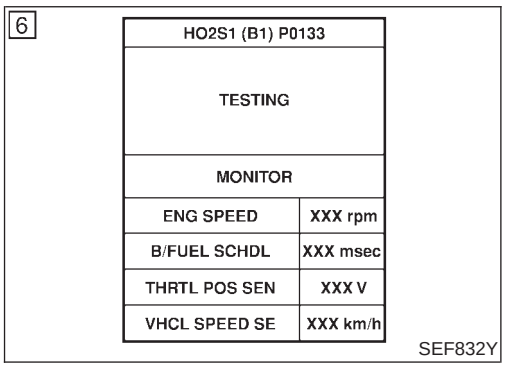
On Board Diagnosis Logic

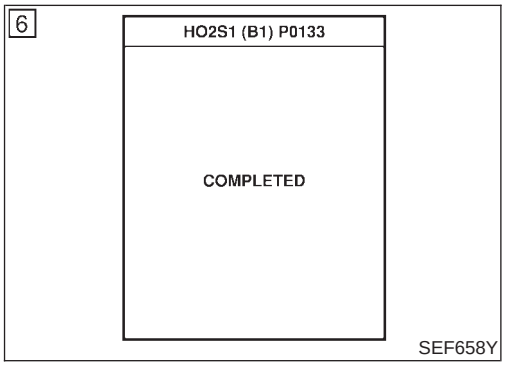
NLEC1441

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.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0133	● The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1 (front) ● Heated oxygen sensor 1 heater (front) ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV ● Mass air flow sensor







DTC Confirmation Procedure

NLEC1442

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 10 seconds.
3) Turn ignition switch “ON” and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3.5 minutes.

NOTE:

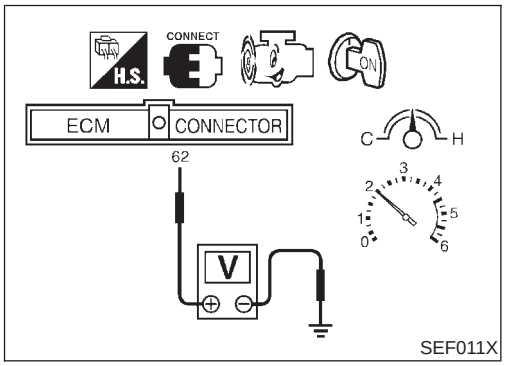
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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.)

ENG SPEED	1,400 - 3,200 rpm
Vehicle speed	80 - 120 km/h (50 - 75 MPH)
B/FUEL SCHDL	3.5 - 14.0 msec
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-734.



Overall Function Check

NLEC1443

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]

4) If NG, go to "Diagnostic Procedure", EC-734.

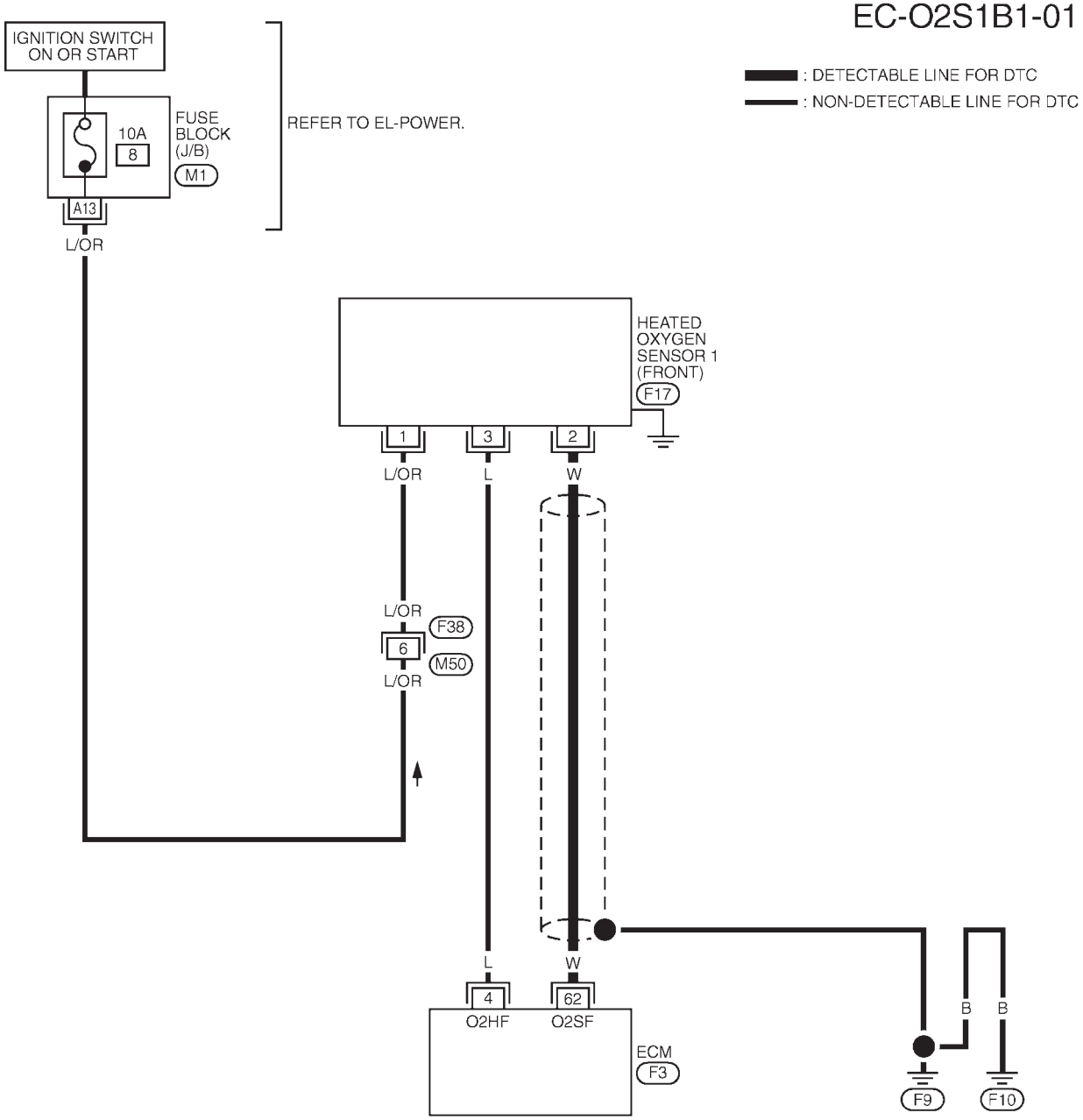
Wiring Diagram

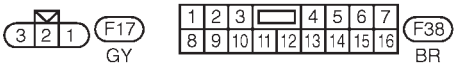
NLEC1444

MODELS WITH ECM IN ENGINE COMPARTMENT

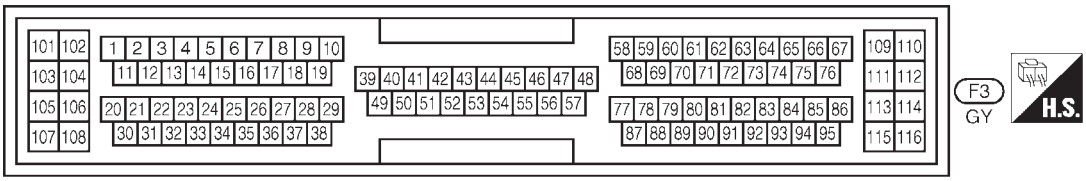
NLEC1444S03

EC-O2S1B1-01





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

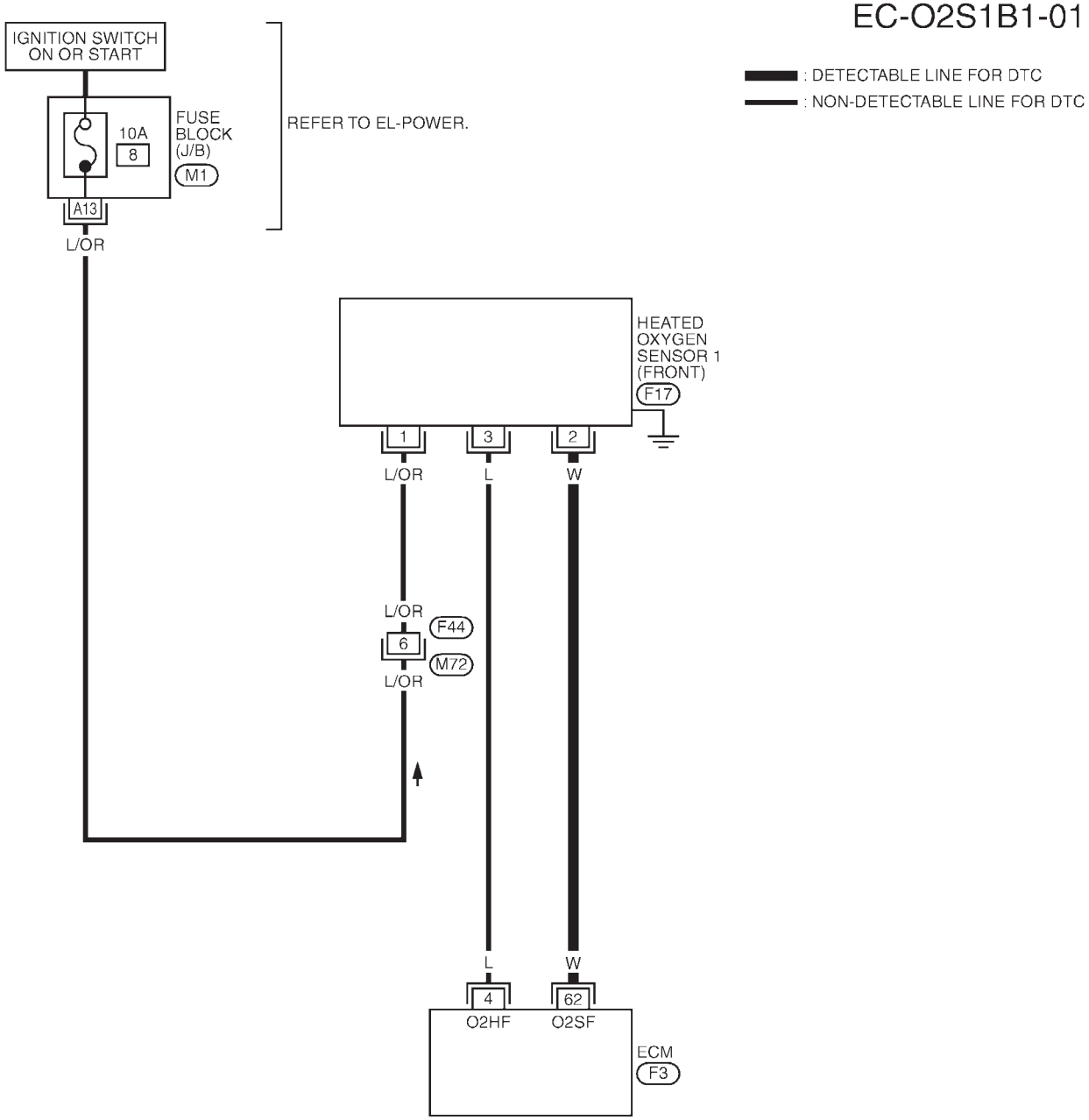


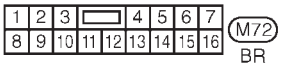
YEC691

MODELS WITH ECM IN CABIN

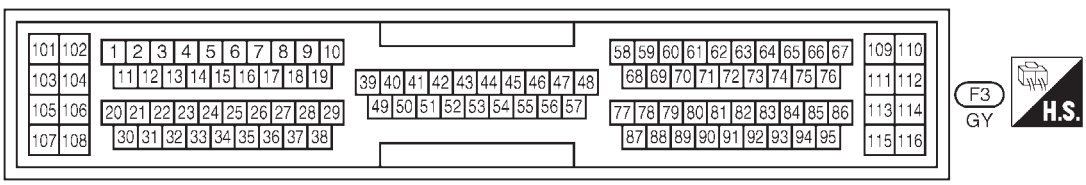
NLEC1444S04

EC-O2S1B1-01





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



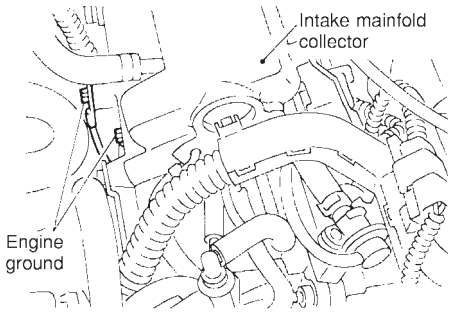
YEC916

Diagnostic Procedure

NLEC1445

1	RETIGHTEN GROUND SCREWS

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



SEF202X

▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)

Loosen and retighten heated oxygen sensor 1 (front).

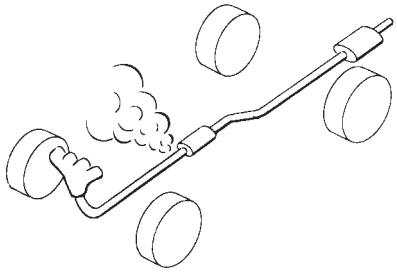
Tightening torque:

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

▶	GO TO 3.

3	CHECK EXHAUST AIR LEAK

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



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.

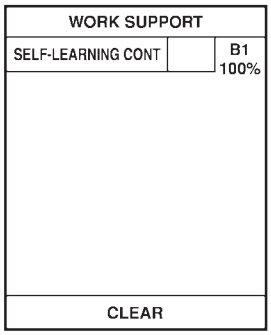
OK or NG

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-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "CLEAR".

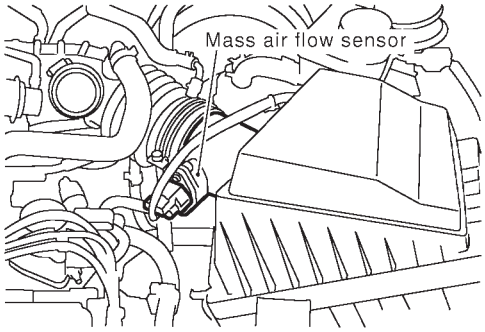


SEF215Z

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



SEF772Z

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-594.
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 P0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171, P0172. Refer to EC-792, 800.
No	▶	GO TO 6.

6	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 1 (front) harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal 62 and HO2S1 terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 62 (or HO2S1 terminal 2) and ground.
   Continuity should not exist.
4. Also check harness for 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 HEATED OXYGEN SENSOR 1 HEATER (FRONT)	
Refer to "Component Inspection", EC-751.		
	OK or NG	
OK	▶	GO TO 8.
NG	▶	Replace heated oxygen sensor 1 (front).

8	CHECK HEATED OXYGEN SENSOR 1 (FRONT)	
Refer to "Component Inspection", EC-737.		
	OK or NG	
OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 1 (front).

9	CHECK MASS AIR FLOW SENSOR	
Refer to "Component Inspection", EC-686.		
	OK or NG	
OK	▶	GO TO 10.
NG	▶	Replace mass air flow sensor.

10	CHECK PCV VALVE	
Refer to "Positive Crankcase Ventilation", EC-576.		
	OK or NG	
OK	▶	GO TO 11.
NG	▶	Repair or replace PCV valve.

11	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**

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

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

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

SEF217YA

Component Inspection

NLEC1446

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC1446S01

With CONSULT-II

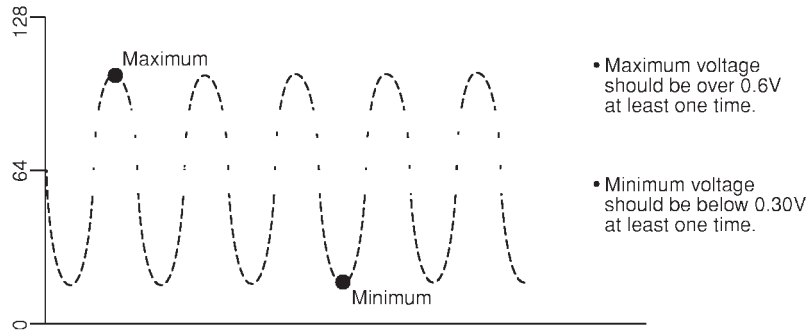
1) Start engine and warm it up to normal operating temperature.
2) Select “MANU TRIG” in “DATA MONITOR” mode, and select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch “RECORD” on CONSULT-II screen.
5) Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” five times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = “HO2S1 MNTR (B1)”, “RICH”
  L = “HO2S1 MNTR (B1)”, “LEAN”
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

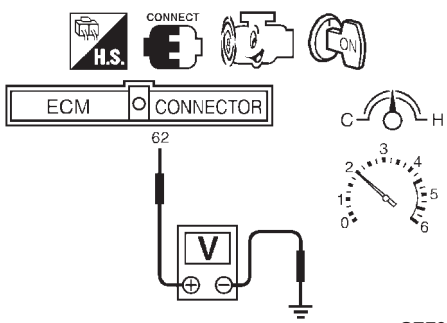
CAUTION:

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

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



SEF011X

Without CONSULT-II

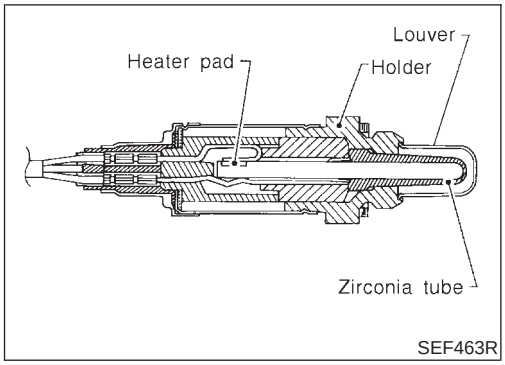
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times within 10 seconds.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

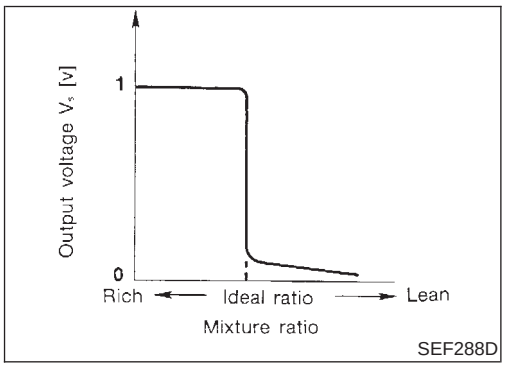
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

CAUTION:

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



SEF463R



SEF288D

Component Description

NLEC1447

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

NLEC1448

Specification data are reference values.

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

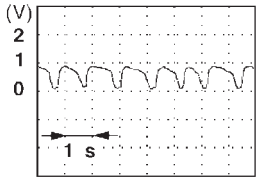
ECM Terminals and Reference Value

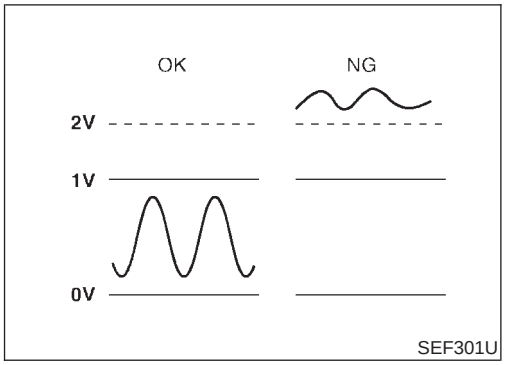
NLEC1449

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

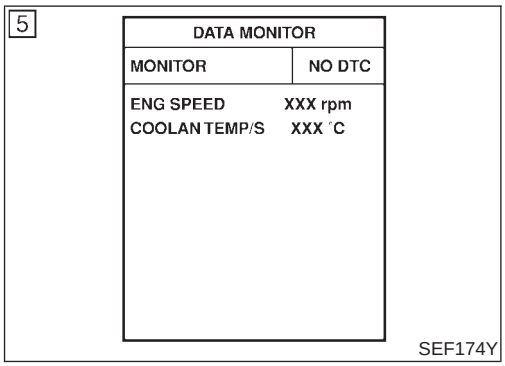


On Board Diagnosis Logic

NLEC1450

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

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0134	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1 (front)



DTC Confirmation Procedure

NLEC1451

NOTE:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 10 seconds.
3) Turn ignition switch “ON”.
4) Select “DATA MONITOR” mode with CONSULT-II.
5) Restart engine and let it idle for 2 minutes.
6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-743.

With GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 10 seconds.
3) Restart engine and let it idle for 2 minutes.
4) Turn ignition switch “OFF” and wait at least 10 seconds.
5) Restart engine and let it idle for 2 minutes.
6) Select “MODE 3” with GST.
7) If DTC is detected, go to “Diagnostic Procedure”, EC-743.

- **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.**

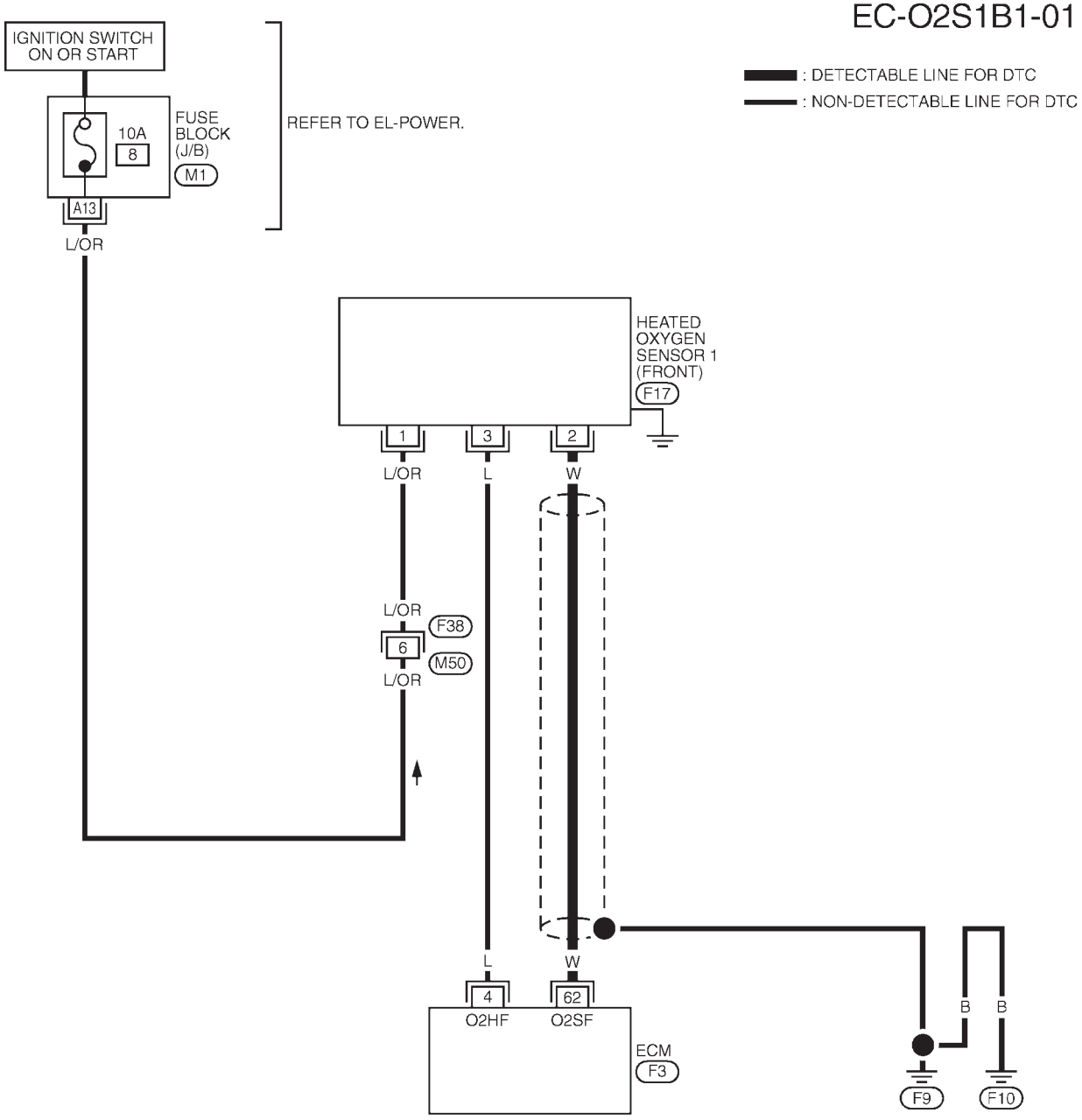
Wiring Diagram

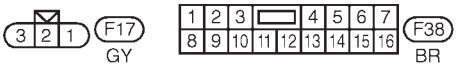
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1452

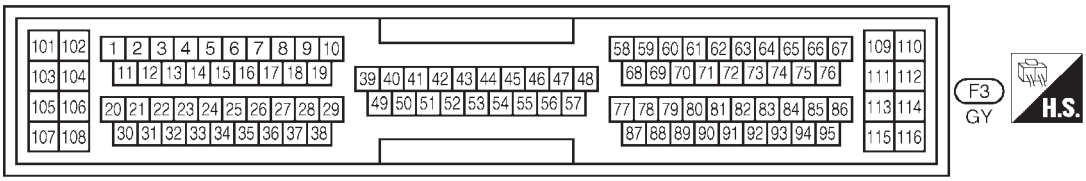
NLEC1452S03

EC-O2S1B1-01





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

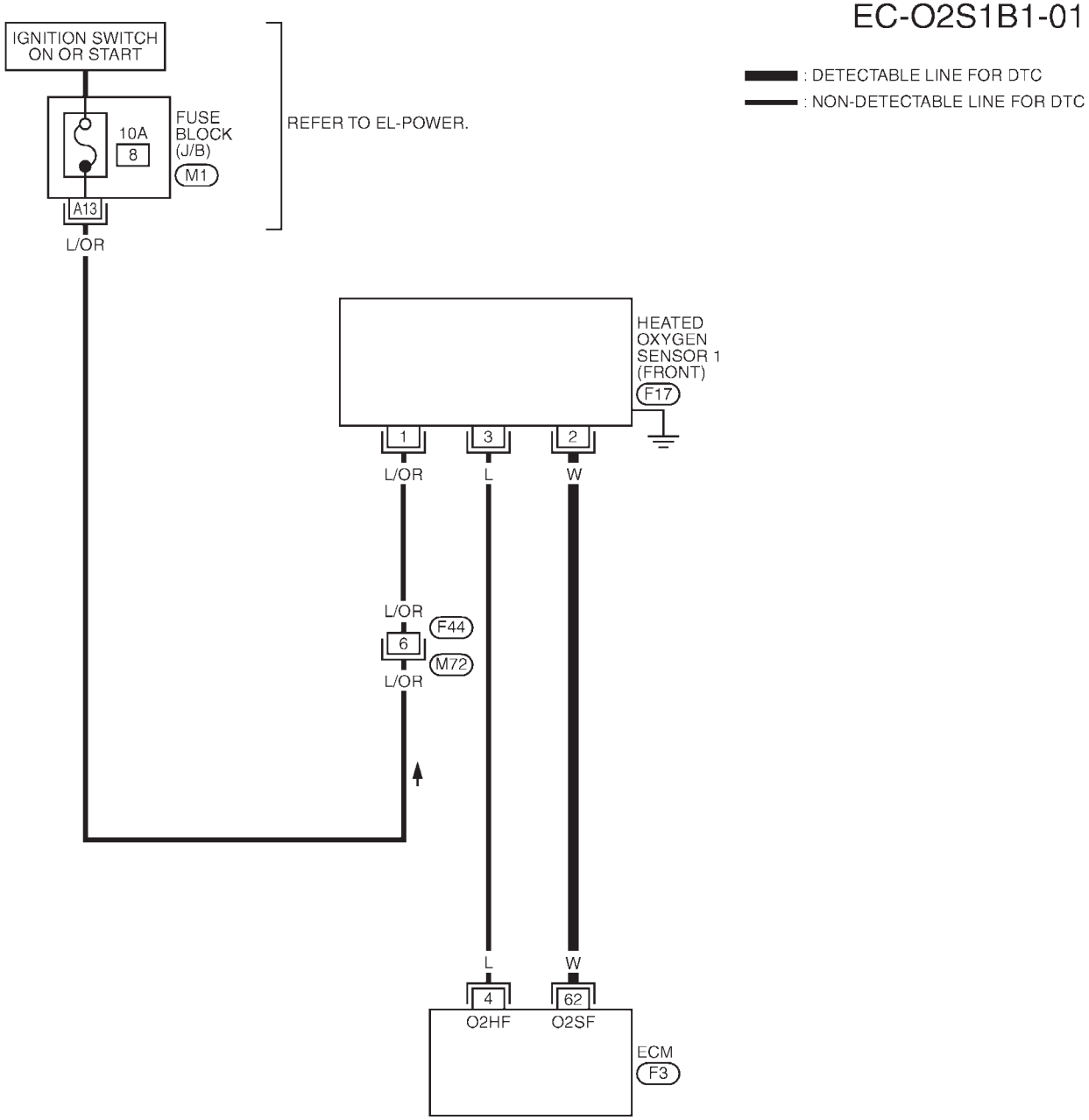


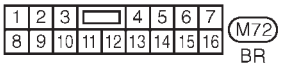
YEC691

MODELS WITH ECM IN CABIN

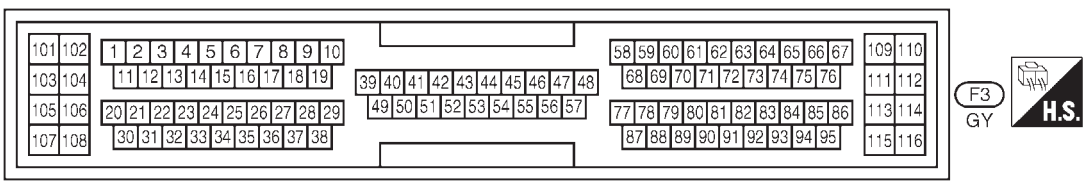
NLEC1452S04

EC-O2S1B1-01





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



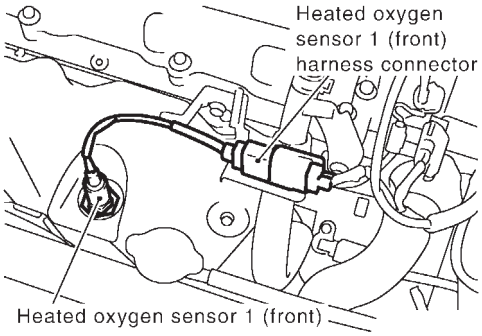
YEC916

Diagnostic Procedure

NLEC1453

1	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
Loosen and retighten heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**	
▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT
1. Disconnect heated oxygen sensor 1 (front) harness connector and ECM harness connector.	



SEF774Z

2. Check harness continuity between ECM terminal 62 and HO2S1 terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 62 (or HO2S1 terminal 2) and ground.
   Continuity should not exist.
4. 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 HARNESS CONNECTOR
Check heated oxygen sensor 1 (front) harness connector for water. **Water should not exist.**	

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair or replace harness connector.

4	CHECK HEATED OXYGEN SENSOR 1 (FRONT)
Refer to “Component Inspection”, EC-744.	

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1 (front).

5	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-670.	
▶	**INSPECTION END**

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

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

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

SEF217YA

Component Inspection

NLEC1454

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC1454S01

With CONSULT-II

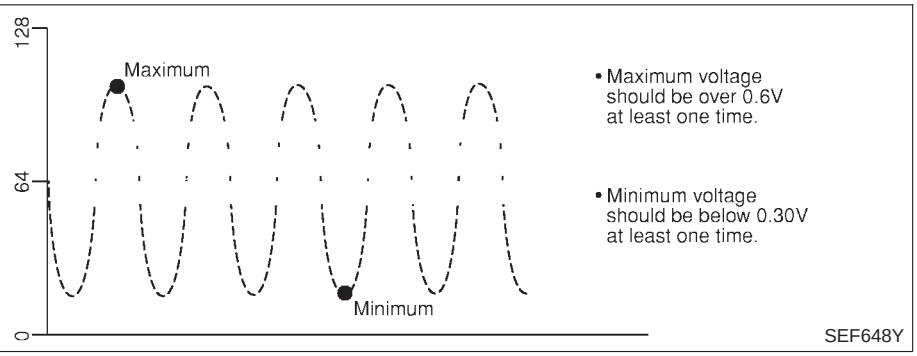
1) Start engine and warm it up to normal operating temperature.
2) Select “MANU TRIG” in “DATA MONITOR” mode, and select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch “RECORD” on CONSULT-II screen.
5) Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” five times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = “HO2S1 MNTR (B1)”, “RICH”
  L = “HO2S1 MNTR (B1)”, “LEAN”
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

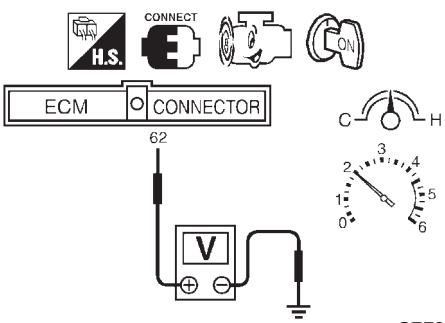
CAUTION:

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

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



SEF011X

Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times within 10 seconds.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

- 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.

CAUTION:

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

Description

NLEC1455

SYSTEM DESCRIPTION

NLEC1455S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Heated oxygen sensor 1 heater (front) control	Heated oxygen sensor 1 heater (front)

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

OPERATION

NLEC1455S02

Engine speed	Heated oxygen sensor 1 heater (front)
Above 3,200 rpm	OFF
Below 3,200 rpm	ON

CONSULT-II Reference Value in Data Monitor Mode

NLEC1456

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine speed: Below 3,200 rpm	ON
	● Engine speed: Above 3,200 rpm	OFF

ECM Terminals and Reference Value

NLEC1457

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	L	Heated oxygen sensor 1 heater (front)	**[Engine is running]** ● Engine speed is below 3,200 rpm.	Approximately 0V
			[Engine is running] ● Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NLEC1458

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0135	● 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).]	● Harness or connectors (The heated oxygen sensor 1 heater (front) circuit is open or shorted.) ● Heated oxygen sensor 1 heater (front)

DTC Confirmation Procedure

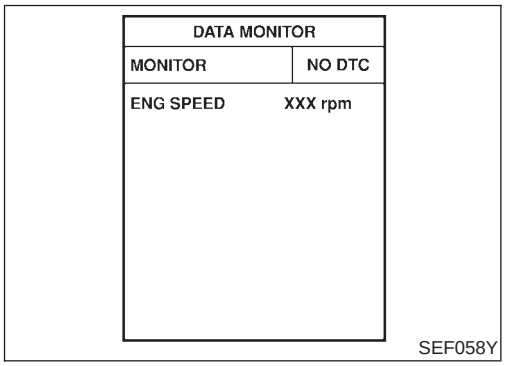
NLEC1459

NOTE:

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

TESTING CONDITION:

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



With CONSULT-II

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 6 seconds at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-750.

With GST

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-750.

- **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.**

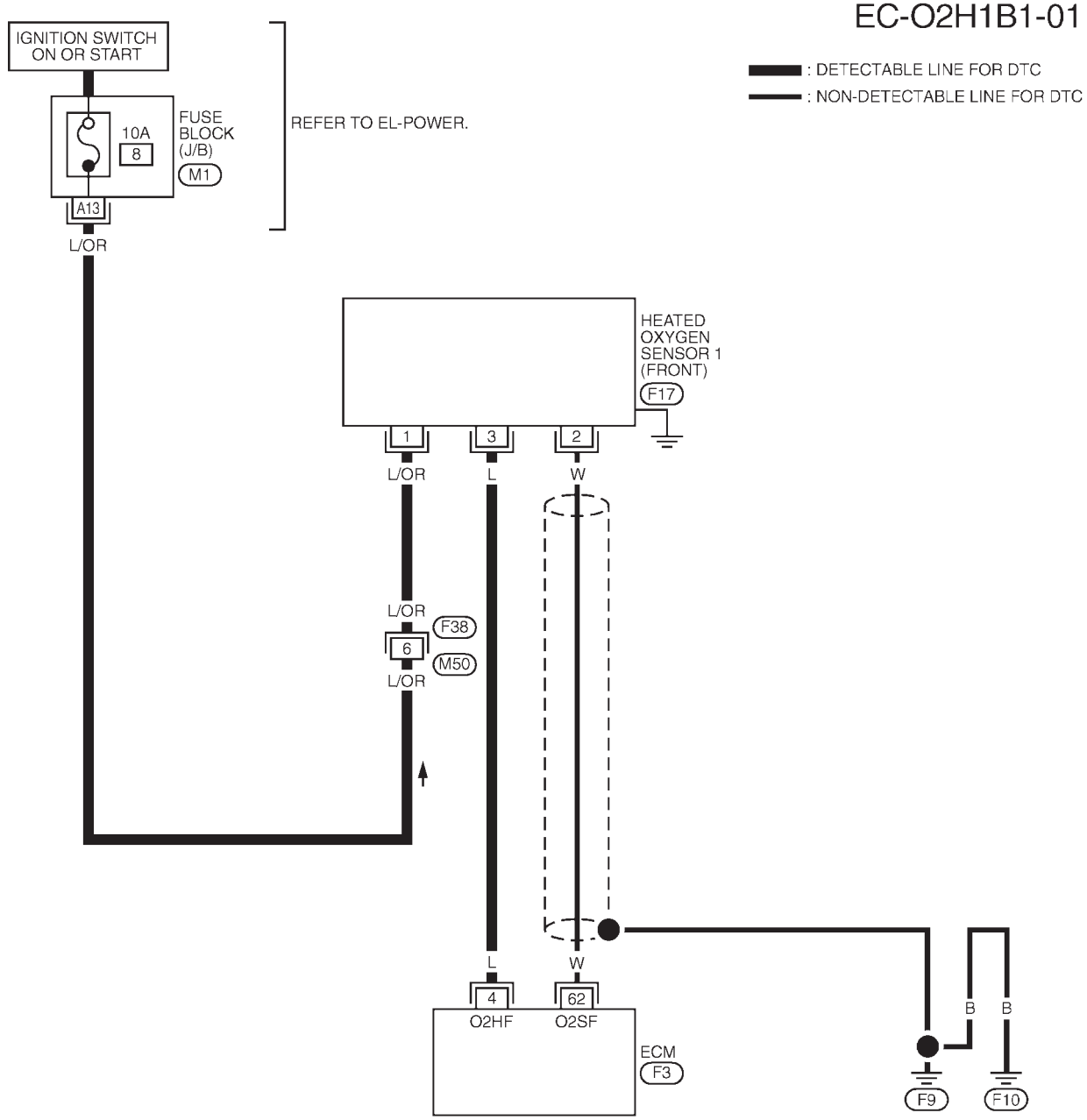
Wiring Diagram

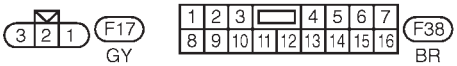
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1460

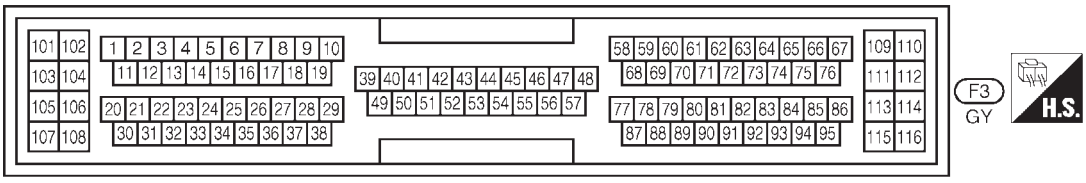
NLEC1460S03

EC-O2H1B1-01





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

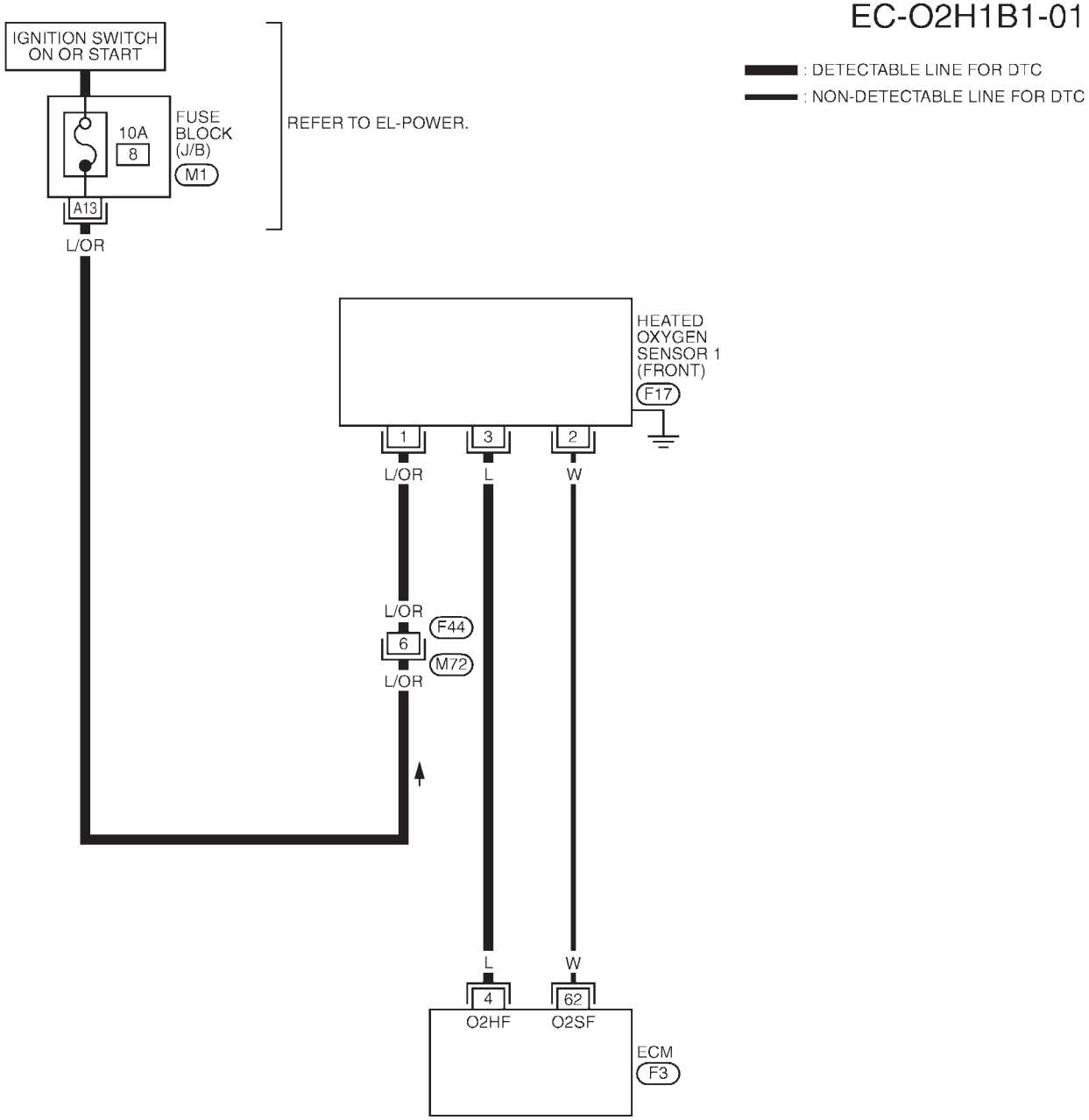


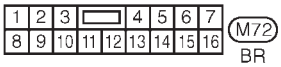
YEC692

MODELS WITH ECM IN CABIN

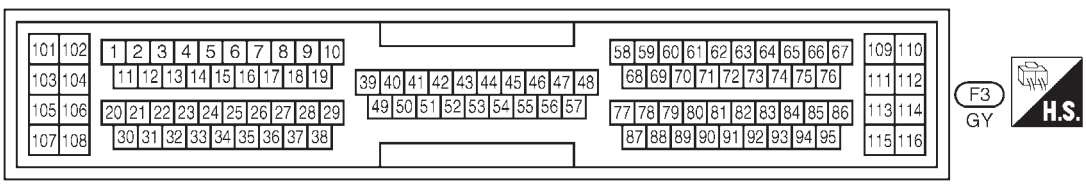
NLEC1460S04

EC-O2H1B1-01





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



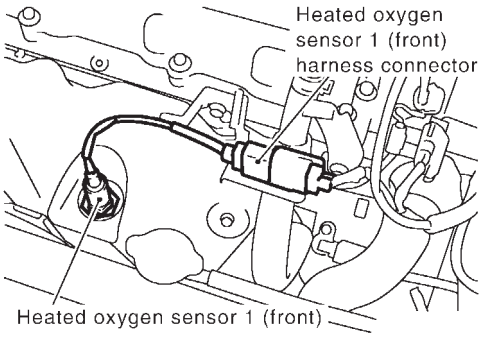
YEC917

Diagnostic Procedure

NLEC1461

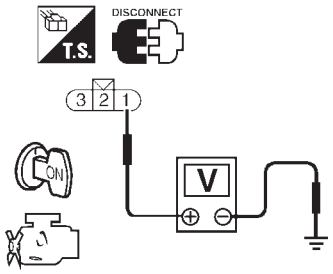
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (front) harness connector.



SEF774Z

3. Turn ignition switch “ON”.
4. Check voltage between HO2S1 terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF934X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F38, M50 (where fitted)
- Harness connectors M72, F44 (where fitted)
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 (front) and fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT CIRCUIT

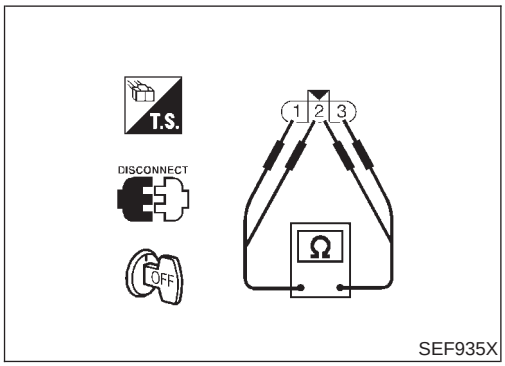
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S1 terminal 3 and ECM terminal 4.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)	
Refer to "Component Inspection", EC-751.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1 (front).

5	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**



SEF935X

Component Inspection

NLEC1462

HEATED OXYGEN SENSOR 1 HEATER (FRONT)

NLEC1462S01

Check resistance between terminals 3 and 1.

Resistance: 2.3 - 4.3 Ω at 25°C (77°F)

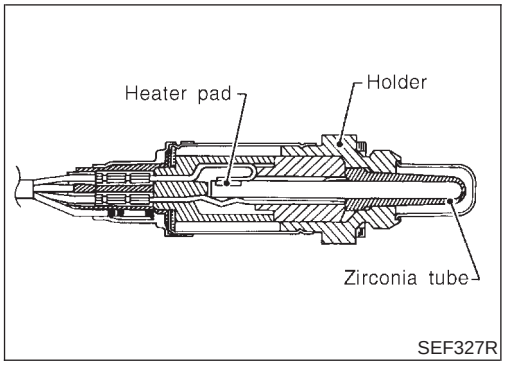
Check continuity between terminals 2 and 1, 3 and 2.

Continuity should not exist.

If NG, replace the heated oxygen sensor 1 (front).

CAUTION:

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



Component Description

NLEC1463

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

NLEC1464

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

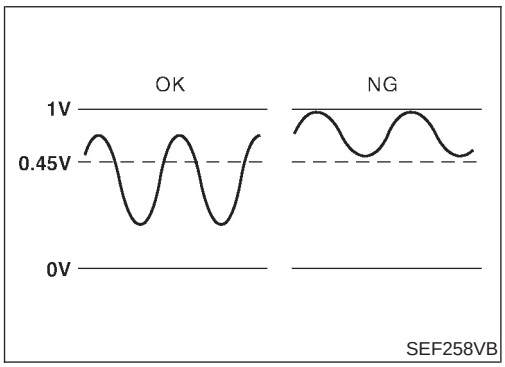
NLEC1465

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 3,000 rpm	0 - Approximately 1.0V



On Board Diagnosis Logic

NLEC1466

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 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the minimum voltage of the sensor is sufficiently low during various driving conditions such as fuel-cut.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0137	● The minimum voltage from the sensor does not reach the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 (rear) ● Fuel pressure ● Injectors

DTC Confirmation Procedure

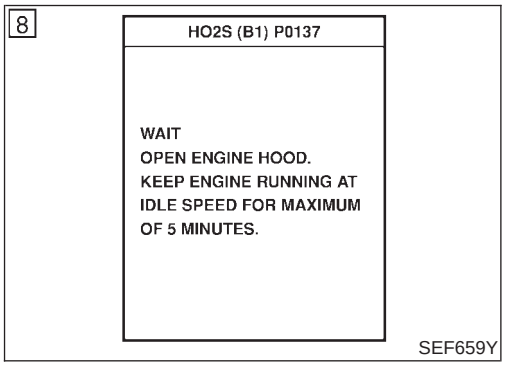
NLEC1906

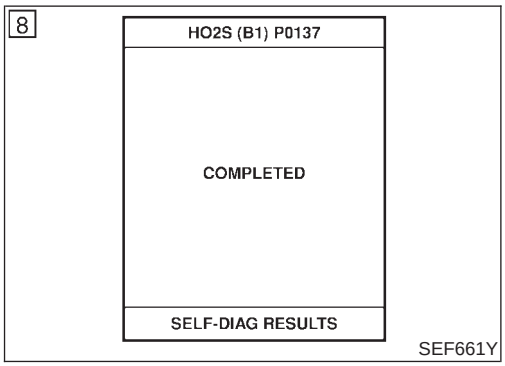
CAUTION:

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).**
- **Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2.**

With CONSULT-II

NOTE:

The figure on the left will be displayed on the CONSULT-II screen when you start the DTC Work Support. Ignore the first figure and start the test.
“COMPLETED” will be displayed on the screen as the second figure when the test is completed properly.

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” of “HO2S2” 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 10.
   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) Additionally, “COMPLETED” will be displayed on the CONSULT-II screen when the accelerator pedal is completely released after the vehicle is driven for 60 seconds or more under the following conditions.
   (If will take approximately 5 seconds.)

ENG SPEED	1,400 - 3,300 rpm
Vehicle speed	68 - 130 km/h (42 - 81 MPH)
B/FUEL SCHDL	3.0 - 14.0 msec
Selector lever	D position

NOTE:

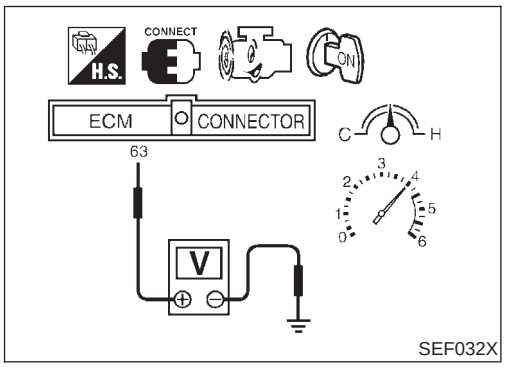
- **If “COMPLETED” appears on the CONSULT-II screen, go to step 10.**
- **If “COMPLETED” does not appear on the CONSULT-II screen, go to the following step.**

9) Stop the vehicle and let it idle until “COMPLETED” is displayed on the CONSULT-II screen. (It will take 6 minutes at the most.)

NOTE:

If “COMPLETED” is not displayed after 6 minutes, retry from step 2.

10) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-757.



Overall Function Check

NLEC1468

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

With GST

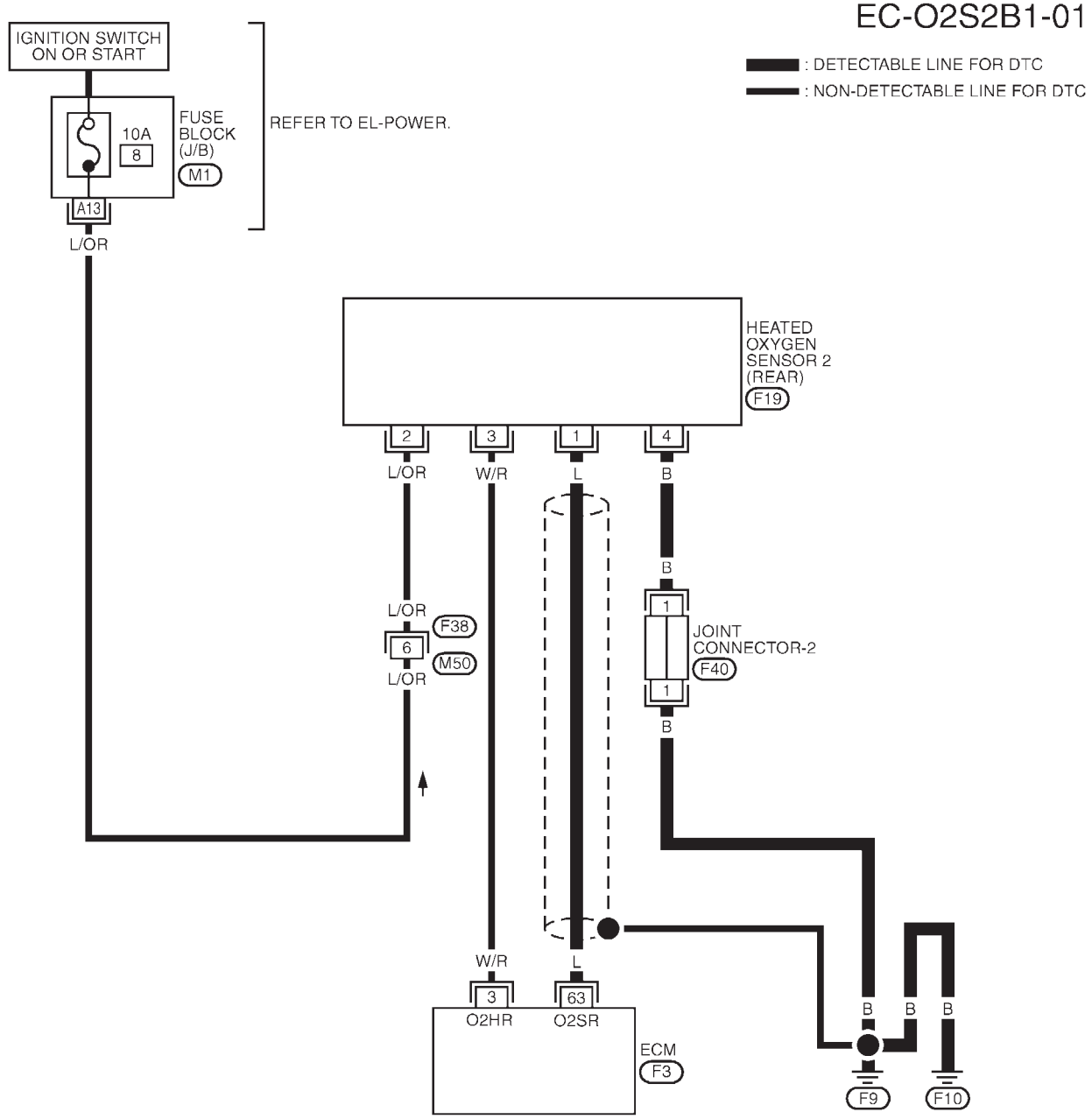
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (HO2S2 signal) and engine ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.45V 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 D position with "SPORTS MODE SW" OFF.
   The voltage should be below 0.45V at least once during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-757.

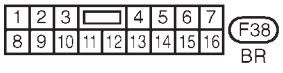
Wiring Diagram

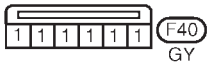
NLEC1469

MODELS WITH ECM IN ENGINE COMPARTMENT

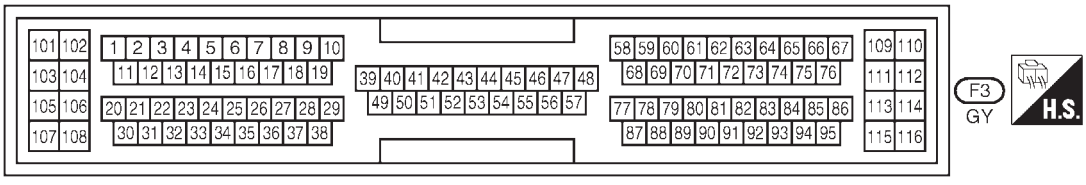
NLEC1469S03







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

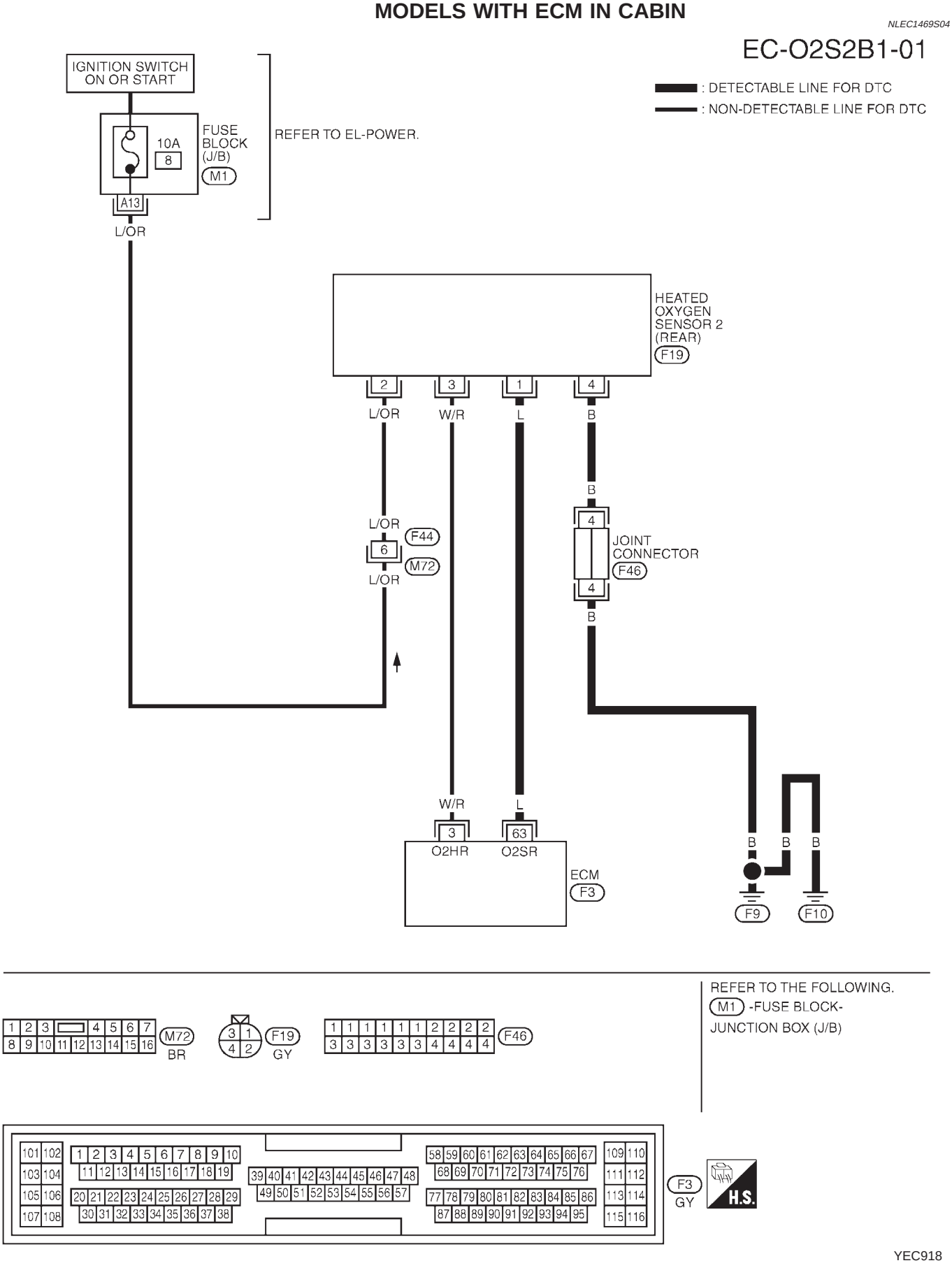


YEC693

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC1469S04



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

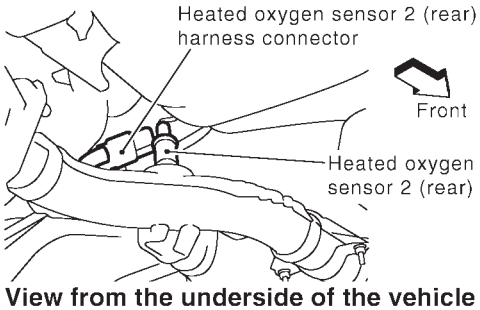
YEC918

Diagnostic Procedure

NLEC1470

1	RETIGHTEN GROUND SCREWS

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



View from the underside of the vehicle

SEF639Z

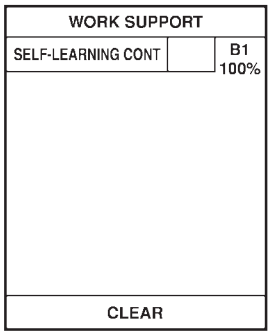
▶	GO TO 2.

Diagnostic Procedure (Cont'd)

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "CLEAR".

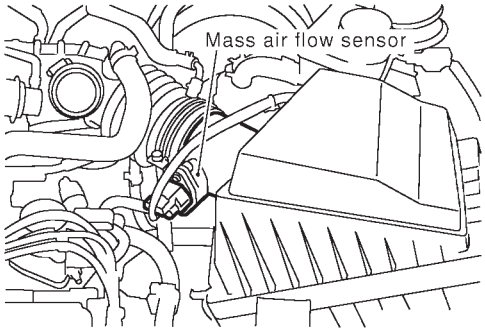


SEF215Z

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



SEF772Z

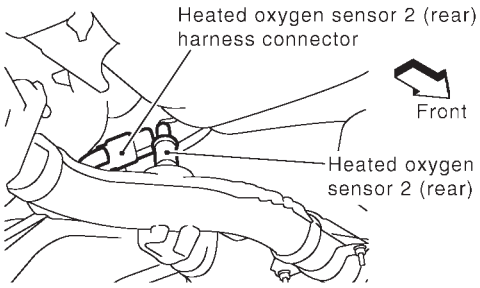
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-594.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-800.
No	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

3. Check harness continuity between ECM terminal 63 and HO2S2 terminal 1.
   Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 63 (or HO2S2 terminal 1) and ground.
   Continuity should not exist.
5. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK GROUND CIRCUIT

1. Check harness continuity between HO2S2 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 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-2 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between heated oxygen sensor 2 (rear) and engine ground.

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

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)

Refer to "Component Inspection", EC-760.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

	▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC1471

HEATED OXYGEN SENSOR 2 (REAR)

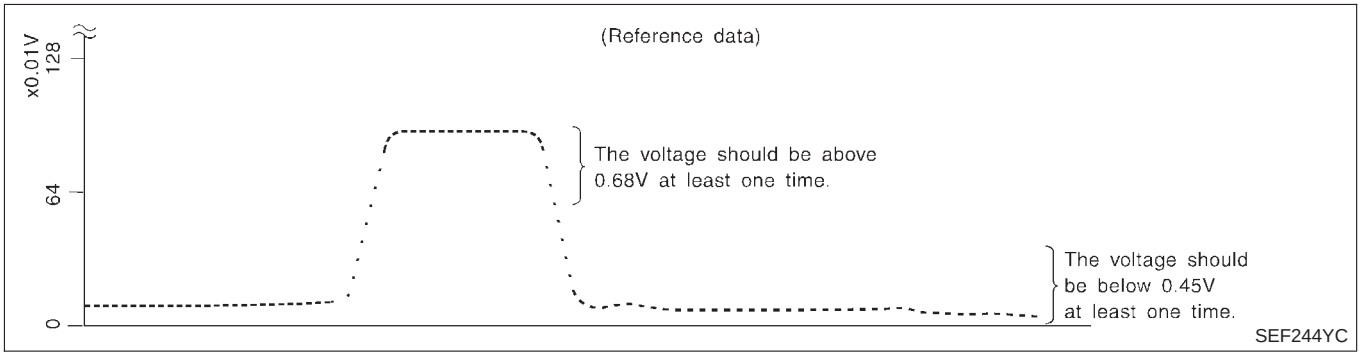
NLEC1471S01

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)” as the monitor item with CONSULT-II.
4) Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.
   “HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%. “HO2S2 (B1)” should be below 0.45V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



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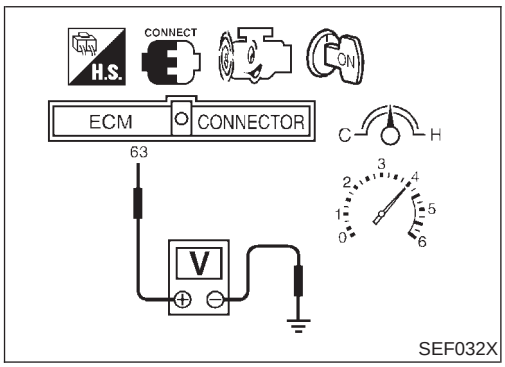


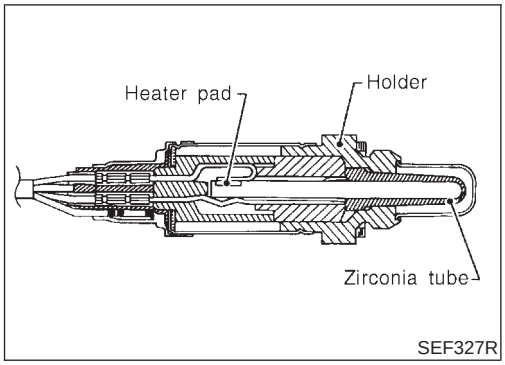
SEF032X

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 terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at 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 D position with “SPORTS MODE SW” OFF.
   The voltage should be below 0.45V at least once.

CAUTION:

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



Component Description

NLEC1472

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

NLEC1473

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

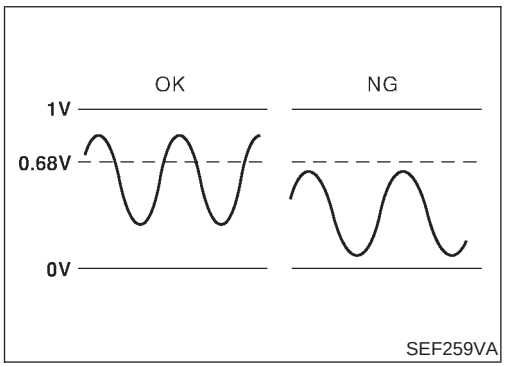
NLEC1474

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V



On Board Diagnosis Logic

NLEC1475

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 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 various driving conditions such as fuel-cut.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0138	● The maximum voltage from the sensor does not reach the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 (rear) ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

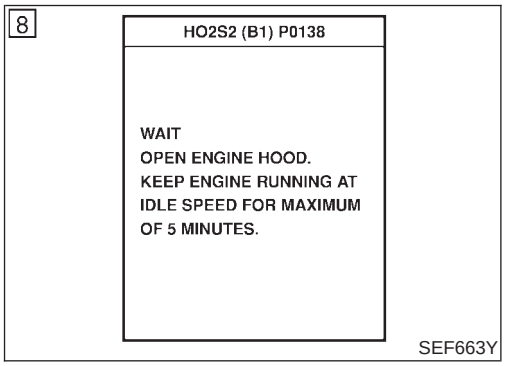
NLEC1907

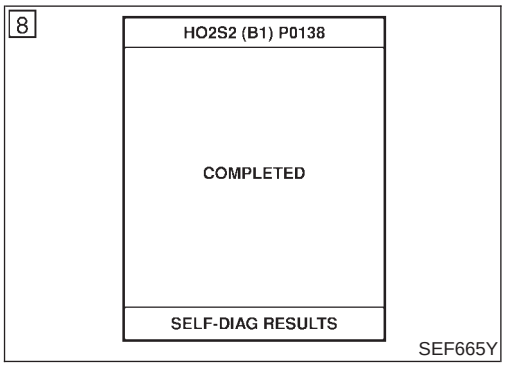
CAUTION:

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).**
- **Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2.**

With CONSULT-II

NOTE:

The figure on the left will be displayed on the CONSULT-II screen when you start the DTC Work Support. Ignore the first figure and start the test.
“COMPLETED” will be displayed on the screen as the second figure when the test is completed properly.

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” of “HO2S2” 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 10.
   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) Additionally, “COMPLETED” will be displayed on the CONSULT-II screen when the accelerator pedal is completely released after the vehicle is driven for 60 seconds or more under the following conditions.
   (If will take approximately 5 seconds.)

ENG SPEED	1,400 - 3,300 rpm
Vehicle speed	68 - 130 km/h (42 - 81 MPH)
B/FUEL SCHDL	3.0 - 14.0 msec
Selector lever	D position (CVT)

NOTE:

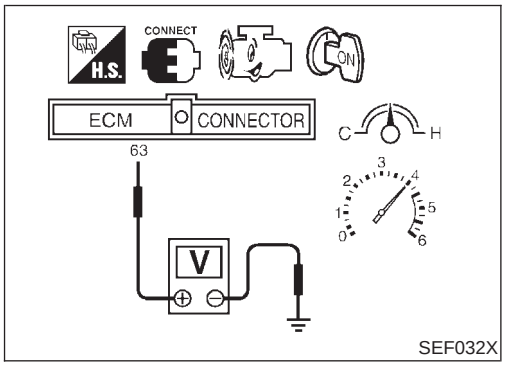
- **If “COMPLETED” appears on the CONSULT-II screen, go to step 10.**
- **If “COMPLETED” does not appear on the CONSULT-II screen, go to the following step.**

9) Stop the vehicle and let it idle until “COMPLETED” is displayed on the CONSULT-II screen. (It will take 6 minutes at the most.)

NOTE:

If “COMPLETED” is not displayed after 6 minutes, retry from step 2.

10) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, refer to "Diagnostic Procedure", EC-766.



Overall Function Check

NLEC1477

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

With GST

1) Start engine and drive vehicle at a speed of 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (HO2S2 signal) and engine ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.68V at least once during this procedure.
If the voltage can be confirmed in step 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 D position with "SPORTS MODE SW" OFF.
The voltage should be above 0.68V at least once during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-766.

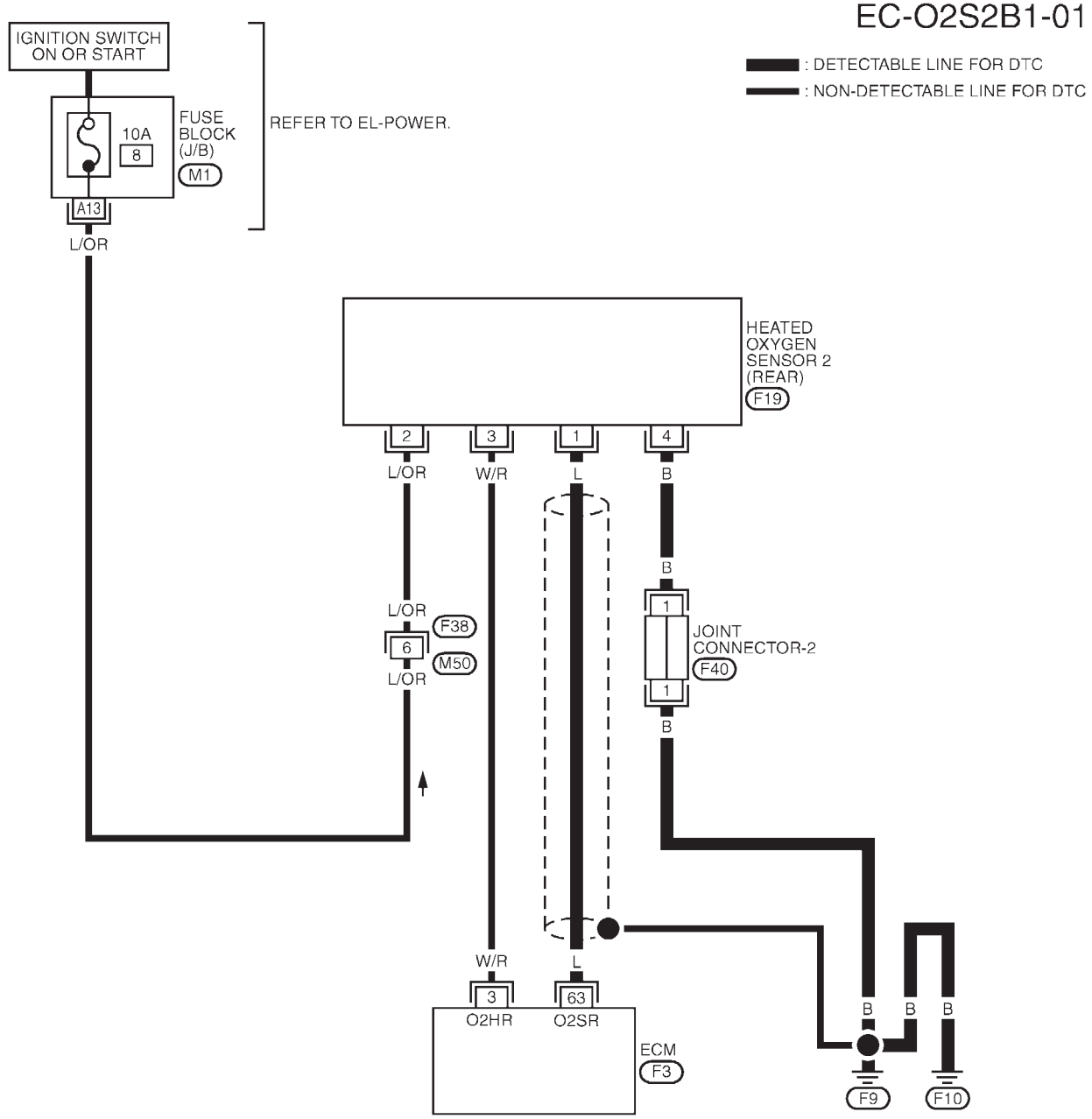
Wiring Diagram

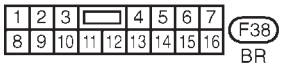
NLEC1478

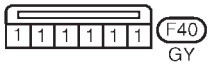
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1478S03

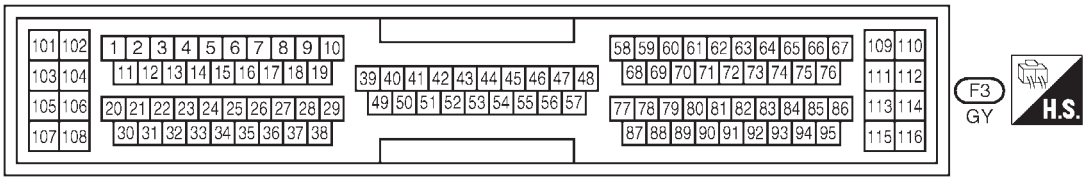
EC-O2S2B1-01







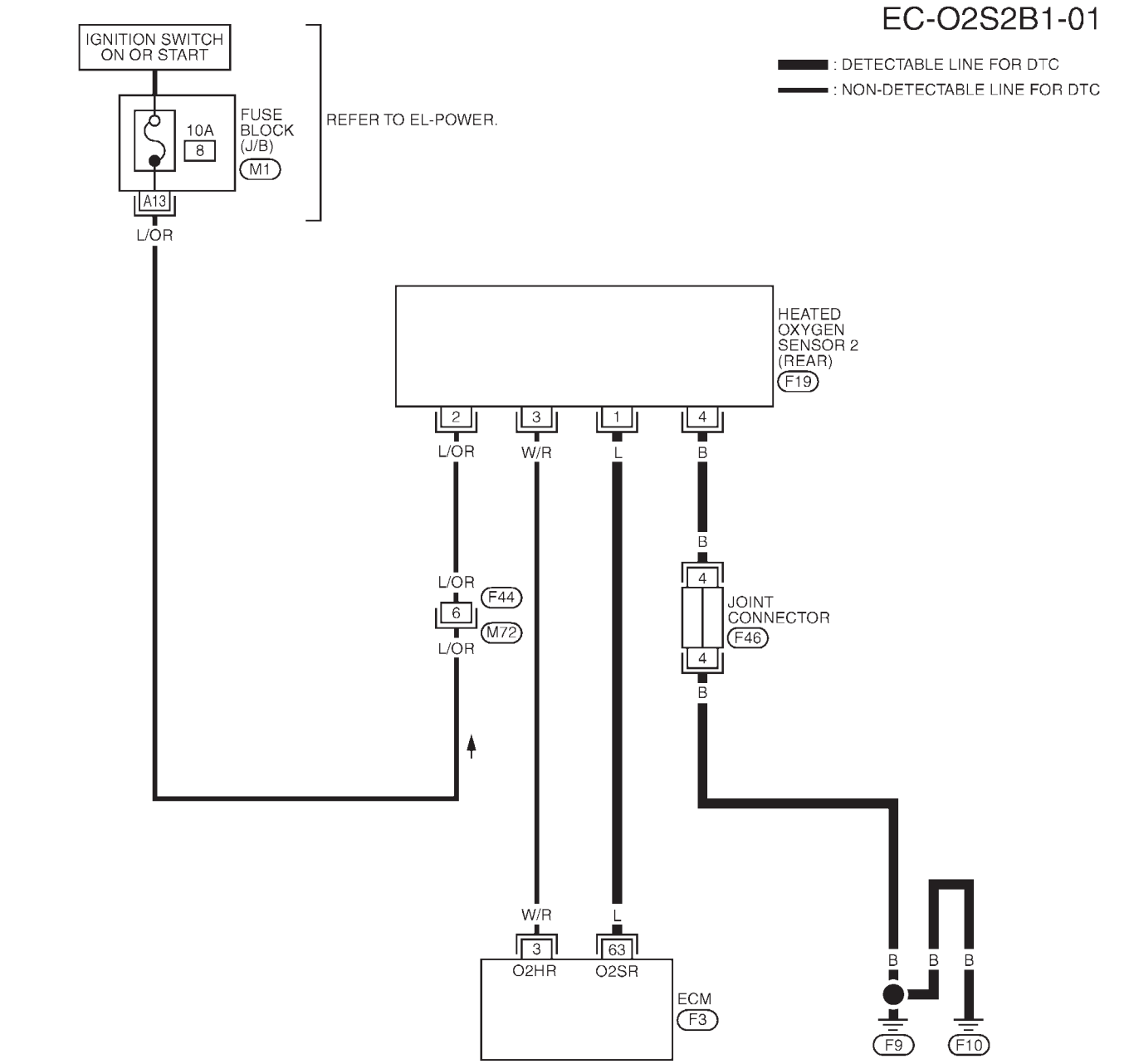
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

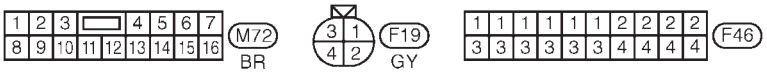


YEC693

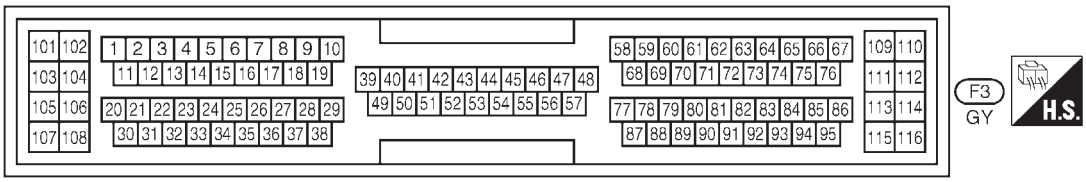
MODELS WITH ECM IN CABIN

NLEC1478S04





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



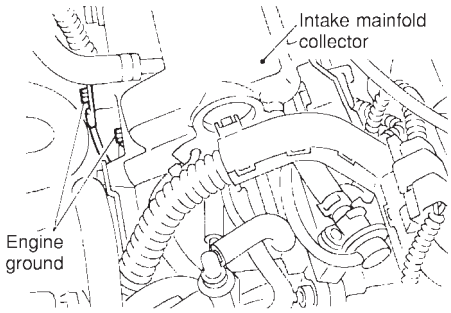
YEC918

Diagnostic Procedure

NLEC1479

1	RETIGHTEN GROUND SCREWS

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



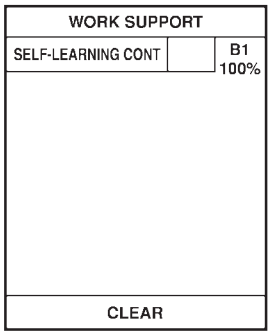
SEF202X

▶	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-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "CLEAR".

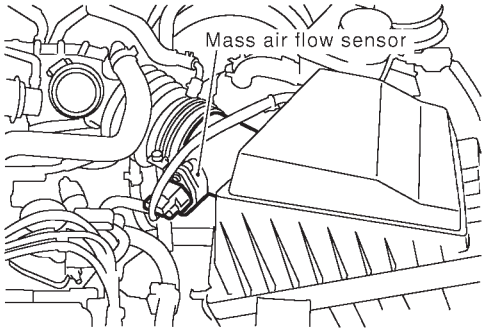


SEF215Z

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



SEF772Z

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-594.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

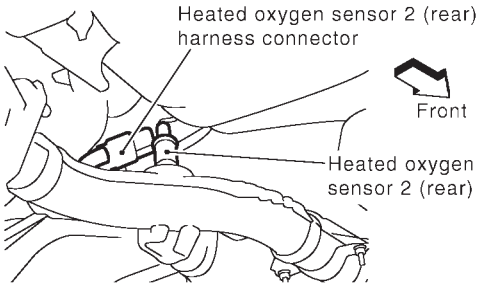
Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171. Refer to EC-792.
No	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

2. Check harness continuity between ECM terminal 63 and HO2S2 terminal 1.
   Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 63 (or HO2S2 terminal 1) and ground.
   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 GROUND CIRCUIT

1. Check harness continuity between HO2S2 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 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-2 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between heated oxygen sensor 2 (rear) and engine ground.

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

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)

Refer to "Component Inspection", EC-769.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

	▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC1480

HEATED OXYGEN SENSOR 2 (REAR)

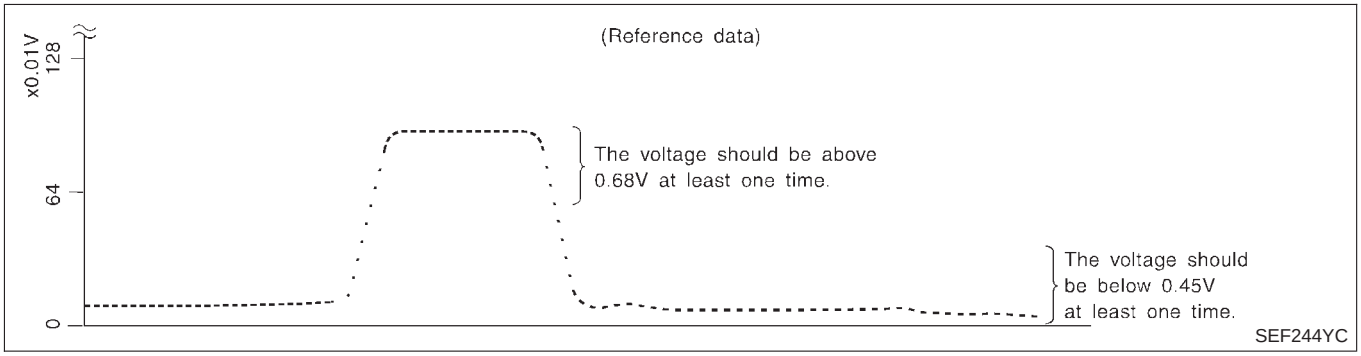
NLEC1480S01

With CONSULT-II

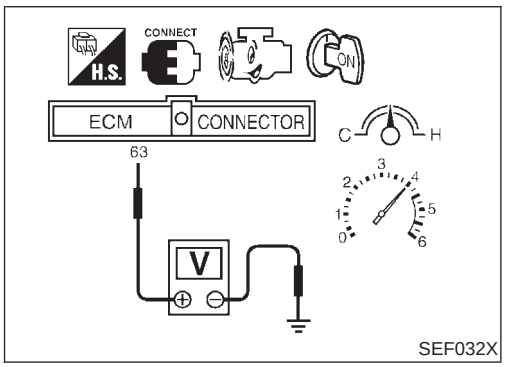
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes..
2) Stop vehicle with engine running.
3) Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.
4) Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.
   “HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
   “HO2S2 (B1)” should be below 0.45V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



SEF244YC



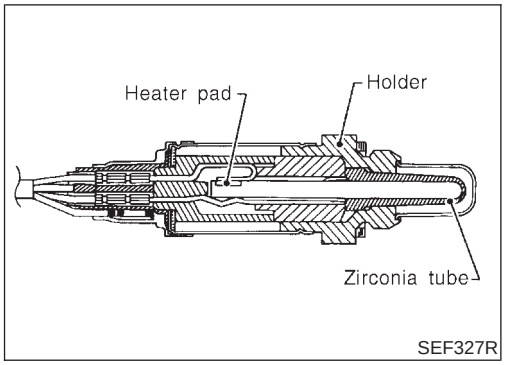
SEF032X

Without CONSULT-II

1) Start engine and drive vehicle at a speed of 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at 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 D position with “SPORTS MODE SW” OFF.
   The voltage should be below 0.45V at least once.

CAUTION:

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



Component Description

NLEC1481

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

NLEC1482

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

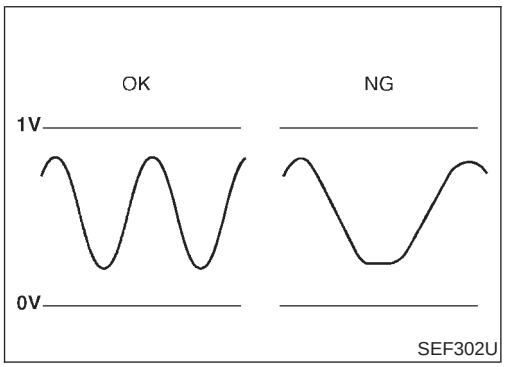
NLEC1483

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V



On Board Diagnosis Logic

NLEC1484

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 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 various driving conditions such as fuel-cut.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0139	● It takes more than the specified time for the sensor to respond between rich and lean.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 (rear) ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

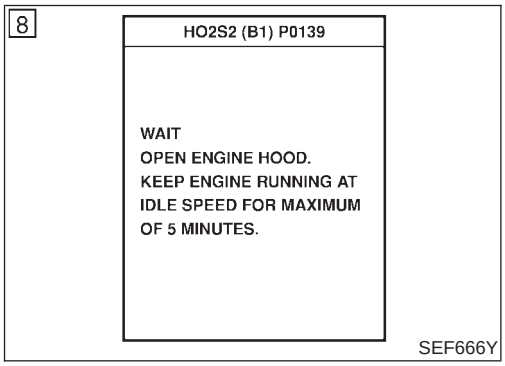
NLEC1908

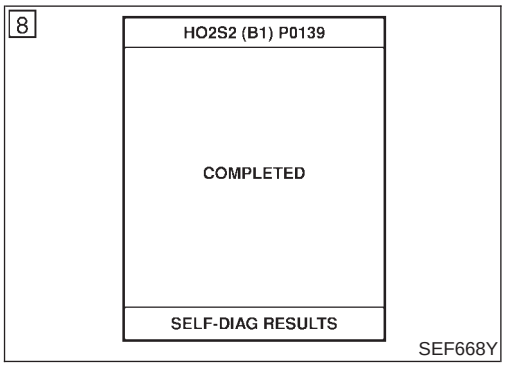
CAUTION:

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).**
- **Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2.**

With CONSULT-II

NOTE:

The figure on the left will be displayed on the CONSULT-II screen when you start the DTC Work Support. Ignore the first figure and start the test.
“COMPLETED” will be displayed on the screen as the second figure when the test is completed properly.

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) P0139” of “HO2S2” 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 10.
   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) Additionally, “COMPLETED” will be displayed on the CONSULT-II screen when the accelerator pedal is completely released after the vehicle is driven for 60 seconds or more under the following conditions.
   (If will take approximately 5 seconds.)

ENG SPEED	1,400 - 3,300 rpm
Vehicle speed	68 - 130 km/h (42 - 81 MPH)
B/FUEL SCHDL	3.0 - 14.0 msec
Selector lever	D position

NOTE:

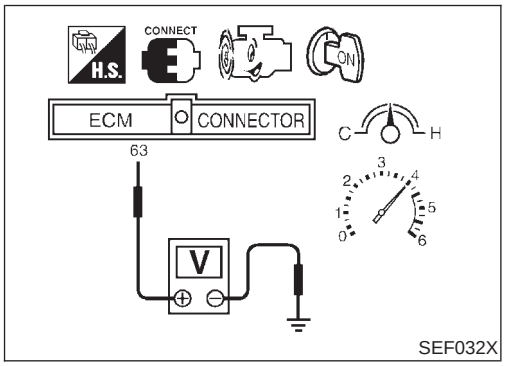
- **If “COMPLETED” appears on the CONSULT-II screen, go to step 10.**
- **If “COMPLETED” does not appear on the CONSULT-II screen, go to the following step.**

9) Stop the vehicle and let it idle until “COMPLETED” is displayed on the CONSULT-II screen. (It will take 6 minutes at the most.)

NOTE:

If “COMPLETED” is not displayed after 6 minutes, retry from step 2.

10) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, refer to "Diagnostic Procedure", EC-775.



Overall Function Check

NLEC1486

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

With GST

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 terminals 63 (HO2S2 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 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 D position with "SPORTS MODE SW" OFF.
The voltage should change at more than 0.06V for 1 second during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-775.

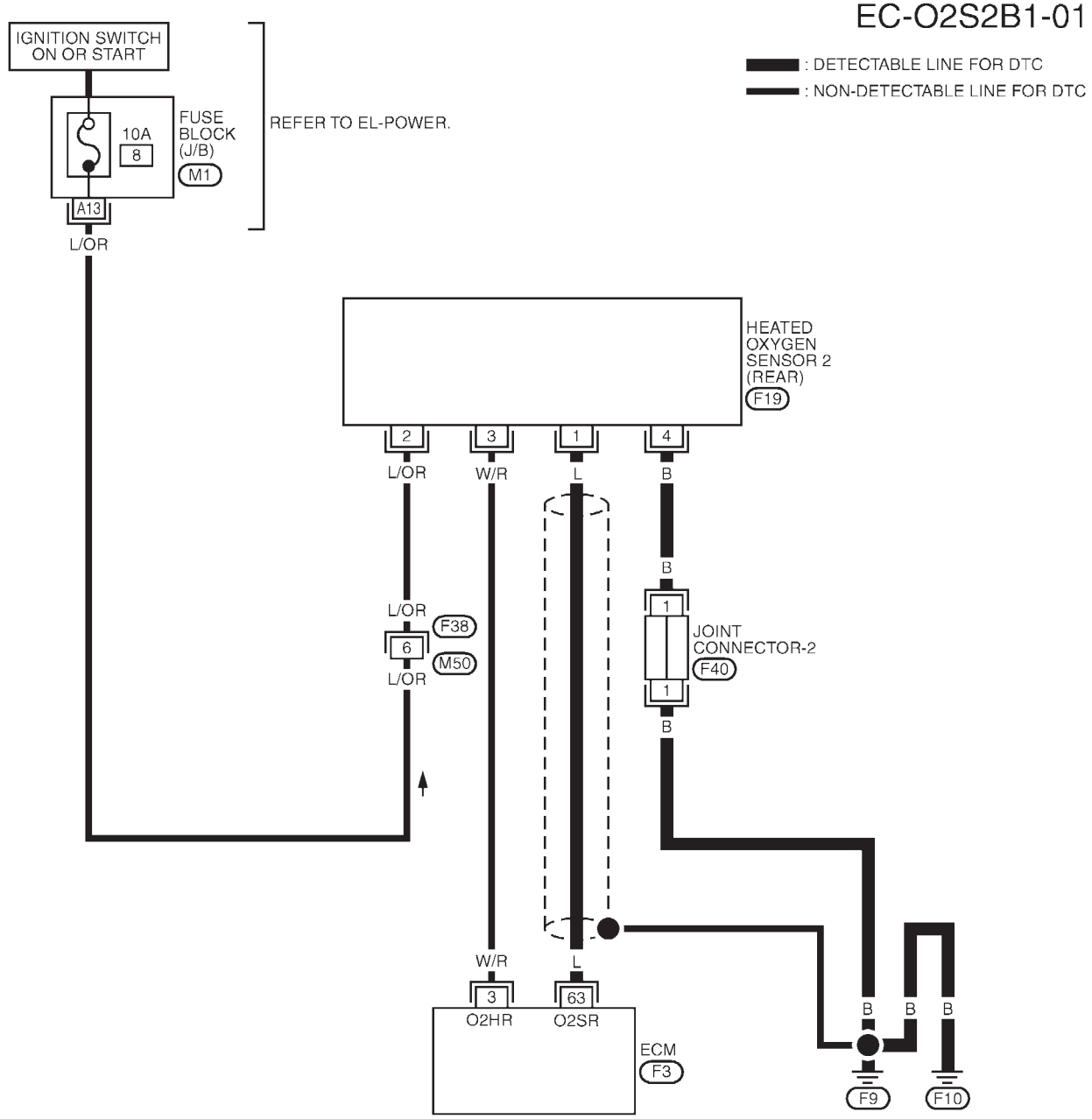
Wiring Diagram

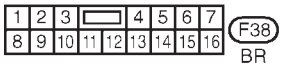
NLEC1487

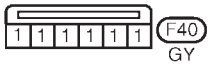
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1487S03

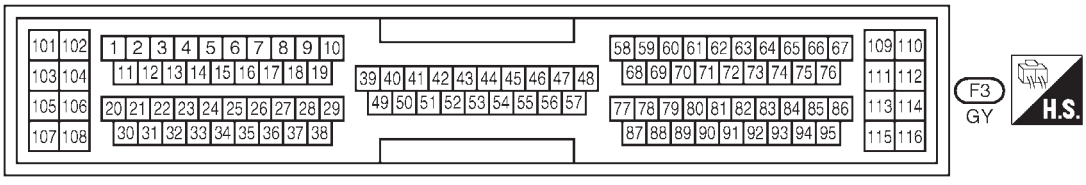
EC-O2S2B1-01







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

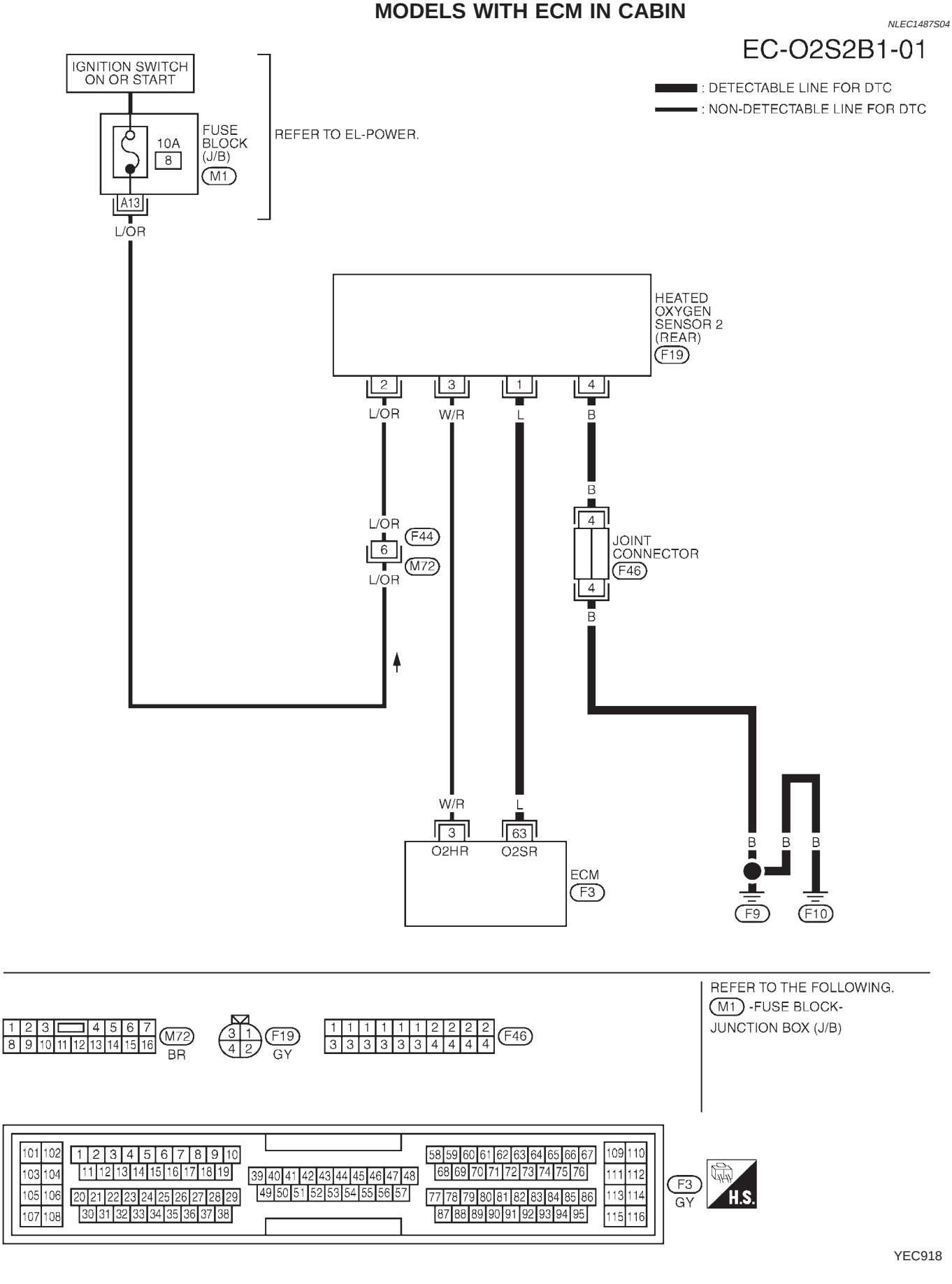


YEC693

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC1487S04



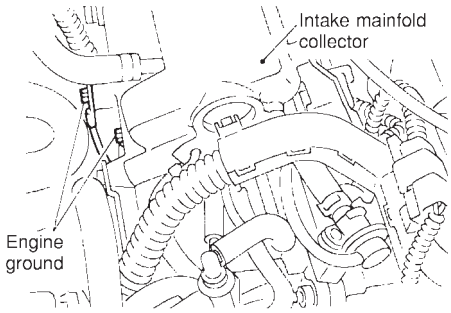
YEC918

Diagnostic Procedure

NLEC1488

1	RETIGHTEN GROUND SCREWS

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



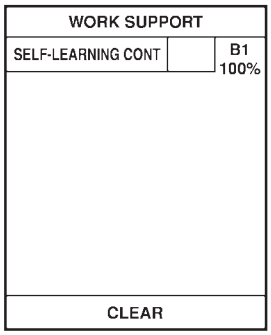
SEF202X

▶	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-LEARN CONTROL" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "CLEAR".

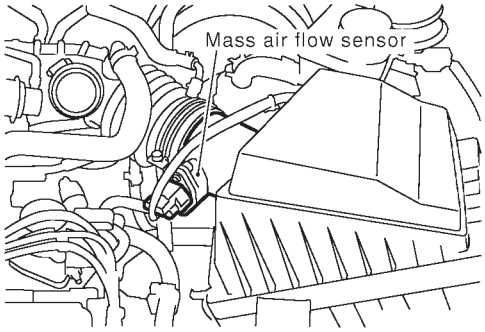


SEF215Z

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



SEF772Z

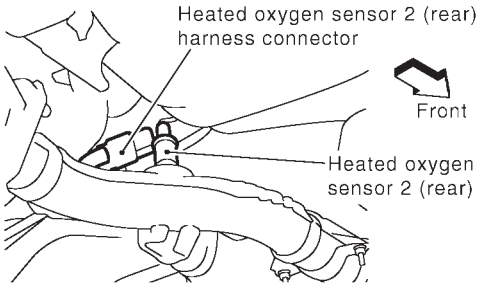
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-594.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-800.
No	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

2. Check harness continuity between ECM terminal 63 and HO2S2 terminal 1.
   Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 63 (or HO2S2 terminal 1) and ground.
   Continuity should not 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 GROUND CIRCUIT

1. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to wiring diagram.
   Continuity should exist.
2. Also check harness short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-2 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between heated oxygen sensor 2 (rear) and engine ground.

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

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)

Refer to "Component Inspection", EC-778.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

	▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC1489

HEATED OXYGEN SENSOR 2 (REAR)

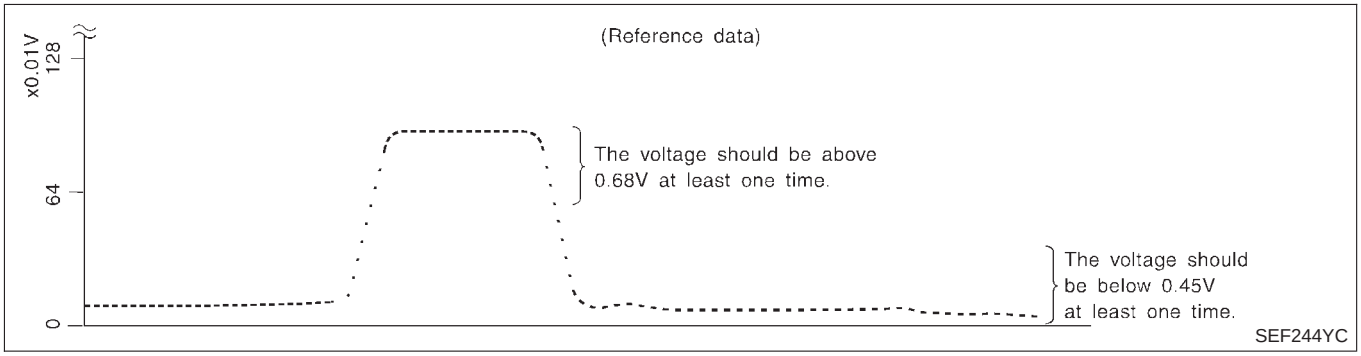
NLEC1489S01

With CONSULT-II

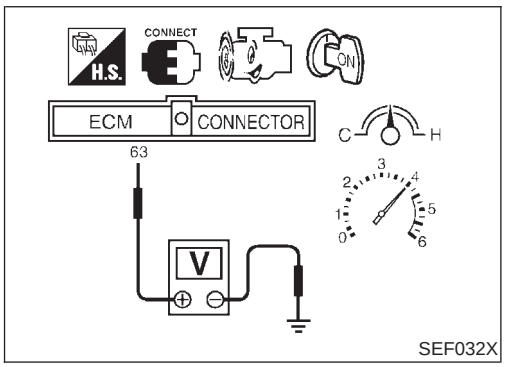
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.
4) Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.
   “HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
   “HO2S2 (B1)” should be below 0.45V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



SEF244YC



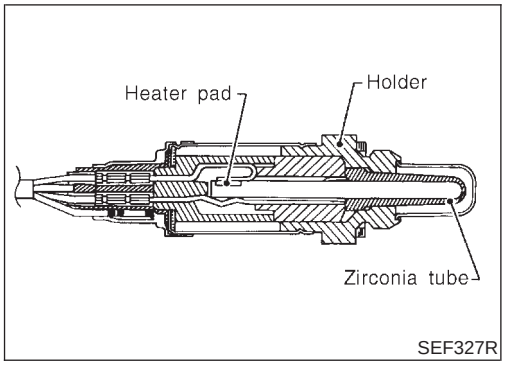
SEF032X

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 terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at 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 D position with “SPORTS MODE SW” OFF.
   The voltage should be below 0.45V at least once.

CAUTION:

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



Component Description

NLEC1490

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

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

NLEC1491

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

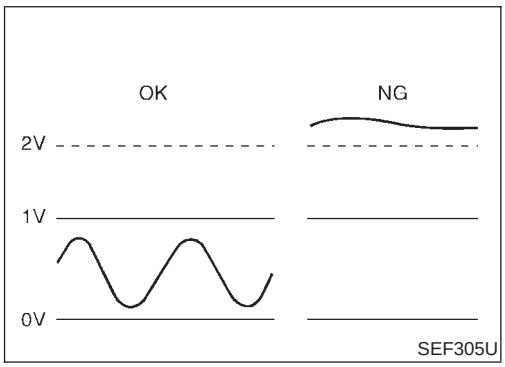
NLEC1492

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V

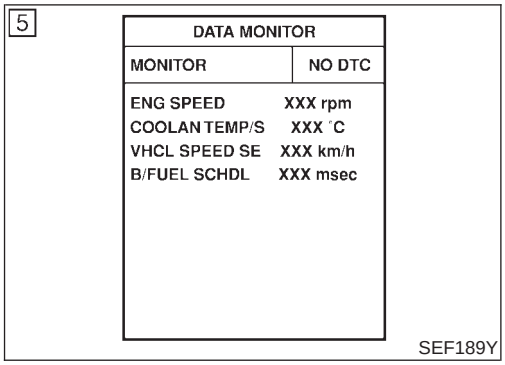


On Board Diagnosis Logic

NLEC1493

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 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether or not the voltage is too high during various driving conditions such as fuel-cut.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0140	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 (rear)



DTC Confirmation Procedure

NLEC1494

NOTE:

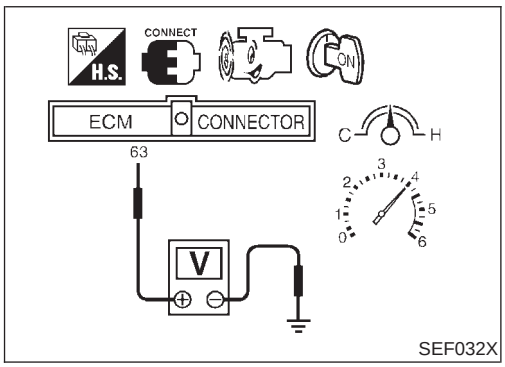
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine and 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	1,400 - 3,300 rpm
VHCL SPEED SE	68 - 130 km/h (48 - 81 MPH)
B/FUEL SCHDL	3.0 - 14.0 msec
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-783.



Overall Function Check

NLEC1495

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

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 terminals 63 (HO2S2 signal) and engine ground.
4) Check the voltage after revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 2V during this procedure.
5) If NG, go to "Diagnostic Procedure", EC-783.

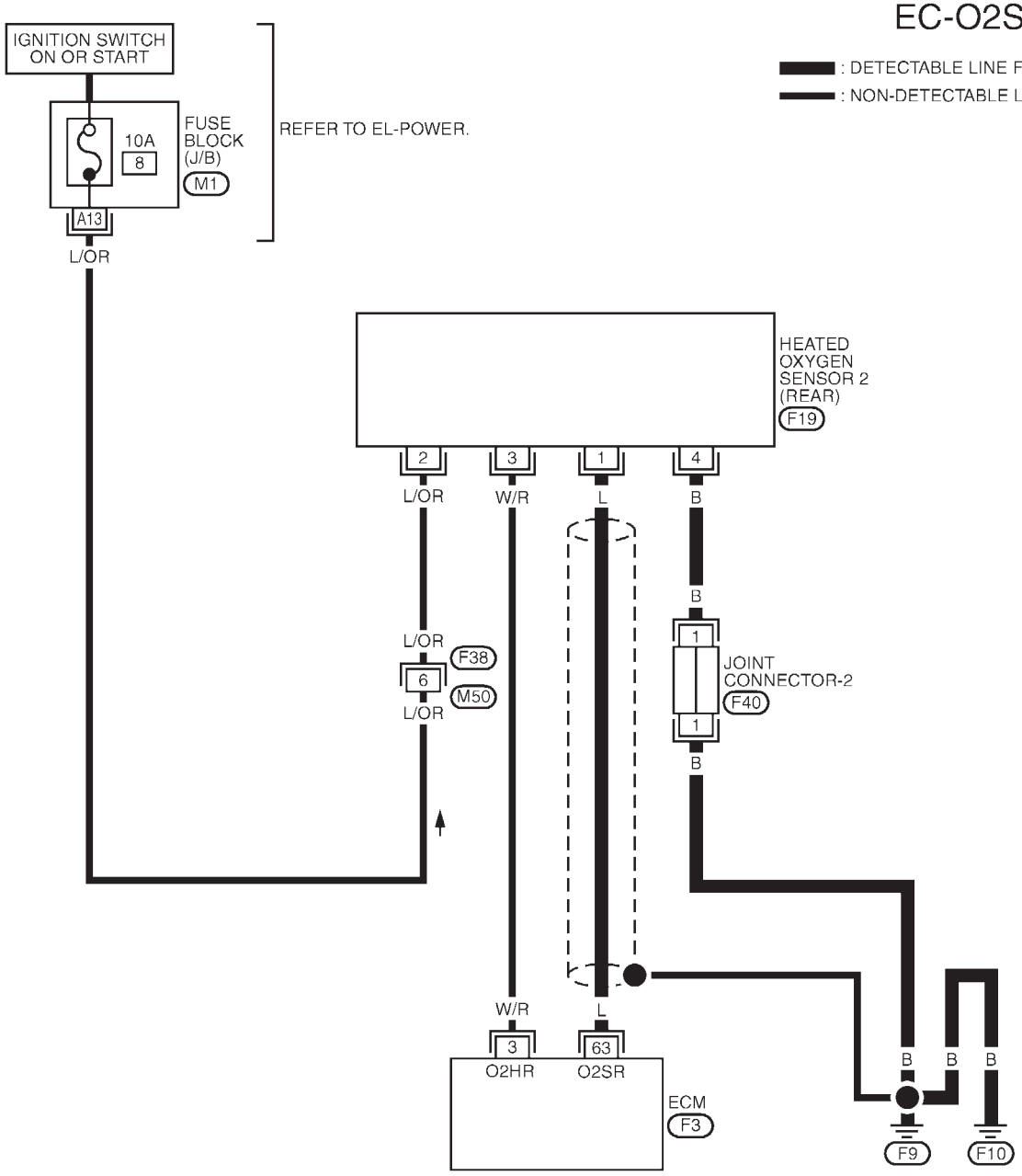
Wiring Diagram

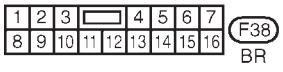
NLEC1496

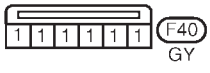
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1496S03

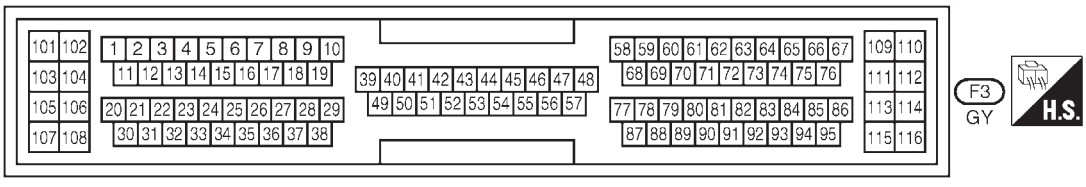
EC-O2S2B1-01







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

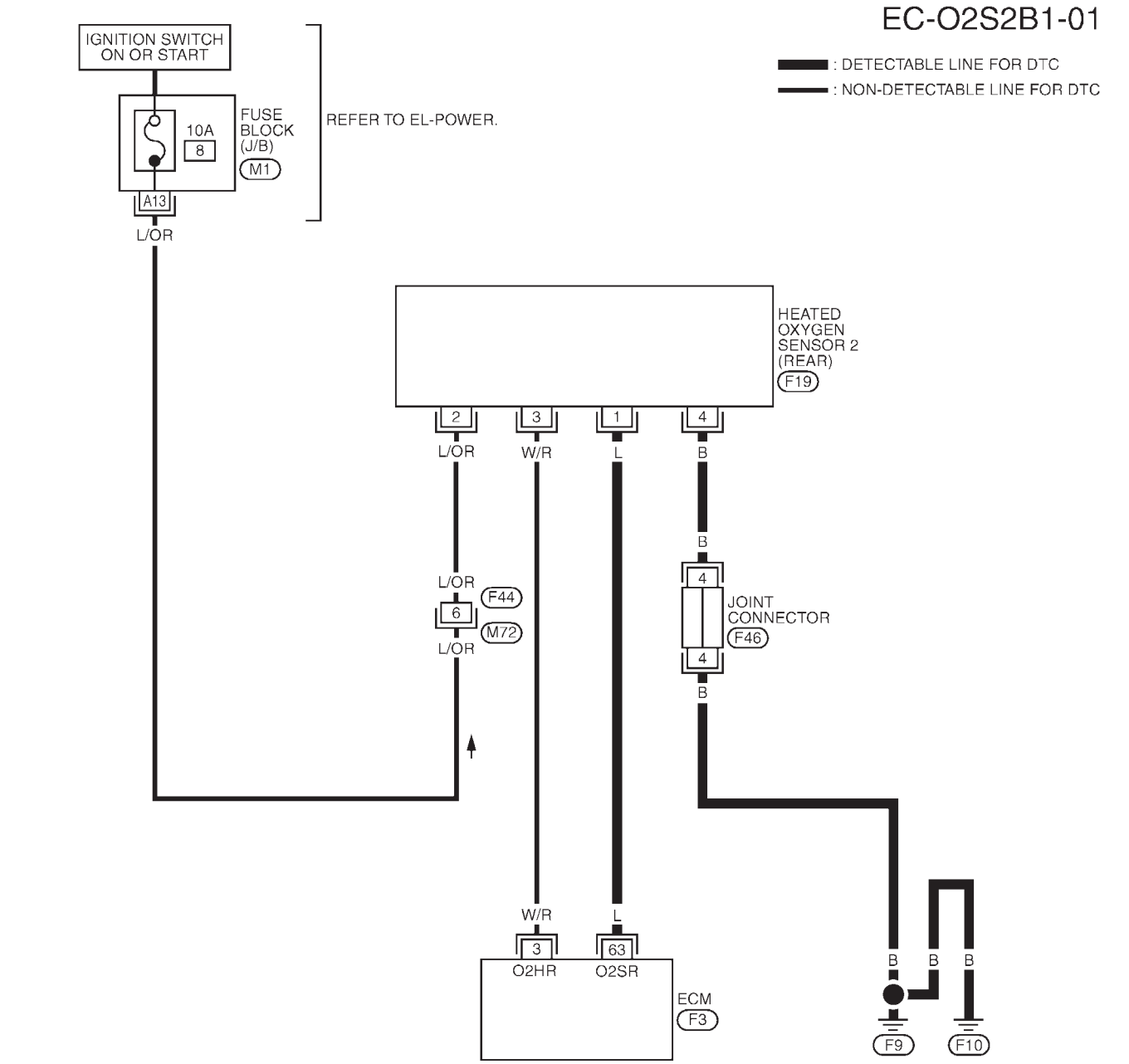


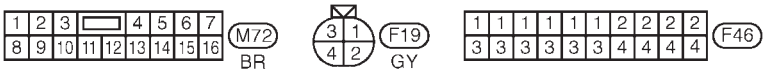
YEC693

Wiring Diagram (Cont'd)

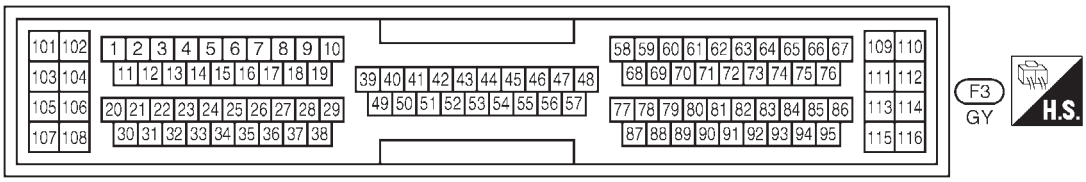
MODELS WITH ECM IN CABIN

NLEC1496S04





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



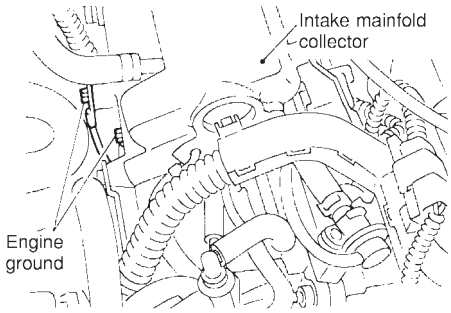
YEC918

Diagnostic Procedure

NLEC1497

1	RETIGHTEN GROUND SCREWS

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

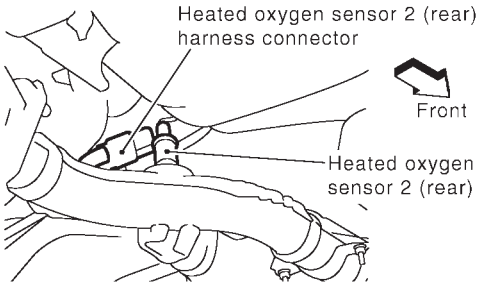


SEF202X

▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

2. Check harness continuity between ECM terminal 63 and HO2S2 terminal 1.
   Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 63 (or HO2S2 terminal 1) and ground.
   Continuity should not 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 GROUND CIRCUIT

1. Check harness continuity between HO2S2 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 5.
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-2 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between heated oxygen sensor 2 (rear) and ECM.	
▶	Repair open circuit or short to power in harness or connectors.

5	CHECK HARNESS CONNECTOR
Check heated oxygen sensor 2 (rear) harness connector for water. **Water should not exist.**	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Repair or replace harness connector.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)
Refer to "Component Inspection", EC-784.	
OK or NG	
OK ▶	GO TO 7.
NG ▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC1498

HEATED OXYGEN SENSOR 2 (REAR)

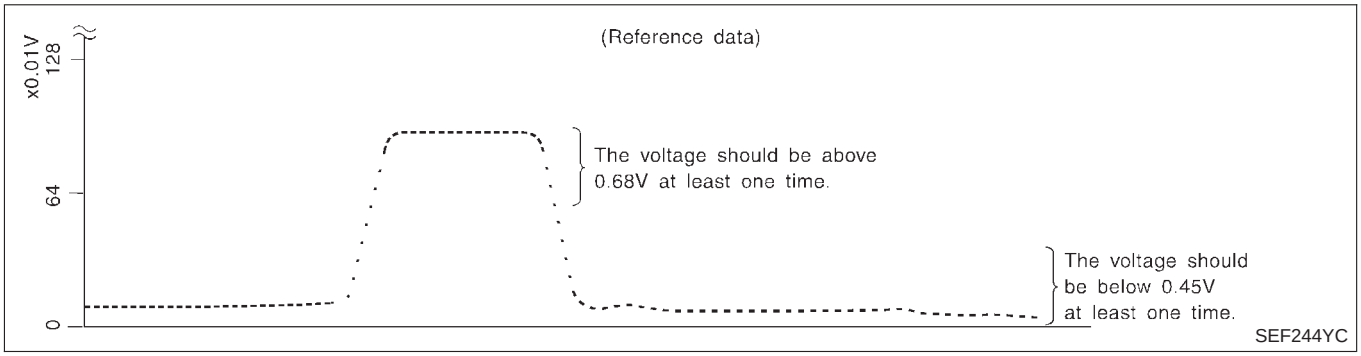
NLEC1498S01

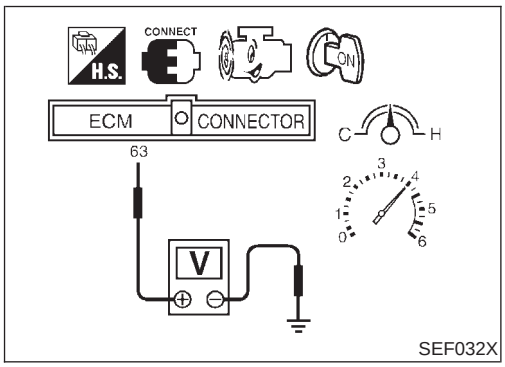
With CONSULT-II

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)" as the monitor item with CONSULT-II.
4) Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
   "HO2S2 (B1)" should be below 0.45V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

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





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 terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at 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 D position with "SPORTS MODE SW" OFF.
   The voltage should be below 0.45V at least once.

CAUTION:

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

Description

NLEC1499

SYSTEM DESCRIPTION

NLEC1499S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Heated oxygen sensor 2 heater (rear) control	Heated oxygen sensor 2 heater (rear)

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater (rear) corresponding to the engine speed.

OPERATION

NLEC1499S02

Engine condition		Heated oxygen sensor 2 heater (rear)
Engine stopped		OFF
Engine is running.	Engine speed below 3,600 rpm After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	ON
	Engine speed above 3,600 rpm	OFF

CONSULT-II Reference Value in Data Monitor Mode

NLEC1500

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 HTR (B1)	● Engine speed	Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
		Above 3,600 rpm	OFF
	● Ignition switch ON (Engine stopped)		OFF

ECM Terminals and Reference Value

NLEC1501

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	W/R	Heated oxygen sensor 2 heater (rear)	**[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]	Approximately 0.7V
			[Engine is running] ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Engine stopped	

On Board Diagnosis Logic

NLEC1502

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0141	● 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).]	● Harness or connectors (The heated oxygen sensor 2 heater (rear) circuit is open or shorted.) ● Heated oxygen sensor 2 heater (rear)

DTC Confirmation Procedure

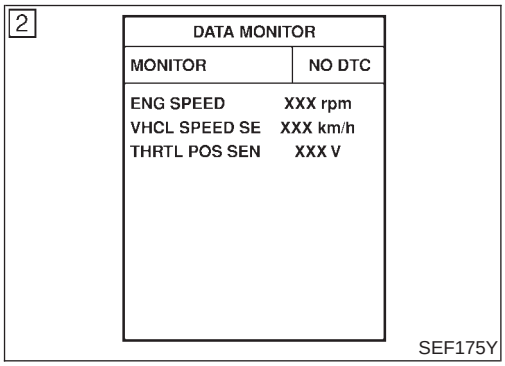
NLEC1503

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 in between 10.5V and 16V at idle.



With CONSULT-II

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-790.

With GST

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Turn ignition switch “OFF” and wait at least 10 seconds.
3) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
4) Select “MODE 3” with GST.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-790.

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.

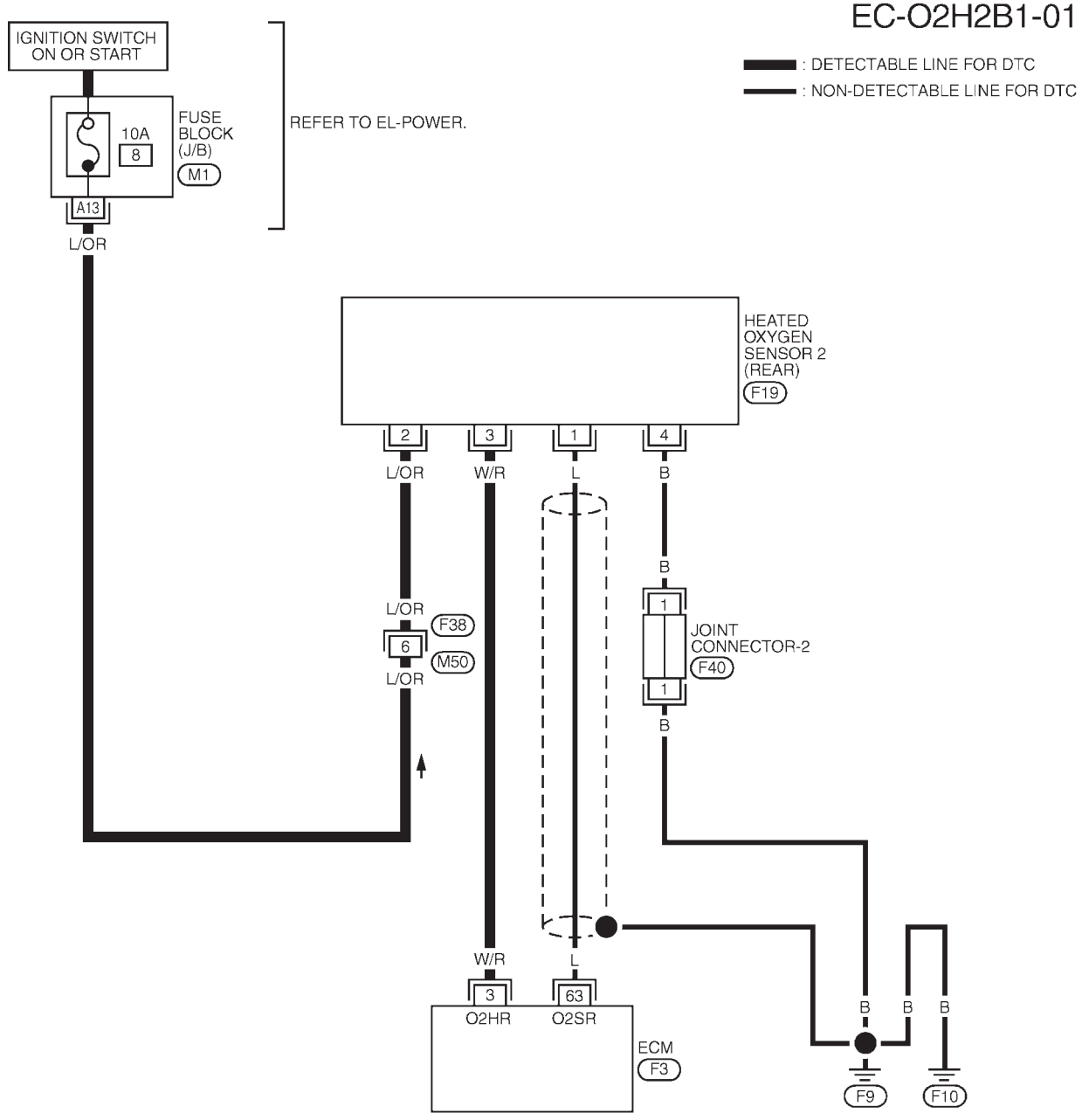
Wiring Diagram

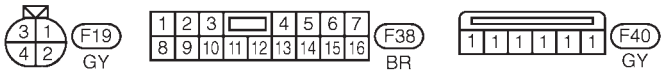
MODELS WITH ECM IN ENGINE COMARTMENT

NLEC1504

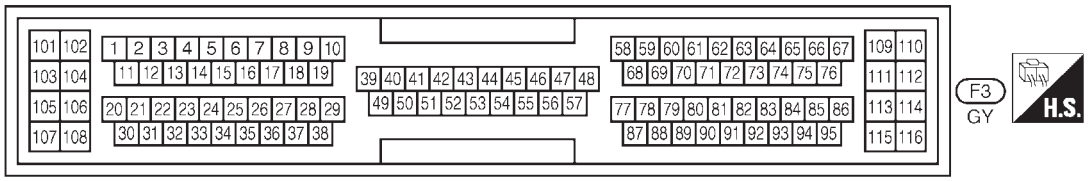
NLEC1504S03

EC-O2H2B1-01





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

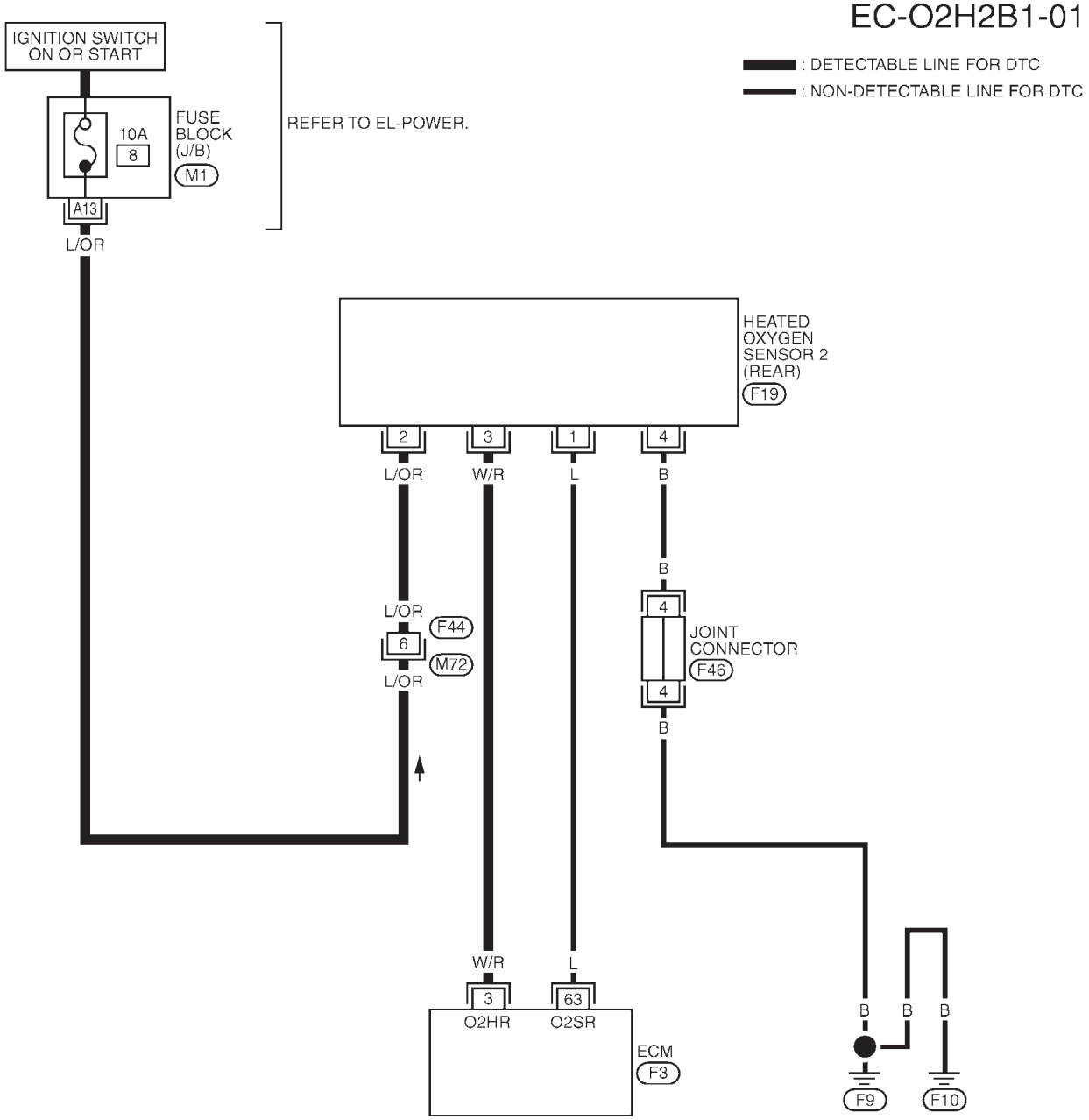


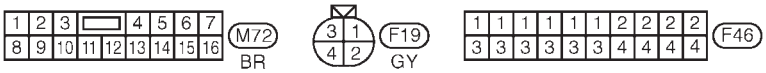
YEC694

MODELS WITH ECM IN CABIN

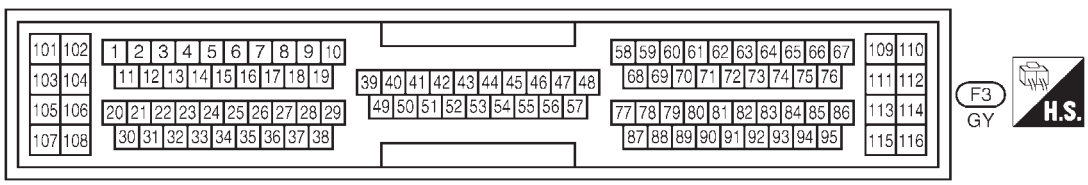
NLEC1504S04

EC-O2H2B1-01





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



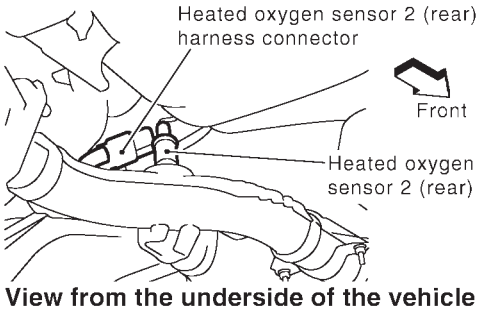
YEC919

Diagnostic Procedure

NLEC1505

1	CHECK POWER SUPPLY

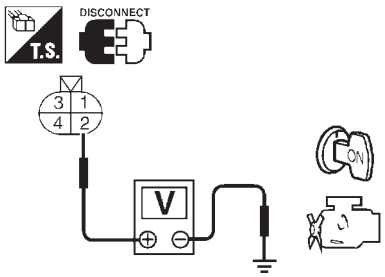
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 (rear) harness connector.



View from the underside of the vehicle

SEF639Z

3. Turn ignition switch “ON”.
4. Check voltage between HO2S2 terminal 2 and ground.



SEF218W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F38, M50 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness for open or short between heated oxygen sensor 2 (rear) and fuse
- 10A fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S2 terminal 3 and ECM terminal 3.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

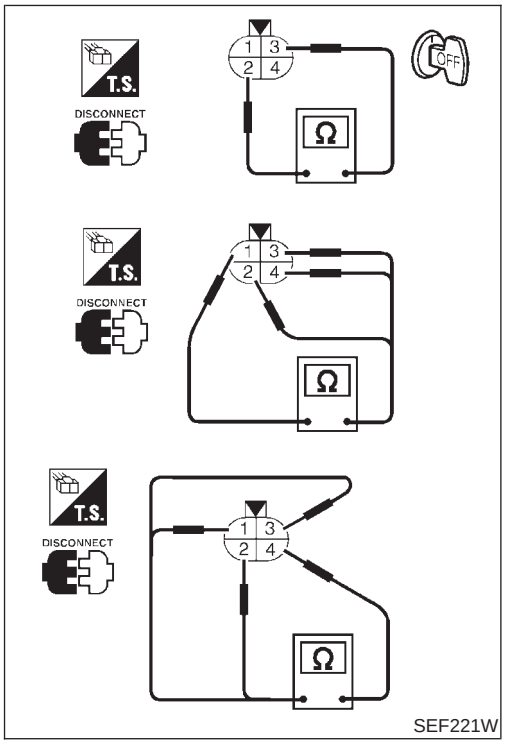
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the harness for open or short between heated oxygen sensor 2 heater (rear) and ECM.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK HEATED OXYGEN SENSOR 2 HEATER (REAR)
Refer to "Component Inspection", EC-791.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace heated oxygen sensor 2 (rear).

6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



Component Inspection

NLEC1506

HEATED OXYGEN SENSOR 2 HEATER (REAR)

NLEC1506S01

Check the following.

1. Check resistance between terminals 2 and 3.
   Resistance: 2.3 - 4.3Ω at 25°C (77°F)
2. Check continuity.

Terminal No.	Continuity
1 and 2, 3, 4	No
4 and 1, 2, 3	

If NG, replace the heated oxygen sensor 2 (rear).

CAUTION:

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

On Board Diagnosis Logic

NLEC1507

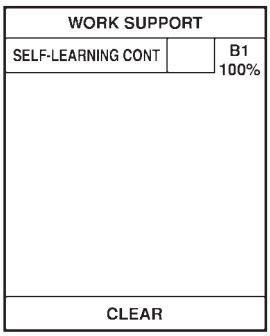
With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1 (front). The ECM calculates the necessary compensation to correct the offset between the actual 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 lights up the MIL (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 & mixture ratio control	Injectors

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0171	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	• Intake air leaks • Heated oxygen sensor 1 (front) • Injectors • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor

4



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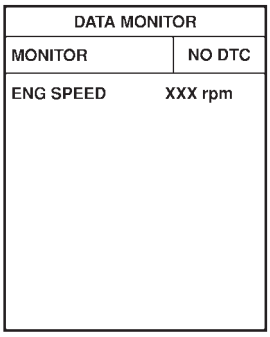
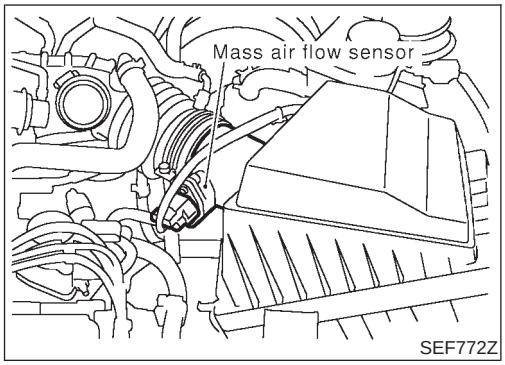
6



SEF058Y



SEF772Z

DTC Confirmation Procedure

NLEC1508

NOTE:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 10 seconds.
3) Turn ignition switch “ON” and select “SELF-LEARN CONTROL” in “WORK SUPPORT” mode with CONSULT-II.
4) Clear the self-learning control coefficient by touching “CLEAR”.
5) Select “DATA MONITOR” mode with CONSULT-II.
6) Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-796.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
8) Crank engine while depressing accelerator pedal. If engine starts, go to “Diagnostic Procedure”, EC-796. If engine does not start, visually check for exhaust and intake air leak.

With GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 10 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 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.

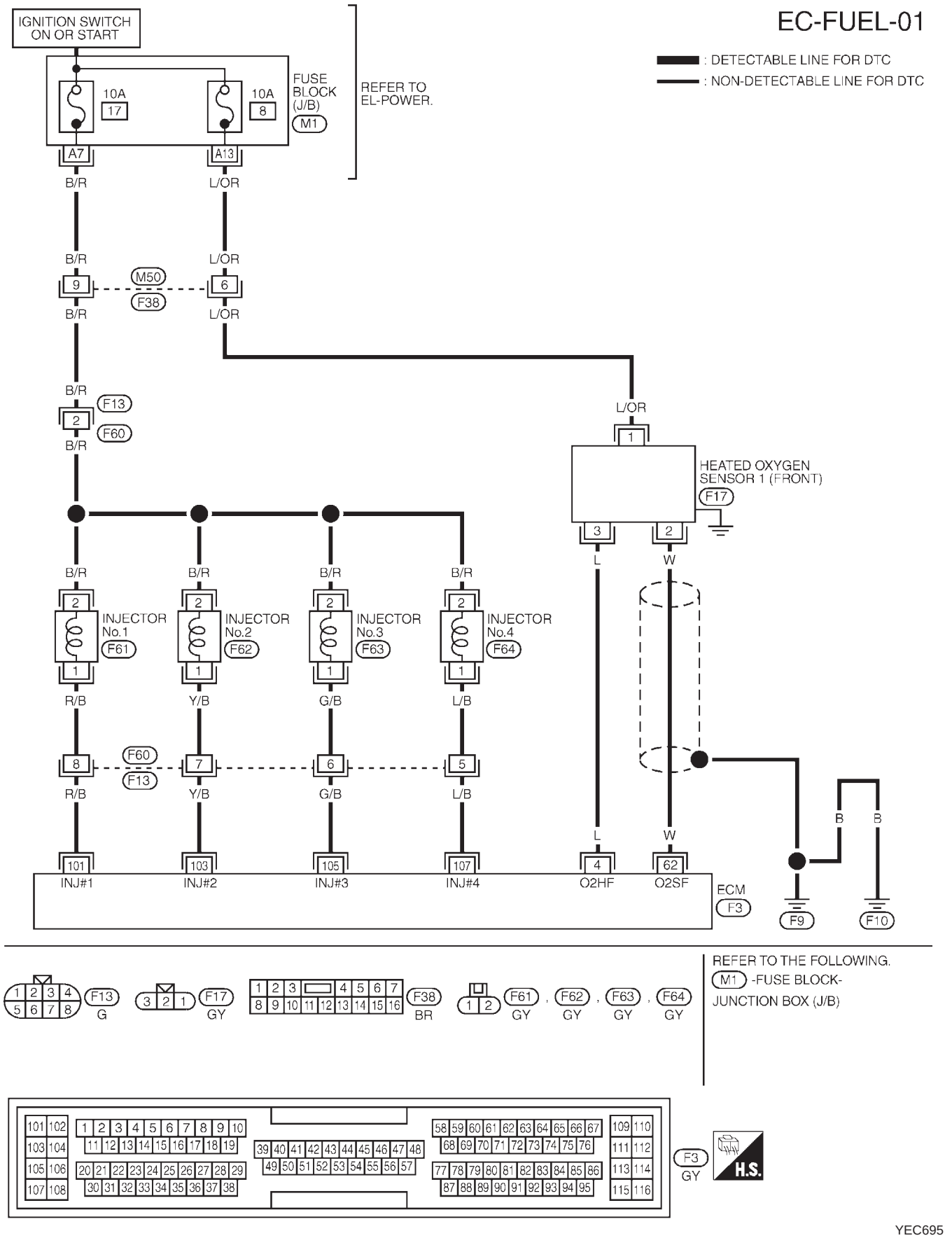
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select "MODE 7" with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-796.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
10) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-796. If engine does not start, visually check for exhaust and intake air leak.

Wiring Diagram

NLEC1509

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1509S03



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

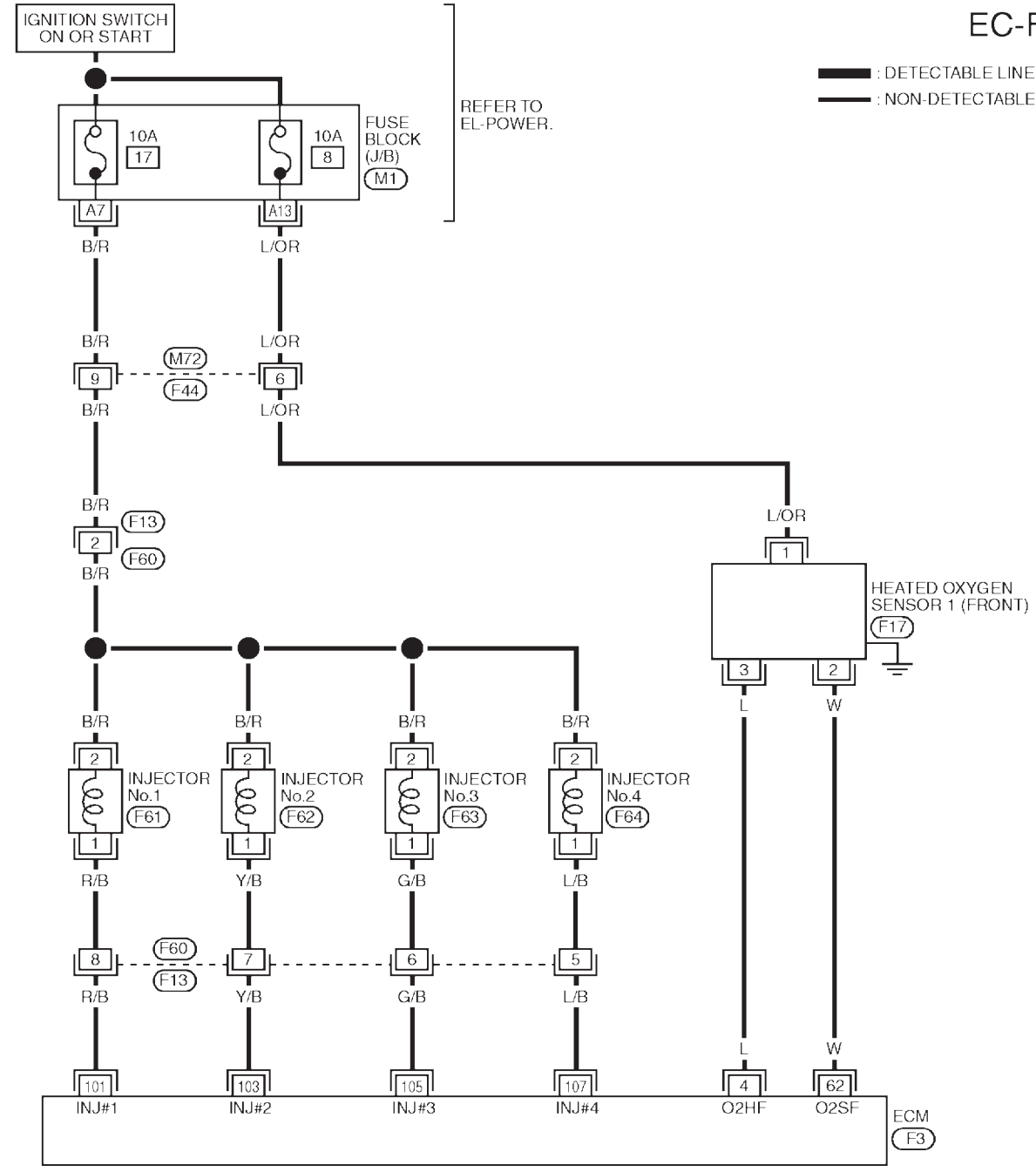
YEC695

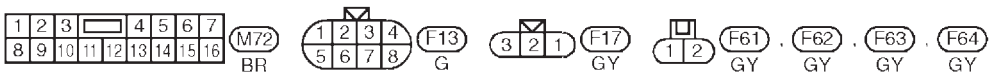
MODELS WITH ECM IN CABIN

NLEC1509S04

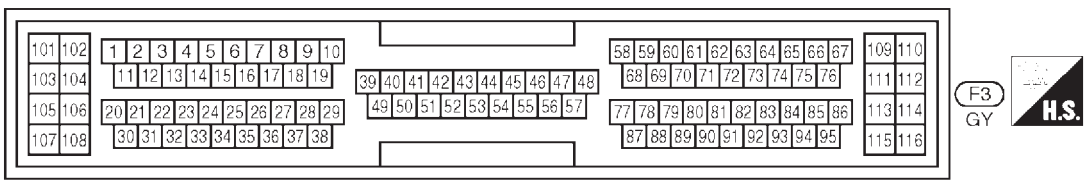
EC-FUEL-01

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





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



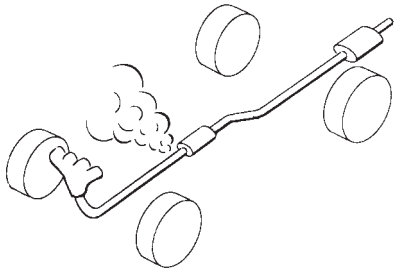
YEC920

Diagnostic Procedure

NLEC1510

1	CHECK EXHAUST AIR LEAK

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



SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK FOR INTAKE AIR LEAK

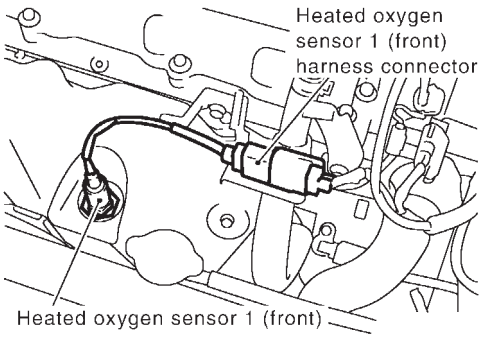
Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair or replace.

3	CHECK HEATED OXYGEN SENSOR 1 (FRONT) CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (front) harness connector and ECM harness connector.



SEF774Z

3. Check harness continuity between ECM terminal 62 and HO2S1 terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 62 (or HO2S1 terminal 2) and ground.
   Continuity should not exist.
5. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK FUEL PRESSURE	
1. Release fuel pressure to zero. Refer to EC-577. 2. Install fuel pressure gauge and check fuel pressure. **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-1032.) ● Fuel pressure regulator (Refer to EC-578.) ● Fuel lines (Refer to "ENGINE MAINTENANCE" in MA section.) ● Fuel filter for clogging		
	▶	Repair or replace.

6	CHECK MASS AIR FLOW SENSOR	
With CONSULT-II Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II. **at idling: 2.5 - 5.0 g·m/sec** **at 2,500 rpm: 7.1 - 12.5 g·m/sec**		
With GST Check mass air flow sensor signal in MODE 1 with GST. **at idling: 2.5 - 5.0 g·m/sec** **at 2,500 rpm: 7.1 - 12.5 g·m/sec** **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-679.

7	CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Install all parts removed.
2. Start engine.
3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

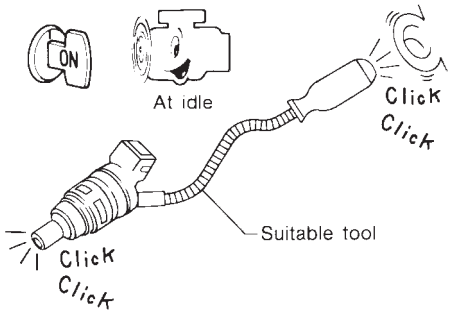
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

4. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-II

1. Install all parts removed.
2. Start engine.
3. 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-1021.

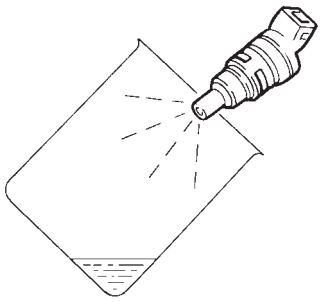
8	REMOVE INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch "OFF".
3. Remove injector with fuel tube assembly. Refer to EC-578.
   Keep fuel hose and all injectors connected to injector gallery. The injector harness connectors should remain connected.

	▶	GO TO 9.

9	CHECK INJECTOR

1. Disconnect all ignition wires.
2. Place pans or saucers under each injector.
3. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.



SEF595Q

Fuel should be sprayed evenly for each cylinder.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace injectors from which fuel does not spray out. Always replace O-ring with new one.

10	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NLEC1511

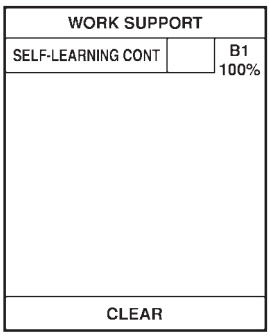
With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1 (front). The ECM calculates the necessary compensation to correct the offset between the actual 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 lights 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 & mixture ratio control	Injectors

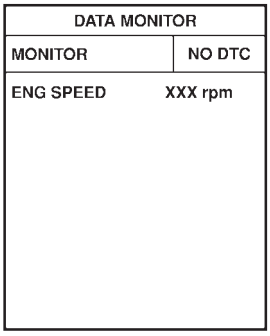
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0172	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	• Heated oxygen sensor 1 (front) • Injectors • Exhaust gas leaks • Incorrect fuel pressure • Mass air flow sensor

4

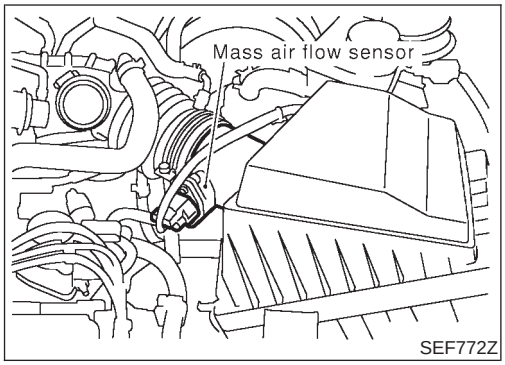


SEF215Z

6



SEF058Y



SEF772Z

DTC Confirmation Procedure

NLEC1512

NOTE:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 10 seconds.
3) Turn ignition switch “ON” and select “SELF-LEARN CONTROL” in “WORK SUPPORT” mode with CONSULT-II.
4) Clear the self-learning control coefficient by touching “CLEAR”.
5) Select “DATA MONITOR” mode with CONSULT-II.
6) Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-804.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
8) Crank engine while depressing accelerator pedal. If engine starts, go to “Diagnostic Procedure”, EC-804. If engine does not start, remove ignition plugs and check for fouling, etc.

With GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 10 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 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.

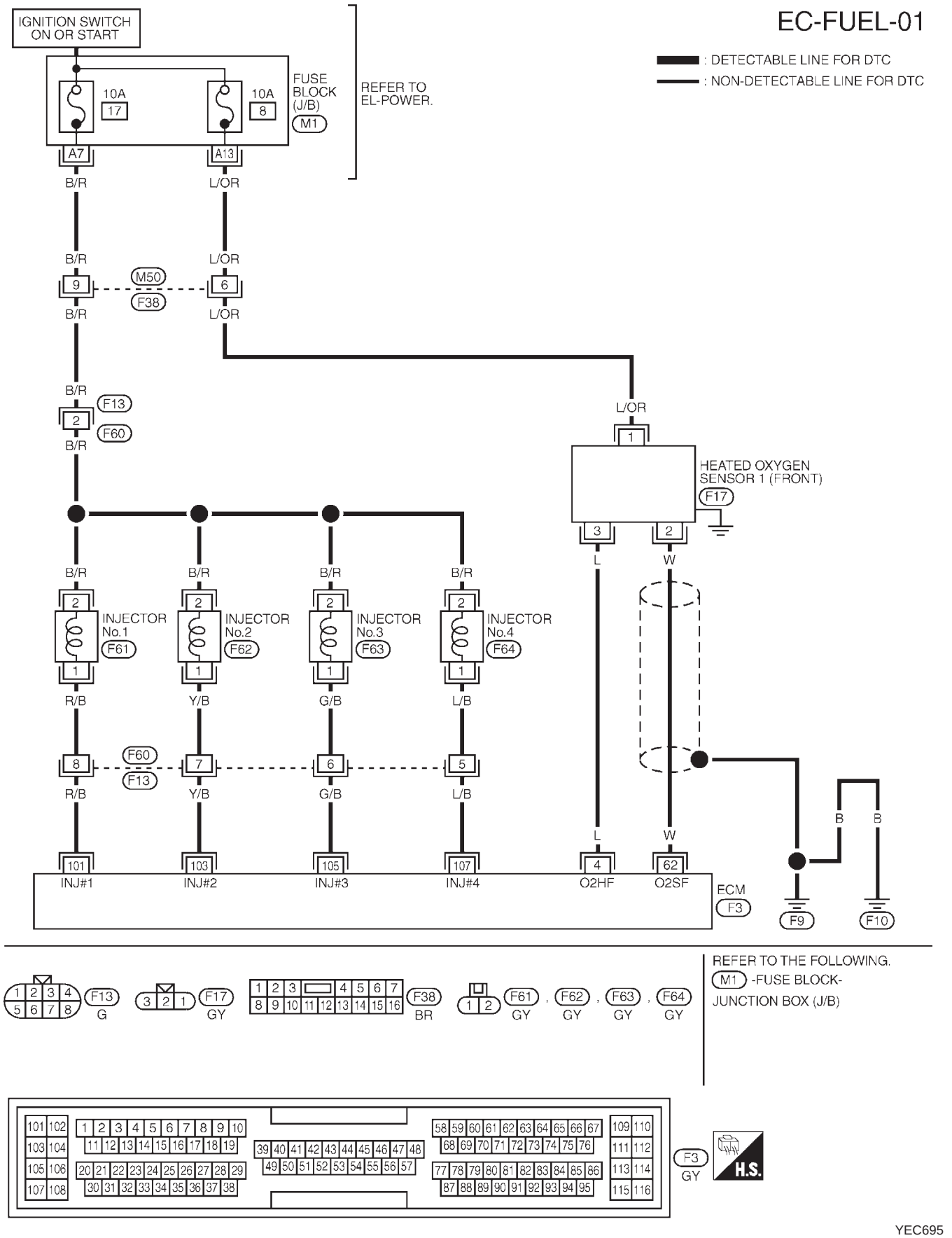
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select "MODE 7" with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-804.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
10) Crank engine while depressing accelerator pedal.
If engine starts, go to "Diagnostic Procedure", EC-804. If engine does not start, remove ignition plugs and check for fouling, etc.

Wiring Diagram

NLEC1513

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1513S03

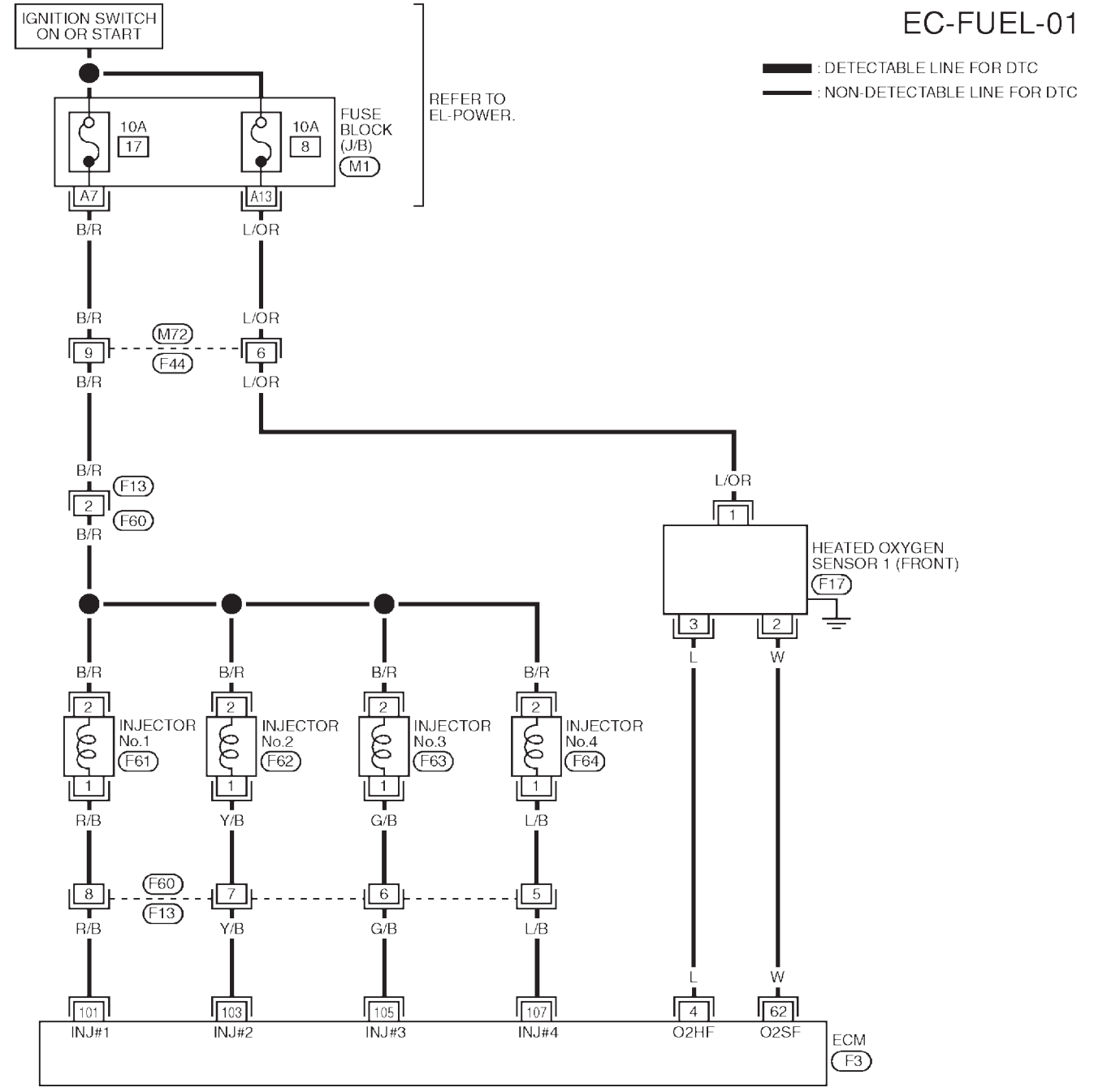


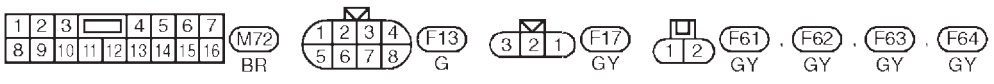
YEC695

MODELS WITH ECM IN CABIN

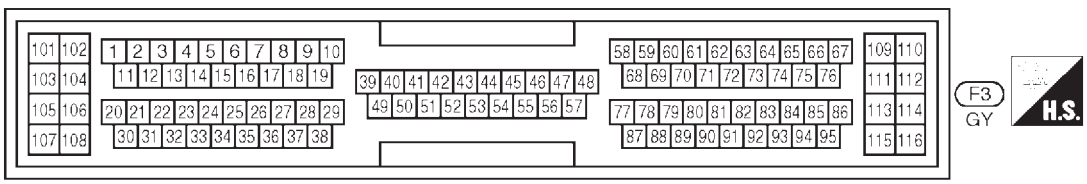
NLEC1513S04

EC-FUEL-01





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



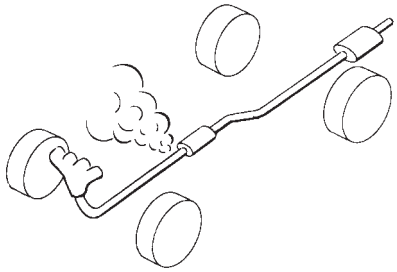
YEC920

Diagnostic Procedure

NLEC1514

1	CHECK FOR EXHAUST AIR LEAK

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



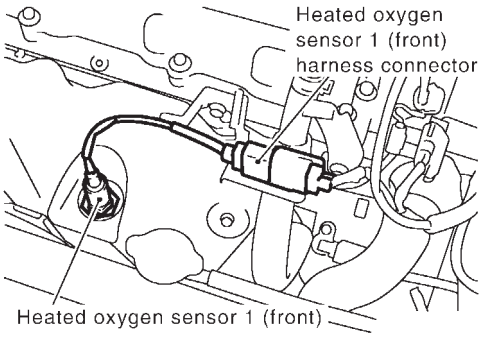
SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK HEATED OXYGEN SENSOR 1 (FRONT) CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (front) harness connector and ECM harness connector.



SEF774Z

3. Check harness continuity between ECM terminal 62 and HO2S1 terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 62 (or HO2S1 terminal 2) and ground.
   Continuity should not exist.
5. Also check harness for short to ground and short to power.

OK or NG

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

3	CHECK FUEL PRESSURE
1. Release fuel pressure to zero. Refer to EC-577. 2. Install fuel pressure gauge and check fuel pressure. **At idling:** **When fuel pressure regulator valve vacuum hose is connected.** **Approximately 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)** **When fuel pressure regulator valve vacuum hose is disconnected.** **Approximately 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)** **OK or NG**	
OK ▶	GO TO 5.
NG ▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the following. ● Fuel pump and circuit (Refer to EC-1032.) ● Fuel pressure regulator (Refer to EC-578.)	
▶	Repair or replace.

5	CHECK MASS AIR FLOW SENSOR
With CONSULT-II Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II. **at idling: 2.5 - 5.0 g·m/sec** **at 2,500 rpm: 7.1 - 12.5 g·m/sec**	
With GST Check mass air flow sensor signal in MODE 1 with GST. **at idling: 2.5 - 5.0 g·m/sec** **at 2,500 rpm: 7.1 - 12.5 g·m/sec** **OK or NG**	
OK ▶	GO TO 6.
NG ▶	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-679.

6	CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Install all parts removed.
2. Start engine.
3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

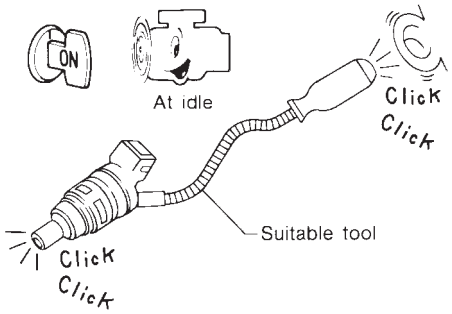
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

4. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-II

1. Install all parts removed.
2. Start engine.
3. Listen to each injector operating sound.



MEC703B

Clicking noise should be heard.

OK or NG

OK	▶	GO TO 7.
NG	▶	Perform trouble diagnosis for "INJECTORS", EC-1021.

7	REMOVE INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch "OFF".
3. Remove injector assembly. Refer to EC-578.
   Keep fuel hose and all injectors connected to injector gallery.

	▶	GO TO 8.

8	CHECK INJECTOR

1. Disconnect all injector harness connectors.
2. Disconnect all ignition wires.
3. Prepare pans or saucers under each injectors.
4. 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**
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NLEC1752

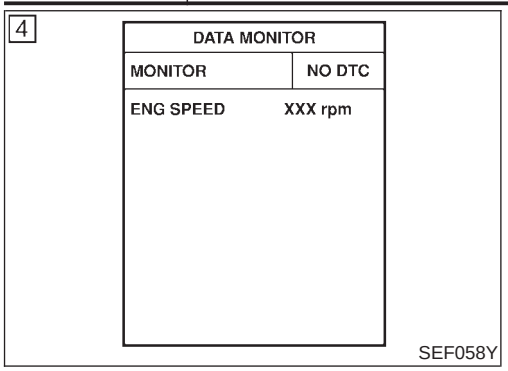
When a misfire occurs, engine speed will fluctuate (vary). If the engine speed fluctuates enough to cause the CKP sensor to vary, ECM can detect a misfire.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (OBD)	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 rip 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 (OBD) 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 (OBD) signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on-multiple cylinders.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0300	● Multiple cylinders misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● EGR volume control valve ● The injector circuit is open or shorted ● Injectors ● Intake air leak ● The ignition secondary circuit is open or shorted ● Lack of fuel ● Drive plate ● Heated oxygen sensor 1 (front) ● Incorrect distributor roter
P0301	● No. 1 cylinder misfires.	
P0302	● No. 2 cylinder misfires.	
P0303	● No. 3 cylinder misfires.	
P0304	● No. 4 cylinder misfires.	



DTC Confirmation Procedure

NLEC1522

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

With CONSULT-II

1) Turn ignition switch “ON”, and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and warm it up to normal operating temperature.
3) Turn ignition switch “OFF” and wait at least 10 seconds.
4) Start engine again and drive at 1,500 - 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-809.

With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

NLEC1523

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	
Stop engine and visually check exhaust tube, three way catalyst and muffler for dents. **OK or NG**		
OK	▶	GO TO 3.
NG	▶	Repair or replace it.

3	CHECK EGR FUNCTION	
Perform DTC Confirmation Procedure for DTC P1402 EGR FUNCTION (OPEN). Refer to EC-921. **OK or NG**		
OK	▶	GO TO 4.
NG	▶	Repair EGR system.

Diagnostic Procedure (Cont'd)

4	PERFORM POWER BALANCE TEST

With CONSULT-II

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.

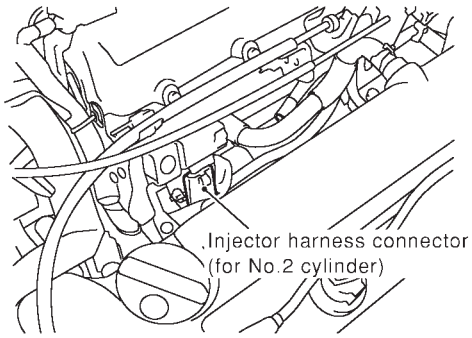
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

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?



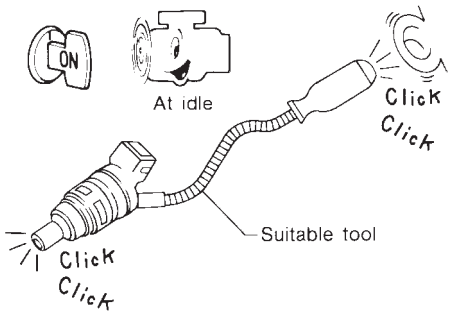
SEF846X

Yes or No

Yes	▶	GO TO 5.
No	▶	GO TO 10.

5	CHECK INJECTOR

Does each injector make an operating sound at idle?

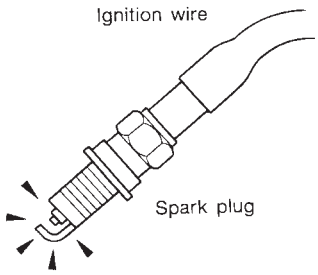


MEC703B

Yes or No

Yes	▶	GO TO 6.
No	▶	Check injector(s) and circuit(s). Refer to EC-1021.

6	CHECK IGNITION SIGNAL CIRCUIT	
Refer to "Diagnostic Procedure", EC-1008.		
OK or NG		
OK	▶	GO TO 7.
NG	▶	Repair or replace malfunctioning parts.

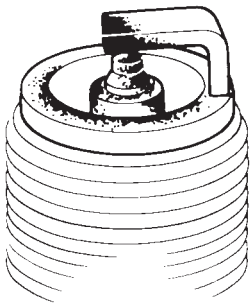
7	CHECK IGNITION SPARK	
1. Turn Ignition switch "OFF". 2. Disconnect ignition wire from spark plug. 3. Connect a known good spark plug to the ignition wire. 4. Place end of spark plug against a suitable ground and crank engine. 5. Check for spark.		
 SEF282G		
OK or NG		
OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	CHECK IGNITION WIRES	
Refer to "Component Inspection", EC-814.		
OK or NG		
OK	▶	Check distributor rotor head for incorrect parts. Check ignition coil, power transistor and their circuits. Refer to EC-1004.
NG	▶	Replace.

Diagnostic Procedure (Cont'd)

9	CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.



SEF156I

OK or NG

OK	▶	GO TO 10.
NG	▶	Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-19, "Checking and changing".

10	CHECK COMPRESSION PRESSURE

Refer to EM section.

- Check compression pressure.

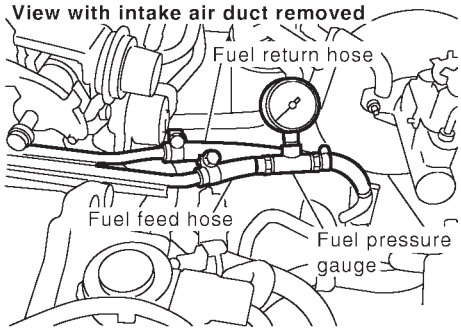
Standard:
1,125 kPa (12.75 bar, 13.0 kg/cm^2, 185 psi)/300 rpm
Minimum:
1,079 kPa (10.79 bar, 11.0 kg/cm^2, 156 psi)/300 rpm
Difference between each cylinder:
98 kPa (0.98 bar, 1.0 kg/cm^2, 14 psi)/300 rpm

OK or NG

OK	▶	GO TO 11.
NG	▶	Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

11	CHECK FUEL PRESSURE

1. Install any parts removed.
2. Release fuel pressure to zero. Refer to EC-577.
3. Install fuel pressure gauge and check fuel pressure.



SEF775Z

At idle: Approx. 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART
Check the following. ● Fuel pump and circuit (Refer to EC-1032.) ● Fuel pressure regulator (Refer to EC-578.) ● Fuel lines ● Fuel filter for clogging	
▶	Repair or replace.

13	CHECK IGNITION TIMING
Perform "Basic Inspection". Refer to EC-623.	
OK or NG	
OK ▶	GO TO 14.
NG ▶	Adjust ignition timing.

14	CHECK HEATED OXYGEN SENSOR 1 (FRONT)
Refer to "Component Inspection", EC-715.	
OK or NG	
OK ▶	GO TO 15.
NG ▶	Replace heated oxygen sensor 1 (front).

15	CHECK MASS AIR FLOW SENSOR
With CONSULT-II Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II. **at idling: 2.5 - 5.0 g·m/sec** **at 2,500 rpm: 7.1 - 12.5 g·m/sec**	
With GST Check mass air flow sensor signal in MODE 1 with GST. **at idling: 2.5 - 5.0 g·m/sec** **at 2,500 rpm: 7.1 - 12.5 g·m/sec**	
OK or NG	
OK ▶	GO TO 17.
NG ▶	GO TO 16.

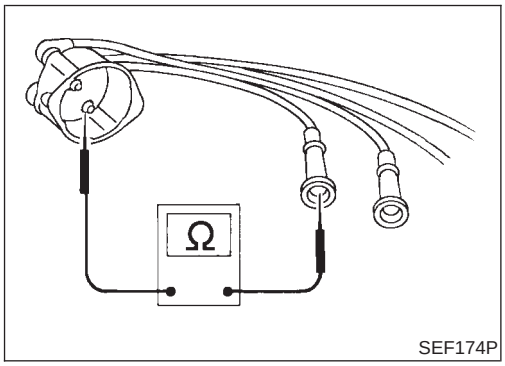
16	CHECK CONNECTORS
Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-679.	
OK or NG	
NG ▶	Repair or replace it.

17	CHECK SYMPTOM MATRIX CHART
Check items on the rough idle symptom in "Symptom Matrix Chart", EC-648.	
OK or NG	
OK ▶	GO TO 18.
NG ▶	Repair or replace.

Diagnostic Procedure (Cont'd)

18	ERASE THE 1ST TRIP DTC
Some tests may cause a 1st trip DTC to be set. Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-594.	
▶	GO TO 19.

19	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF174P

Component Inspection

NLEC1753

IGNITION WIRES

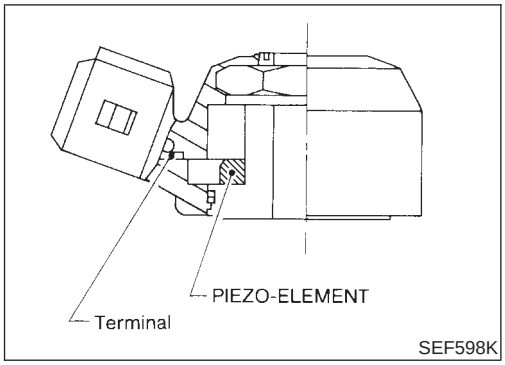
NLEC1753S01

1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires to their distributor cap terminal. Move each wire while testing to check for intermittent breaks.

   Resistance:

   13.6 - 18.4 kΩ/m (4.15 - 5.61 kΩ/ft) at 25°C (77°F)

   If the resistance exceeds the above specification, inspect ignition wire to distributor cap connection. Clean connection or replace the ignition wire with a new one.



Component Description

NLEC1524

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.

ECM Terminals and Reference Value

NLEC1525

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

CAUTION:

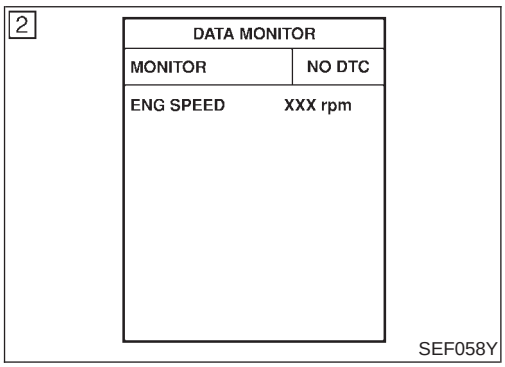
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
81	W	Knock sensor	**[Engine is running]** ● Idle speed	2.0 - 3.0V

On Board Diagnosis Logic

NLEC1526

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0325 0325	● An excessively low or high voltage from the knock sensor is sent to ECM.	● Harness or connectors (The knock sensor circuit is open or shorted.) ● Knock sensor



DTC Confirmation Procedure

NLEC1527

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine and run it for at least 5 seconds at idle speed.
3) If DTC is detected, go to "Diagnostic Procedure", EC-817.

With GST

Follow the procedure "With CONSULT-II" above.

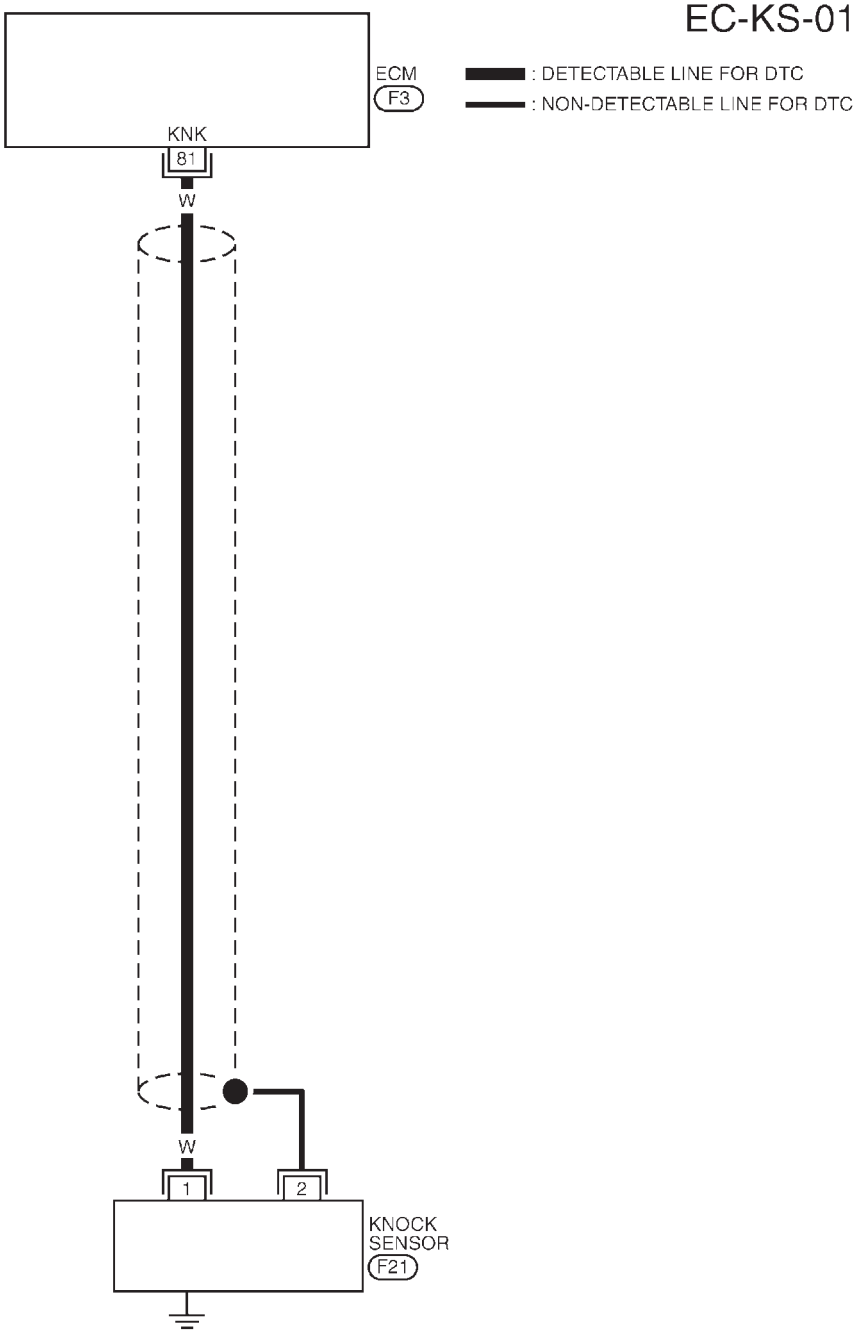
No Tools

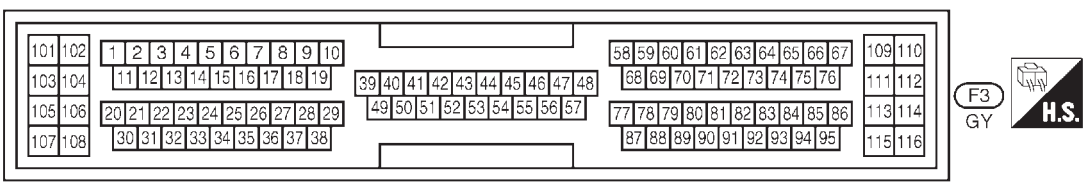
1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-817.

Wiring Diagram

NLEC1528

EC-KS-01





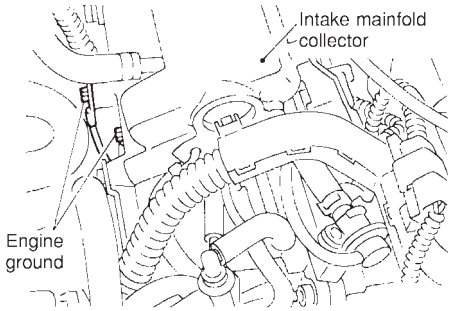
YEC697

Diagnostic Procedure

NLEC1529

1	RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

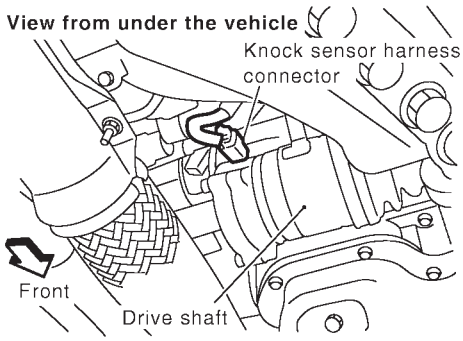


SEF202X

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT-1

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and knock sensor harness connector.



SEF776Z

3. Check harness continuity between knock sensor terminal 1 and ECM terminal 81.
   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 F21, F101
- Harness for open or short between knock sensor and ECM.

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

4	CHECK KNOCK SENSOR

Refer to “Component Inspection”, EC-818.

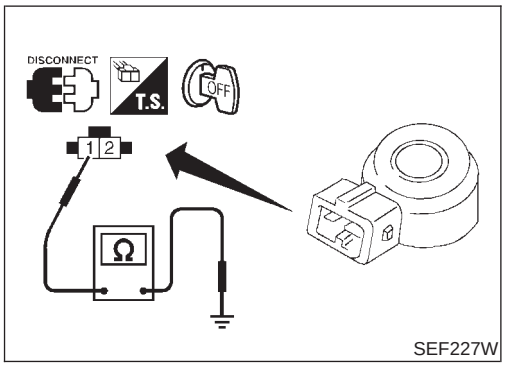
OK or NG

OK	▶	GO TO 5.
NG	▶	Replace knock sensor.

Diagnostic Procedure (Cont'd)

5	CHECK SHIELD CIRCUIT	
1. Reconnect harness connectors disconnected. 2. Disconnect harness connectors F21, F101. 3. Check harness continuity between F21 terminal 2 and engine ground. Refer to wiring diagram. **Continuity should exist.** 4. Also check harness for short to power. 5. Then reconnect harness connectors.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to power in harness or connectors.

6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF227W

Component Inspection

NLEC1530

KNOCK SENSOR

NLEC1530S01

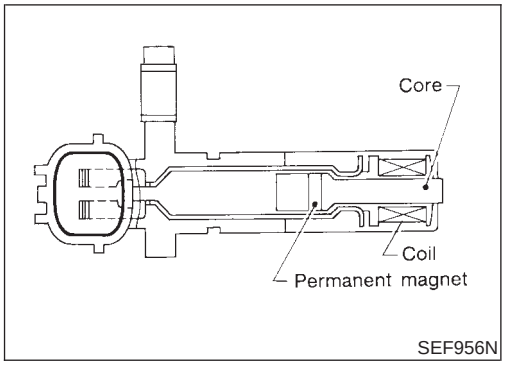
- Use an ohmmeter which can measure more than 10 MΩ.

1. Disconnect knock sensor harness connector.
2. Check resistance between terminal 1 and ground.

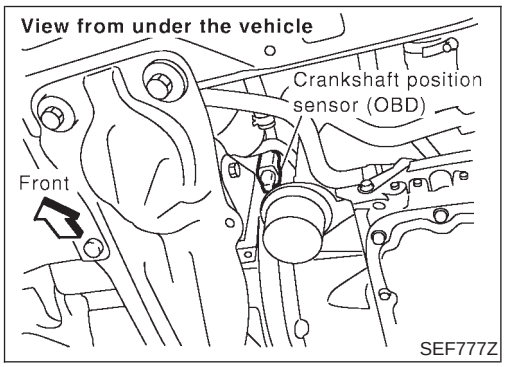
Resistance: 500 - 620 kΩ [at 25°C (77°F)]

CAUTION:

Discard any knock sensors that have been dropped or physically damaged. Use only new ones.



SEF956N



SEF777Z

Component Description

NLEC1754

The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not directly used to control the engine system. It is used only for the on board diagnosis.

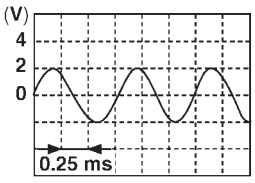
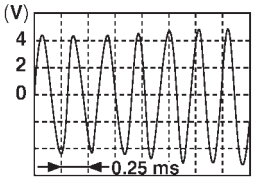
ECM Terminals and Reference Value

NLEC1755

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

CAUTION:

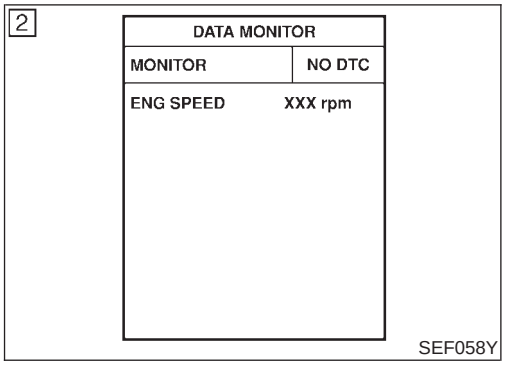
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (AC Voltage)
65	W	Crankshaft position sensor (OBD)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 1.3V  SEF814Z
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 2.0V  SEF815Z

On Board Diagnosis Logic

NLEC1756

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0335	● The proper pulse signal from the crankshaft position sensor (OBD) is not sent to ECM while the engine is running at the specified engine speed.	● Harness or connectors (The crankshaft position sensor (OBD) circuit is open.) ● Crankshaft position sensor (OBD)



DTC Confirmation Procedure

NLEC1757

NOTE:

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

With CONSULT-II

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 10 seconds at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-823.

With GST

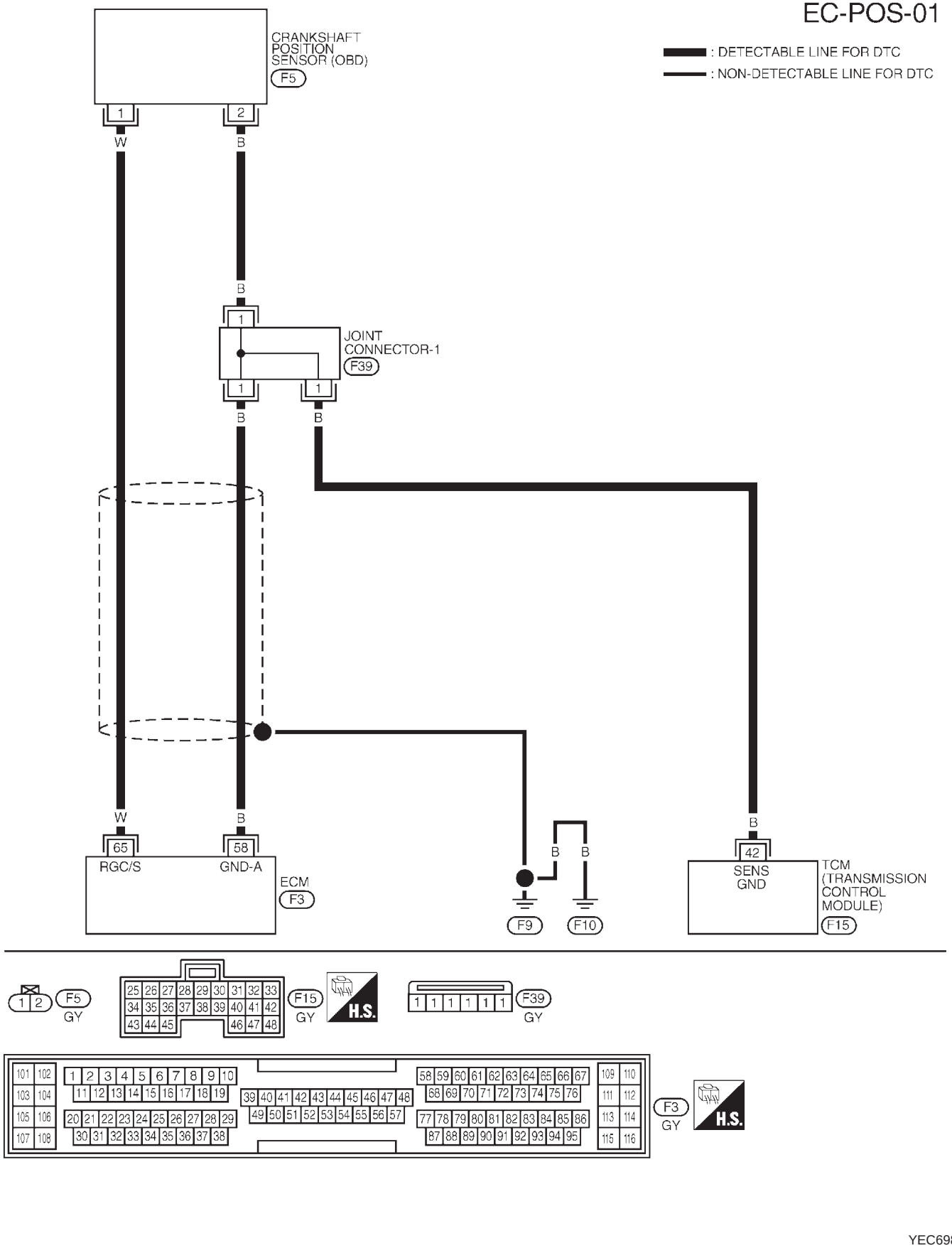
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1758

NLEC1758S01

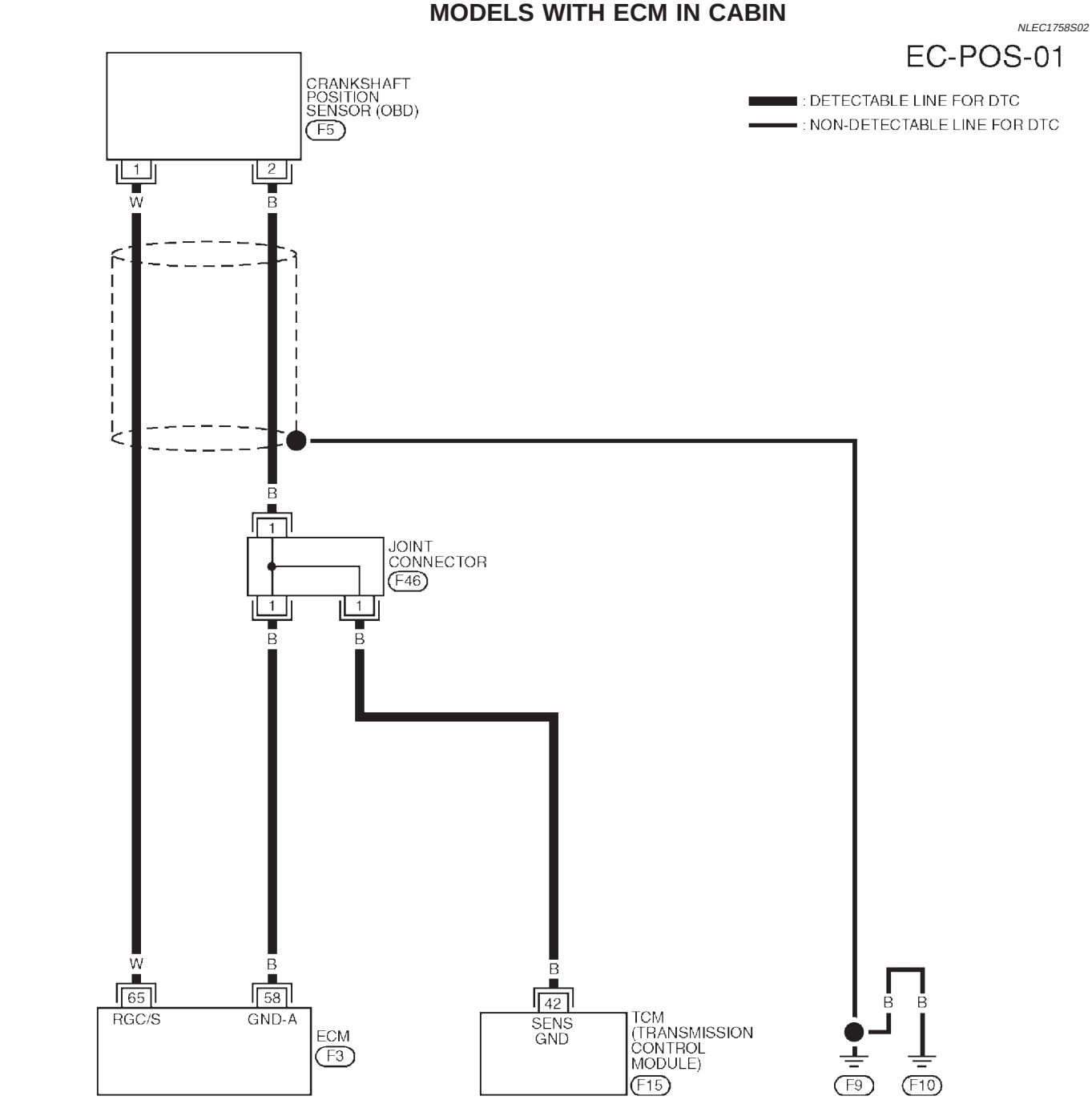


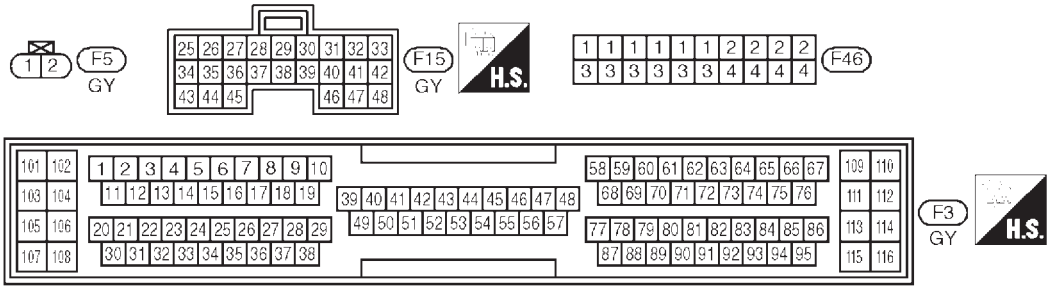
YEC698

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC1758S02





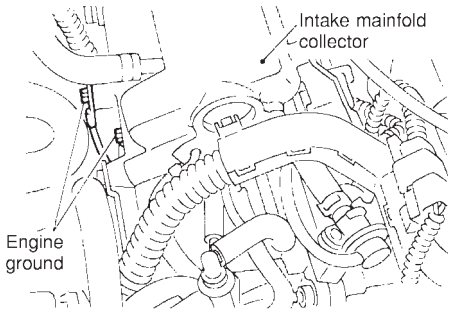
YEC921

Diagnostic Procedure

NLEC1759

1	RETIGHTEN GROUND SCREWS

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

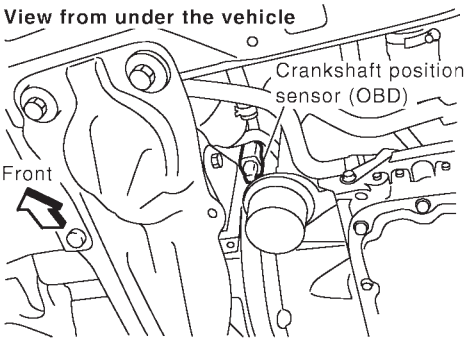


SEF202X

▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.



SEF777Z

2. Check continuity between ECM terminal 65 and CKPS (OBD) 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 harness for open or short between crankshaft position sensor (OBD) and ECM

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

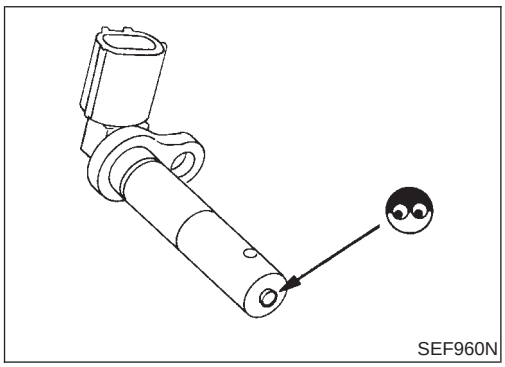
Diagnostic Procedure (Cont'd)

4	CHECK GROUND CIRCUIT	
1. Reconnect ECM harness connector. 2. Check harness continuity between CKPS (OBD) terminal 2 and engine ground. Refer to woring diagram. **Continuity should exist.** 3. Also check harness for short to power. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	GO TO 5.

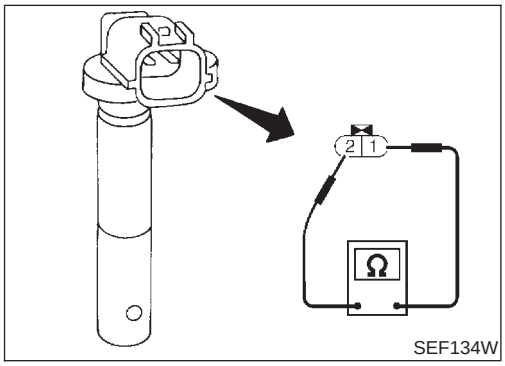
5	DETECT MALFUNCTIONING PART	
Check the following. ● Joint connector-1 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between crankshaft position sensor (OBD) and ECM ● Harness for open or short between crankshaft position sensor (OBD) and TCM (Transmission control module)		
	▶	Repair open circuit or short to power in harness or connectors.

6	CHECK CRANKSHAFT POSITION SENSOR (OBD)	
Refer to "Component Inspection", EC-824. **OK or NG**		
OK	▶	GO TO 7.
NG	▶	Replace crankshaft position sensor (OBD).

7	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**



SEF960N



SEF134W

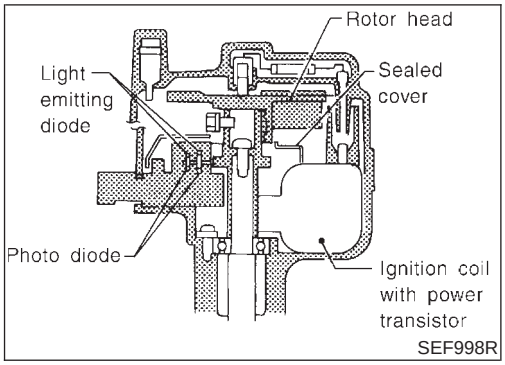
Component Inspection

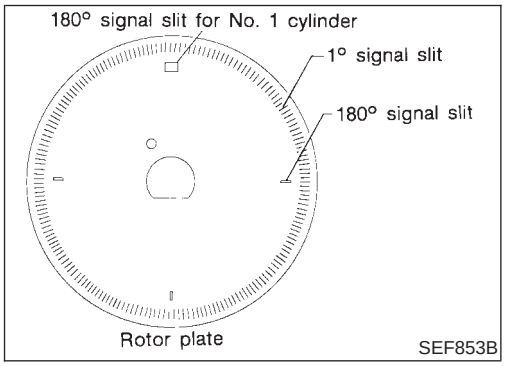
NLEC1760

CRANKSHAFT POSITION SENSOR (OBD)

NLEC1760S01

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance as shown in the figure.
   Resistance: 166 - 204 Ω [at 20°C (68°F)]
   If NG, replace crankshaft position sensor (OBD).





Component Description

NLEC1761

The camshaft position sensor is a basic component of the engine control system. It monitors engine speed and piston position. These input signals to the engine control system are used to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for a 1° (POS) signal and 4 slits for a 180° (REF) signal. The wave-forming circuit consists of Light Emitting Diodes (LED) and photo diodes.

The rotor plate is positioned between the LED and the photo diode. The LED transmits light to the photo diode. As the rotor plate turns, the slits cut the light to generate rough-shaped pulses. These pulses are converted into on-off signals by the wave-forming circuit and sent to the ECM.

The distributor is not repairable and must be replaced as an assembly except distributor cap and rotor head.

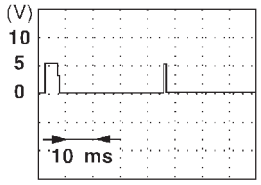
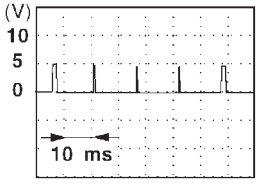
ECM Terminals and Reference Value

NLEC1762

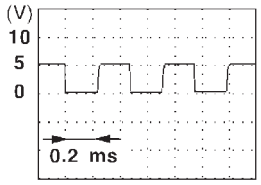
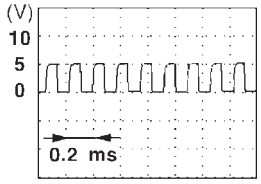
Specification data are reference values and are measured between each terminal and ground.

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)
66	L	Camshaft position sensor (Reference signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 0.4V  SEF006W
75	L		**[Engine is running]** ● Engine speed is 2,000 rpm	0.1 - 0.4V  SEF007W

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
85	B/W	Camshaft position sensor (Position signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V  SEF004W
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 2.4V  SEF005W

On Board Diagnosis Logic

NLEC1763

DTC No.	Malfunction is detected when ...		Check Items (Possible Cause)
P0340 0340	A)	Either 1° or 180° signal is not sent to ECM for the first few seconds during engine cranking.	● Harness or connectors (The camshaft position sensor circuit is open or shorted.) ● Camshaft position sensor ● Starter motor (Refer to SC-13, "STARTING SYSTEM".) ● Starting system circuit (Refer to SC-13, "STARTING SYSTEM".) ● Dead (Weak) battery
	B)	Either 1° or 180° signal is not sent to ECM often enough while the engine speed is higher than the specified engine speed.	
	C)	The relation between 1° and 180° signal is not in the normal range during the specified engine speed.	

DTC Confirmation Procedure

NLEC1764

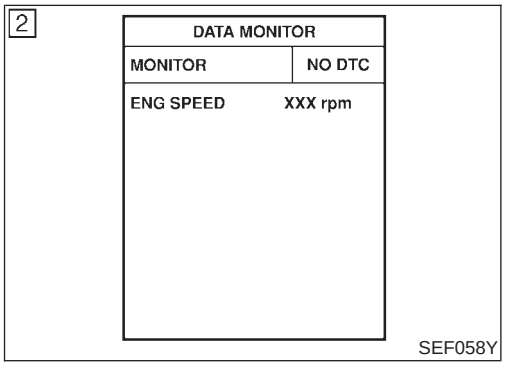
Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "Procedure for malfunction B and C".

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.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V.



SEF058Y

PROCEDURE FOR MALFUNCTION A

NLEC1764S01

With CONSULT-II

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-830.

With GST

Follow the procedure "With CONSULT-II" above.

No Tools

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-830.

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION B AND C

NLEC1764S02

With CONSULT-II

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-830.

With GST

Follow the procedure "With CONSULT-II" above.

No Tools

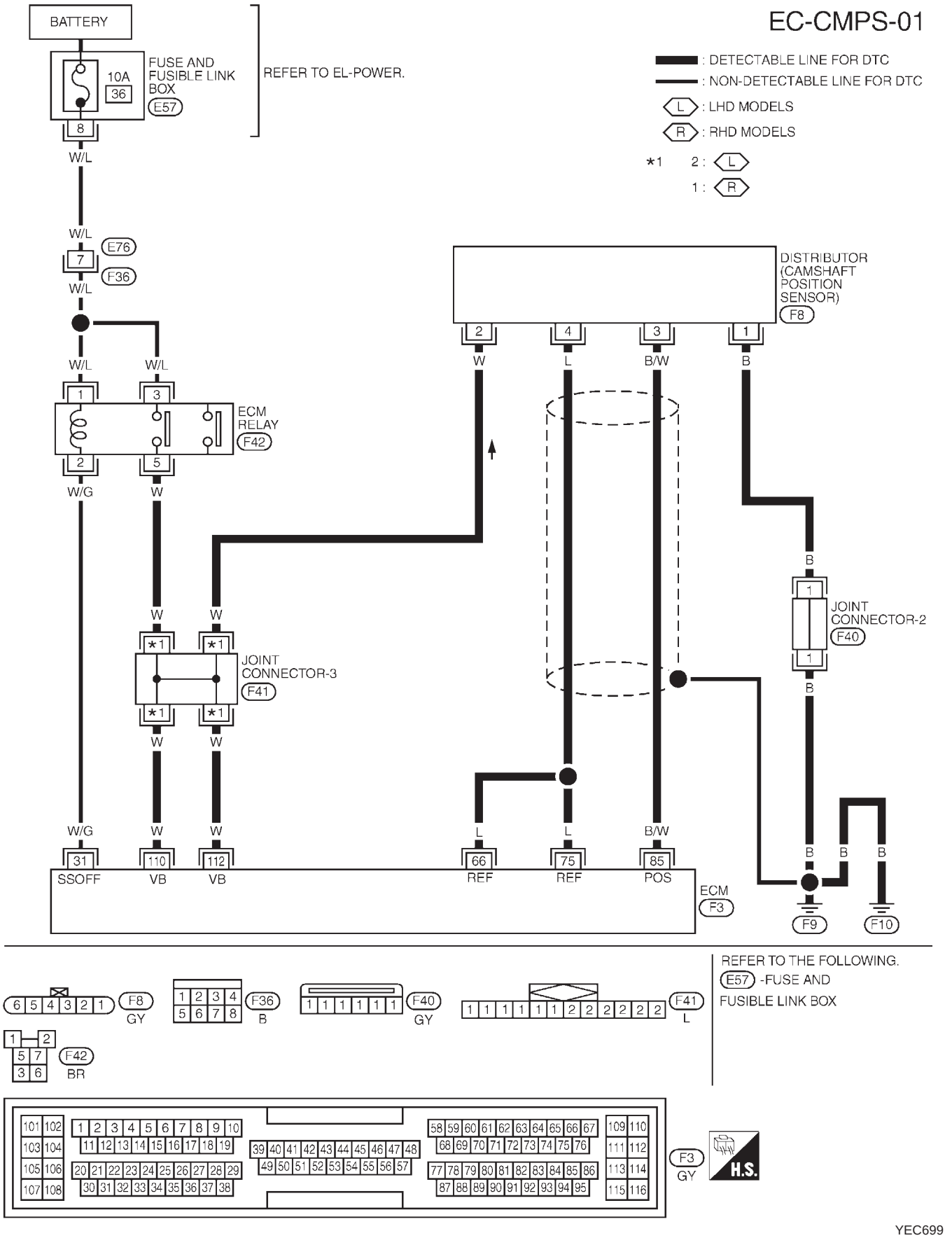
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-830.

Wiring Diagram

NLEC1765

MODELS WITH ECM IN ENGINE COMPARTMENT

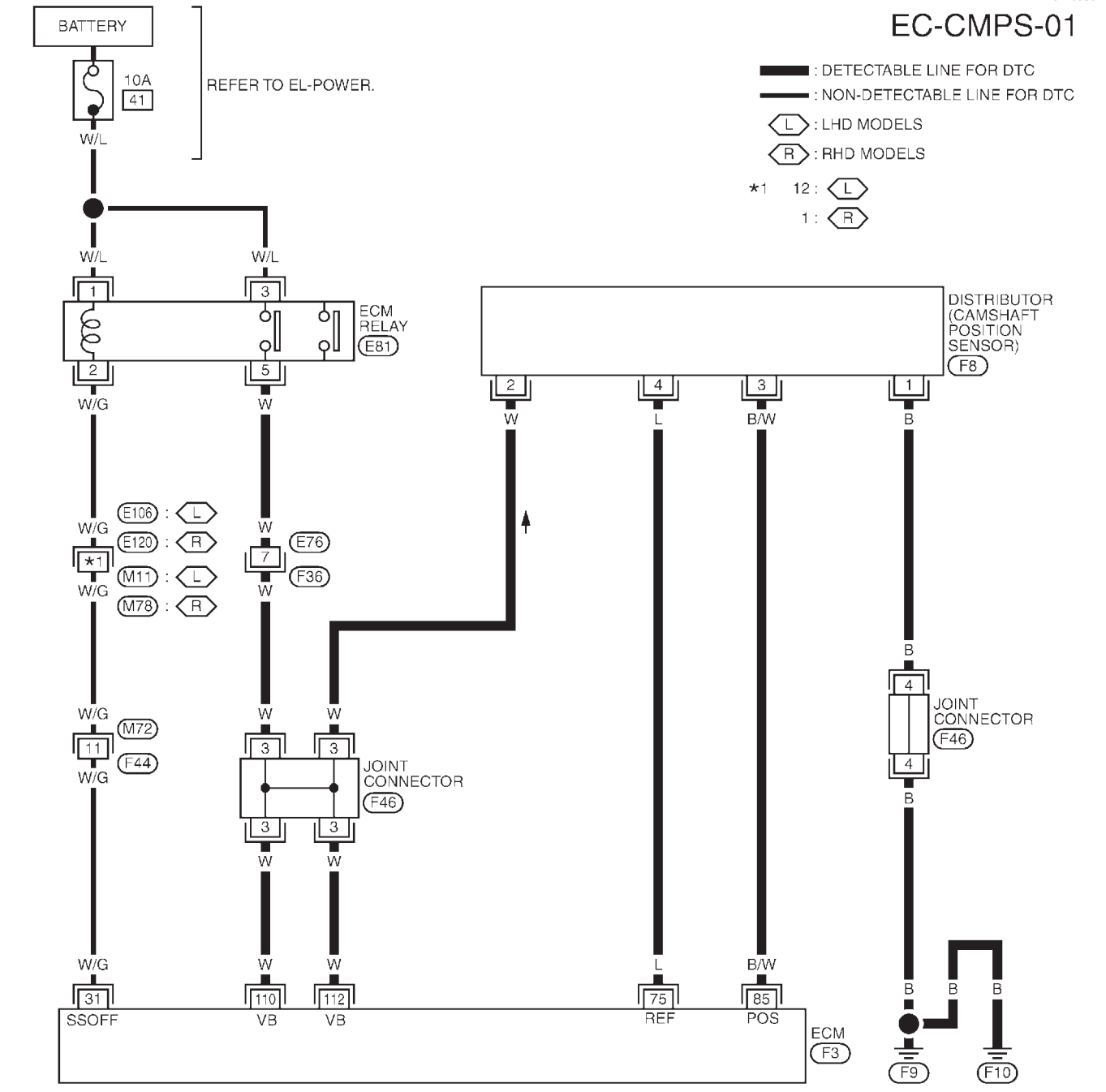
NLEC1765S01

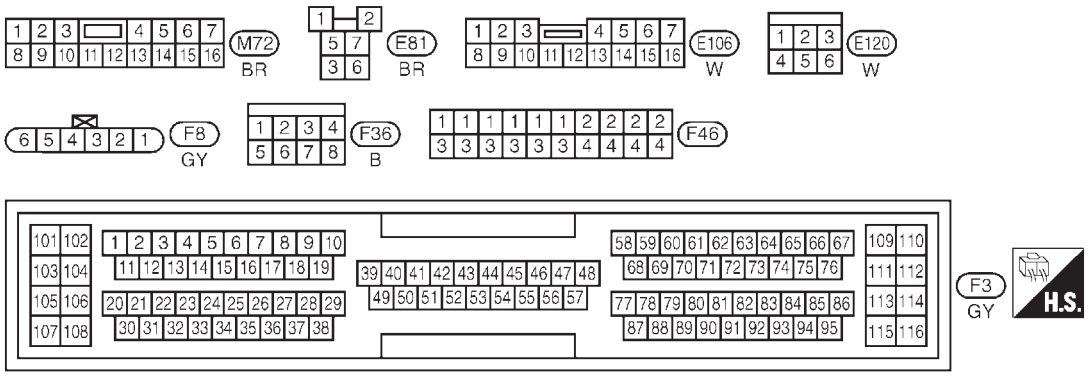


YEC699

MODELS WITH ECM IN CABIN

NLEC1765S02



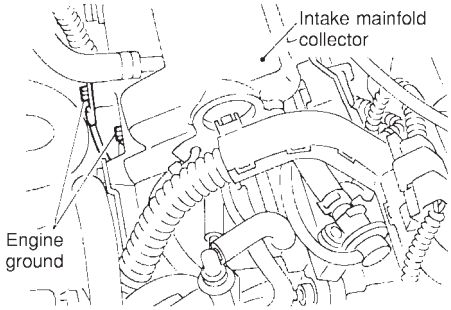


YEC922

Diagnostic Procedure

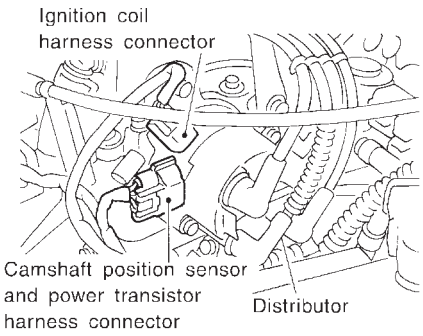
NLEC1766

1	CHECK STARTING SYSTEM	
Does the engine turn over? (Does the starter motor operate?)		
	Yes or No	
Yes	▶	GO TO 2.
No	▶	Check starting system. (Refer to SC-13, “STARTING SYSTEM”.)

2	RETIGHTEN GROUND SCREWS	
1. Turn ignition switch “OFF”. 2. Loosen and retighten engine ground screws.  SEF202X		
	▶	GO TO 3.

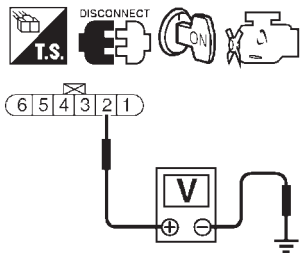
3	CHECK POWER SUPPLY

1. Disconnect camshaft position sensor harness connector.



SEF211X

2. Turn ignition switch "ON".
3. Check voltage between CMPS terminal 2 and ground with CONSULT-II or tester.



SEF232W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3 (where fitted)
- Harness connectors E76, F36 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between CMPS and ECM relay
- Harness for open or short between CMPS and ECM

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

5	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between CMPS terminal 3 and ECM terminal 85, CMPS terminal 4 and ECM terminals 66, 75.
   Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

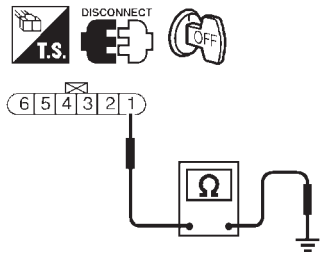
OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

6	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between CMPS terminal 1 and engine ground.



SEF234W

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.
- Joint connector-2 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between CMPS and engine ground

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

8	CHECK CAMSHAFT POSITION SENSOR

Refer to "Component Inspection", EC-833.

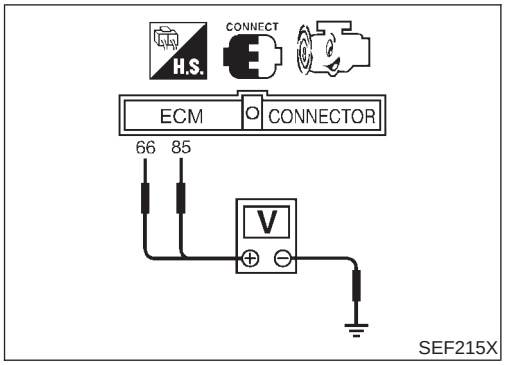
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace camshaft position sensor.

9	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

	▶	**INSPECTION END**



SEF215X

Component Inspection

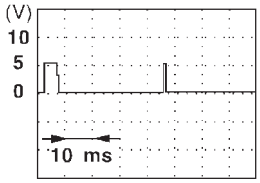
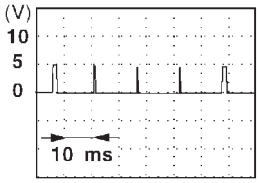
=NLEC1767

CAMSHAFT POSITION SENSOR

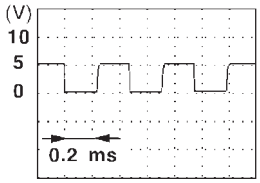
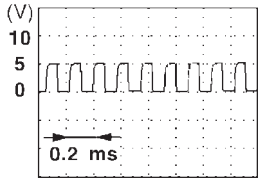
NLEC1767S01

1. Start engine and warm it up to normal operating temperature.
2. Check voltage between ECM terminals 66, 85 and engine ground under the following conditions.

Terminal 66 (or 75) and engine ground

Condition	Idle	2,000 rpm
Voltage	0.1 - 0.4V	0.1 - 0.4V
Pulse signal	 SEF006W	 SEF007W

Terminal 85 and engine ground

Condition	Idle	2,000 rpm
Voltage	Approximately 2.5V	Approximately 2.4V
Pulse signal	 SEF004W	 SEF005W

If NG, replace distributor assembly with camshaft position sensor.

Description

NLEC1545

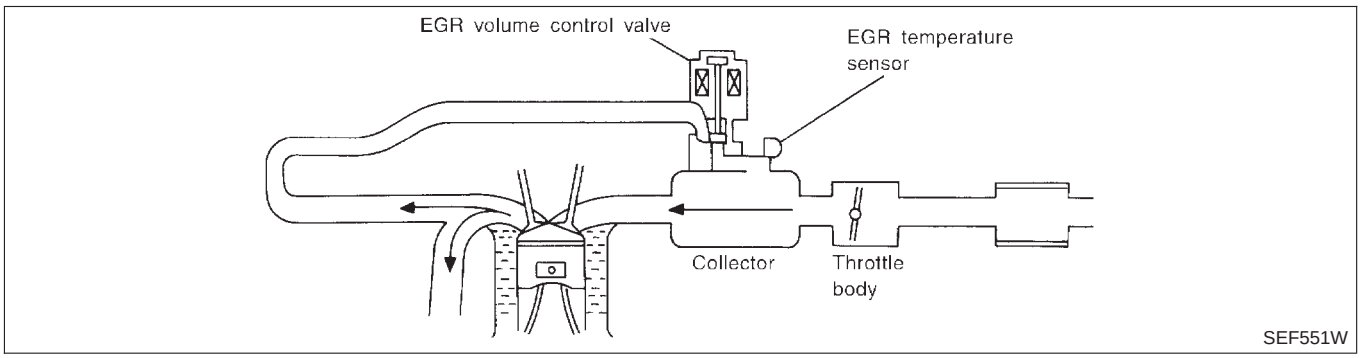
SYSTEM DESCRIPTION

NLEC1545S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	EGR volume control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
PNP switch	Park/Neutral position signal		
TCM (Transmission Control Module)	Gear position, shifting signal		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Extremely light load engine operation
- Engine idling
- Excessively high engine coolant temperature
- Wide open throttle
- Mass air flow sensor malfunction
- Low battery voltage



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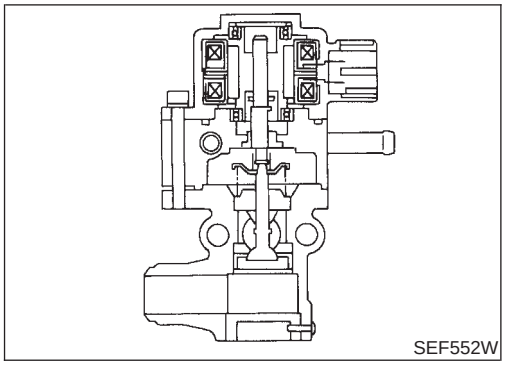

SEF552W

COMPONENT DESCRIPTION

NLEC1545S02

EGR Volume Control Valve

NLEC1545S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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

NLEC1546

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

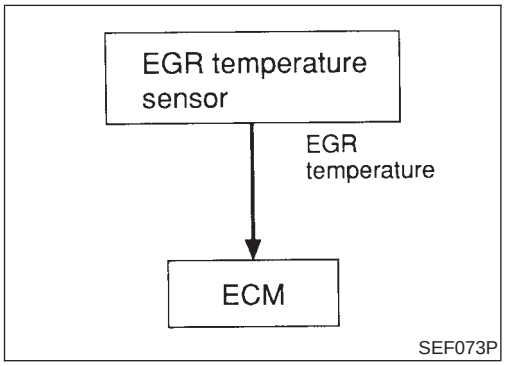
NLEC1547

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)
8 9 17 18	SB W/B R/W G/R	EGR volume control valve	**[Engine is running]** ● Idle speed	0 - 14V
58	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0V
72	PU	EGR temperature sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Less than 4.5V
			[Engine is running] ● **Warm-up condition** ● EGR system is operating.	0 - 1V



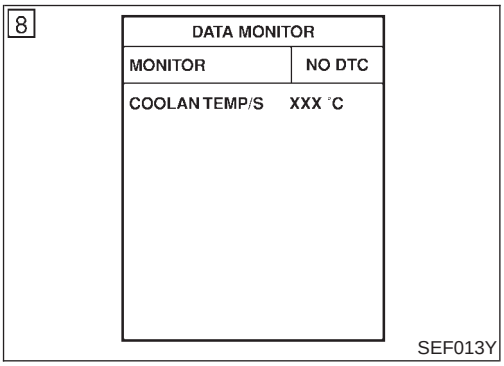
SEF073P

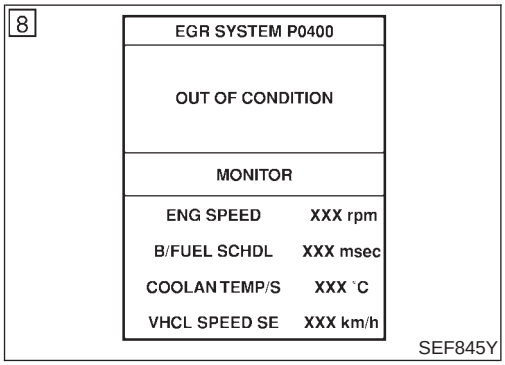
On Board Diagnosis Logic

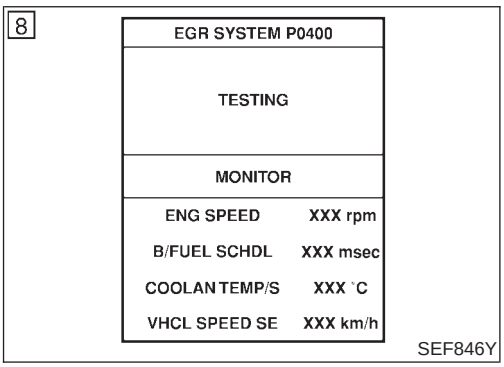
NLEC1548

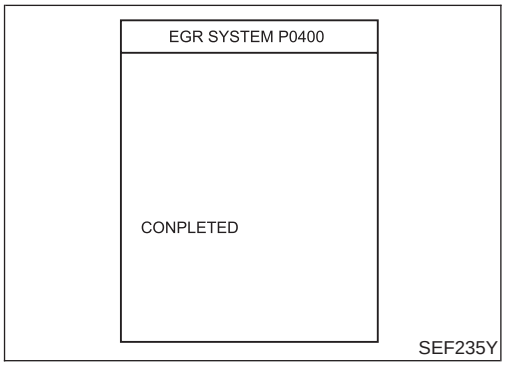
If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400	● No EGR flow is detected under conditions that call for EGR.	● Harness or connectors (EGR volume control valve circuit is open or shorted.) ● EGR volume control valve stuck closed ● Dead (Weak) battery ● EGR passage clogged ● EGR temperature sensor and circuit ● Exhaust gas leaks









DTC Confirmation Procedure

NLEC1549

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.
- P0400 will not be displayed at "SELF-DIAG RESULTS" mode with CONSULT-II even though DTC work support test result is "NG".

TESTING CONDITION:

- **Before performing the following procedure, confirm battery voltage is more than 10V at idle, then stop engine immediately.**
- **For best result, perform the test at a temperature of 0°C (32°F) or higher.**

With CONSULT-II

1) Turn ignition switch "OFF" and wait at least 10 seconds.
2) Turn ignition switch "ON".
3) Check "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-II and confirm it is within the range listed below.

   COOLAN TEMP/S: Less than 40°C (104°F)

   If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the engine coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.
4) Start engine and let it idle monitoring "COOLAN TEMP/S" value. When the "COOLAN TEMP/S" value reaches 70°C (158°F), immediately go to the next step.
5) Select "EGR SYSTEM P0400" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
6) Touch "START".
7) Accelerate vehicle to a speed of 40 km/h (25 MPH) once and then stop vehicle with engine running.
   If "COMPLETED" appears on CONSULT-II screen, go to step 10.
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
8) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
9) When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions until "TESTING" changes to "COMPLETED". (It will take approximately 45 seconds or more.)

ENG SPEED	1,600 - 3,500 rpm
Vehicle speed	10 km/h (6 MPH) or more
B/FUEL SCHDL	5.0 - 8.5 msec
THRTL POS SEN	(X + 0.05) − (X + 0.87)V X = Voltage value measured at step 8
Selector lever	Suitable position

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

10) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-839.

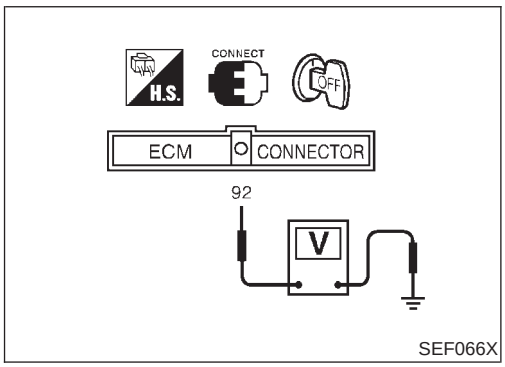
With GST

1) Turn ignition switch "ON".
2) Check engine coolant temperature in MODE 1 with GST.

Engine coolant temperature: Less than 40°C (104°F)

If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the engine coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

3) Start engine and let it idle monitoring the value of "COOLAN TEMP/S". When the engine coolant temperature reaches 70°C (158°F), immediately go to the next step.



4) Maintain the following conditions for at least 1 minute.

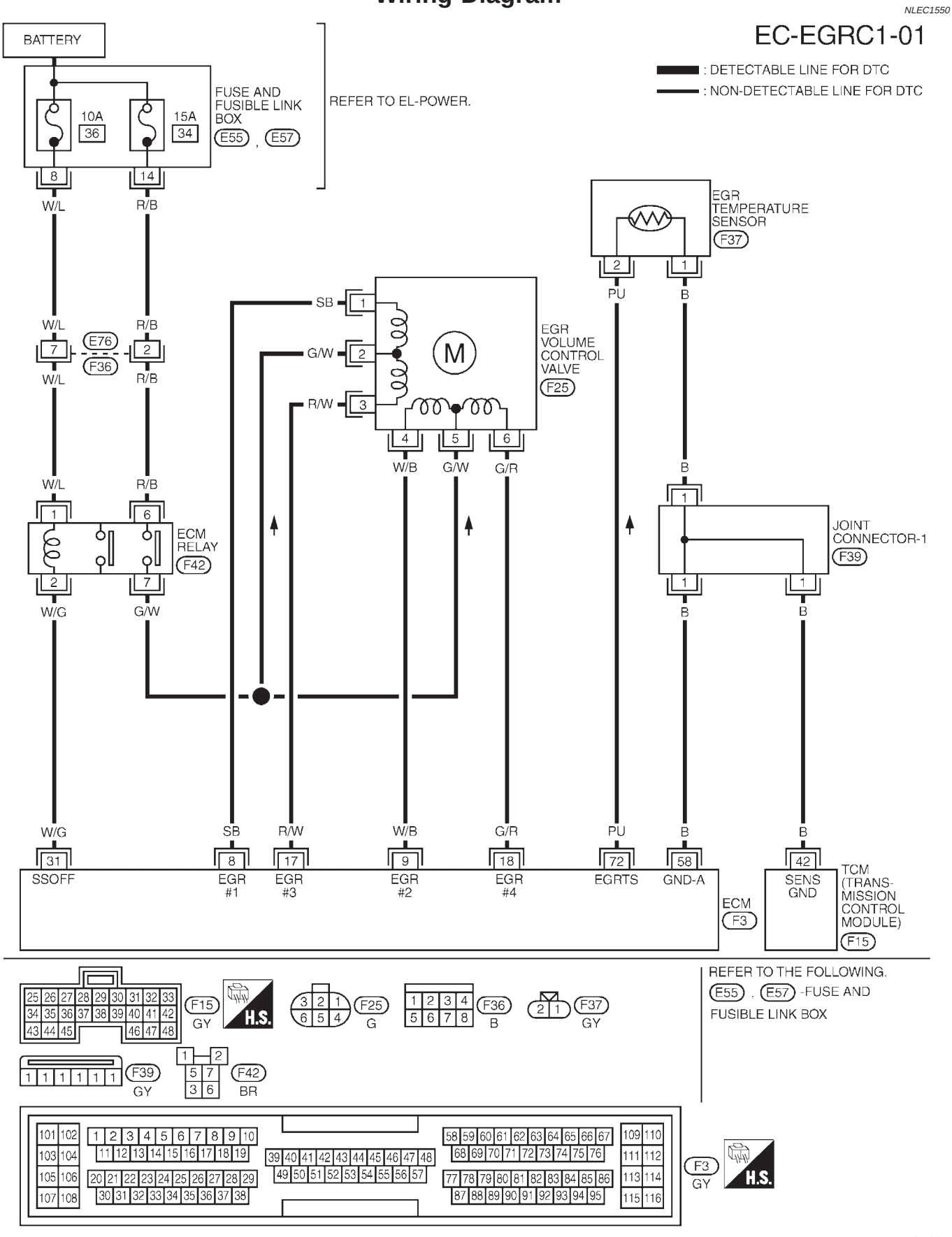
Engine speed	1,600 - 3,500 rpm
Vehicle speed	10 km/h (6 MPH) or more
Voltage between ECM terminal 92 and ground	0.86 - 2.0V
Selector lever	Suitable position

5) Stop vehicle.
6) Turn ignition switch "OFF" and wait at least 10 seconds, then turn "ON".
7) Repeat step 2 to 4.
8) Select "MODE 3" with GST.
9) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-839.

- **When using GST, "DTC CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT-II because GST cannot diaplay MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

NLEC1550



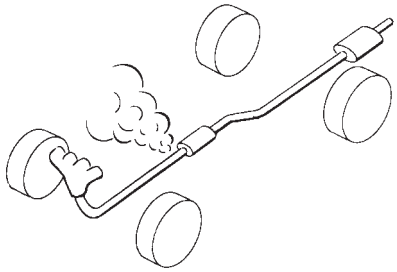
YEC700

Diagnostic Procedure

NLEC1551

1	CHECK EXHAUST SYSTEM

1. Start engine.
2. Check exhaust pipes and muffler for leaks.



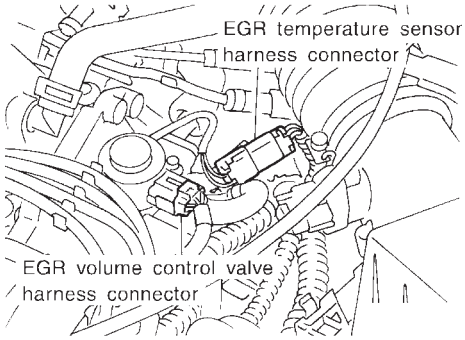
SEF099P

OK or NG

OK (With CONSULT-II)	▶	GO TO 2.
OK (Without CONSULT-II)	▶	GO TO 4.
NG	▶	Repair or replace exhaust system.

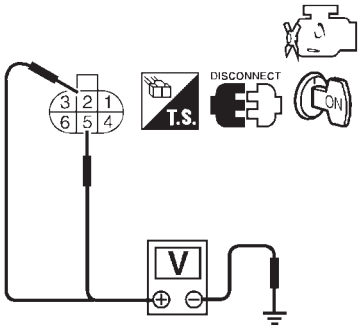
2	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.



SEF216X

2. Turn ignition switch “ON”.
3. Check voltage between EGR volume control valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF782Z

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	DETECT MALFUNCTIONING PART
Check the following. ● 15A fuse ● Harness connectors E76, F36 ● ECM relay ● Harness for open or short between EGR volume control valve and fuse	
▶	Repair harness or connectors or replace fuse or ECM relay.

4	CHECK OUTPUT SIGNAL CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 8 and EGR volume control valve terminal 1, ECM terminal 9 and EGR volume control valve terminal 4, ECM terminal 17 and EGR volume control valve terminal 3, ECM terminal 18 and EGR volume control valve terminal 6. 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, short to ground or short to power in harness connectors.

5	CHECK EGR PASSAGE
Check EGR passage for clogging and cracks.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Repair or replace EGR passage.

6	CHECK EGR TEMPERATURE SENSOR
Refer to "COMPONENT INSPECTION", EC-920.	
OK or NG	
OK ▶	GO TO 7.
NG ▶	Replace EGR temperature sensor.

7	CHECK EGR VOLUME CONTROL VALVE
Refer to "COMPONENT INSPECTION", EC-847.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Replace EGR volume control valve.

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**

Description

NLEC1553

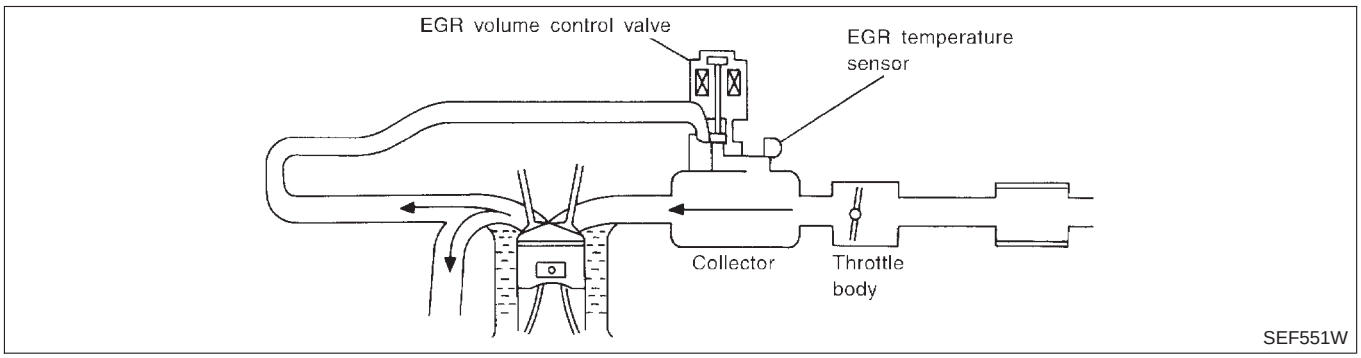
SYSTEM DESCRIPTION

NLEC1553S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed	EGR volume control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
PNP switch	Park/Neutral position signal		
TCM (Transmission Control Module)	Gear position, shifting signal		

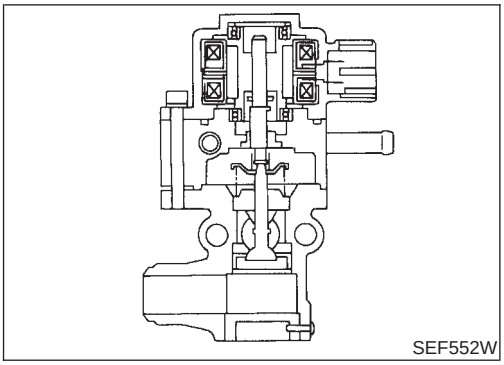
This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Extremely light load engine operation
- Engine idling
- Excessively high engine coolant temperature
- Wide open throttle
- Mass air flow sensor malfunction
- Low battery voltage



SEF551W

Description (Cont'd)


SEF552W

COMPONENT DESCRIPTION

NLEC1553S02

EGR Volume Control Valve

NLEC1553S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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

NLEC1554

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	• Engine: After warming up • Shift lever: "N" • No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

NLEC1555

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

CAUTION:

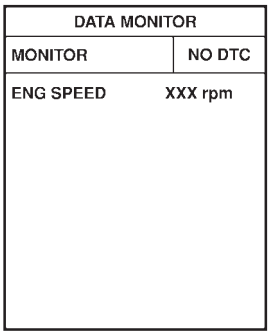
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8 9 17 18	SB W/B R/W G/R	EGR volume control valve	**[Engine is running]** • **Warm-up condition** • Idle speed	0 - 14V

On Board Diagnosis Logic

NLEC1556

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0403 0403	• An improper voltage signal is sent to ECM through the valve.	• Harness or connectors (The EGR volume control valve circuit is open or shorted.) • EGR volume control valve



SEF058Y

DTC Confirmation Procedure

NLEC1557

NOTE:

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

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Rev engine from idle to 2,000 rpm 20 times.

If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-845.

With GST

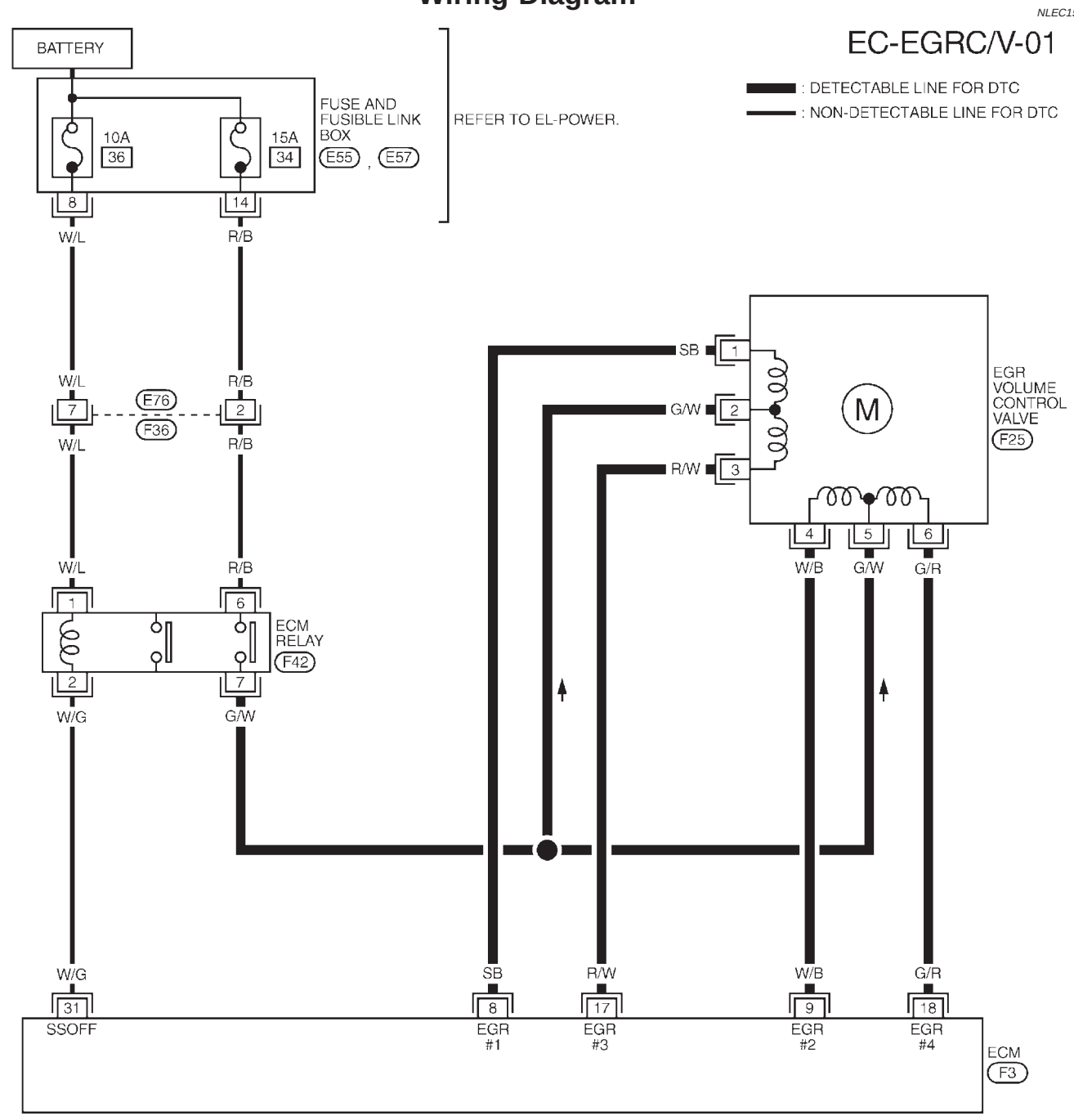
Follow the procedure "With CONSULT-II" above.

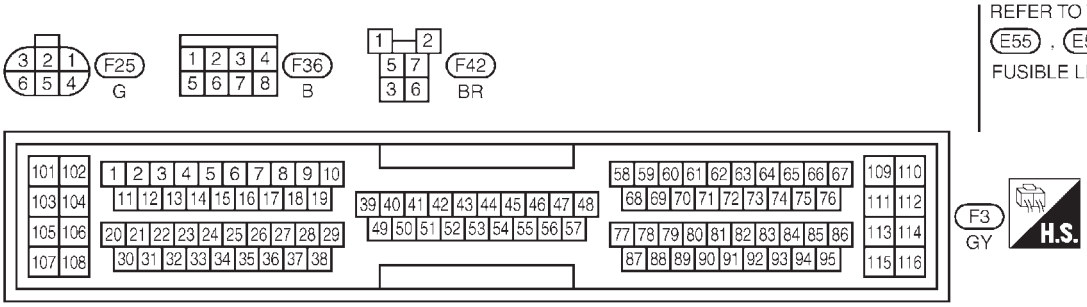
No Tools

1) Start engine and warm it up to normal operating temperature.
2) Rev engine from idle to 2,000 rpm 20 times.
3) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-845.

Wiring Diagram

NLEC1558





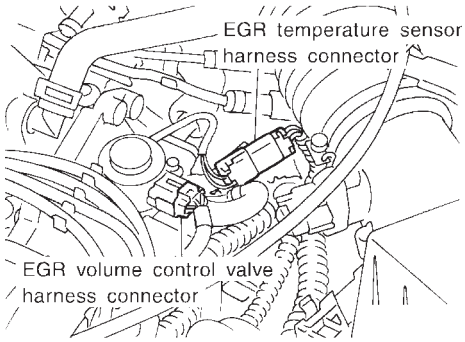
YEC701

Diagnostic Procedure

NLEC1559

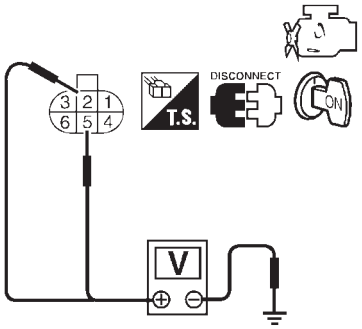
1	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.



SEF216X

2. Turn ignition switch “ON”.
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF782Z

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuse
- Harness connectors E76, F36
- ECM relay
- Harness for open or short between EGR volume control valve and fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and EGR volume control valve terminal 1,
   ECM terminal 9 and EGR volume control valve terminal 4,
   ECM terminal 17 and EGR volume control valve terminal 3,
   ECM terminal 18 and EGR volume control valve terminal 6.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

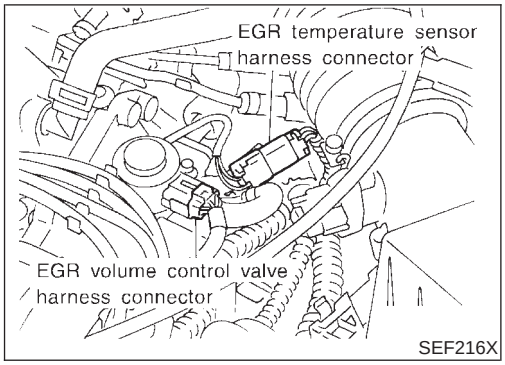
OK or NG

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

Diagnostic Procedure (Cont'd)

4	CHECK EGR VOLUME CONTROL VALVE	
Refer to "COMPONENT INSPECTION", EC-847.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace EGR volume control valve.

5	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**



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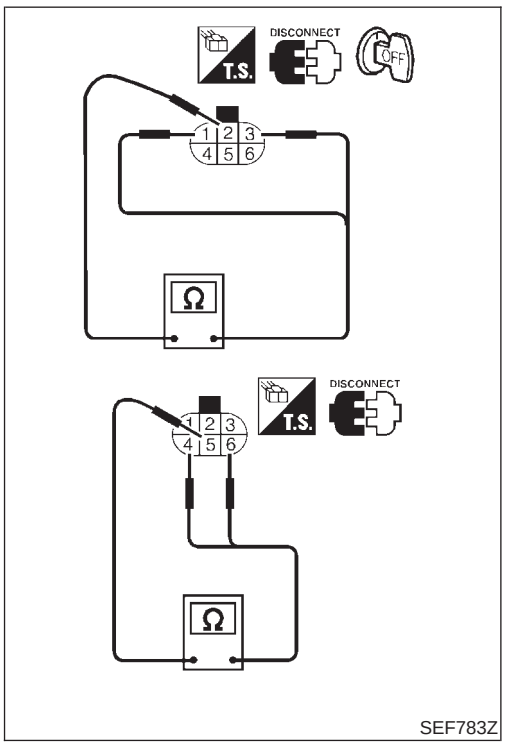
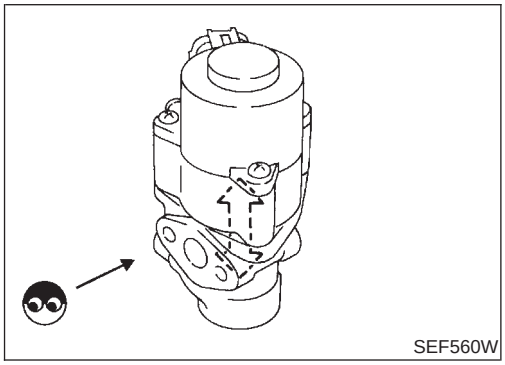


SEF783Z

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF015Y


SEF560W

Component Inspection

NLEC1560

EGR VOLUME CONTROL VALVE

NLEC1560S01

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20.9 - 23.1

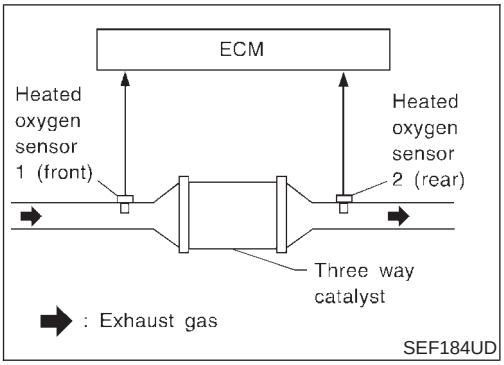
3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON".
6) Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EGR volume control valve.

Without CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20.9 - 23.1

3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.



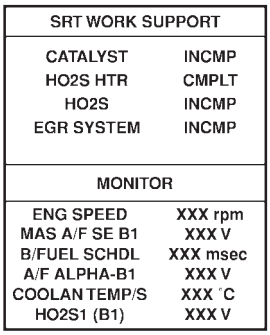
SEF184UD

On Board Diagnosis Logic

NLEC1561

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 (front) and 2 (rear).
A three way catalyst 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 sensors 1 (front) and 2 (rear) approaches a specified limit value, the three way catalyst malfunction is diagnosed.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420	● Three way catalyst does not operate properly. ● Three way catalyst does not have enough oxygen storage capacity.	● Three way catalyst ● Exhaust tube ● Intake air leaks ● Injectors ● Injector leaks ● Spark plug ● Improper ignition timing

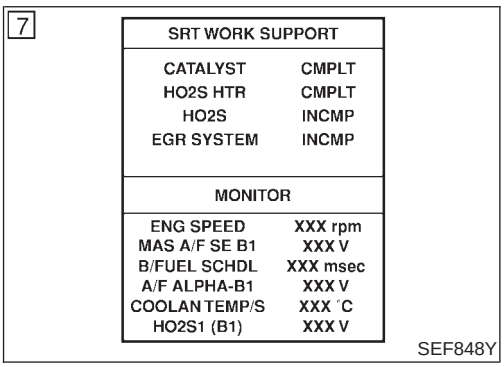

SRT WORK SUPPORT

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


7

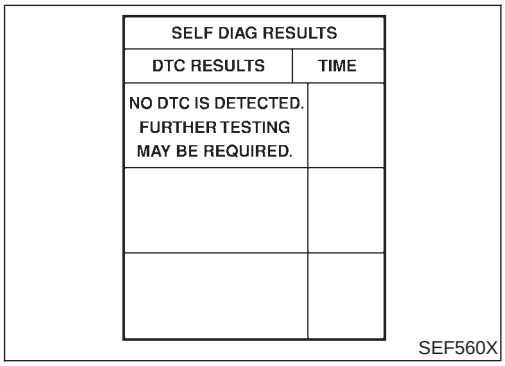
SRT WORK SUPPORT

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


SELF DIAG RESULTS

DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

SEF560X

DTC Confirmation Procedure

NLEC1562

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

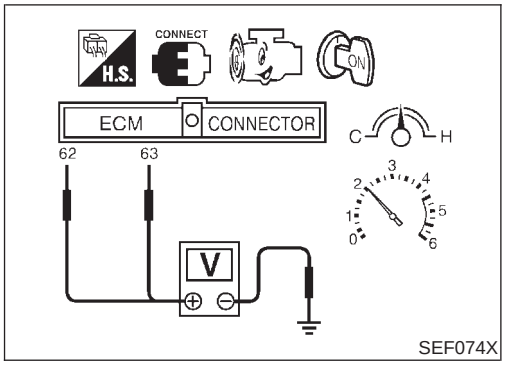
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

With CONSULT-II

TESTING CONDITION:

- **Open engine hood before conducting following procedure.**
- **Do not hold engine speed more than 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.
   If “COMPLETED” appears on the CONSULT-II screen, go to step 7.
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-849.



Overall Function Check

NLEC1563

Use this procedure to check the overall function of the three way catalyst. During this check, a 1st trip DTC might not be confirmed.

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 voltmeters probes between ECM terminals 62 (HO2S1 signal), 63 (HO2S2 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 terminal 63 and engine ground is much less than that of ECM terminal 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 does not operate properly.

NOTE:
If the voltage at terminal 62 does not switch periodically more than 5 times within 10 seconds at step 4, perform trouble diagnosis for DTC P0133 first. (See EC-729.)

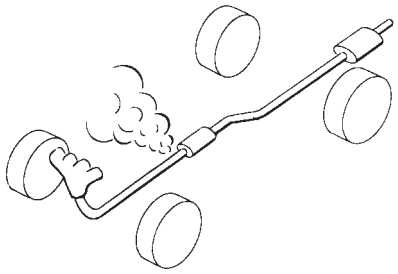
Diagnostic Procedure

NLEC1564

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.



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

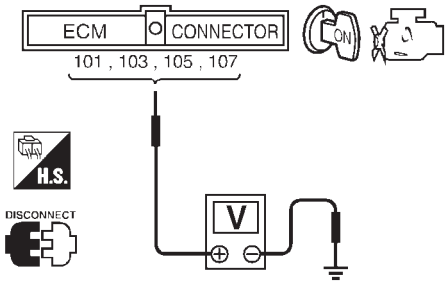
Check for ignition timing.
Refer to "BASIC INSPECTION", EC-623.

OK or NG

OK	▶	GO TO 5.
NG	▶	Adjust ignition timing.

5	CHECK INJECTORS

1. Refer to Wiring Diagram for Injectors, EC-1022.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals 101, 103, 105 and 107 and ground with CONSULT-II or tester.



SEF075X

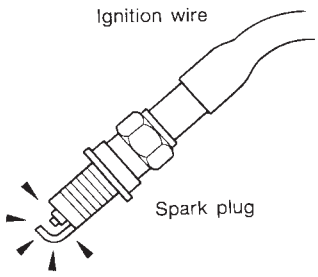
Battery voltage should exist.

OK or NG

OK	▶	GO TO 6.
NG	▶	Perform "Diagnostic Procedure" INJECTOR, EC-1024.

6	CHECK IGNITION SPARK

1. Turn Ignition switch "OFF".
2. Disconnect ignition wire from spark plug.
3. Connect a known good spark plug to the ignition wire.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



SEF282G

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	CHECK IGNITION WIRES

Refer to "Component Inspection", EC-814.

OK or NG

OK	▶	Check distributor rotor head for incorrect parts. Check ignition coil, power transistor and their circuits. Refer to EC-1004.
NG	▶	Replace.

8	CHECK INJECTOR

1. Turn ignition switch "OFF".
2. Remove injector assembly. Refer to EC-578.
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect camshaft position sensor harness connector.
4. Turn ignition switch "ON".
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip)	▶	GO TO 9.
NG (Drips)	▶	Replace the injector(s) from which fuel is dripping.

9	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

Trouble is fixed	▶	**INSPECTION END**
Trouble is not fixed	▶	Replace three way catalyst.

Description

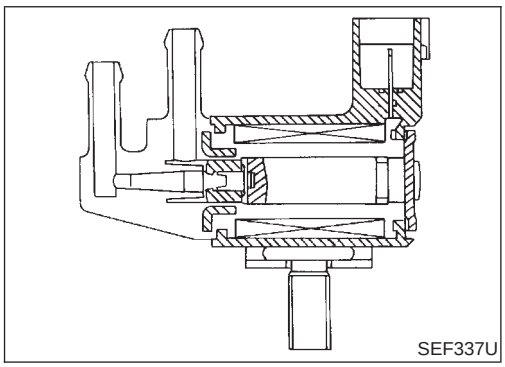
NLEC1565

SYSTEM DESCRIPTION

NLEC1565S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	EVAP canister purge control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage		
Ignition switch	Start signal		
Throttle position switch	Closed throttle position		
Throttle position sensor	Throttle position		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
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

NLEC1565S02

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

NLEC1566

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● No-load	Idle	0%
		Revving engine	—

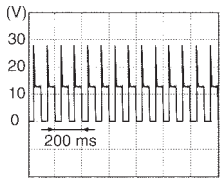
ECM Terminals and Reference Value

=NLEC1567

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	P	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● 2,000 rpm	5 - 12V  SEF975W

On Board Diagnosis Logic

NLEC1568

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0443	● An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

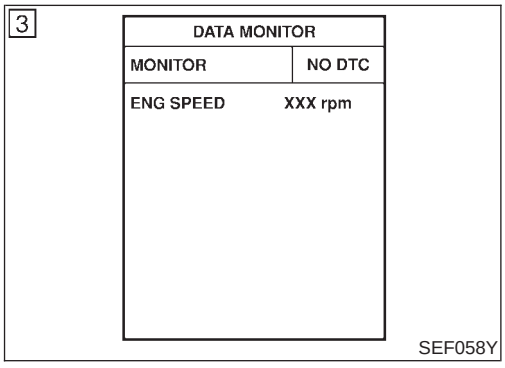
NLEC1569

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.



SEF058Y

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and let it idle for at least 13 seconds.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-856.

With GST

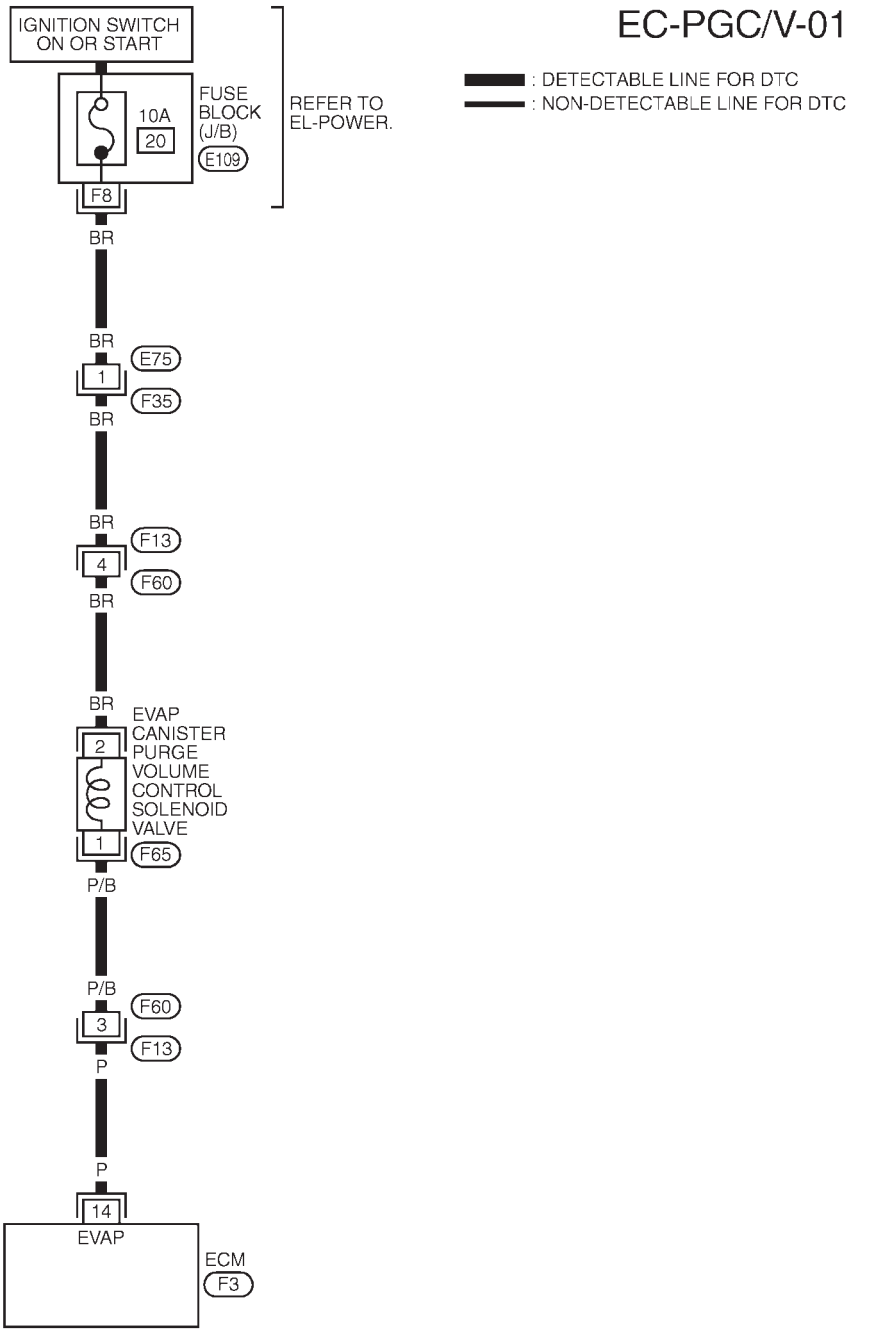
Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NLEC1570

MODELS WITH ECM IN ENGINE COMPARTMENT

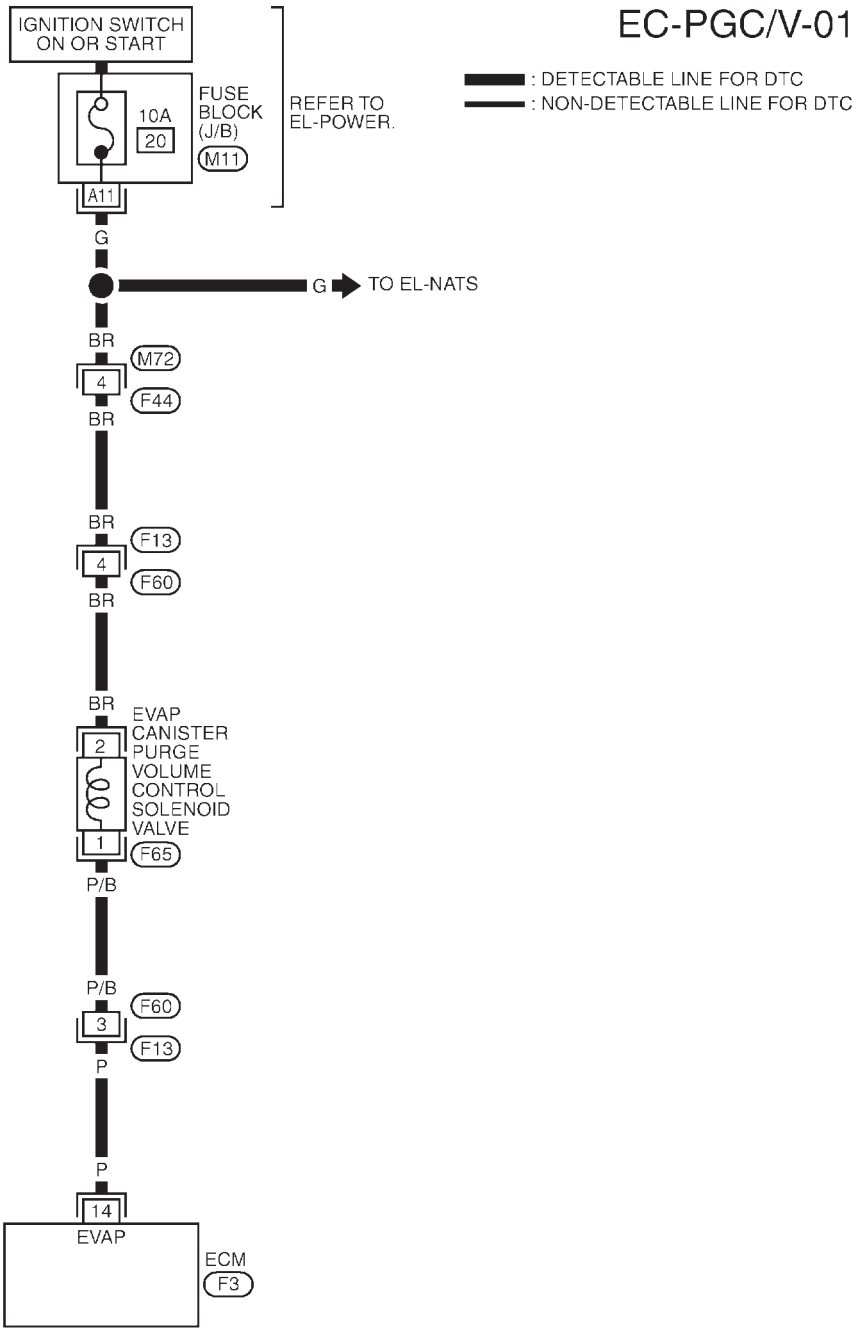
NLEC1570S01



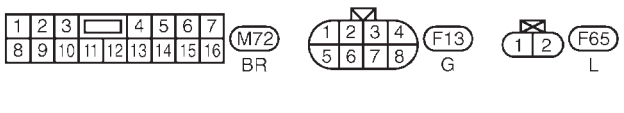
YEC702

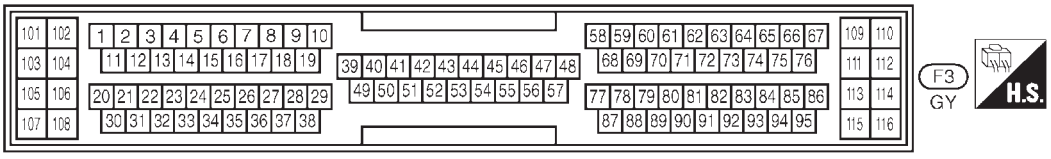
MODELS WITH ECM IN CABIN

NLEC1570S02



REFER TO THE FOLLOWING.
M11 -FUSE BLOCK-
JUNCTION BOX (J/B)





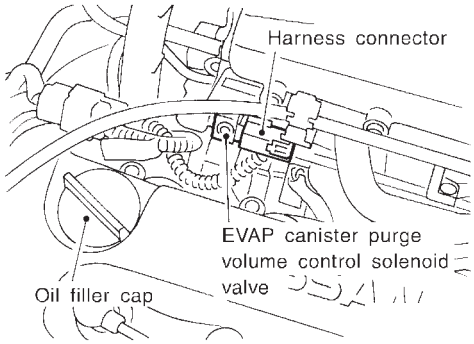
YEC923

Diagnostic Procedure

NLEC1571

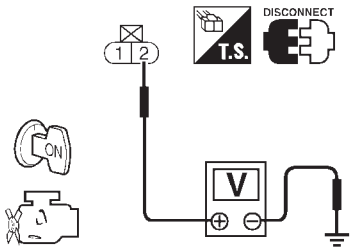
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF219X

3. Turn ignition switch “ON”.
4. Check voltage between EVAP canister purge volume control solenoid valve terminal 2 and engine 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 E75, F35 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors F13, F60
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 14 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	▶	GO TO 5.
NG	▶	GO TO 4.

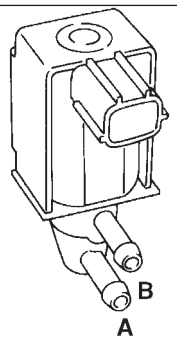
4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F60, F13 ● Harness for open or short between EVAP canister purge volume control solenoid valve and ECM.	
▶	Repair copen circuit or short to ground or short to power in harness or connectors.

5	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Refer to "Component Inspection" EC-857.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace EVAP canister purge volume control solenoid valve.

6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN
THRTL POS SEN	XXX V

SEF801Y



SEF079X

Component Inspection

NLEC1572

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

NLEC1572S01

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.
   If OK, inspection end. If NG, go to following step.
3) Check air passage continuity.

Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

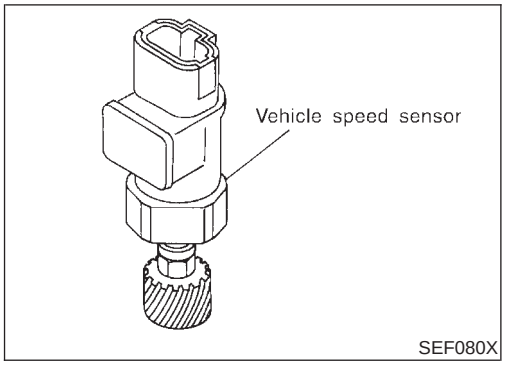
If NG or operation takes more than 1 second, replace the EVAP canister purge volume control solenoid valve.

Without CONSULT-II

Check air passage continuity.

Condition	Air passage continuity between A and B
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace the EVAP canister purge volume control solenoid valve.



Component Description

NLEC1573

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.

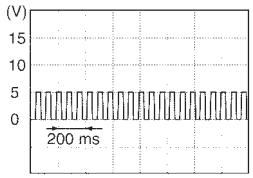
ECM Terminals and Reference Value

NLEC1574

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)
86	OR/W	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● In 2nd gear position ● Vehicle speed is 40 km/h (25 MPH)	0 - Approximately 5V  SEF976W

On Board Diagnosis Logic

NLEC1575

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0500 0500	● The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connector (The vehicle speed sensor circuit is open or shorted.) ● Vehicle speed sensor

DTC Confirmation Procedure

NLEC1576

CAUTION:

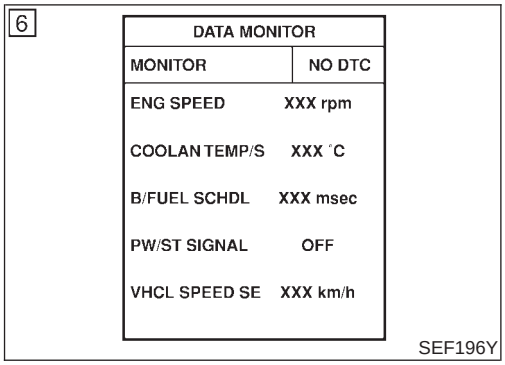
Always drive vehicle at a safe speed.

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:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.



With CONSULT-II

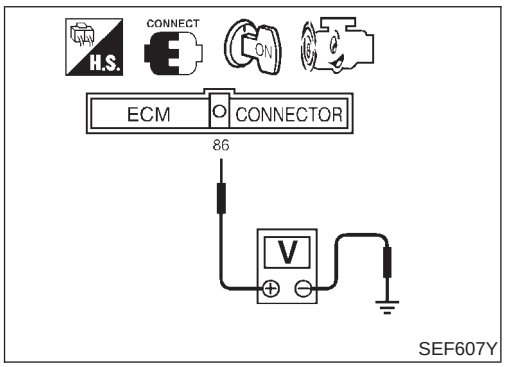
1) Start engine
2) Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
3) If NG, go to "Diagnostic Procedure", EC-862.
   If OK, go to following step.
4) Select "DATA MONITOR" mode with CONSULT-II.
5) Warm engine up to normal operating temperature.
6) Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	1,600 - 3,100 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	5.0 - 11.8 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF

7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-862.

With GST

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-862.



No Tools

1) Lift up drive wheels.
2) Start engine.
3) Read the voltage signal between ECM terminal 86 (Vehicle speed sensor signal) and ground with oscilloscope.
4) Verify that the oscilloscope screen shows the signal wave as shown at "ECM terminals and Reference Value", EC-858.
5) If NG, go to "Diagnostic Procedure", EC-862.

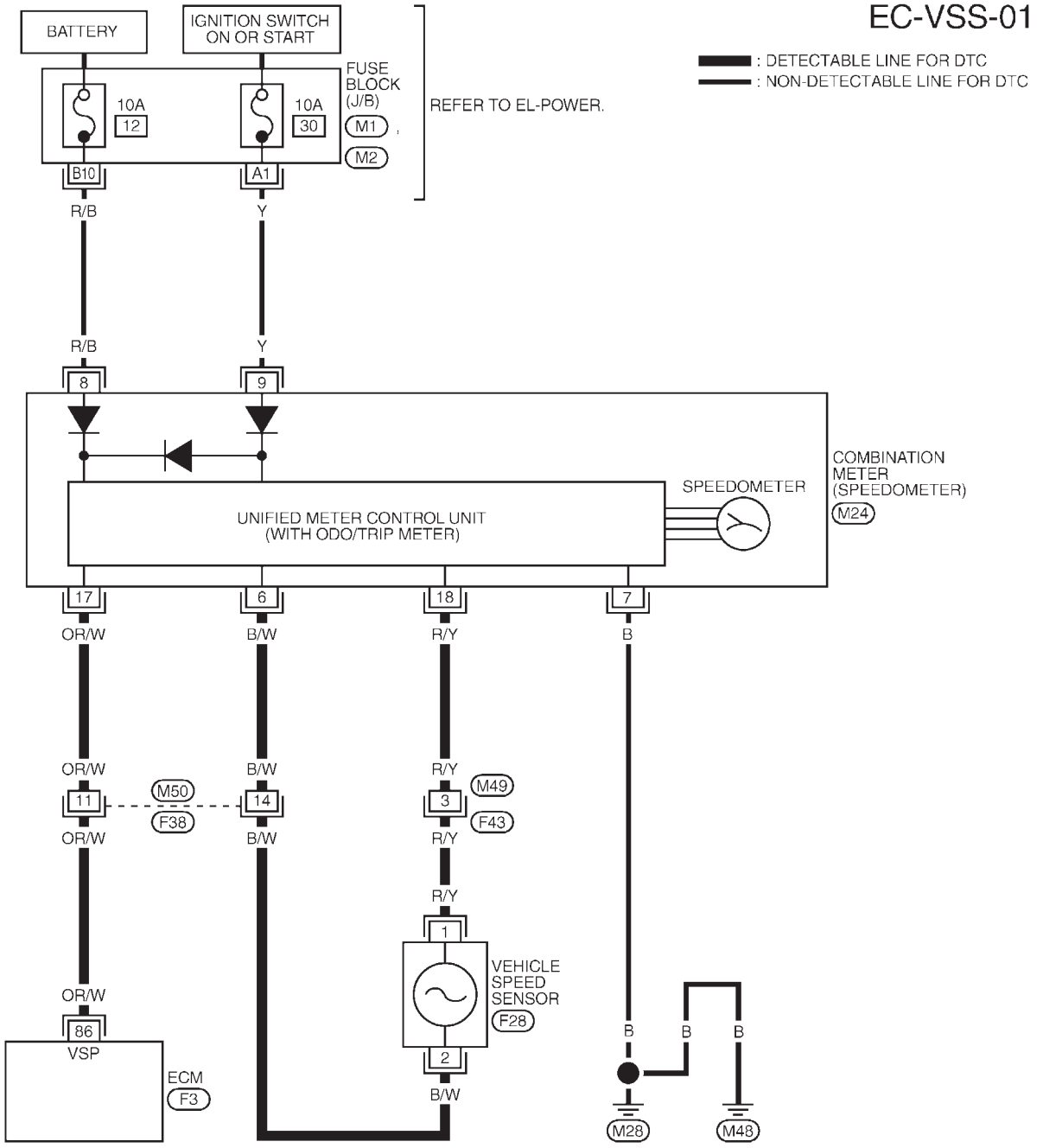
Wiring Diagram

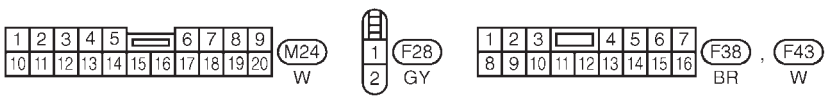
NLEC1577

MODELS WITH ECM IN ENGINE COMPARTMENT

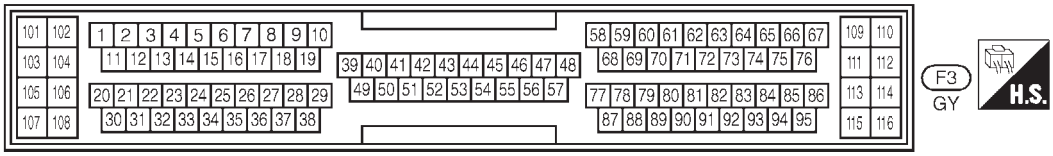
NLEC1577S03

EC-VSS-01





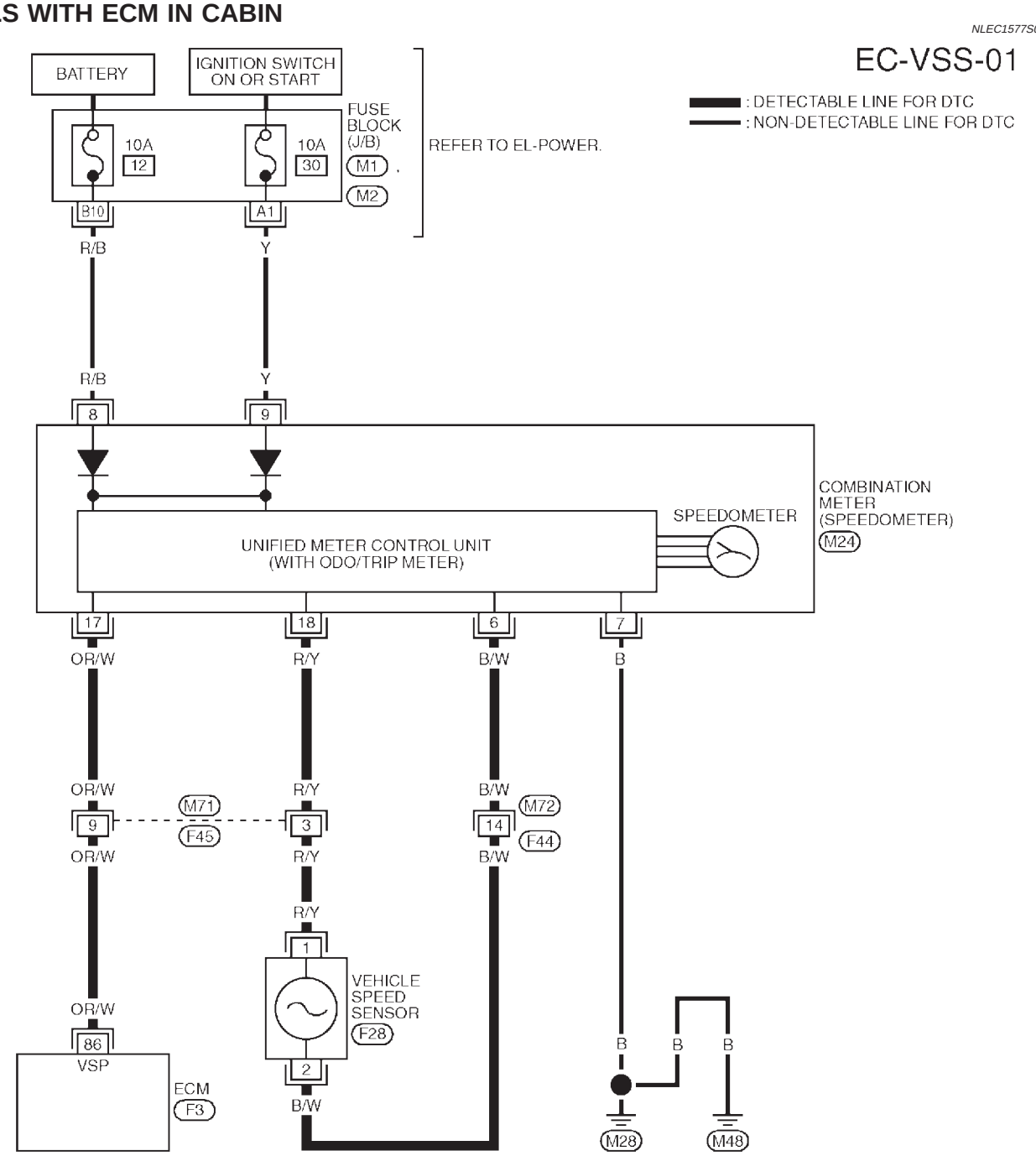
REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

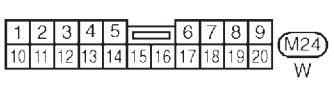


YEC703

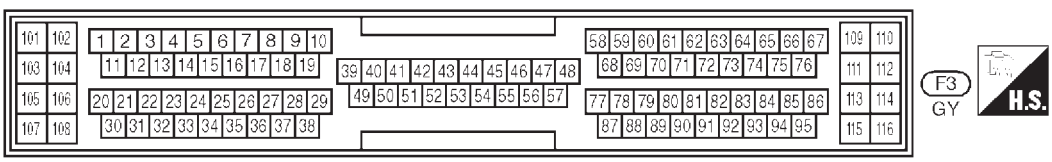
MODELS WITH ECM IN CABIN

NLEC1577S04





REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK-
JUNCTION BOX (J/B)



YEC924

Diagnostic Procedure

NLEC1578

1	CHECK INPUT SIGNAL CIRCUIT	
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 17. 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 M50, F38 (where fitted) ● Harness connectors M71, F45 (where fitted) ● 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	
Check the following. ● Harness connectors M50, F38 (where fitted) ● Harness connectors M49, F43 (where fitted) ● Harness connectors M71, F44 (where fitted) ● Harness connectors M72, F45 (where fitted) ● Harness for open or short between combination meter and vehicle speed sensor		
OK	▶	Check combination meter and vehicle speed sensor. Refer to EL-130, “METERS AND GAUGES”.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT	
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-670.		
	▶	**INSPECTION END**

Description

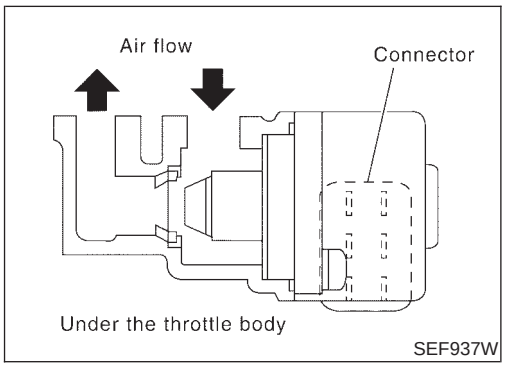
SYSTEM DESCRIPTION

NLEC1768

NLEC1768S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Idle air control	IACV-AAC valve
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		
Intake air temperature sensor	Intake air temperature		
Cooling fan	Cooling fan operation		
Electrical load	Electrical load signal		

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 camshaft position sensor 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

NLEC1768S02

IACV-AAC Valve

NLEC1768S0201

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 sequence. Each time the IACV-AAC valve opens or closes to change the 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

NLEC1580

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	5 - 20 steps
		2,000 rpm	—

ECM Terminals and Reference Value

NLEC1581

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

CAUTION:

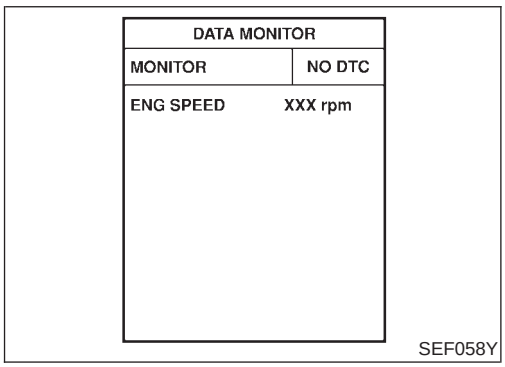
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM’s transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6 7 15 16	BR LG GY/L OR	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V

On Board Diagnosis Logic

NLEC1582

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0505	● An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The IACV-AAC valve circuit is open.) ● IACV-AAC valve



DTC Confirmation Procedure

NLEC1583

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 target idle speed is out of the specified value, perform “Idle Air Volume Learning”, EC-581, before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to “Service Data and Specifications (SDS)”, EC-1062.**

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Rev engine from idle to 2,000 rpm 20 times.
   If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-867.

With GST

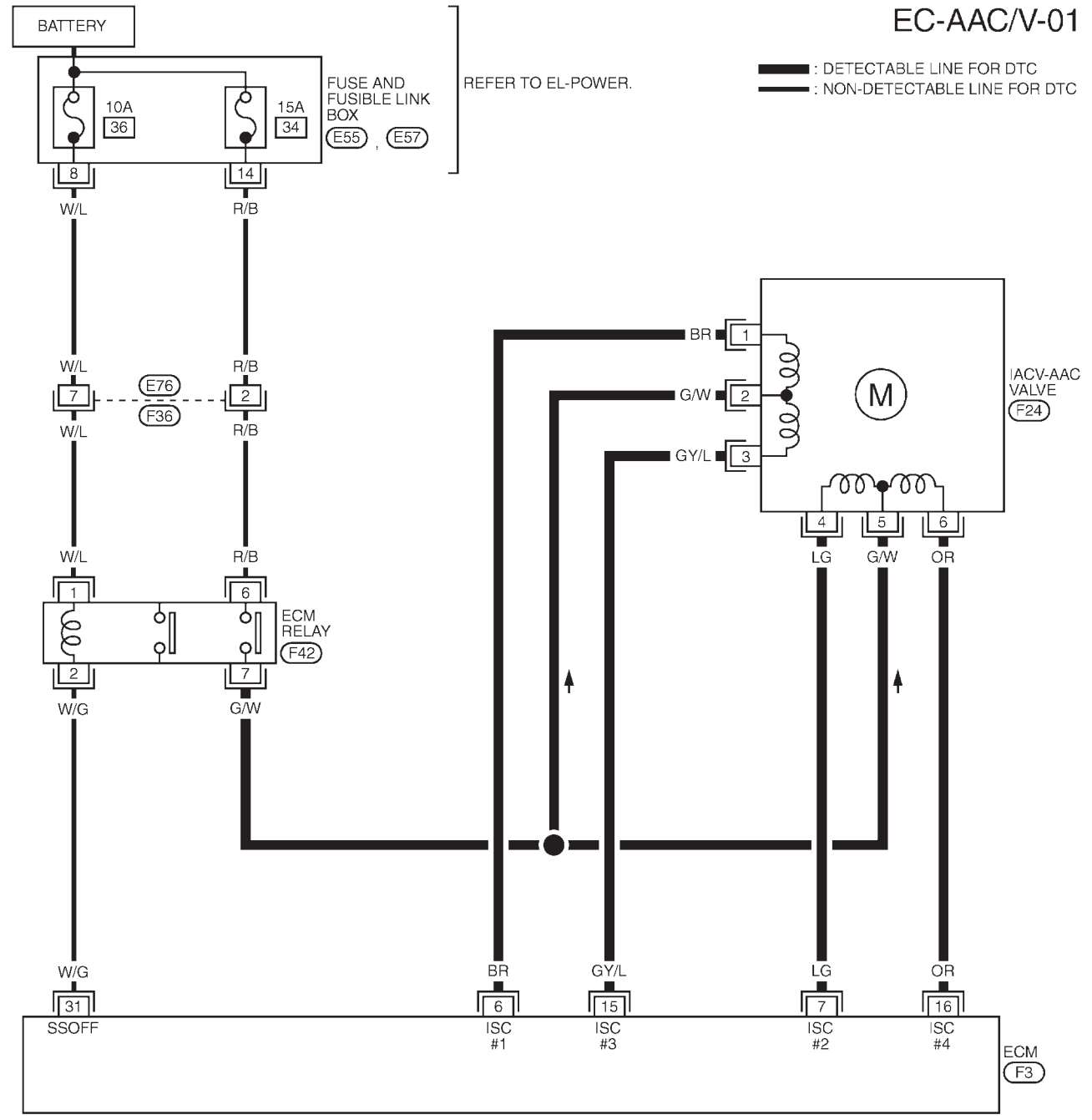
Follow the procedure “With CONSULT-II” above.

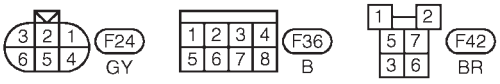
Wiring Diagram

NLEC1584

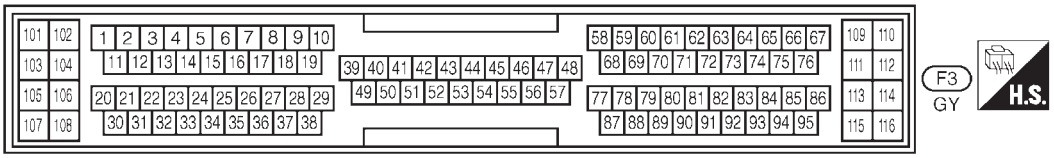
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1584S01





REFER TO THE FOLLOWING.
E55 , E57 -FUSE AND FUSIBLE LINK BOX

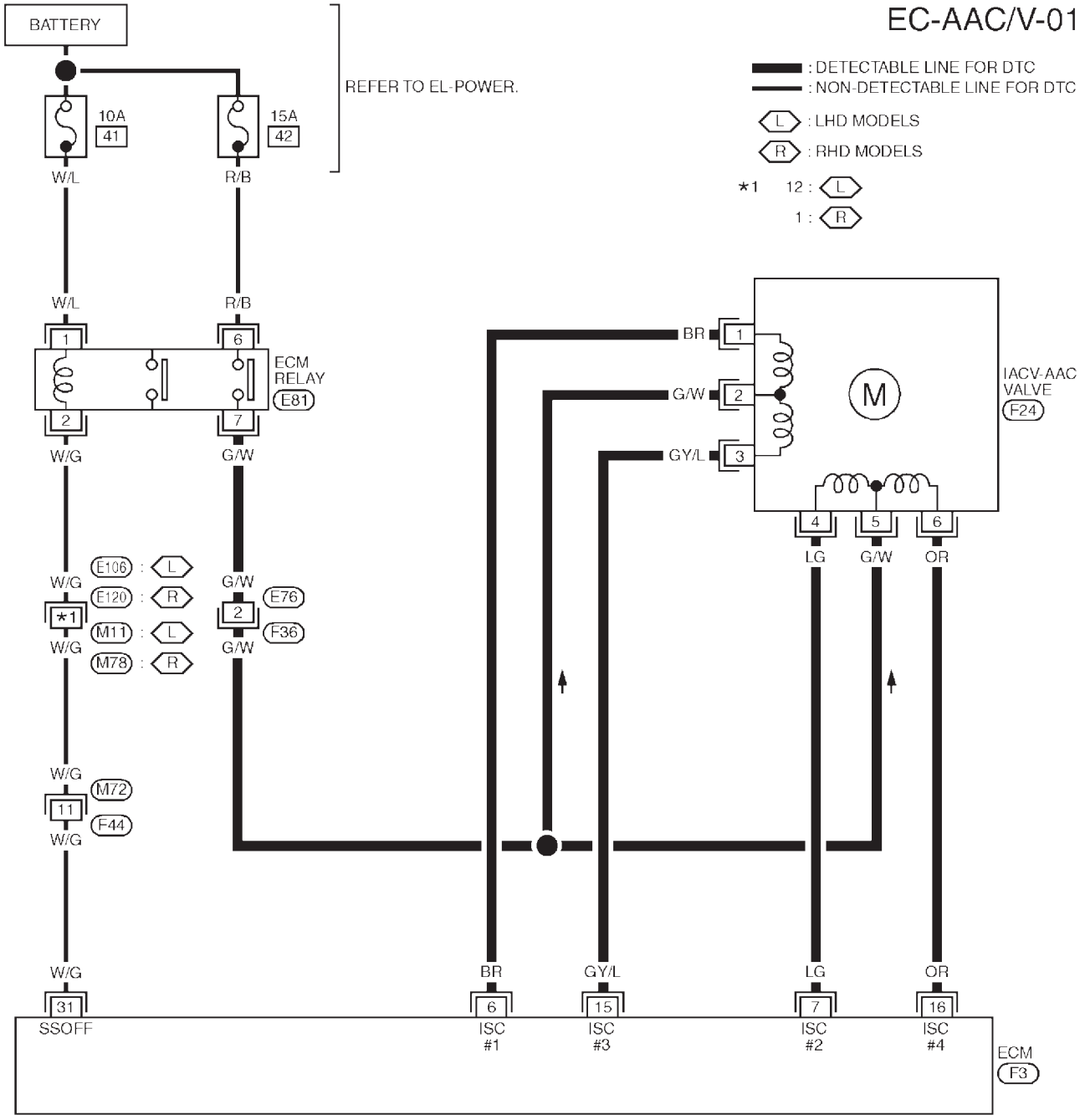


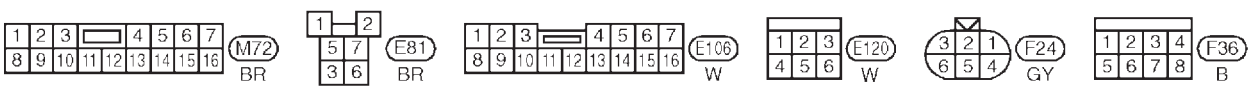
YEC704

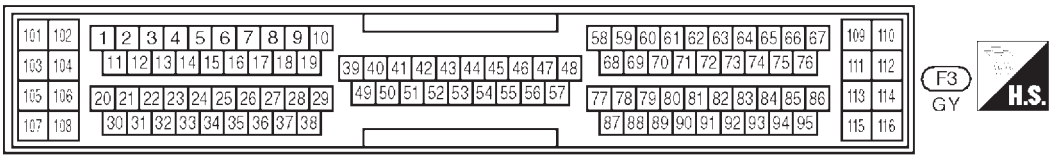
Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC1584S02







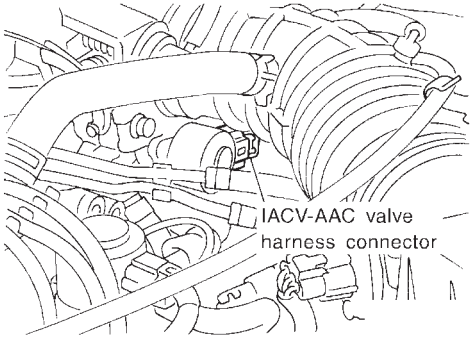
YEC925

Diagnostic Procedure

NLEC1585

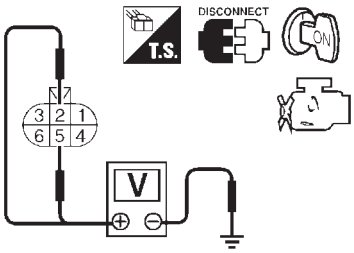
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect IACV-AAC valve harness connector.



SEF221X

3. Turn ignition switch “ON”.
4. Check voltage between terminal 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.
- 15A fuse
- Harness connectors E76, F36
- ECM relay
- Harness for open or short between IACV-AAC and fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 6 and IACV-AAC valve terminal 1,
   ECM terminal 7 and IACV-AAC valve terminal 4,
   ECM terminal 15 and IACV-AAC valve terminal 3,
   ECM terminal 16 and IACV-AAC valve terminal 6.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

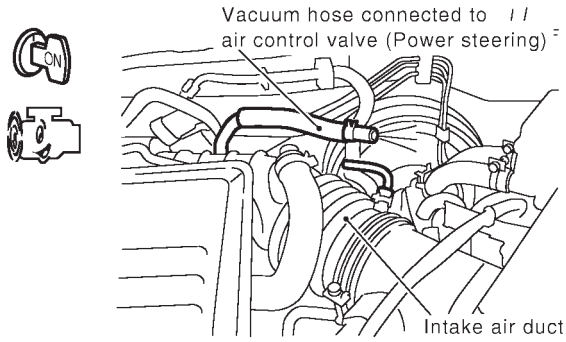
OK or NG

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 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 intake air duct.
3. Start engine and let it idle.
4. Check vacuum hose for vacuum existence.



SEF778Z

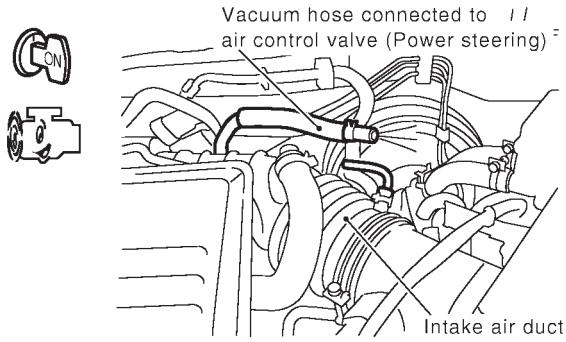
Vacuum does not exist or slightly exist.

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace air control valve (Power steering).

5	CHECK AIR CONTROL VALVE (POWER STEERING) OPERATION-II

Check the vacuum hose for vacuum existence when steering wheel is turned.



SEF778Z

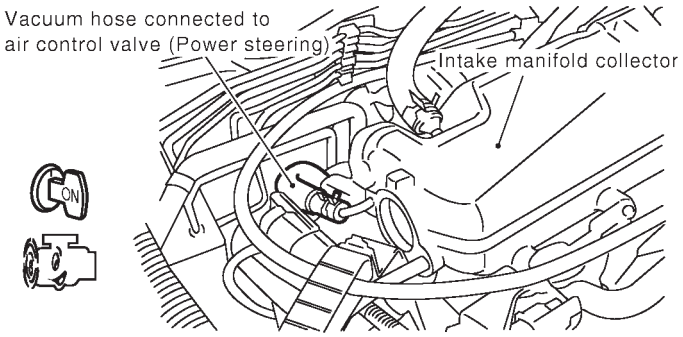
Vacuum should exist.

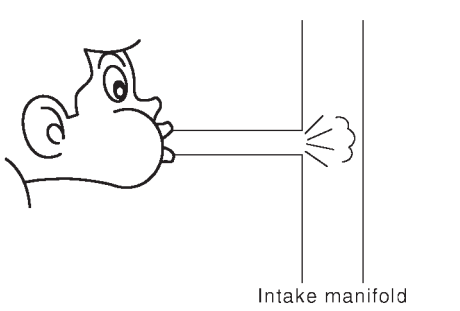
OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 6.

6	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.





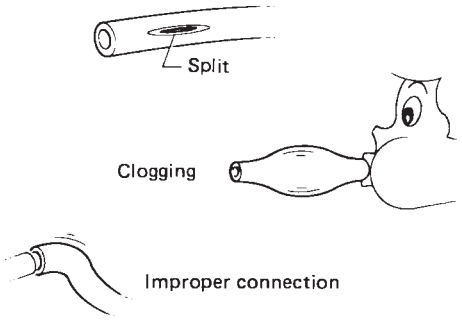
SEF779Z

OK or NG

OK	▶	GO TO 7.
NG	▶	Repair or clean vacuum port.

7	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 8.
NG	▶	Repair hoses or tubes.

8	CHECK IACV-AAC VALVE

Refer to "Component Inspection", EC-871.

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

Diagnostic Procedure (Cont'd)

9	REPLACE IACV-AAC VALVE

1. Replace IACV-AAC valve assembly.
2. Perform "Idle Air Volume Learning", EC-581.

Is the result CMPLT or INCMP?

CMPLT or INCMP		
CMPLT	▶	**INSPECTION END**
INCMP	▶	Follow the construction of "Idle Air Volume Learning".

10	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 models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "CVT" system indicates less than 0.9V.
- For models without CONSULT-II, drive vehicle for 10 minutes.

5. Stop vehicle with engine running.
6. Check target idle speed.

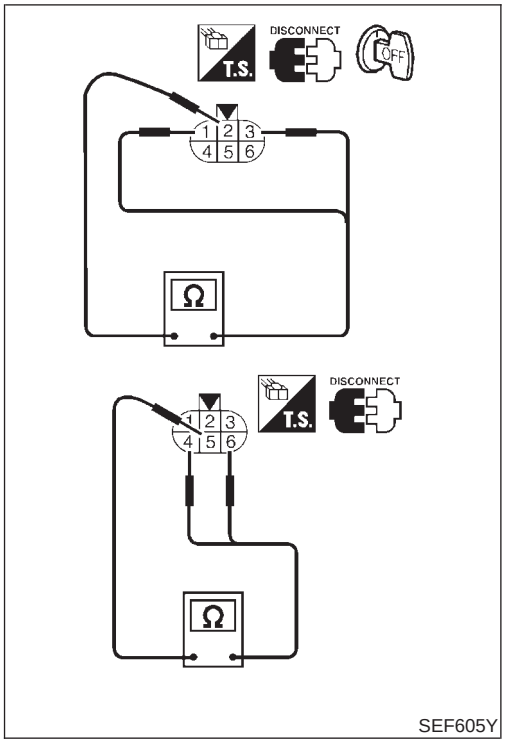
750±50 rpm

OK or NG		
OK	▶	GO TO 11.
NG	▶	Perform "Idle Air Volume Learning", EC-581.

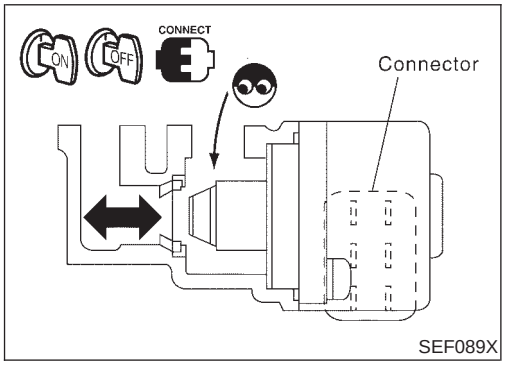
11	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

	▶	**INSPECTION END**



SEF605Y



SEF089X

Component Inspection

NLEC1586

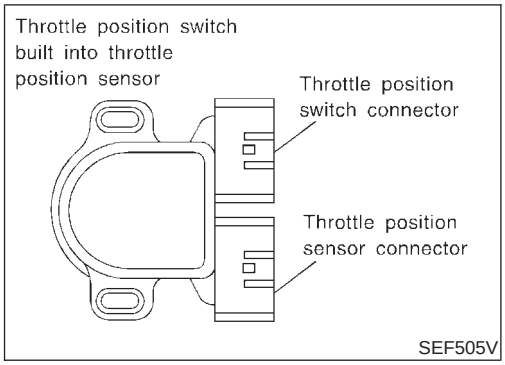
IACV-AAC VALVE

NLEC1586S01

1) Disconnect IACV-AAC valve harness connector.
2) Check IACV-AAC valve resistance.

Condition	Resistance
Terminal 2 and terminals 1, 3	20 - 24Ω [at 20°C (68°F)]
Terminal 5 and terminals 4, 6	

3) Reconnect IACV-AAC valve harness connector.
4) Remove idle air adjusting unit assembly (IACV-AAC valve is built-in) from throttle body.
   (The IACV-AAC valve harness connector should remain connected.)
5) Turn ignition switch “ON” and “OFF”, and ensure the IACV-AAC valve shaft smoothly moves forward and backward, according to the ignition switch position.
   If NG, replace the IACV-AAC valve.



Component Description

NLEC1587

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 control valve when the throttle position sensor is malfunctioning.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1588

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
CLSD THL/P SW	● Engine: Idle	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

ECM Terminals and Reference Value

NLEC1589

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

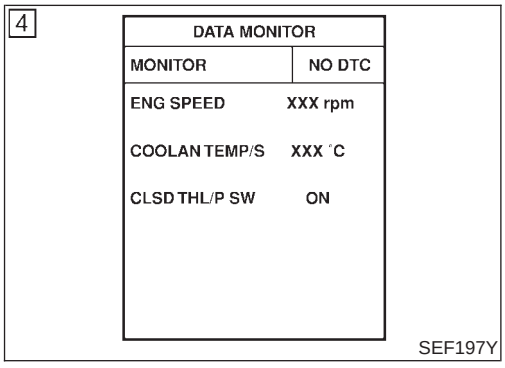
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	Y/PU	Throttle position switch (Closed position)	**[Engine is running]** ● Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Accelerator pedal depressed	Approximately 0V

On Board Diagnosis Logic

NLEC1590

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0510 0510	● Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened.	● Harness or connectors (The closed throttle position switch circuit is shorted.) ● Closed throttle position switch ● Throttle position sensor



DTC Confirmation Procedure

NLEC1591

CAUTION:
Always drive vehicle at a safe speed.

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

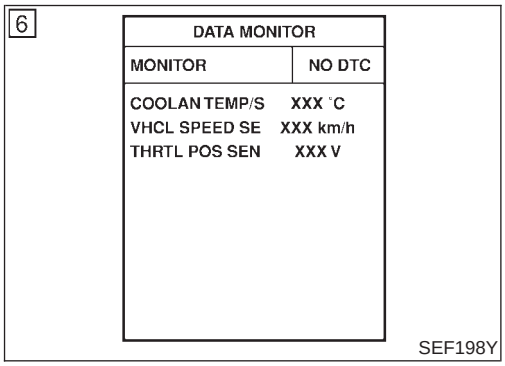
With CONSULT-II

1) 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.

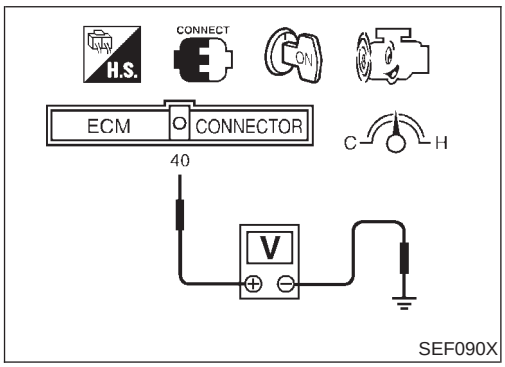
Condition	Signal indication
Throttle valve: Idle position	ON
Throttle valve: Slightly open	OFF

If the result is NG, go to "Diagnostic Procedure", EC-876.
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 2.3V
VHCL SPEED SE	More than 4 km/h (2 MPH)
Selector lever	Suitable position
Driving pattern	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-876.



Overall Function Check

NLEC1592

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.

Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Check the voltage between ECM terminal 40 (Closed throttle position switch signal) and ground under the following conditions.

Condition	Voltage
At idle	Battery voltage
At 2,000 rpm	Approximately 0V

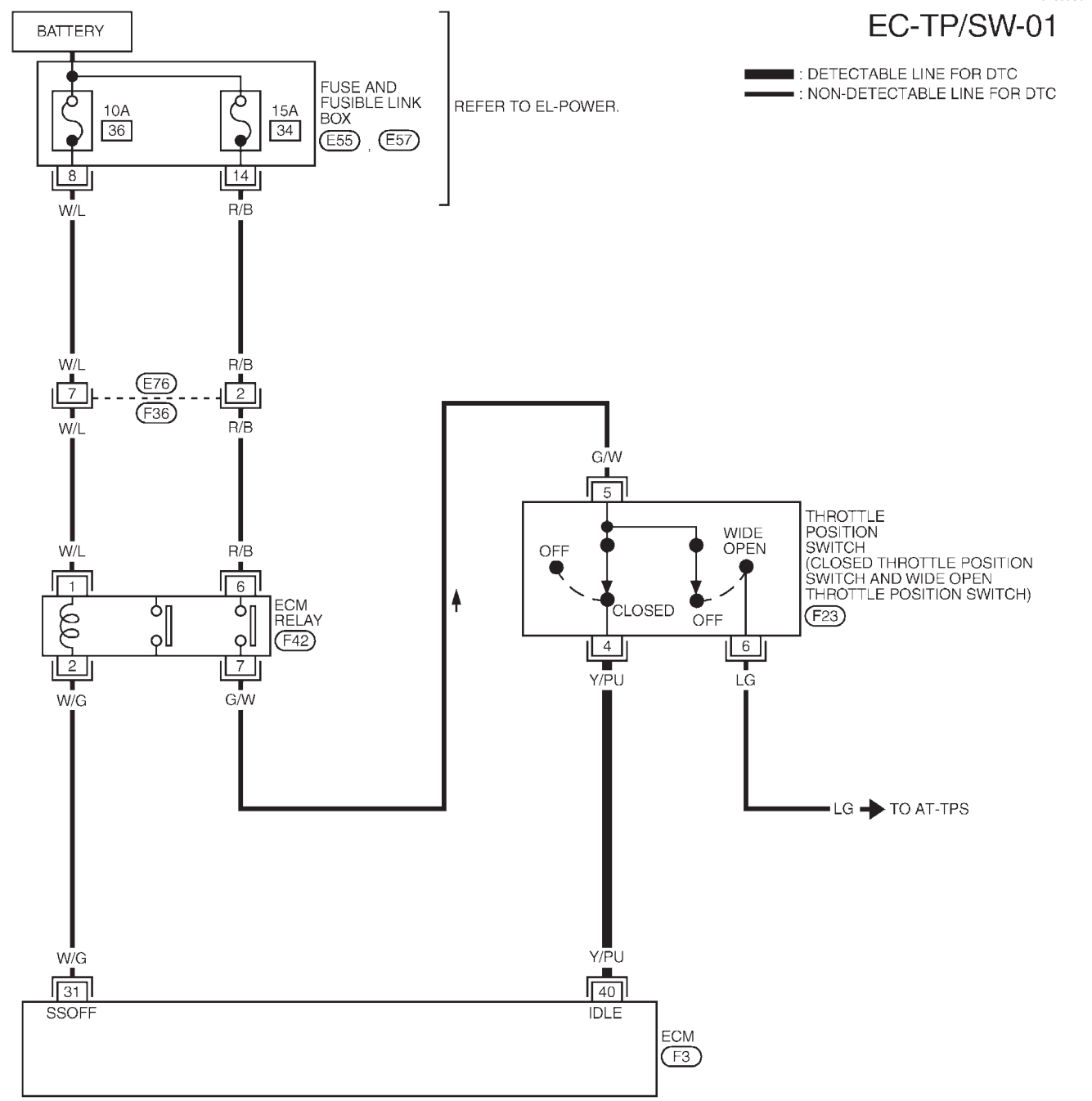
3) If NG, go to "Diagnostic Procedure", EC-876.

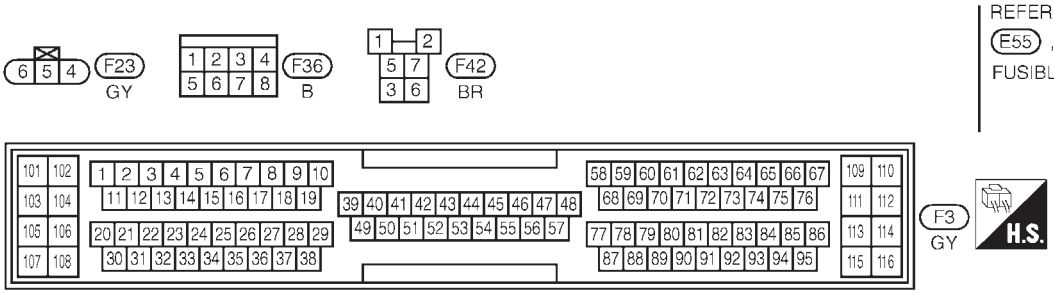
Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1593

NLEC1593S01

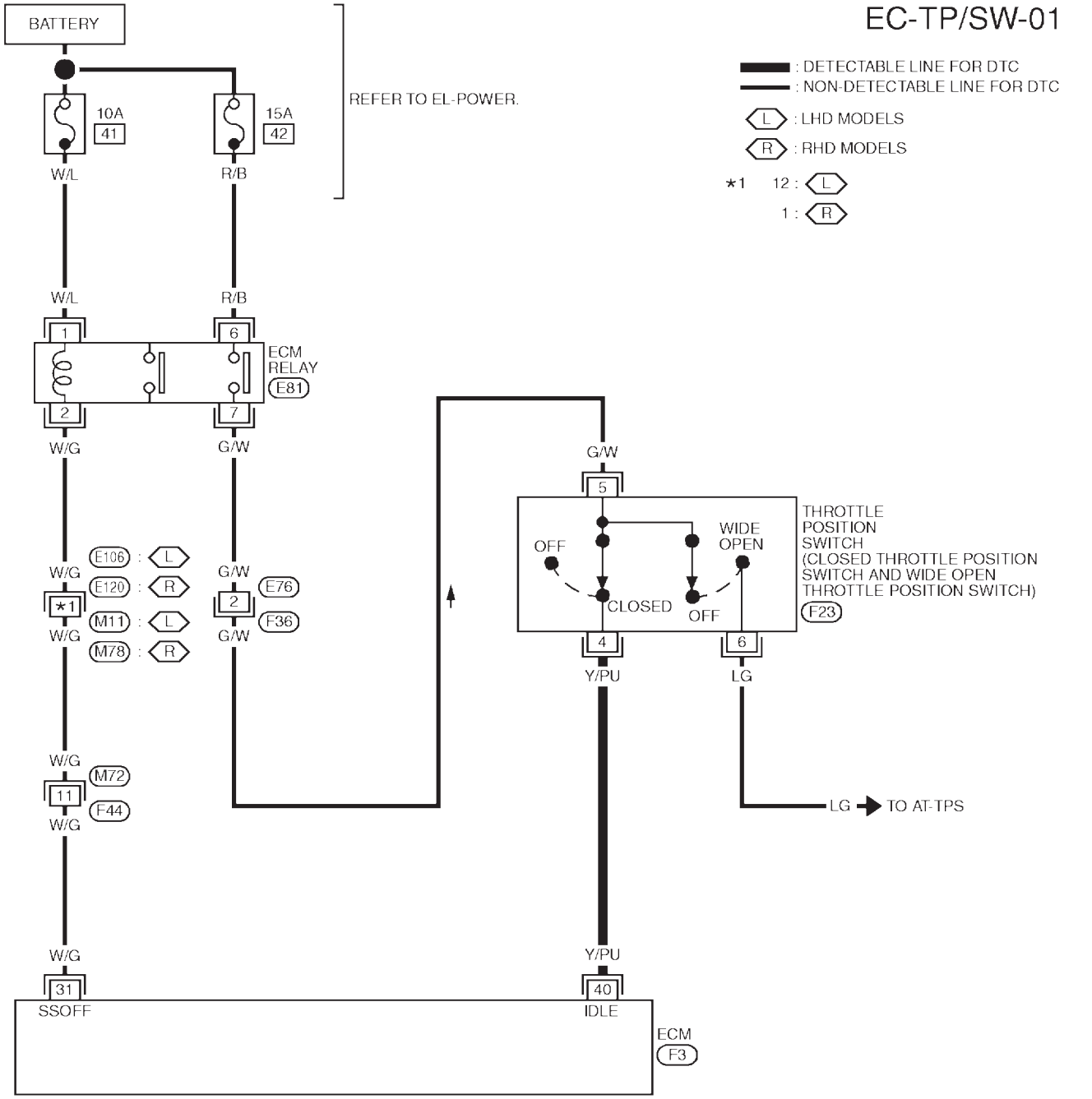


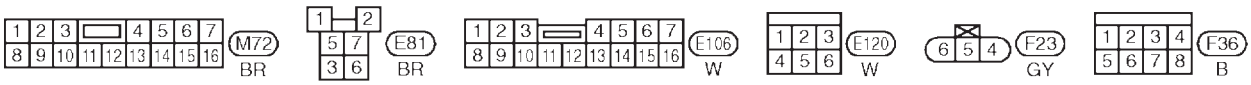


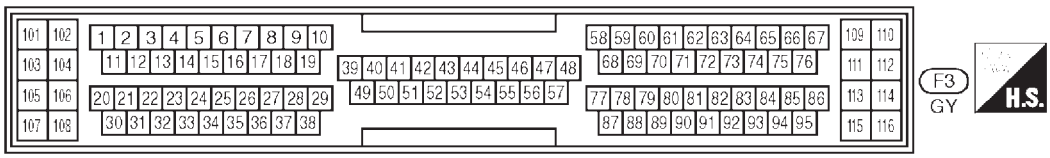
YEC705

MODELS WITH ECM IN CABIN

NLEC1593S02







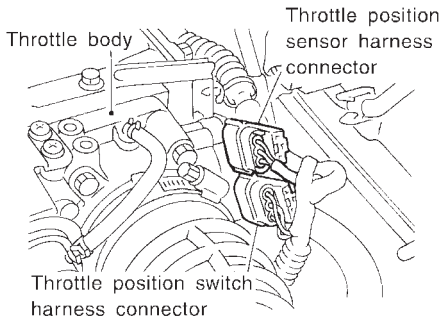
YEC926

Diagnostic Procedure

NLEC1594

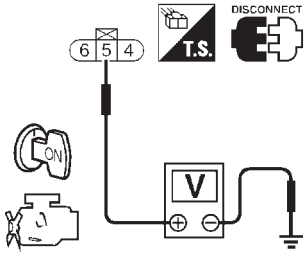
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect throttle position switch harness connector.



SEF770Z

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 E76, F36
- 15A fuse
- ECM relay
- Harness for open or short between throttle position switch and fuse

	▶	Repair harness or connectors.

3	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 40 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	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the harness for open or short between throttle position switch and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK IGNITION TIMING AND ENGINE IDLE SPEED
Check the following items. Refer to "Basic Inspection", EC-623.	

Items	Specifications
Ignition timing	15° ± 2° BTDC
Idle speed	750 ± 50 rpm (in "P" or "N" position)

MTBL0548

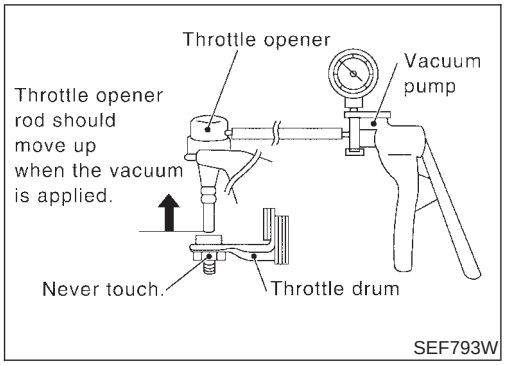
▶	GO TO 6.

6	ADJUST THROTTLE POSITION SWITCH IDLE POSITION
Perform Basic Inspection, EC-623.	
▶	GO TO 7.

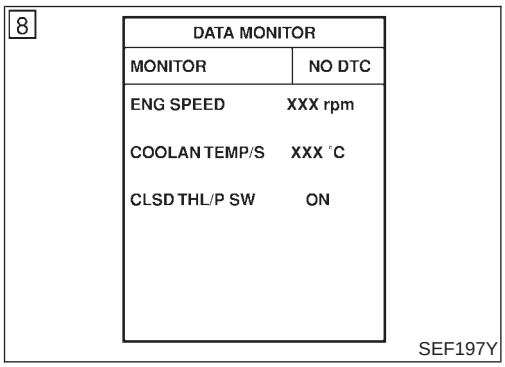
7	CHECK CLOSED THROTTLE POSITION SWITCH
Refer to "Component Inspection", EC-878.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Replace throttle position switch.

8	CHECK THROTTLE POSITION SENSOR
Refer to "Component Inspection", EC-707.	
OK or NG	
OK ▶	GO TO 9.
NG ▶	Replace throttle position sensor.

9	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF793W



SEF197Y

Component Inspection

NLEC1595

CLOSED THROTTLE POSITION SWITCH

NLEC1595S01

Models with Throttle Opener

NLEC1595S0101

With CONSULT-II

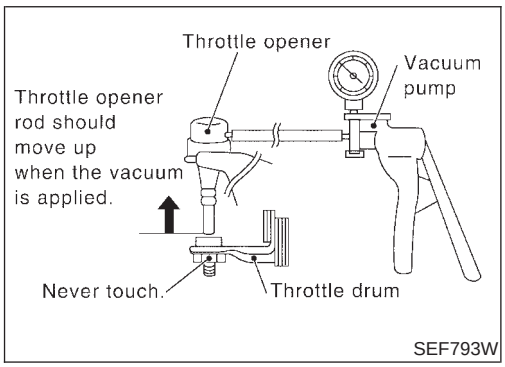
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF”.
3) Remove vacuum hose connected to throttle opener.
4) Connect suitable vacuum hose to vacuum pump and the throttle opener.
5) Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6) Turn ignition switch “ON”.
7) Select “DATA MONITOR” mode with CONSULT.
8) Check indication of “CLSD THL/P SW”.

NOTE:
Measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-638.

9) If it is impossible to adjust closed throttle position switch in “Basic Inspection”, replace closed throttle position switch.



SEF793W

Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF”.
3) Remove vacuum hose connected to throttle opener.
4) Connect suitable vacuum hose to vacuum pump and the throttle opener.
5) Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6) Disconnect throttle position switch harness connector.
7) Check continuity between terminals 4 and 5 under the following conditions. Refer to wiring diagram.

NOTE:
Continuity measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-623.

8) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

Models without throttle opener

NLEC1595S0102

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and turn ignition switch "ON".
3) Select "DATA MONITOR" mode with CONSULT-II.
4) Check indication of "CLSD THL/P SW" under the following conditions.

NOTE:
Measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-638.

5) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

Without CONSULT-II

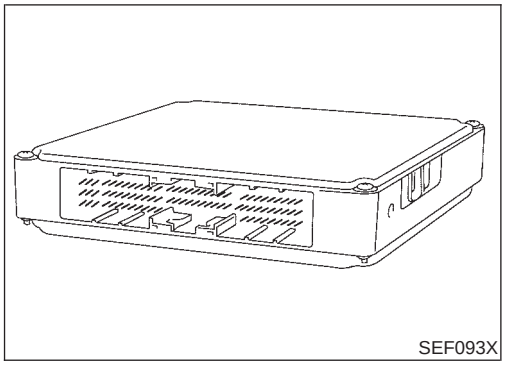
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF".
3) Disconnect throttle position switch harness connector.
4) Check continuity between terminals 4 and 5 under the following conditions. Refer to wiring diagram.

NOTE:
Continuity measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-638.

5) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.



SEF093X

Component Description

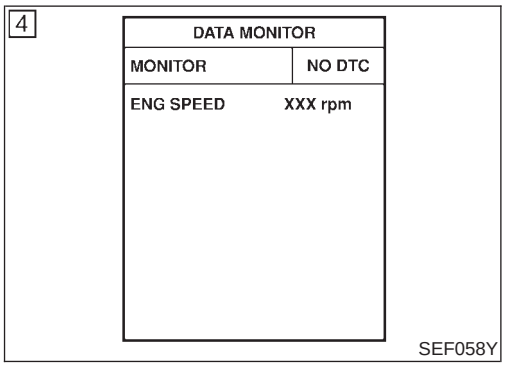
NLEC1596

The ECM consists of a microcomputer, and connectors for signal input and output and for power supply. The ECM controls the engine.

On Board Diagnosis Logic

NLEC1597

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0605	● ECM calculation function is malfunctioning.	● ECM



SEF058Y

DTC Confirmation Procedure

NLEC1598

NOTE:

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

With CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine.
4) Run engine for at least 1 second at idle speed.
5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-881.

With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

=NLEC1599

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-880. 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-880. 5. Is the 1st trip DTC P0605 displayed again?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	**INSPECTION END**

2	REPLACE ECM
1. Replace ECM. 2. Perform initialization of NATS (NISSAN ANTI-THEFT SYSTEM) system and registration of all NATS ignition key IDs. Refer to “NATS (NISSAN ANTI-THEFT SYSTEM)”, EC-597. 3. Perform “Idle Air Volume Learning”, EC-581. **Is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	**INSPECTION END**
INCMP ▶	Follow the construction of “Idle Air Volume Learning”.

System Description

NLEC1618

COOLING FAN CONTROL

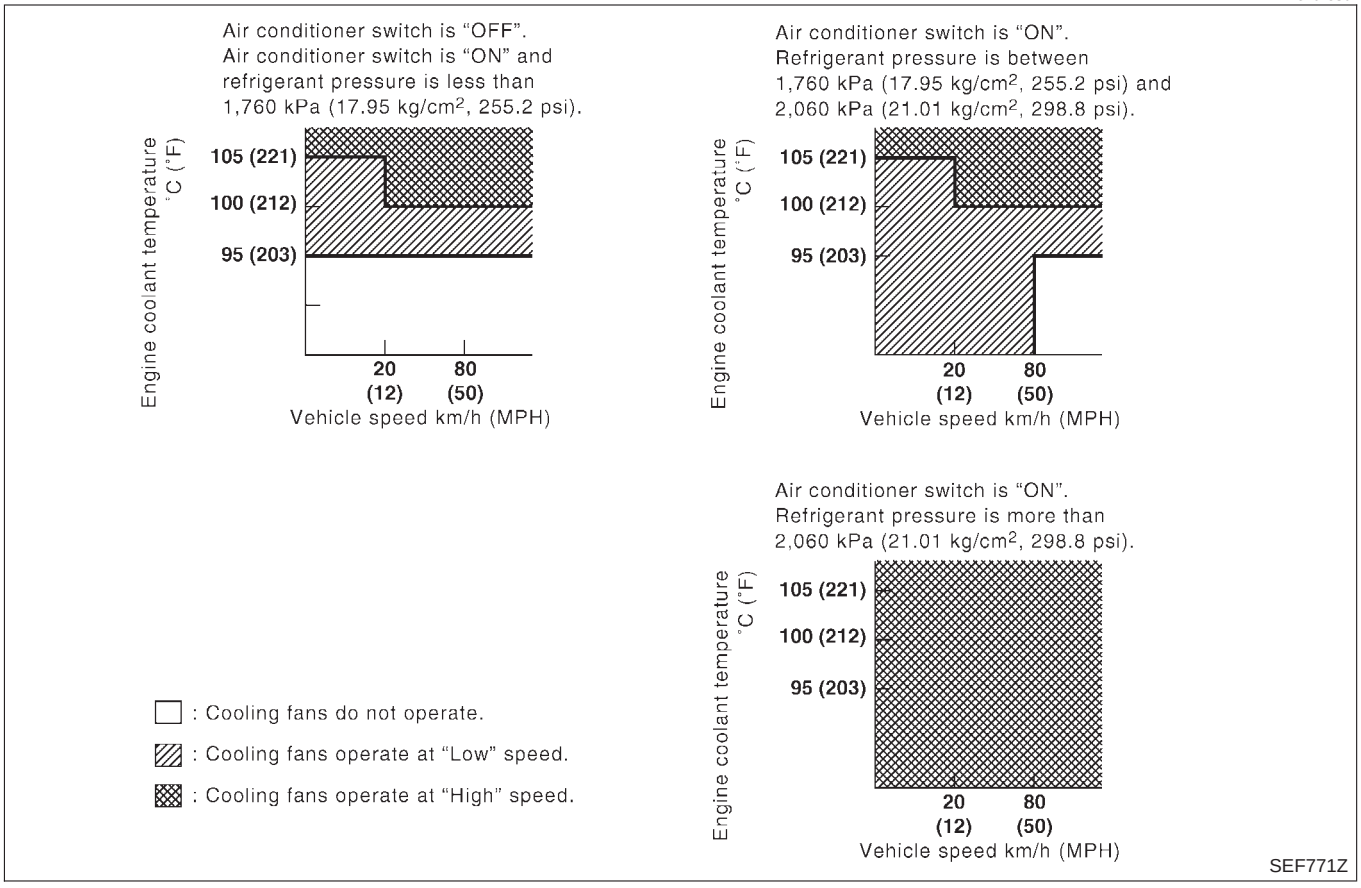
NLEC1618S01

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

NLEC1618S02



CONSULT-II Reference Value in Data Monitor Mode

NLEC1619

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

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is less than 95°C (203°F)	OFF
		Engine coolant temperature is 95°C (203°F) and 105°C (221°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

ECM Terminals and Reference Value

NLEC1769

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan (High) is operating	0 - 0.6V
13	LG/R	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	0 - 0.6V

On Board Diagnosis Logic

NLEC1770

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.

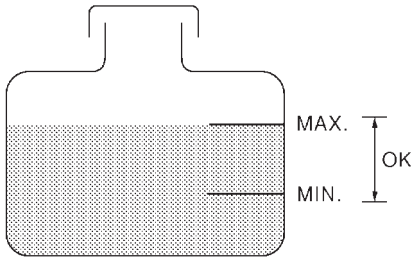
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1217 1217	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-898.

CAUTION:

When a malfunction is indicated, be sure to replace the coolant following the procedure in the LC-19, "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-20, "Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS".
2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.

1

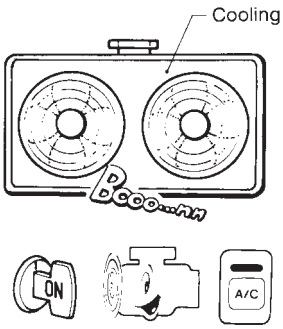


SEF621W

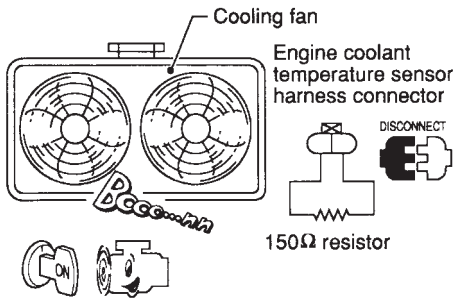
4

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF111X



SEC163BA



MEC475B

Overall Function Check

NLEC1771

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

With CONSULT-II

1) Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "Diagnostic Procedure", EC-887.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-887.
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-887.

Without CONSULT-II

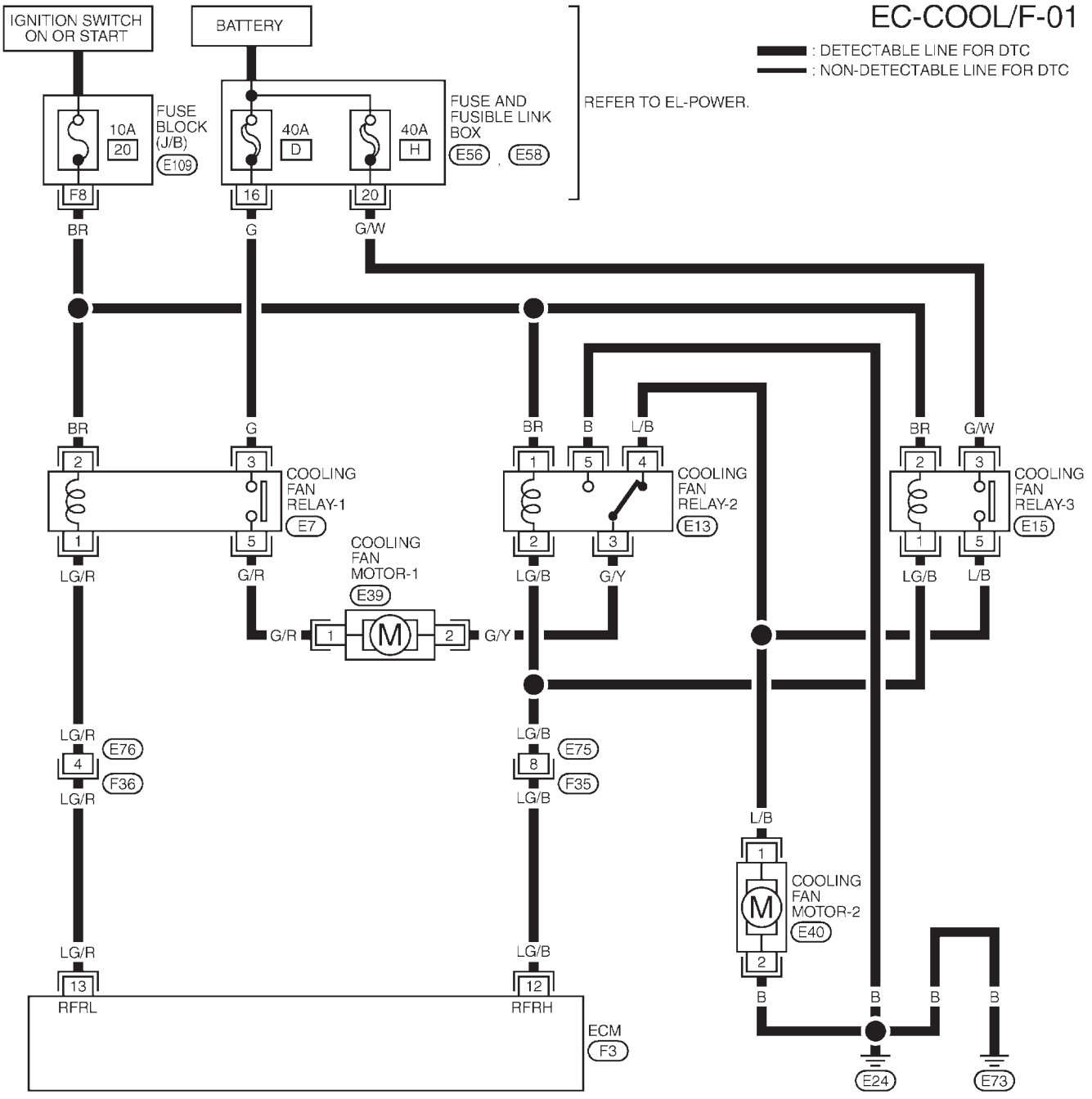
1) Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "Diagnostic Procedure", EC-887.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-887.
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 air conditioner operating.
Be careful not to overheat engine.
8) Make sure that cooling fan operates at low speed.
If NG, go to "Diagnostic Procedure", EC-887.
If OK, go to the following step.
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 that cooling fan operates at higher speed than low speed.
Be careful not to overheat engine.
14) If NG, go to "Diagnostic Procedure", EC-887.

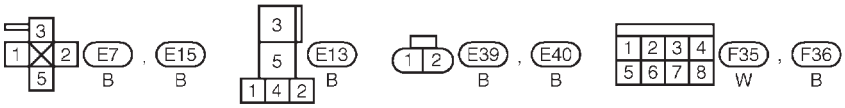
Wiring Diagram

NLEC1623

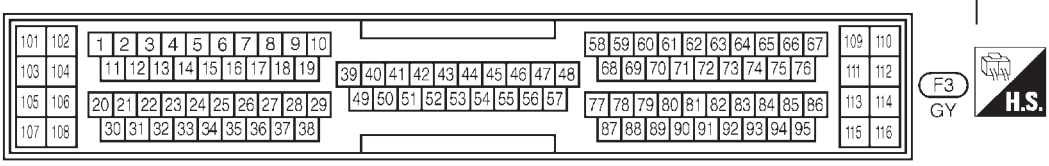
MODELS WITH FUSE AND FUSIBLE LINK BOX E43

NLEC1623S03





REFER TO THE FOLLOWING.
E109 -FUSE BLOCK-JUNCTION BOX (J/B)
E56 , E58 -FUSE AND FUSIBLE LINK BOX

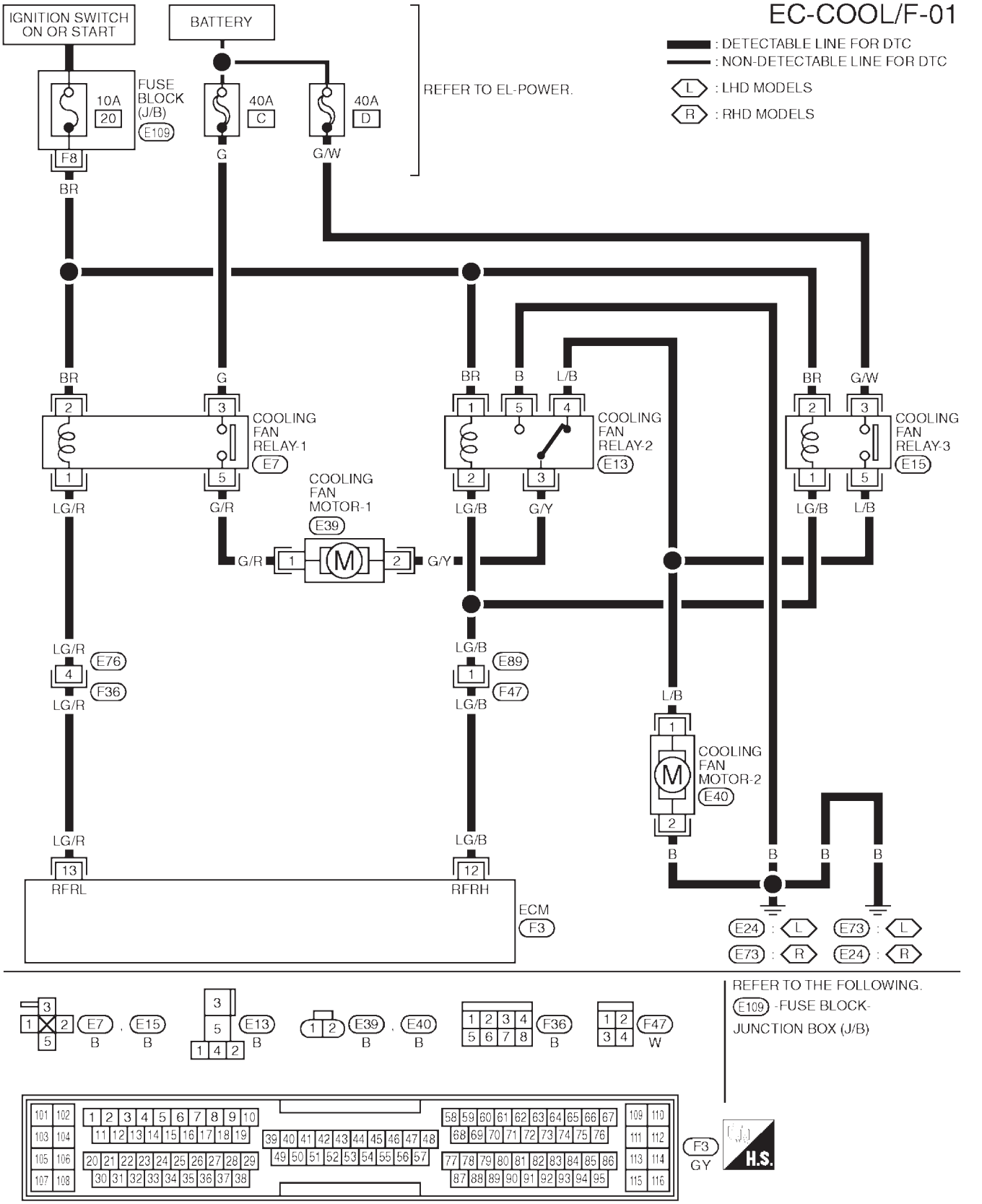


YEC706

Wiring Diagram (Cont'd)

MODELS WITH FUSE AND FUSIBLE LINK BOX E90

NLEC1623S04



YEC927

Diagnostic Procedure

NLEC1772

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. Turn ignition switch “ON”.
2. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
3. Touch “LOW”.

ACTIVE TEST	
COOLING FAN	LOW
MONITOR	
COOLAN TEMP/S	XXX °C

SEF784Z

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-892.)

3	CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
3. Touch “HIGH”.

ACTIVE TEST	
COOLING FAN	HIGH
MONITOR	
COOLAN TEMP/S	XXX °C

SEF785Z

4. Make sure that cooling fans-1 and -2 operate at higher speed than low speed.

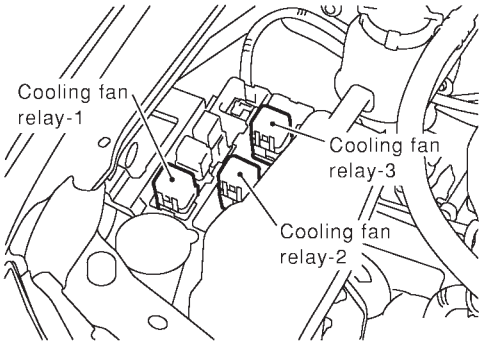
OK or NG

OK ▶	GO TO 6.
NG ▶	Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-895.)

4	CHECK COOLING FAN LOW SPEED OPERATION

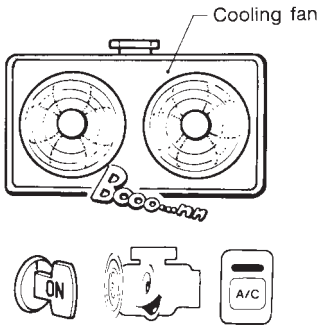
Without CONSULT-II

1. Disconnect cooling fan relay-3.



SEF384Y

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

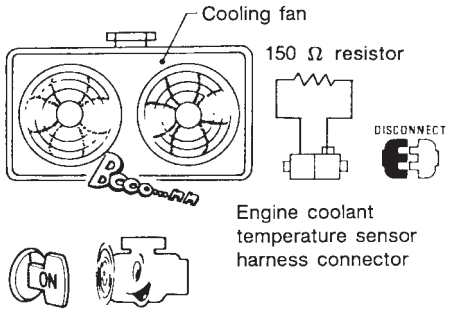
OK or NG

OK	▶	GO TO 5.
NG	▶	Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-892.)

5	CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch "OFF".
2. Reconnect cooling fan relay-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 higher speed than low speed.



MEF613EA

OK or NG

OK	▶	GO TO 6.
NG	▶	Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-895.)

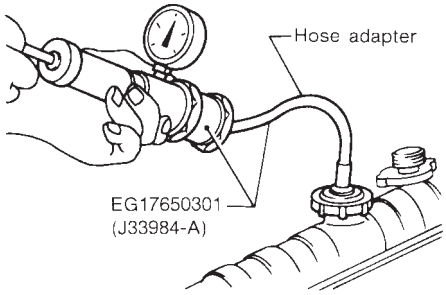
6	CHECK COOLING SYSTEM FOR LEAK

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.

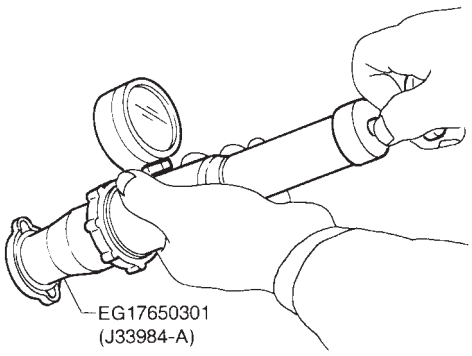
OK or NG

OK	▶	GO TO 7.
NG	▶	**Check the following for leak** ● Hose ● Radiator ● Water pump Refer to LC-14, "Water Pump".

Diagnostic Procedure (Cont'd)

7	CHECK RADIATOR CAP

Apply pressure to cap with a tester.



SLC755A

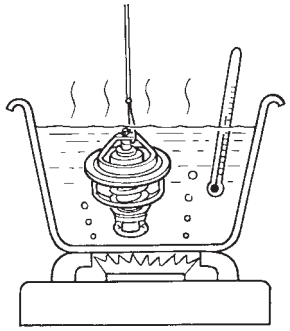
Radiator cap relief pressure:
59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace radiator cap.

8	CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.



SLC343

Valve opening temperature:
82°C (180°F) [standard]
Valve lift:
More than 9 mm/95°C (0.35 in/203°F)

3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC-15, "Thermostat".

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace thermostat

9	CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to "COMPONENT INSPECTION", EC-699.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace engine coolant temperature sensor.

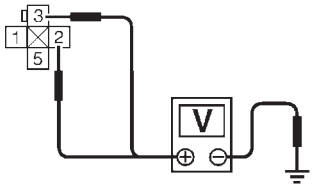
10	**CHECK MAIN 12 CAUSES**
If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-898.	
▶	**INSPECTION END**

PROCEDURE A

=NLEC1772S01

1	CHECK POWER SUPPLY

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 2, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF899Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

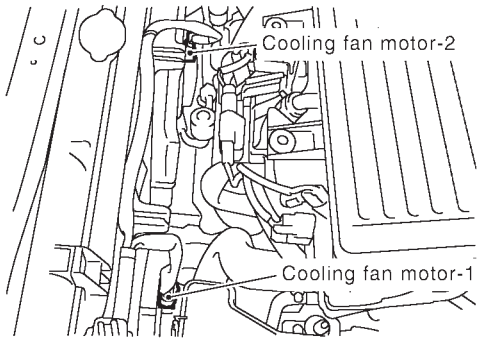
2	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- 40A fusible link
- 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 MOTOR CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.



SEF780Z

3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-2 terminal 2 and body ground.
   Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK COOLING FAN MOTOR CIRCUIT FOR OPEN AND SHORT-II

1. Check harness continuity between cooling fan motor-1 terminal 2 and cooling fan motor-2 terminal 1.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 5.

5	CHECK COOLING FAN MOTOR CIRCUIT FOR OPEN AND SHORT-III

1. Disconnect cooling fan relay-2.
2. Check harness continuity between cooling fan motor-1 terminal 2 and cooling fan relays-2 terminal 3, cooling fan relay-2 terminal 4 and cooling fan motor-2 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 COOLING FAN RELAY-2

Refer to "Component Inspection", EC-899.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace cooling fan relay.

7	CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 13 and cooling fan relays-1 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	▶	GO TO 8.

8	DETECT MALFUNCTION PART

Check the following.
- Harness connectors E76, F36
- 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 connectors.

9	CHECK COOLING FAN RELAY-1

Refer to "Component Inspection", EC-898.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace cooling fan relay.

Diagnostic Procedure (Cont'd)

10	CHECK COOLING FAN MOTORS-1 AND -2	
Refer to "Component Inspection", EC-899.		
OK or NG		
OK	▶	GO TO 11.
NG	▶	Replace cooling fan motors.

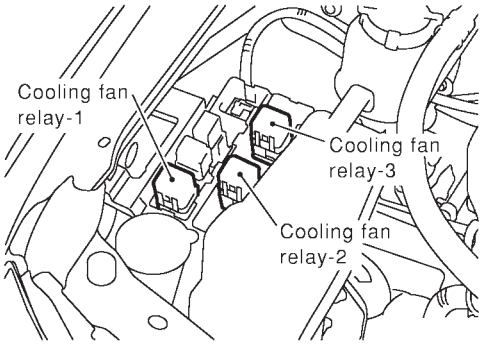
11	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**

PROCEDURE B

=NLEC1772S02

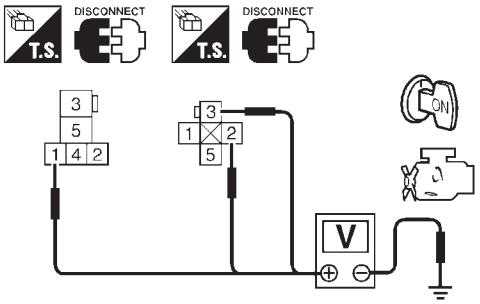
1	CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2 and -3.



SEF384Y

3. Turn ignition switch "ON".
4. Check voltage between cooling fan relays-2 terminal 1 and ground, cooling fan relay-3 terminals 2, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF903Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

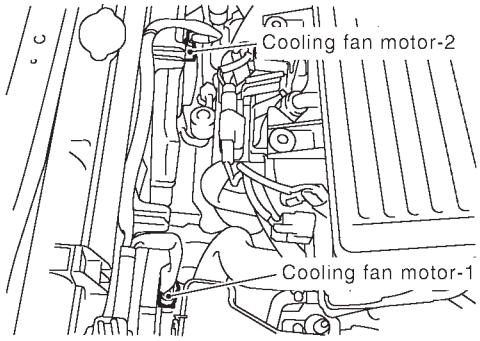
Check the following.
- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relays-2 -3 and fuse
- Harness for open or short between cooling fan relay-3 and fusible link

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

Diagnostic Procedure (Cont'd)

3	CHECK COOLING FAN MOTOR CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-2 harness connector.



SEF780Z

3. Check harness continuity between cooling fan relay-2 terminal 5 and body ground, cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 1.
   Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 12 and cooling fan relay-2 terminal 2, cooling fan relay-3 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	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E75, F35 (where fitted)
- Harness connectors E89, F47 (where fitted)
- Harness for open or short between cooling fan relays-2, -3 and ECM

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

6	CHECK COOLING FAN RELAY-2

Refer to "Component Inspection", EC-899.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace cooling fan relay.

7	CHECK COOLING FAN RELAY-3	
Refer to "Component Inspection", EC-898.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	Replace cooling fan relay.

8	CHECK COOLING FAN MOTOR-1 and -2	
Refer to "Component Inspection", EC-899.		
OK or NG		
OK	▶	GO TO 9.
NG	▶	Replace cooling fan motors.

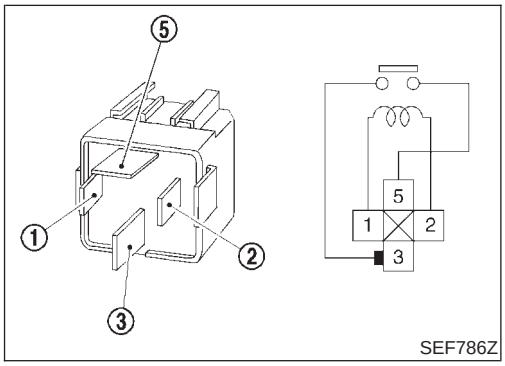
9	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**

Main 12 Causes of Overheating

=NLEC1625

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-20, “RECOMMENDED FLUIDS AND LUBRICANTS”.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See LC-19, “Changing Engine Coolant”.
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See LC-10, “System Check”.
ON*2	5	● Coolant leaks	● Visual	No leaks	See LC-10, “System Check”.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-15, “Thermostat” and LC-17, “Radiator”.
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See “DTC P1217 OVERHEAT” (EC-882).
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 LC-19, “Changing Engine Coolant”.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See LC-20, “Refilling Engine Coolant”.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-36, “Inspection”, “CYLINDER HEAD”.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-54, “Inspection”, “CYLINDER BLOCK”.

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to LC-21, “OVERHEATING CAUSE ANALYSIS”.



SEF786Z

Component Inspection

NLEC1626

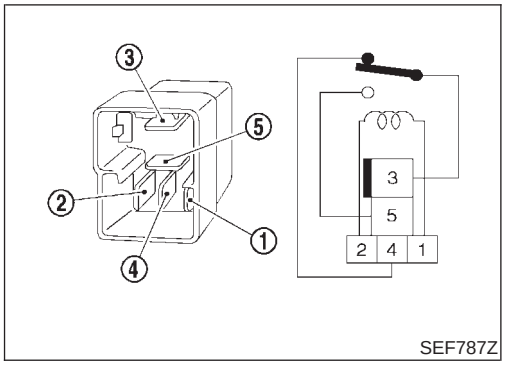
COOLING FAN RELAYS-1 AND -3

NLEC1626S01

Check continuity between terminals 3 and 5.

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

If NG, replace relay.



SEF787Z

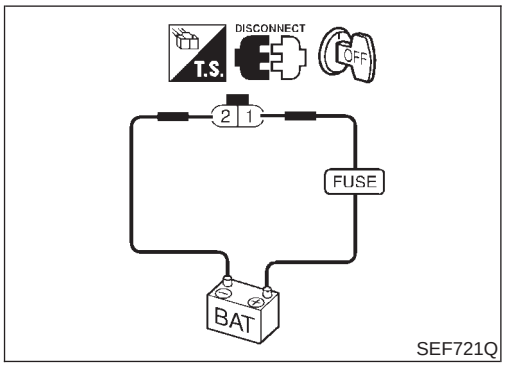
COOLING FAN RELAY-2

NLEC1626S04

Check continuity between terminals 3 and 4, 3 and 5.

Conditions	Continuity	
	Terminal 3 and 4	Terminal 3 and 5
12V direct current supply between terminals 1 and 2	No	Yes
No current supply	Yes	No

If NG, replace relay.



SEF721Q

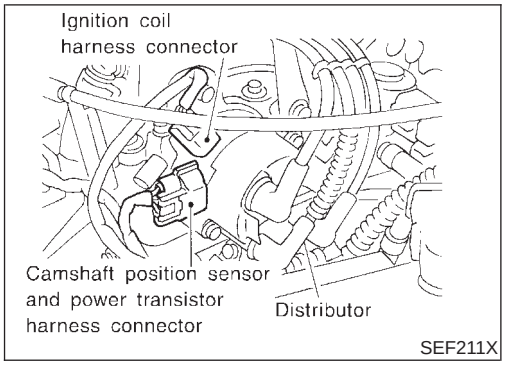
COOLING FAN MOTORS-1 AND -2

NLEC1626S02

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(−)
Cooling fan motor	1	2

Cooling fan motor should operate.
If NG, replace cooling fan motor.



Component Description

NLEC1909

IGNITION COIL & POWER TRANSISTOR (BUILT INTO DISTRIBUTOR)

NLEC1909S01

The ignition coil is built into distributor. The ignition signal from the ECM is sent to the power transistor. The power transistor switches on and off the ignition coil primary circuit. As the primary circuit is turned on and off, the proper high voltage is induced in the coil secondary circuit.

The distributor is not repairable and must be replaced as an assembly except distributor cap and rotor head.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1910

MONITOR ITEM	CONDITION		SPECIFICATION
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	15°±2° BTDC
		2,000 rpm	More than 25° BTDC

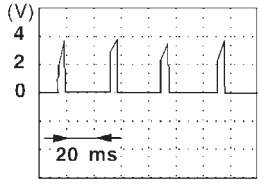
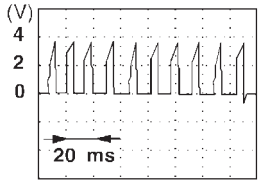
ECM Terminals and Reference Value

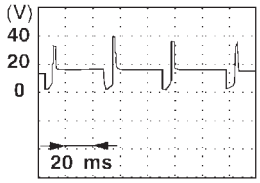
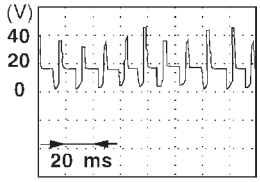
NLEC1911

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W/B	Ignition signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.3V  SEF996V
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 0.8V  SEF997V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
36	G	Ignition check	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 13V  SEF998V
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 12V  SEF999V

On Board Diagnosis Logic

NLEC1912

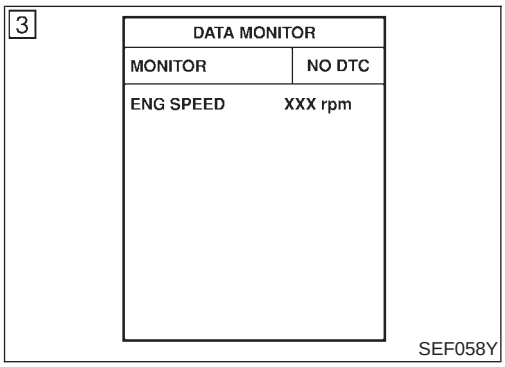
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1320 1320	● The ignition signal in the primary circuit is not sent to ECM during engine cranking or running.	● Harness or connectors (The ignition primary circuit is open or shorted.) ● Power transistor unit. ● Resistor ● Camshaft position sensor ● Camshaft position sensor circuit

DTC Confirmation Procedure

NLEC1913

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 P0340, perform trouble diagnosis for DTC P0340 first. Refer to EC-825.**



SEF058Y

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-905.

Without CONSULT-II

1) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)

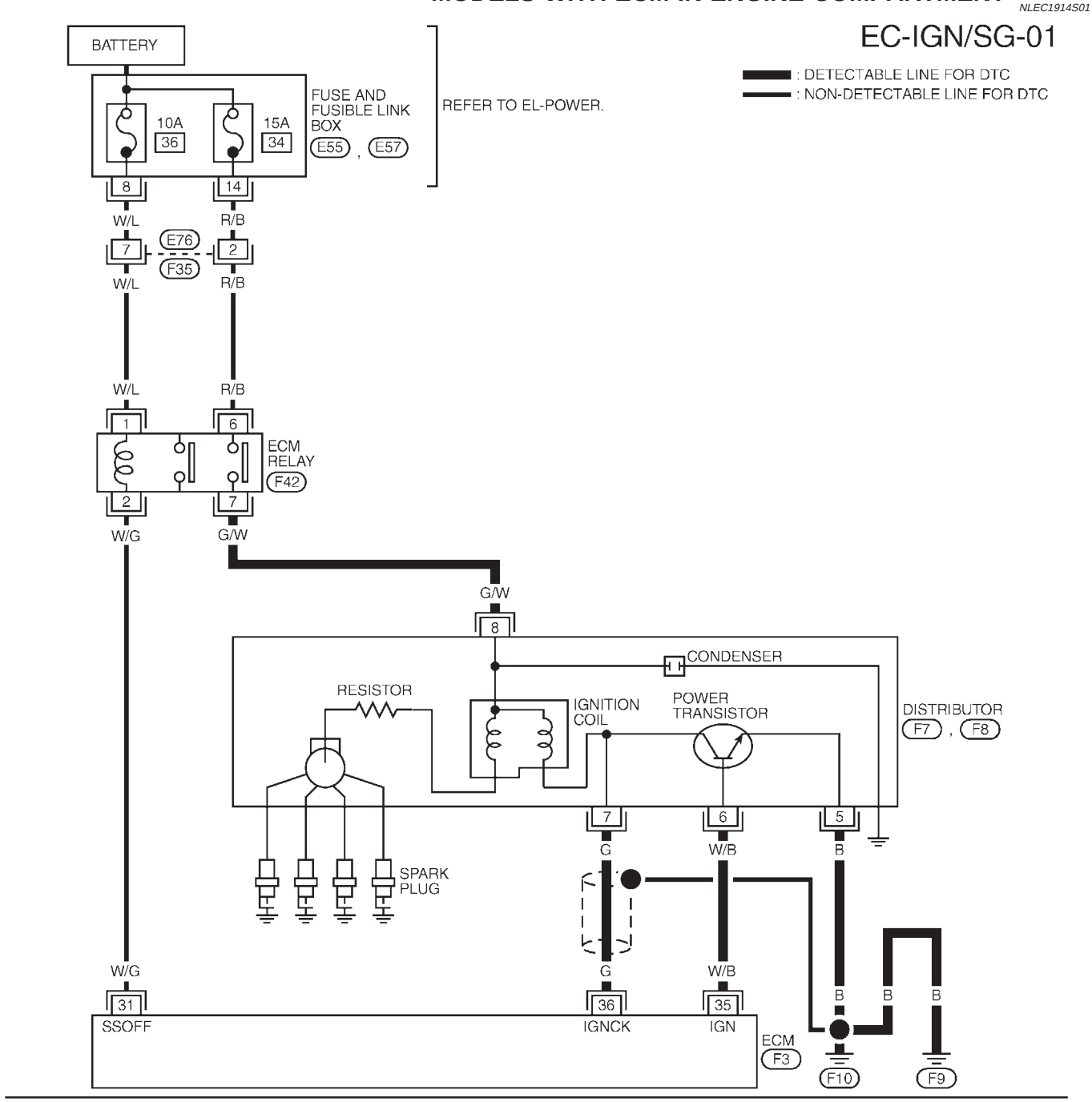
2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic procedure, EC-905.

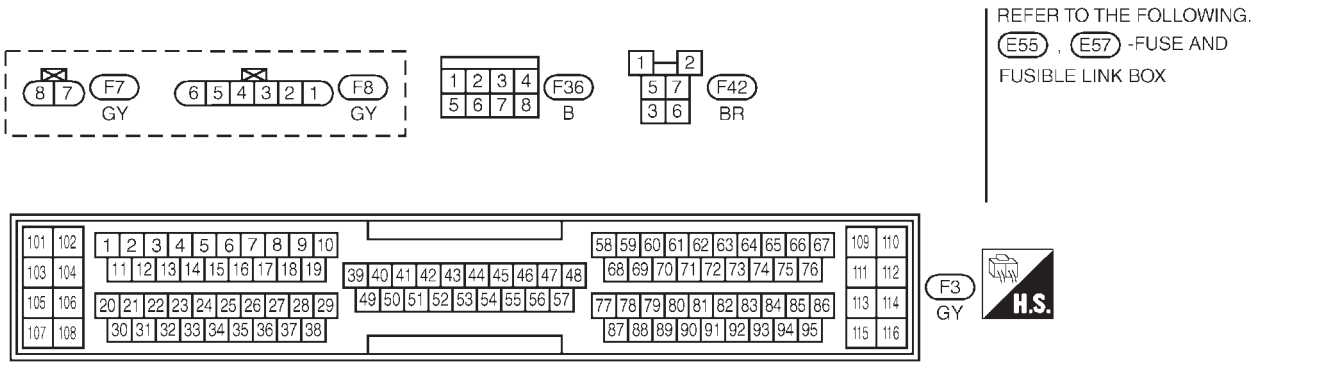
Wiring Diagram

NLEC1914

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1914S01

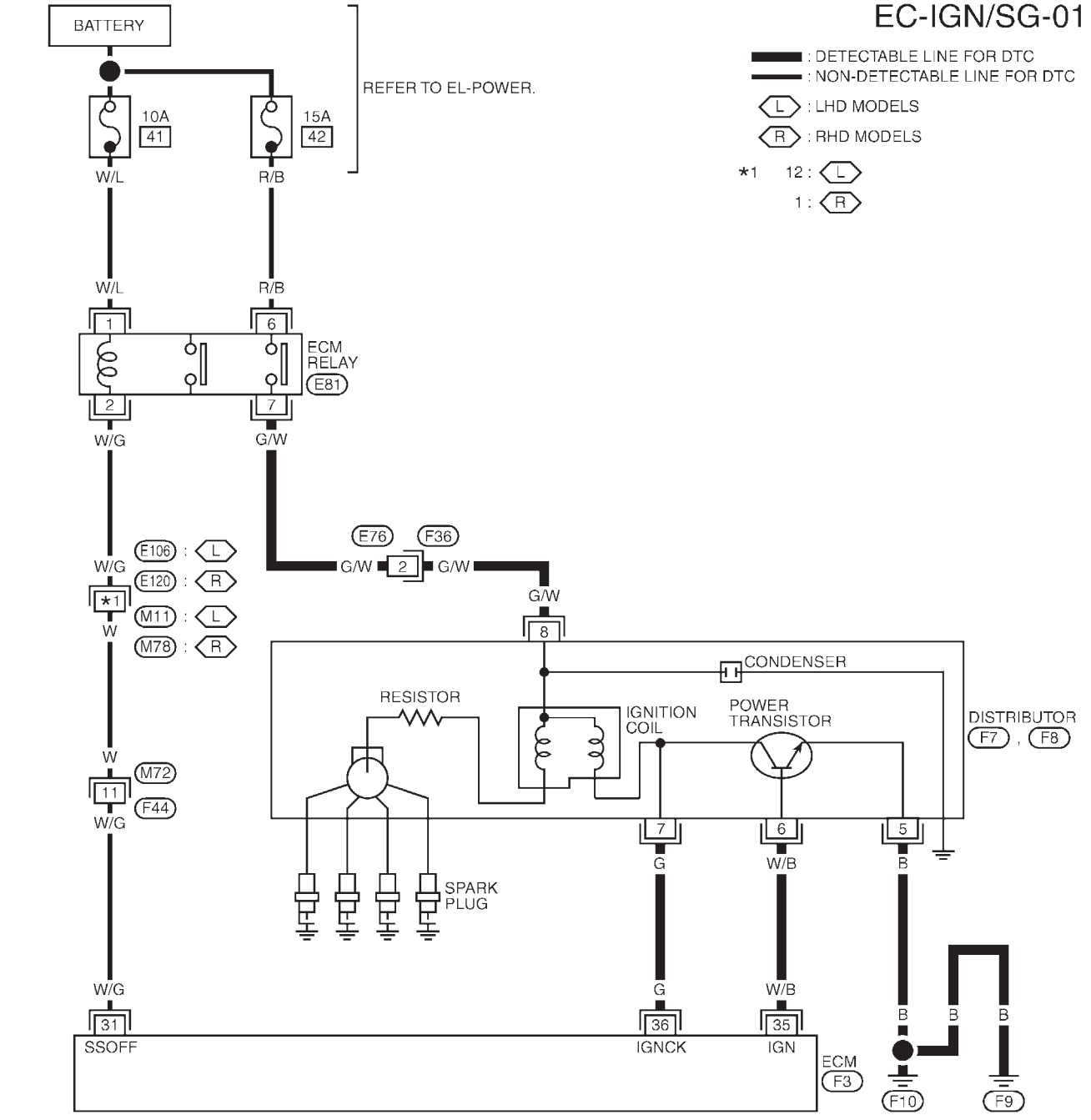


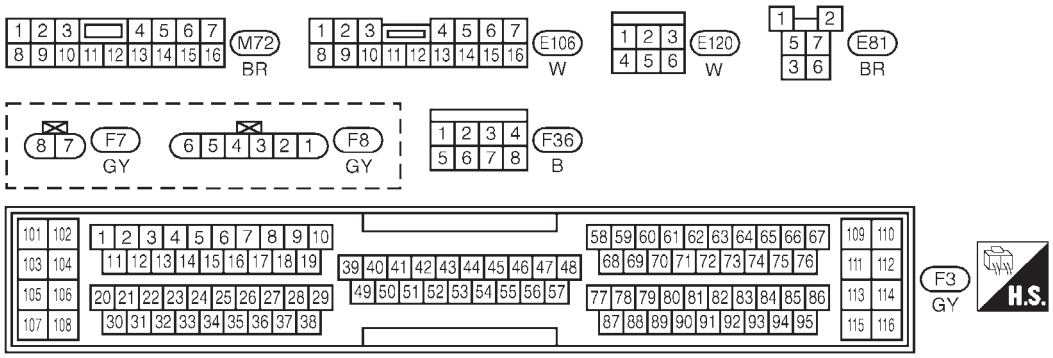


YEC712

MODELS WITH ECM IN CABIN

NLEC1914S02





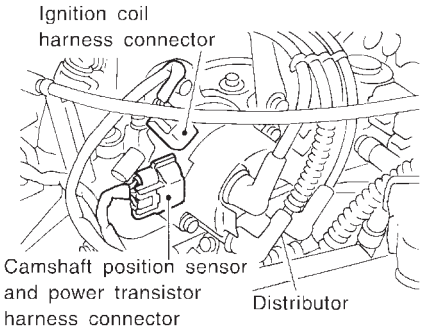
YEC928

Diagnostic Procedure

NLEC1915

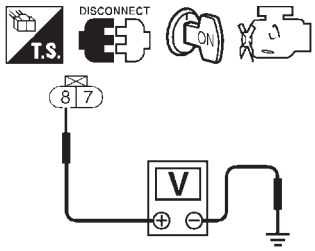
1	CHECK ENGINE START	
Turn ignition switch “OFF”, and restart engine. **Is engine running?**		
Yes or No		
Yes	▶	GO TO 7.
No	▶	GO TO 2.

2	CHECK POWER SUPPLY	
1. Turn ignition switch “OFF”. 2. Disconnect ignition coil harness connector.		



SEF211X

3. Turn ignition switch “ON”.
4. Check voltage between ignition coil terminal 8 and ground with CONSULT-II or tester.



SEF257W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

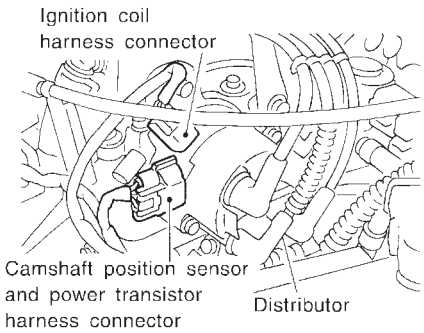
3	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E76, F36 ● ECM relay ● 15A fuse ● Harness for open or short between ignition coil and fuse		
	▶	Repair harness or connectors.

4	CHECK GROUND CIRCUIT	
1. Turn ignition switch "OFF". 2. Disconnect camshaft position sensor harness connector. 3. Check harness continuity between CMPS terminal 5 and engine ground. Refer to "Wiring Diagram", EC-903. **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 INPUT SIGNAL CIRCUIT-I	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 35 and CMPS terminal 6. Refer to "Wiring Diagram", EC-903. **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 IGNITION COIL, POWER TRANSISTOR	
Refer to "Component Inspection", EC-907. **OK or NG**		
OK	▶	GO TO 7.
NG	▶	Replace malfunctioning component(s).

7	CHECK INPUT SIGNAL CIRCUIT-II	
1. Stop engine. 2. Disconnect ignition coil harness connector and ECM harness connector.		
OK	▶	GO TO 8.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



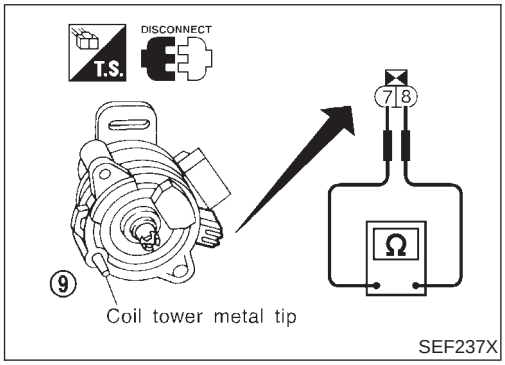
SEF211X

3. Check harness continuity between ignition coil terminal 7 and ECM terminal 36.
Refer to "Wiring Diagram", EC-903.
Continuity should exist.
4. Also check harness for short to ground and short to power.

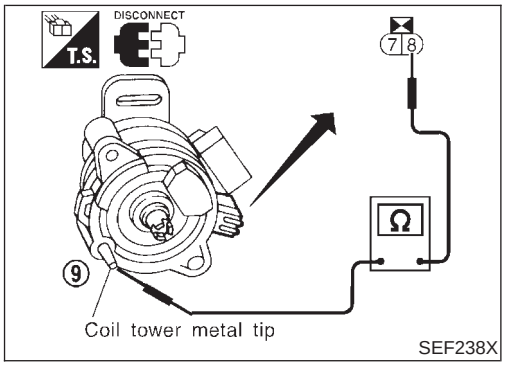
OK or NG

8	CHECK RESISTOR	
Refer to "Component Inspection" EC-908.		
	OK or NG	
OK	▶	GO TO 9.
NG	▶	Replace distributor cap.

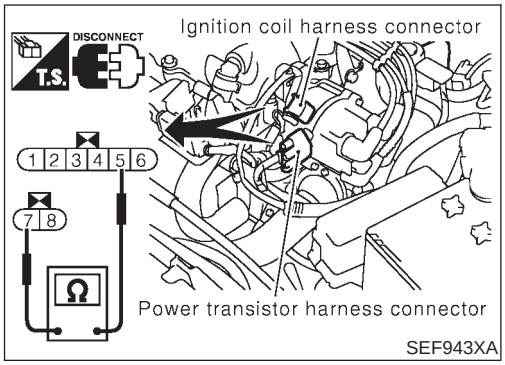
9	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF237X



SEF238X



SEF943XA

Component Inspection

IGNITION COIL

NLEC1916

NLEC1916S01

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.
3. For checking secondary coil, remove distributor cap.
4. Check resistance between ignition coil harness connector terminal 8 and coil tower metal tip 9 (secondary terminal) on the distributor head.

Terminal	Resistance [at 25°C (77°F)]
7 - 8 (Primary coil)	Approximately 2.2Ω
8 - secondary terminal on distributor head (Secondary coil)	Approximately 17 kΩ

If NG, replace distributor.

POWER TRANSISTOR

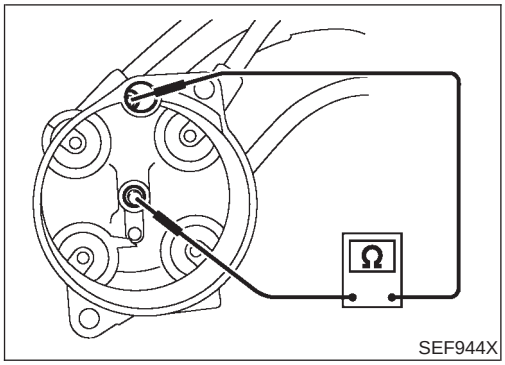
NLEC1916S02

1. Disconnect power transistor harness connector and ignition coil harness connector.
2. Check power transistor resistance between terminals 5 and 7.

Terminals	Resistance	Result
5 and 7	Except 0Ω	OK
	0Ω	NG

If NG, replace distributor.

Component Inspection (Cont'd)



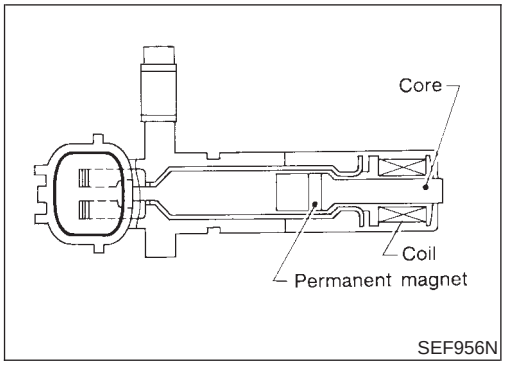
RESISTOR

NLEC1916S03

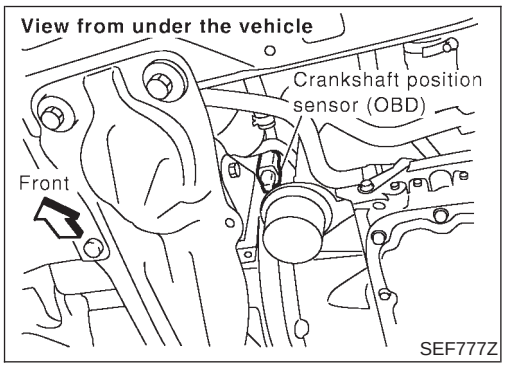
1. Disconnect resistor harness connector.
2. Check resistance as shown in the figure.

Resistance: Approximately 5 kΩ [at 25°C (77°F)]

If NG, replace distributor cap.



SEF956N



SEF777Z

Component Description

NLEC1917

The crankshaft position sensor (OBD) is located on the transmission housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not used to control the engine system.
It is used only for the on board diagnosis.

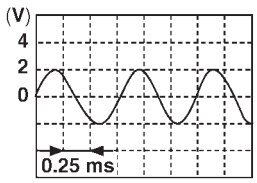
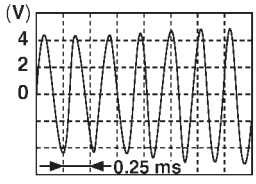
ECM Terminals and Reference Value

NLEC1918

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

CAUTION:

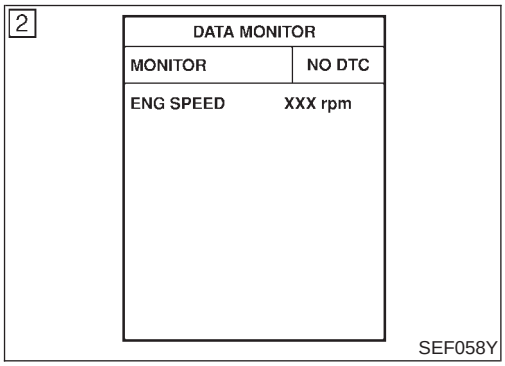
Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (AC Voltage)
65	W	Crankshaft position sensor (OBD)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 1.3V  SEF814Z
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 2.0V  SEF815Z

On Board Diagnosis Logic

NLEC1919

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1336	● A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM.	● Harness or connectors ● Crankshaft position sensor (OBD) ● Drive plate



DTC Confirmation Procedure

NLEC1920

NOTE:

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

With CONSULT-II

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 4 minutes at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-913.

With GST

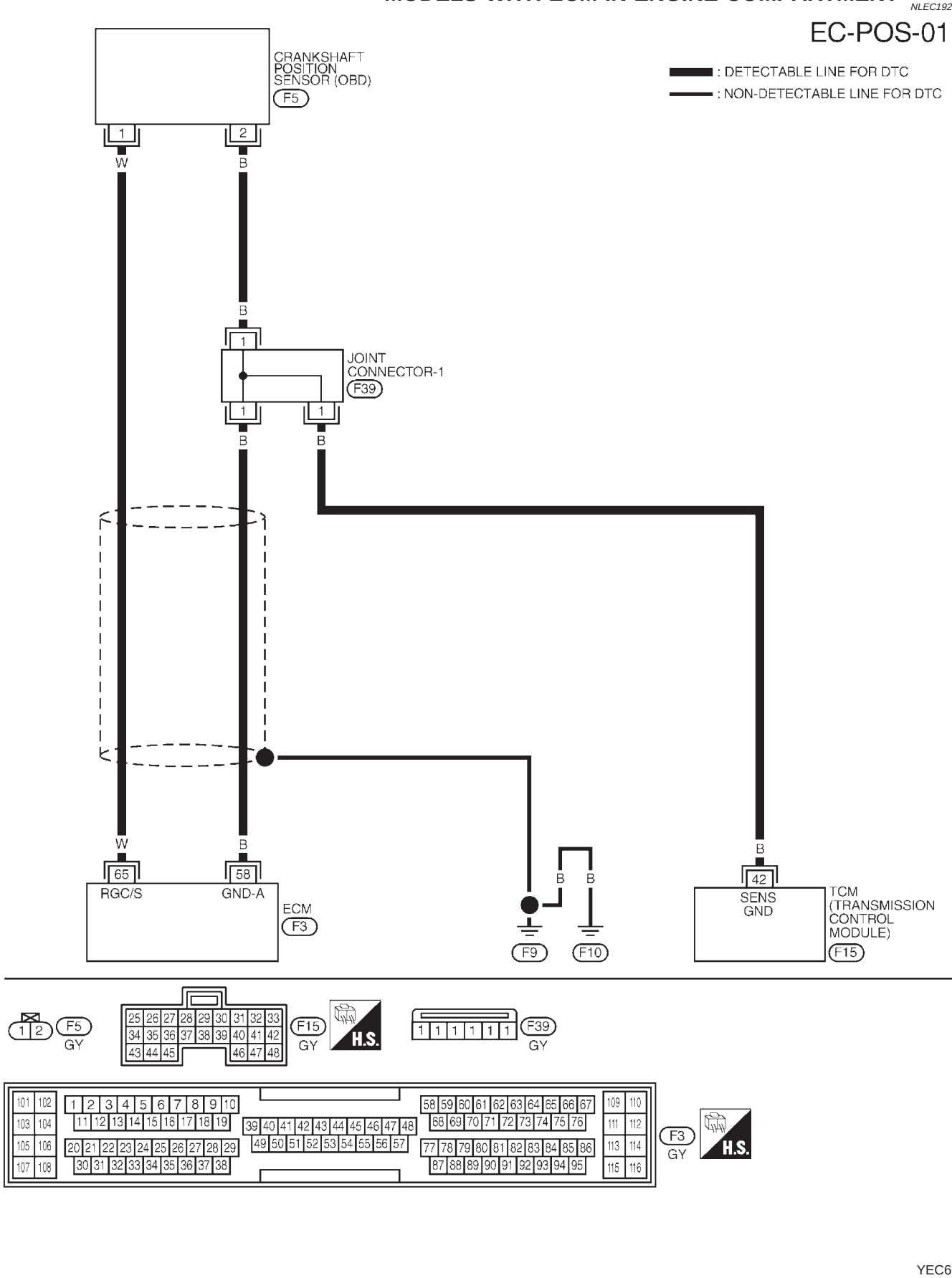
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

NLEC1921

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1921S01

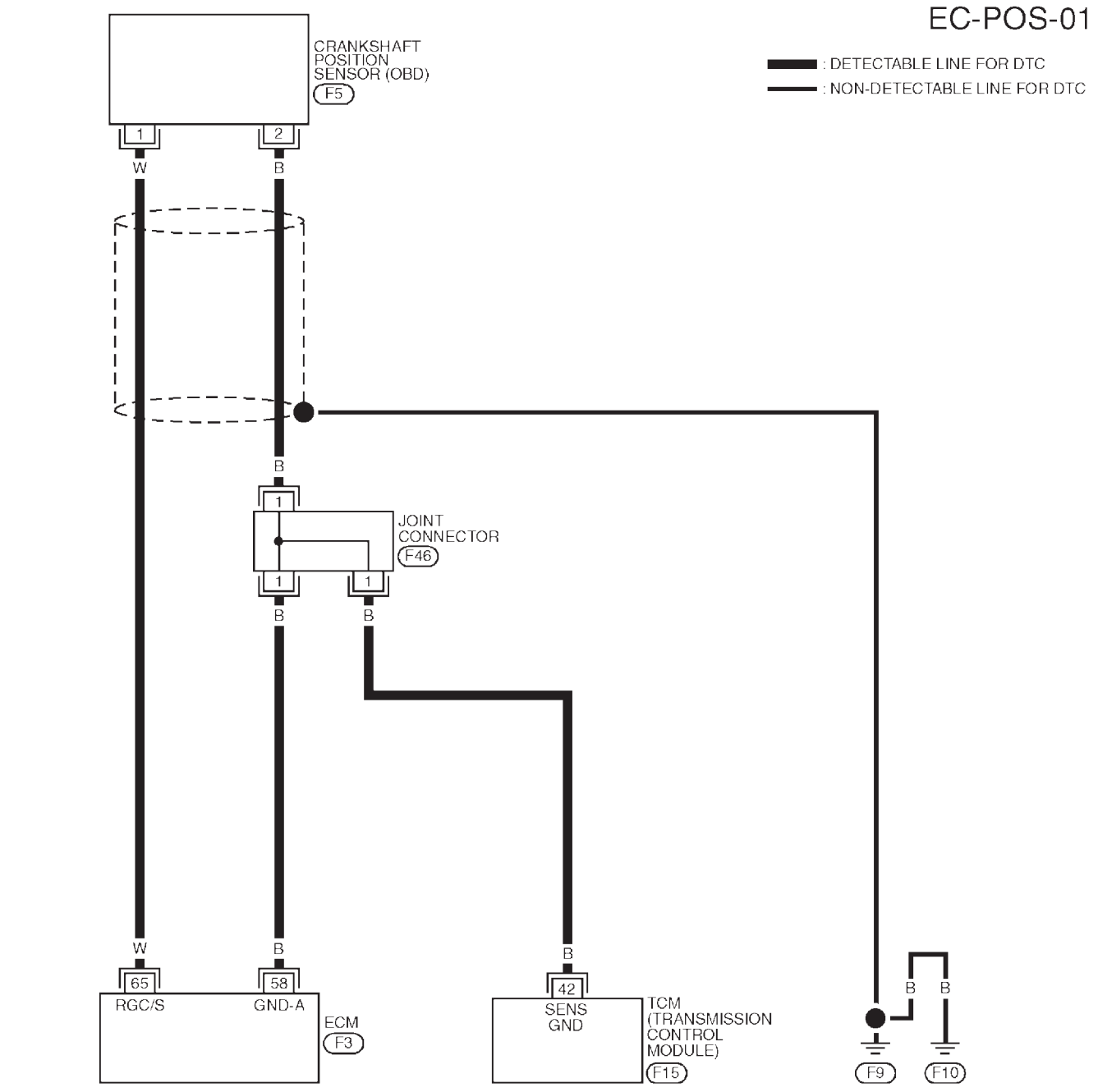


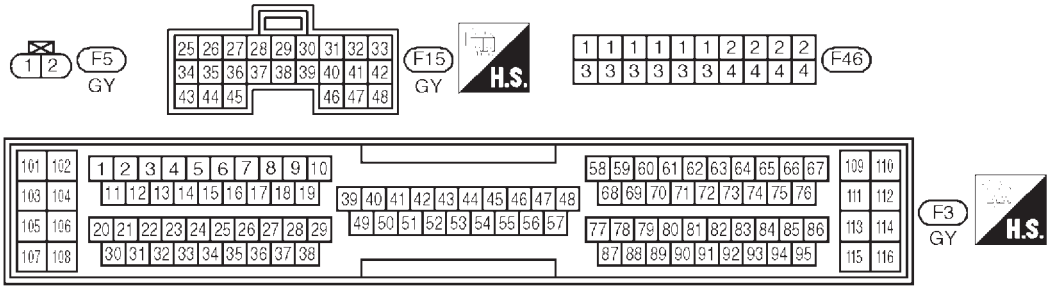
YEC698

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC1921S02





YEC921

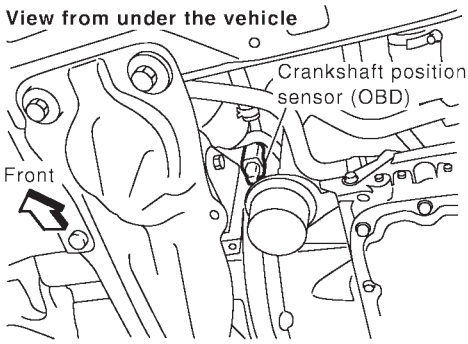
Diagnostic Procedure

NLEC1922

1	RETIGHTEN GROUND SCREWS
1. Turn ignition switch “OFF”. 2. Loosen and retighten engine ground screws.	
▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.



SEF777Z

2. Check continuity between ECM terminal 65 and CKPS (OBD) 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 harness for open or short between crankshaft position sensor (OBD) and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK GROUND CIRCUIT

1. Reconnect ECM harness connectors.
2. Check harness continuity between CKPS (OBD) 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.
- Joint connector-1 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between crankshaft position sensor (OBD) and ECM
- Harness for open or short between crankshaft position sensor (OBD) and TCM (Transmission control module)

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

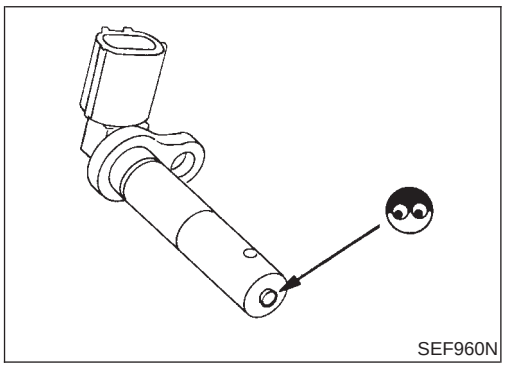
Diagnostic Procedure (Cont'd)

6	CHECK IMPROPER INSTALLATION	
Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD). Then retest.		
Trouble is not fixed.	▶	GO TO 7.

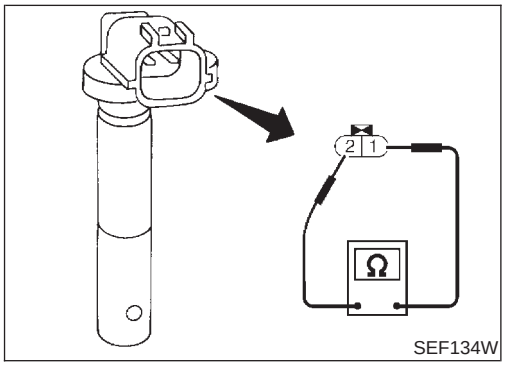
7	CHECK CRANKSHAFT POSITION SENSOR (OBD)	
Refer to "Component Inspection", EC-914.		
	OK or NG	
OK	▶	GO TO 8.
NG	▶	Replace crankshaft position sensor (OBD).

8	CHECK GEAR TOOTH	
Visually check for chipping drive plate gear tooth (cog).		
	OK or NG	
OK	▶	GO TO 9.
NG	▶	Replace the drive plate.

9	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**



SEF960N



SEF134W

Component Inspection

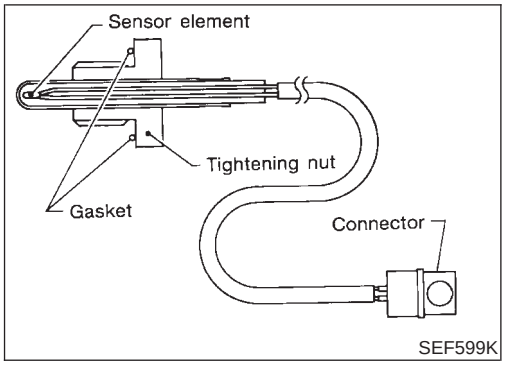
NLEC1923

CRANKSHAFT POSITION SENSOR (OBD)

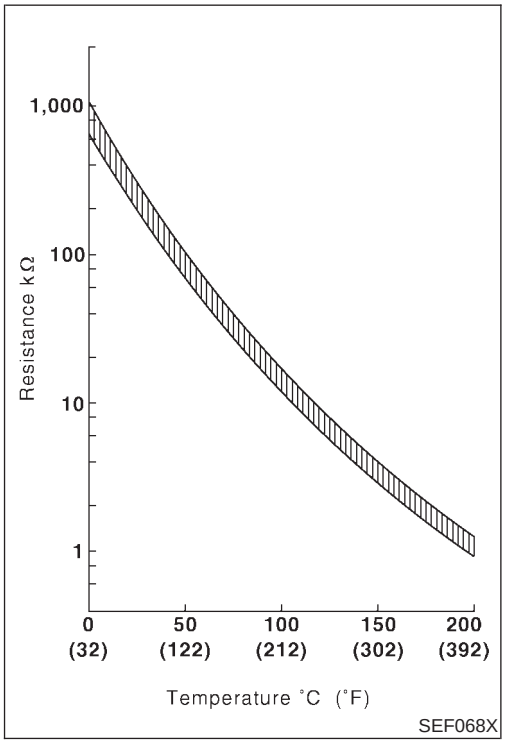
NLEC1923S01

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance as shown in the figure.

Resistance: 166 - 204 Ω [at 20°C (68°F)]



SEF599K



SEF068X

Component Description

NLEC1627

The EGR temperature sensor detects temperature changes in the EGR passageway. When the EGR volume control valve opens, hot exhaust gases flow, and the temperature in the passageway changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases. This sensor is not used to control the engine system.
It is used only for the on board diagnosis.

<Reference data>

EGR temperature °C (°F)	Voltage* V	Resistance MΩ
0 (32)	4.56	0.73 - 0.89
50 (122)	2.25	0.074 - 0.082
100 (212)	0.59	0.012 - 0.014

*: These data are reference values and are measured between ECM terminal 72 (EGR temperature sensor) and ground.
When EGR system is operating.
Voltage: 0 - 1.5V

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

NLEC1628

DTC No.	Malfunction is detected when ...		Check Items (Possible Cause)
P1401	A)	An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low.	● Harness or connectors (The EGR temperature sensor circuit is shorted.) ● EGR temperature sensor ● Malfunction of EGR function
	B)	An excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high.	● Harness or connectors (The EGR temperature sensor circuit is open.) ● EGR temperature sensor ● Malfunction of EGR function

DTC Confirmation Procedure

NLEC1629

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.

4

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C

SEF174Y

PROCEDURE FOR MALFUNCTION A

=NLEC1629S01

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Verify that "COOLAN TEMP/S" is less than 50°C (122°F).
   If the engine coolant temperature is above the range, cool the engine down.
4) Start engine and let it idle for at least 8 seconds.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-919.

With GST

Follow the procedure "With CONSULT-II" above.

4

ACTIVE TEST	
EGR VOL CONT/V	50 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF200Y

PROCEDURE FOR MALFUNCTION B

NLEC1629S02

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

Always perform the test at a temperature above −10°C (14°F).

With CONSULT-II

1) Start engine and warm it up to above 80°C (176°F).
2) Select "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
3) Hold engine speed at 1,500 rpm.
4) Touch "Qu" and set the EGR volume control valve opening to 50 step and check EGR TEMP SEN.
   EGR TEMP SEN should decrease to less than 1.0V.
   If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-919.
   If the check result is OK, go to the following step.

7

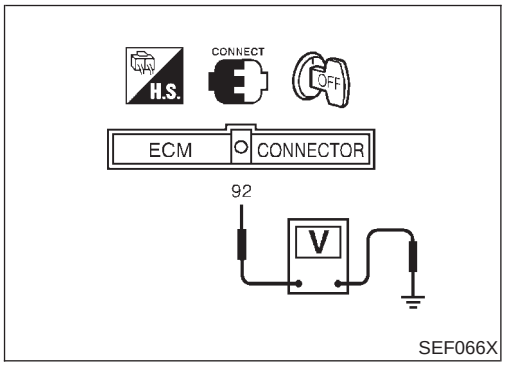
DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

SEF201Y

5) Turn ignition switch "OFF" and wait at least 10 seconds then turn "ON".
6) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
7) Start engine and maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	1,600 - 3,500 rpm
VHCL SPEED SE	10 km/h (6 MPH) or more
B/FUEL SCHDL	5.0 - 8.5 msec
THRTL POS SEN	(X + 0.05) − (X + 0.87)V X = Voltage value measured at step 6
Selector lever	Suitable position

8) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-919.



With GST

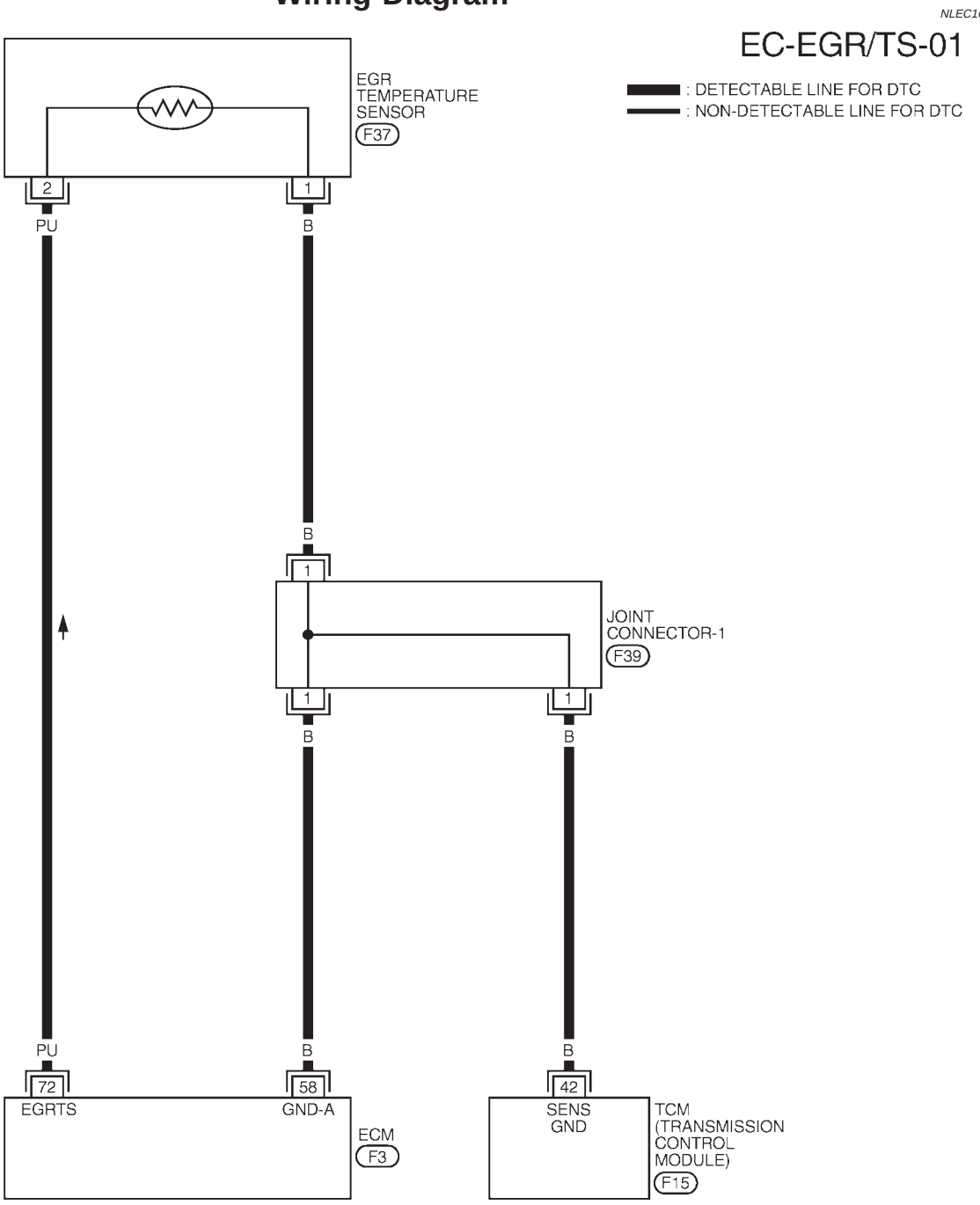
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 seconds, then turn "ON".
3) Select "MODE 1" with GST and maintain the following conditions for at least 5 consecutive seconds.

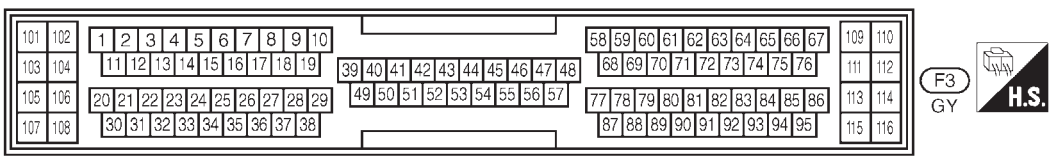
Engine speed	1,600 - 3,500 rpm
Vehicle speed	10 km/h (6 MPH) or more
Voltage between ECM terminal 92 and ground	0.86 - 2.0V
Selector lever	Suitable position

4) Select "MODE 7" with GST
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-919.

Wiring Diagram

NLEC1630





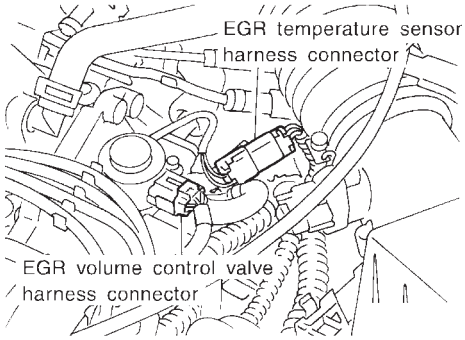
YEC708

Diagnostic Procedure

NLEC1631

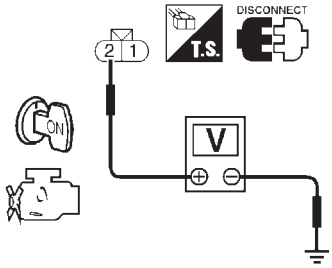
1	CHECK POWER SUPPLY

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



SEF216X

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



Voltage: Approximately 5V

SEF896X

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair harness or connectors.

2	CHECK GROUND CIRCUIT

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

3	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-1
- Harness for open or short between EGR temperature sensor and ECM
- Harness for open or short between TCM (Transmission Control Module) and ECM

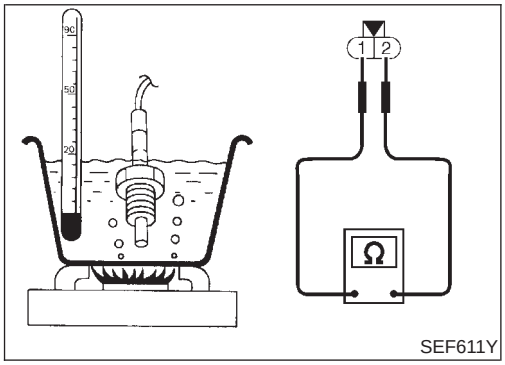
	▶	Repair open circuit or short to power in harness or connector.

Diagnostic Procedure (Cont'd)

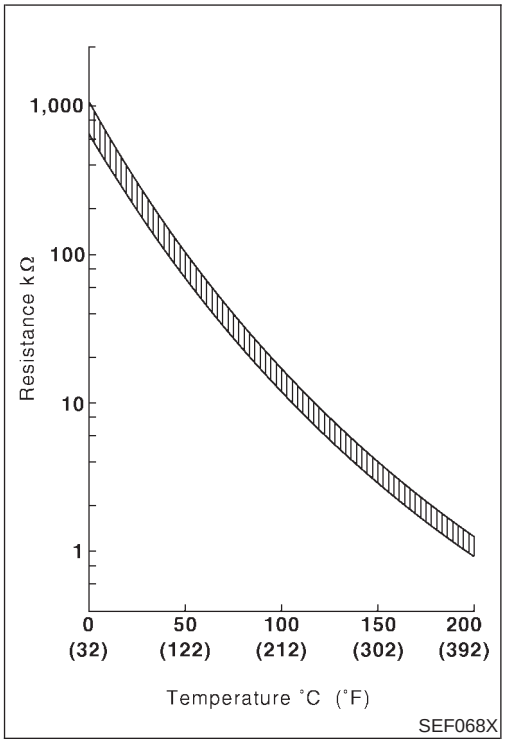
4	CHECK EGR TEMPERATURE SENSOR	
Refer to "Component Inspection", EC-920.		
	OK or NG	
OK	▶	GO TO 5.
NG	▶	Replace EGR temperature sensor.

5	CHECK EGR VOLUME CONTROL VALVE	
Refer to "Component Inspection", EC-847.		
	OK or NG	
OK	▶	GO TO 6.
NG	▶	Replace EGR volume control valve.

6	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**



SEF611Y



SEF068X

Component Inspection

EGR TEMPERATURE SENSOR

NLEC1632

NLEC1632S01

Check resistance change and resistance value.
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.73 - 0.89
50 (122)	2.25	0.074 - 0.082
100 (212)	0.59	0.012 - 0.014

If NG, replace EGR temperature sensor.

Description

NLEC1633

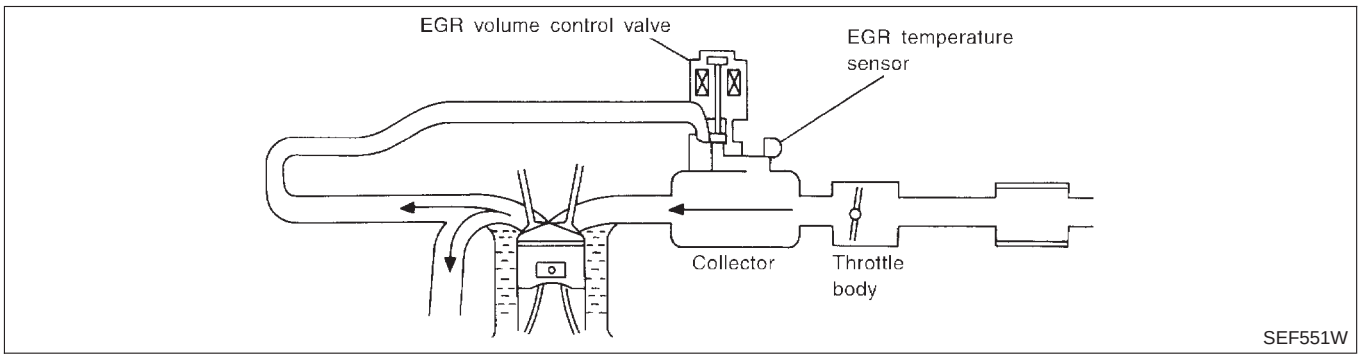
SYSTEM DESCRIPTION

NLEC1633S01

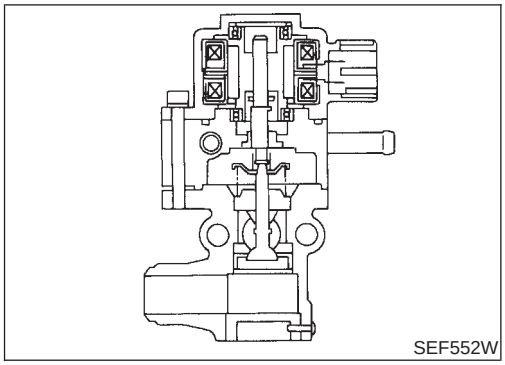
Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	EGR volume control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
Park/Neutral position switch	Park/Neutral position		
TCM (Transmission Control Module)	Gear position, shifting signal		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Extremely light load engine operation
- Mass air flow sensor malfunction
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High-speed engine operation
- Wide open throttle
- Low battery voltage
- Engine starting



Description (Cont'd)


SEF552W

COMPONENT DESCRIPTION

NLEC1633S02

EGR Volume Control Valve

NLEC1633S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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

NLEC1634

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

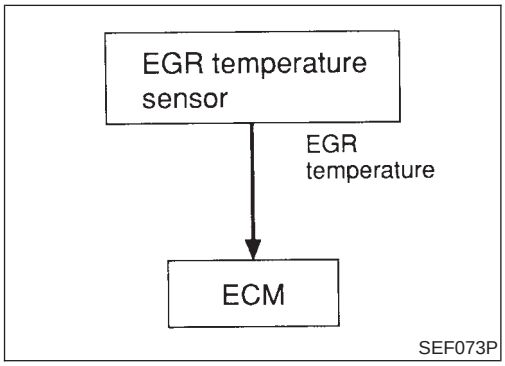
NLEC1635

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)
8 9 17 18	SB W/B R/W G/R	EGR volume control valve	**[Engine is running.]** ● Warm-up condition ● Idle speed	0 - 14V
58	B	Sensor's ground	**[Engine is running.]** ● Warm-up condition ● Idle speed	0V
72	PU	EGR temperature sensor	**[Engine is running.]** ● Warm-up condition ● Idle speed	Less than 4.5V
			[Engine is running.] ● Warm-up condition ● EGR system is operating.	0 - 1.0V



SEF073P

On Board Diagnosis Logic

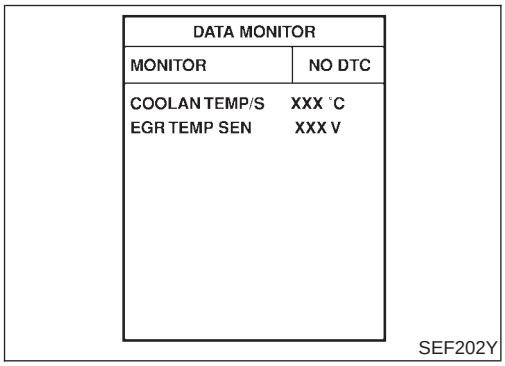
NLEC1636

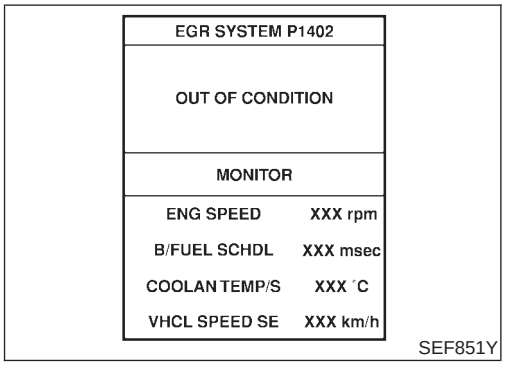
If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

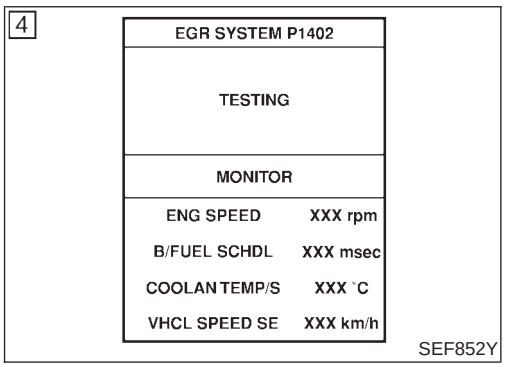
NOTE:

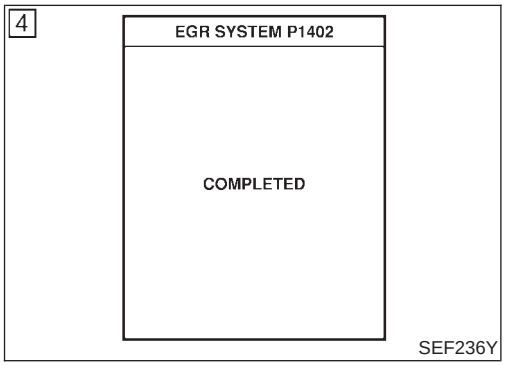
Diagnosis for this DTC will occur when engine coolant temperature is below 50 to 60°C (122 to 140°F). Therefore, it will be better to turn ignition switch "ON" (start engine) at the engine coolant temperature below 30°C (86°F) when starting DTC confirmation procedure.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1402	● EGR flow is detected under conditions that do not call for EGR.	● Harness or connectors (The valve circuit is open or shorted.) ● EGR volume control valve leaking or stuck open ● EGR temperature sensor









DTC Confirmation Procedure

NLEC1637

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:

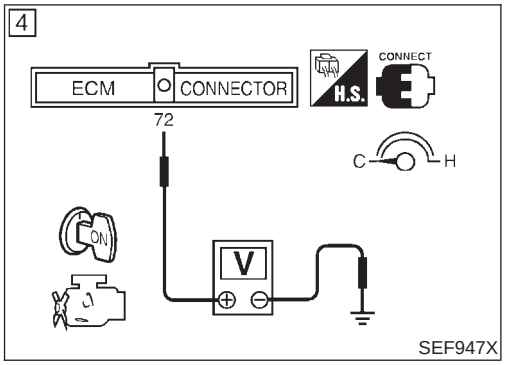
- **Always perform at a temperature above −10°C (14°F).**
- **Engine coolant temperature and EGR temperature must be verified in "DATA MONITOR" mode with CONSULT-II before starting DTC WORK SUPPORT test. If it is out of range below, the test cannot be conducted.**
  COOLAN TEMP/S: −10 to 50°C (14 to 122°F)*
  EGR TEMP SEN: Less than 4.8V
  If the values are out of the ranges indicated above, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to reduce the engine coolant or EGR temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

*: Although CONSULT-II screen displays "−10 to 40°C (14 to 104°F)" as a range of engine coolant temperature, ignore it.

With CONSULT-II

1) Turn ignition switch "OFF" and wait at least 10 seconds, then turn ignition switch "ON".
2) Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
3) Touch "START". Follow instruction of CONSULT-II.
4) Start engine and let it idle until "TESTING" on CONSULT-II screen is turned to "COMPLETED". (It will take 60 seconds or more.)
   If "TESTING" is not displayed after 5 minutes, turn ignition "OFF" and cool the engine coolant temperature to the range of −10 to 50°C (14 to 122°F). Retry from step 1.
5) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-926.

DTC Confirmation Procedure (Cont'd)



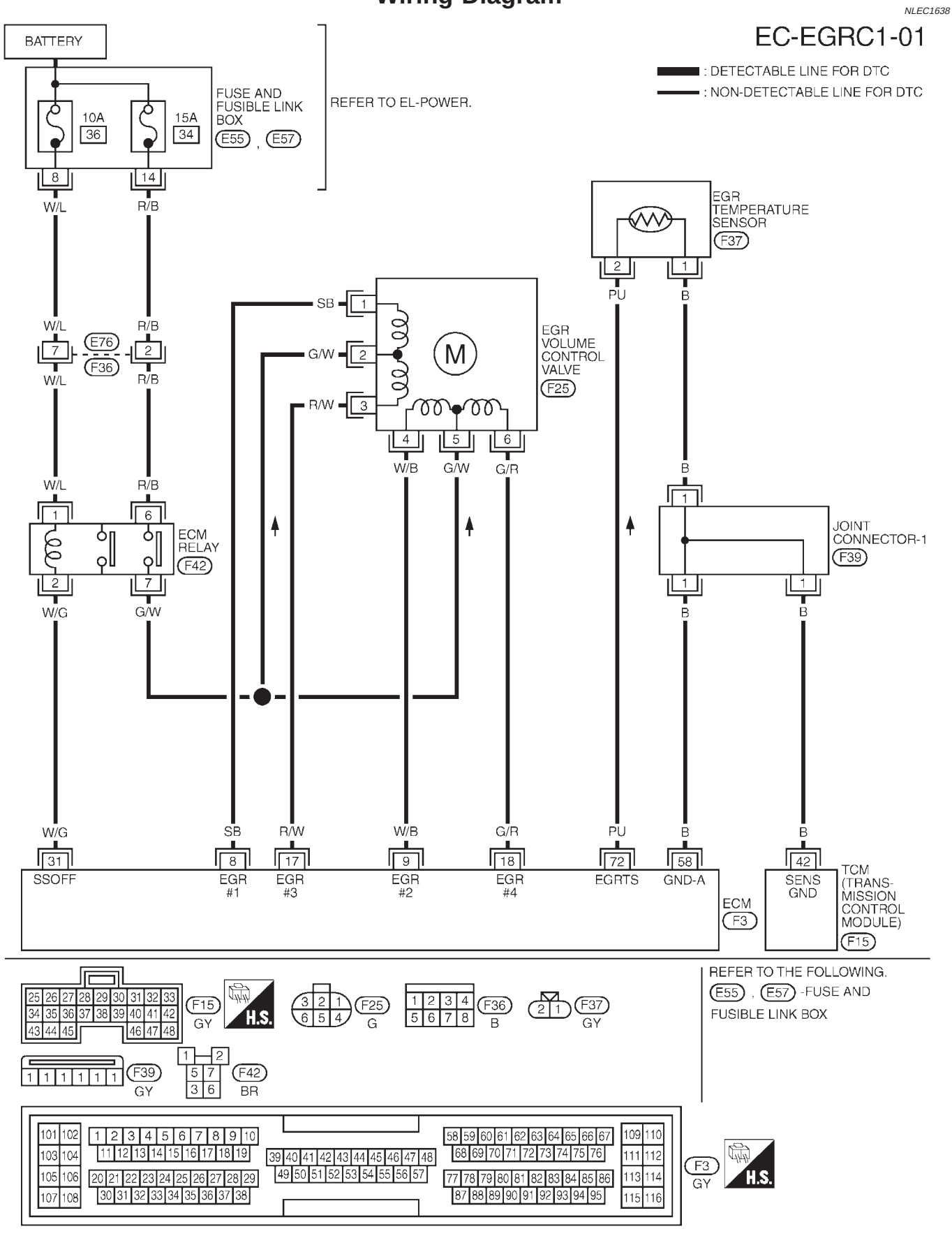
With GST

1) Turn ignition switch "ON" and select "MODE 1" with GST.
2) Check that engine coolant temperature is within the range of −10 to 50°C (14 to 122°F).
3) Check that voltage between ECM terminal 72 (EGR temperature sensor signal) and ground is less than 4.8V.
4) Start engine and let it idle for at least 60 seconds.
5) Stop engine.
6) Perform from step 1 to 4.
7) Select "MODE 3" with GST.
8) If DTC is detected, go to "Diagnostic Procedure", EC-926.

- **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

NLEC1638



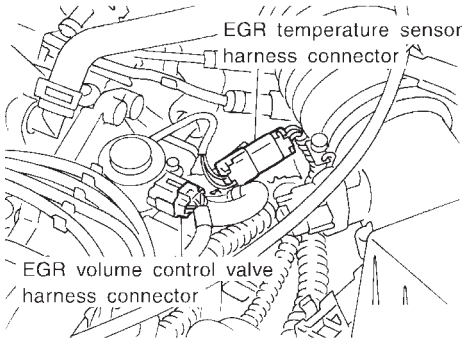
YEC700

Diagnostic Procedure

NLEC1639

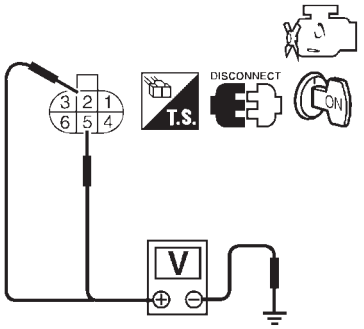
1	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.



SEF216X

2. Turn ignition switch “ON”.
3. Check voltage between EGR volume control valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF782Z

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuse
- Harness connectors E76, F36
- ECM relay
- Harness for open or short between EGR volume control valve and fuse.

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and EGR volume control valve terminal 1,
   ECM terminal 9 and EGR volume control valve terminal 4,
   ECM terminal 17 and EGR volume control valve terminal 3,
   ECM terminal 18 and EGR volume control valve terminal 6.
   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, short to ground or short to power in harness connectors.

4	CHECK EGR TEMPERATURE SENSOR	
Refer to "COMPONENT INSPECTION", EC-920.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace EGR temperature sensor.

5	CHECK EGR VOLUME CONTROL VALVE	
Refer to "COMPONENT INSPECTION", EC-847.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Replace EGR volume control valve.

6	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**

System Description

NLEC1641

The malfunction information related to CVT 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 CVT related repair.

ECM Terminals and Reference Value

NLEC1642

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

CAUTION:

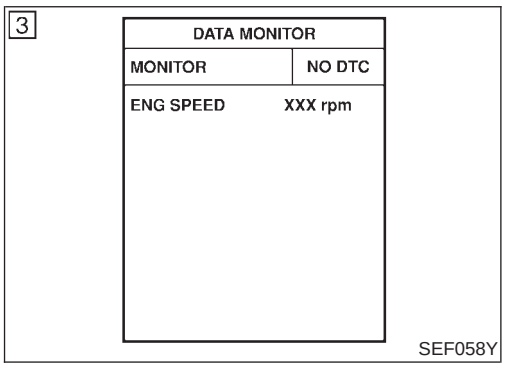
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
91	PU	CVT check signal	**[Ignition switch "ON"]**	0 - Approximately 5V

On Board Diagnosis Logic

NLEC1643

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1605	● An incorrect signal from TCM (Transmission Control Module) is sent to ECM.	● 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

NLEC1644

NOTE:

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

With CONSULT-II

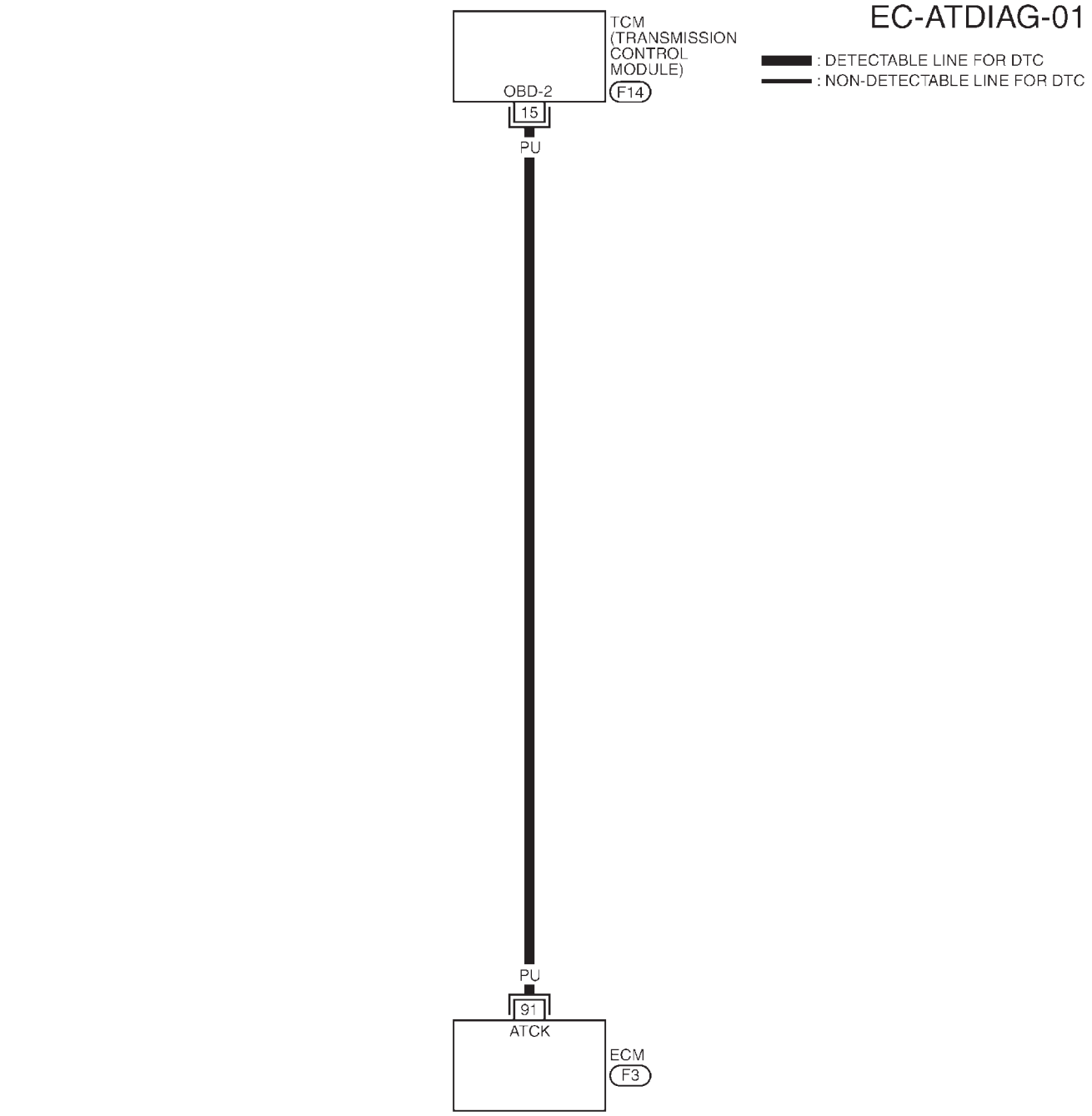
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and let it idle for at least 40 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-930.

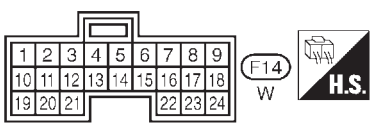
With GST

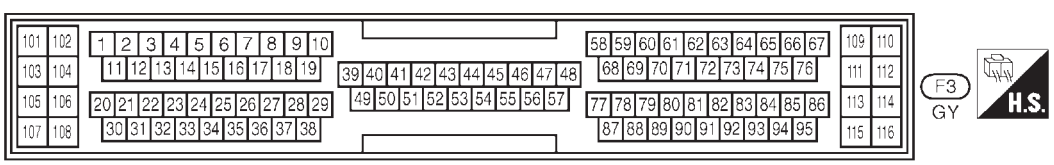
Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NLEC1645







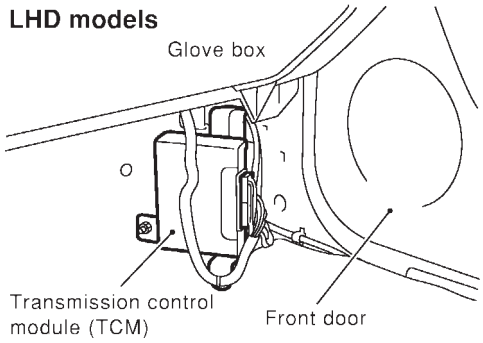
YEC709

Diagnostic Procedure

NLEC1646

1	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and TCM harness connector.



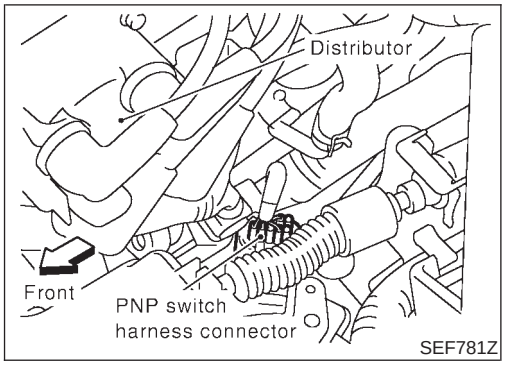
SEF116Y

3. Check harness continuity between ECM terminal 91 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
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-670.	
▶	**INSPECTION END**



Component Description

NLEC1647

When the gear position is “P” or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the park/neutral position when continuity with ground exists.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1648

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

ECM Terminals and Reference Value

NLEC1649

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)
42	G/OR	PNP switch	**[Ignition switch “ON”]** ● Gear position is “N” or “P”	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NLEC1650

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1706	● The signal of the PNP switch is not changed in the process of engine starting and driving.	● Harness or connectors (The PNP switch circuit is open or shorted.) ● PNP switch

DTC Confirmation Procedure

NLEC1651

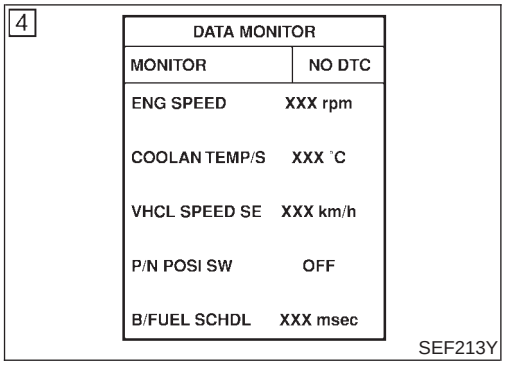
CAUTION:
Always drive vehicle at a safe speed.

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

With CONSULT-II

1) Turn ignition switch “ON”.

DTC Confirmation Procedure (Cont'd)



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.

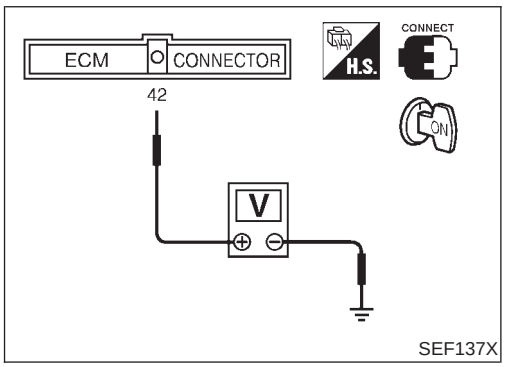
Position (Selector lever)	Known-good signal
"N" and "P" position	ON
Except the above position	OFF

If NG, go to "Diagnostic Procedure", EC-935.
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 50 consecutive seconds.

ENG SPEED	1,250 - 3,350 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.5 - 14.0 msec
VHCL SPEED SE	64 - 130 km/h (40 - 81 MPH)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-935.



Overall Function Check

NLEC1652

Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a 1st trip DTC might not be confirmed.

Without CONSULT-II

1) Turn ignition switch "ON".
2) Check voltage between ECM terminal 42 (PNP switch signal) 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 (11 - 14V)

3) If NG, go to "Diagnostic Procedure", EC-935.

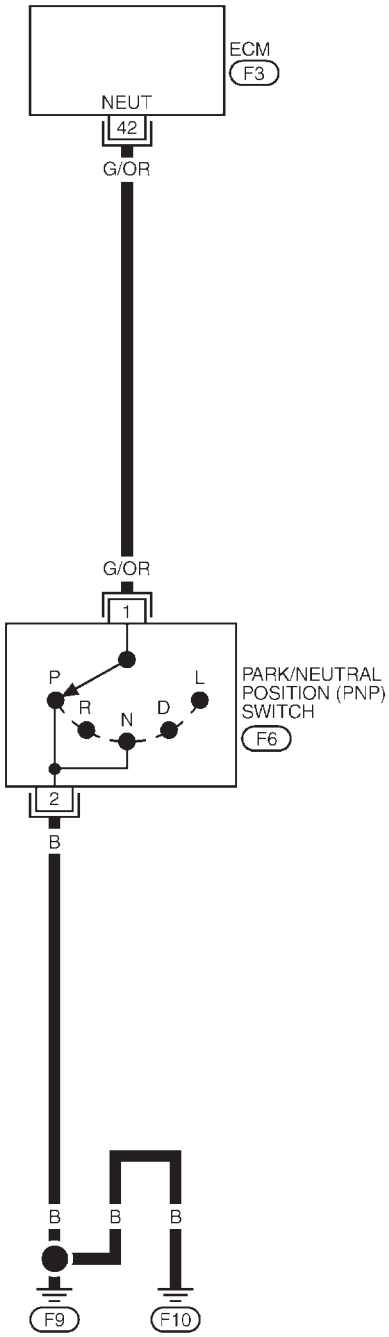
Wiring Diagram

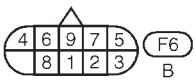
TYPE-1

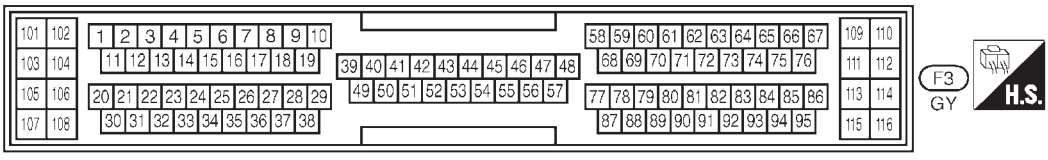
NLEC1653

NLEC1653S01

EC-PNP/SW-01







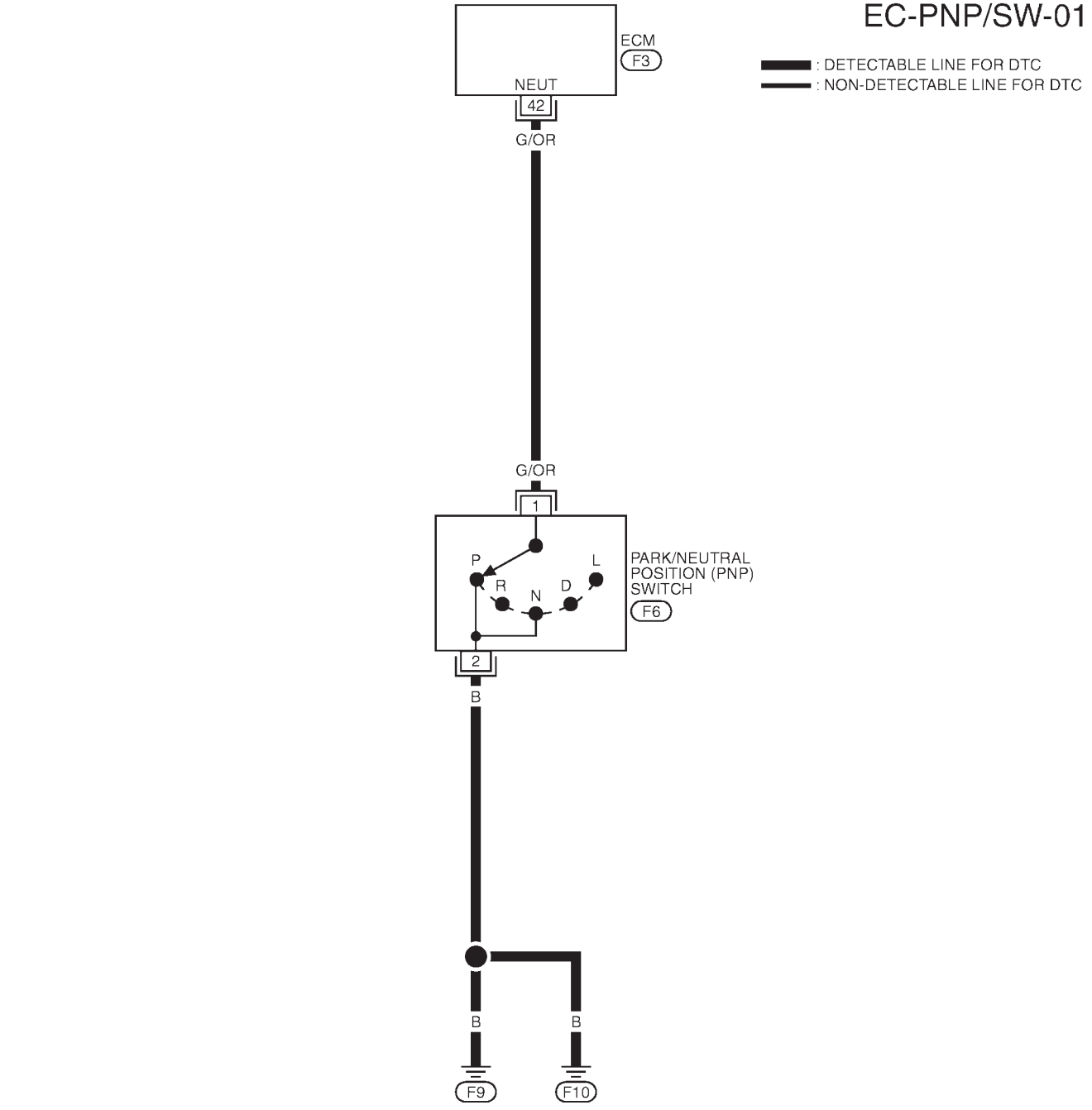
YEC710

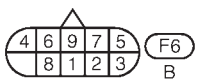
Wiring Diagram (Cont'd)

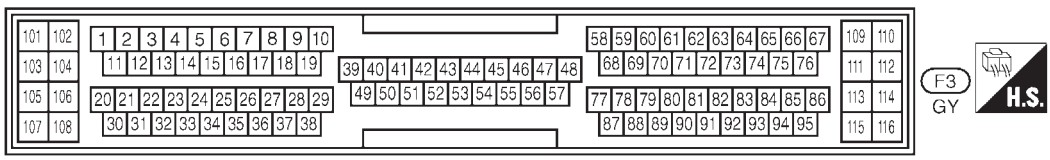
TYPE-2

NLEC1653S02

EC-PNP/SW-01







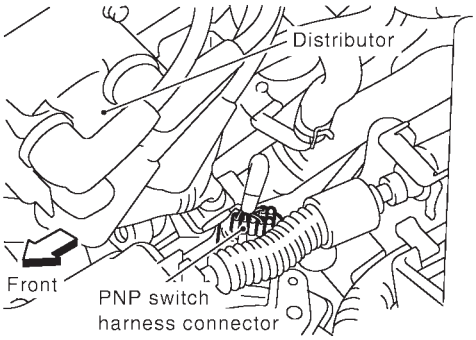
YEC929

Diagnostic Procedure

NLEC1654

1	CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect PNP switch harness connector.



SEF781Z

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 harness for open or short between PNP switch and body ground.

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

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 42 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 harness for open or short between ECM and PNP switch.

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

5	CHECK PNP SWITCH

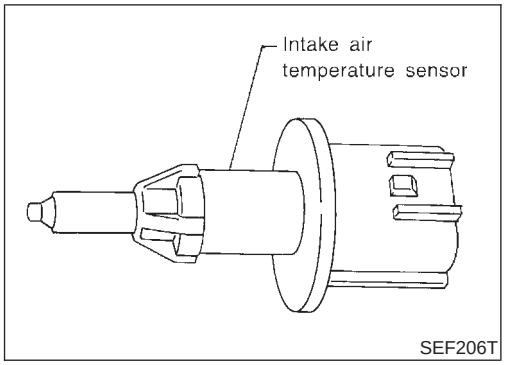
Refer to AT-66, “PARK/NEUTRAL POSITION (PNP) SWITCH”.

OK or NG

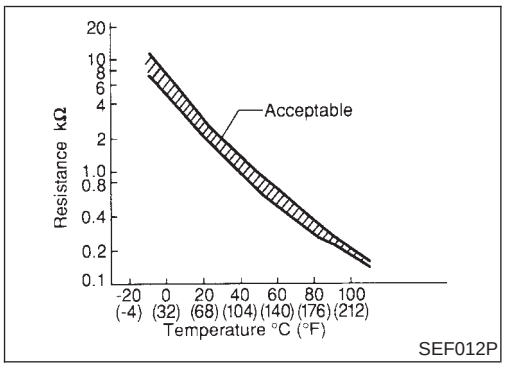
OK	▶	GO TO 6.
NG	▶	Replace PNP switch.

Diagnostic Procedure (Cont'd)

6	**CHECK INTERMITTENT INCIDENT**
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF206T



SEF012P

Component Description

NLEC1773

MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT

NLEC1773S01

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.

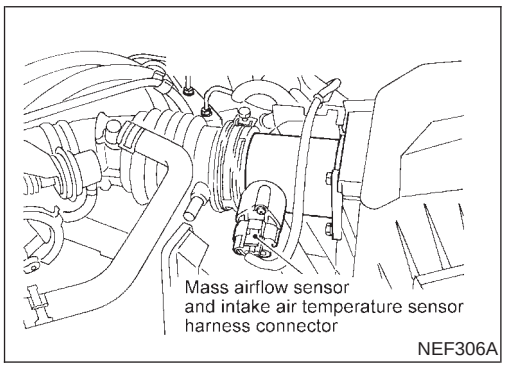
<Reference data>

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

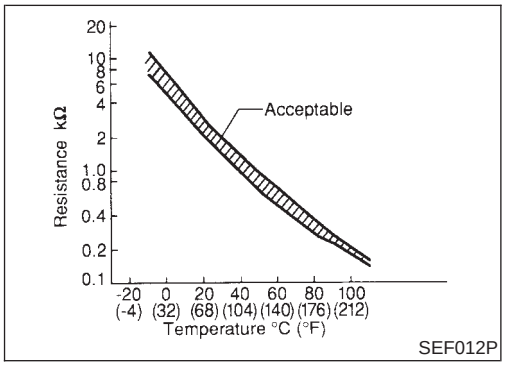
*: These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) and ground.

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.



NEF306A



SEF012P

MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR

NLEC1773S02

The intake air temperature sensor is built into the mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
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.

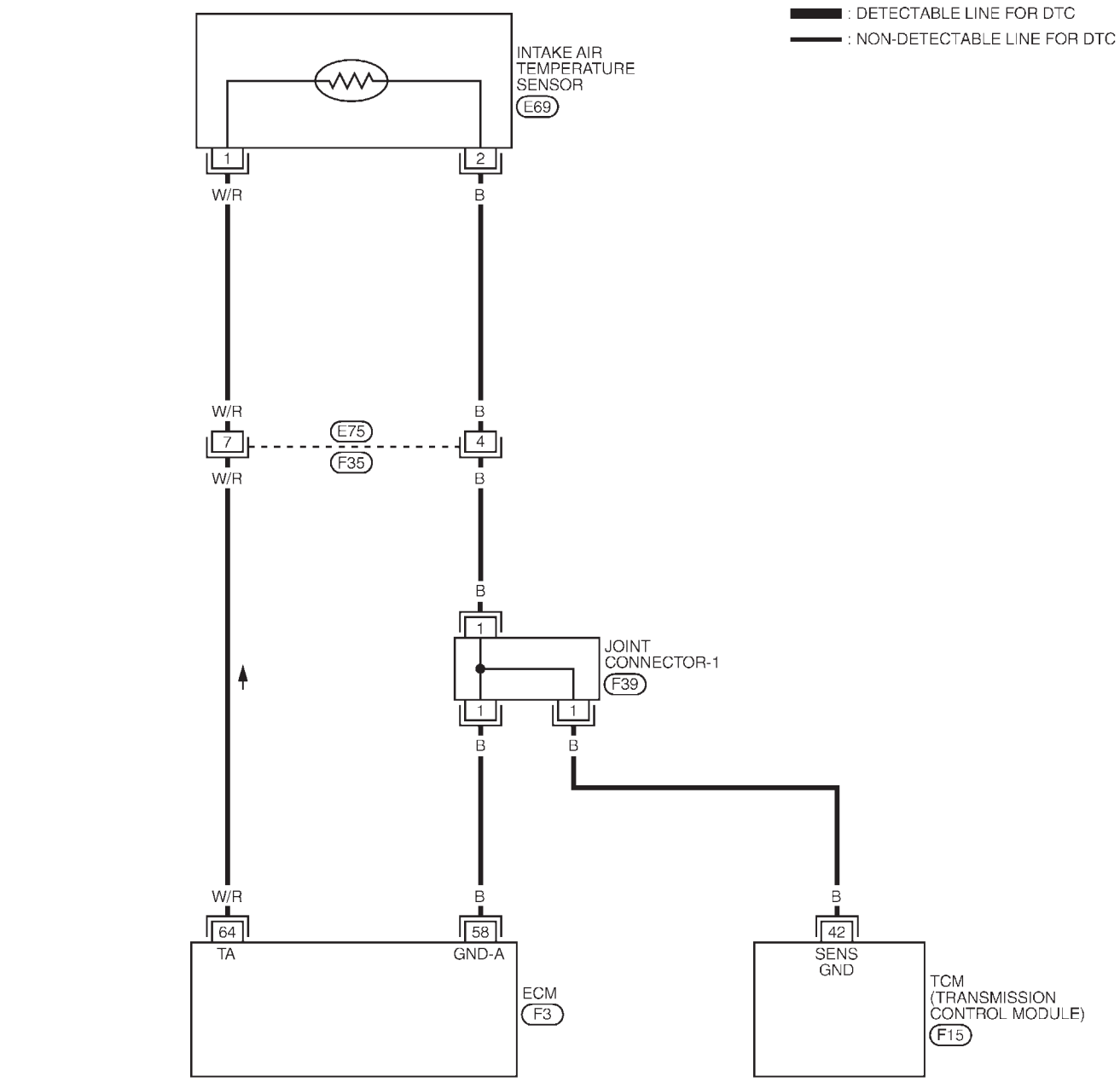
Wiring Diagram

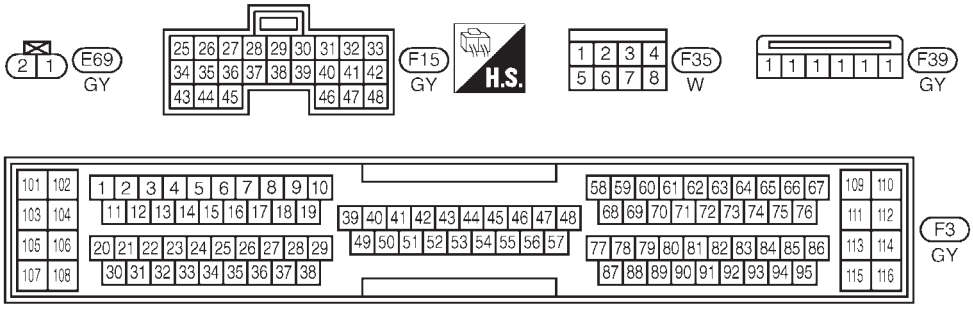
NLEC1776

MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT

NLEC1776S01

EC-IATSEN-01



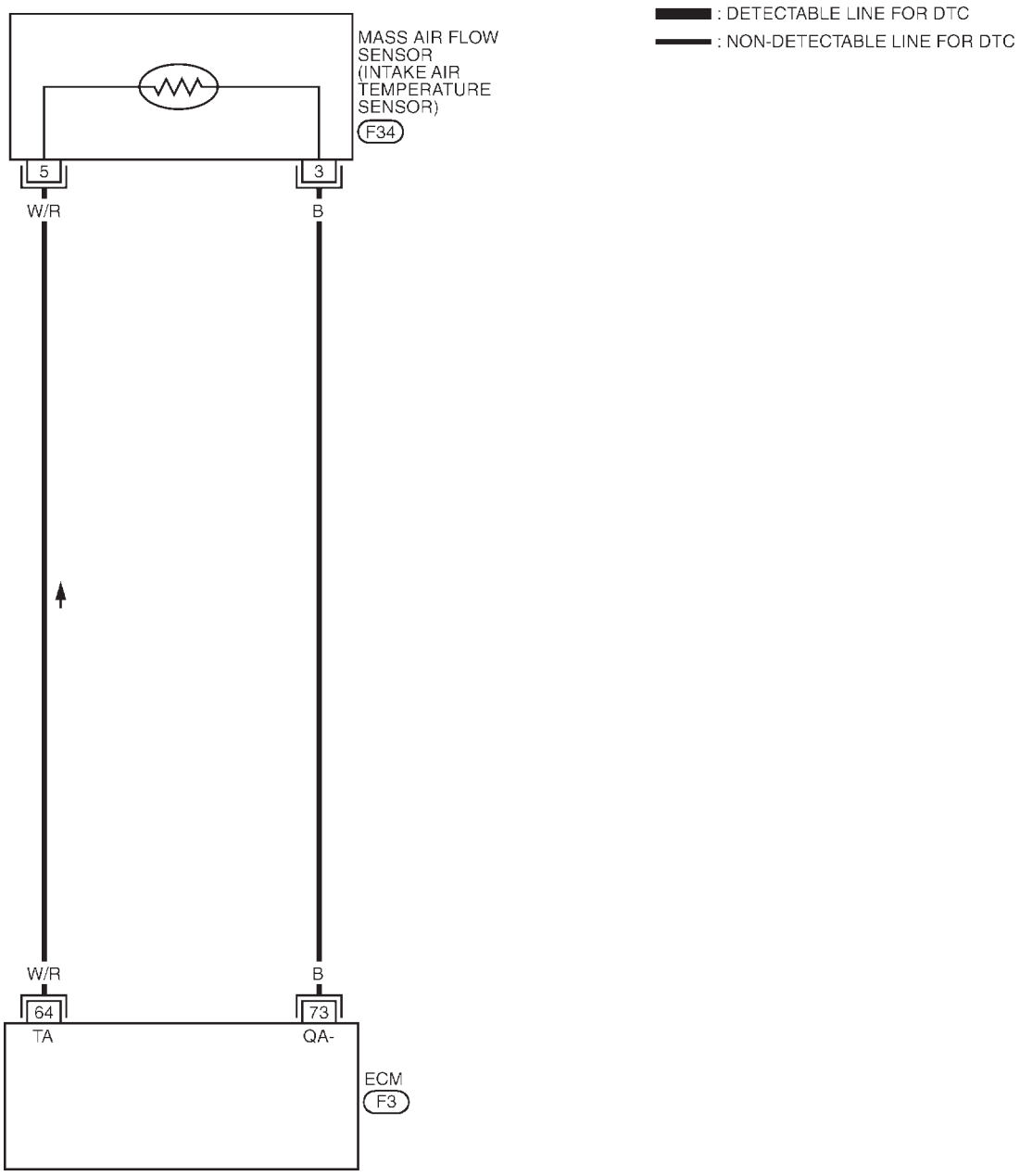


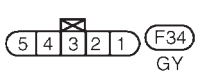
YEC755

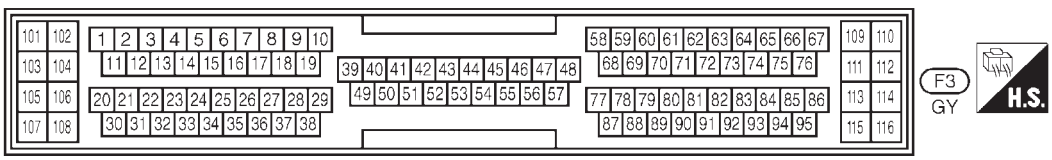
MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR

NLEC1776S02

EC-IATSEN-01







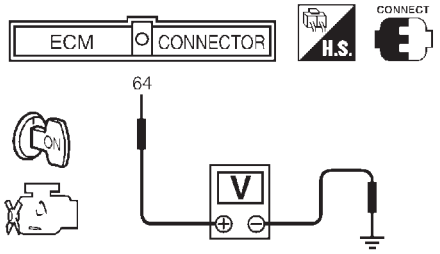
YEC930

Diagnostic Procedure

NLEC1779

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

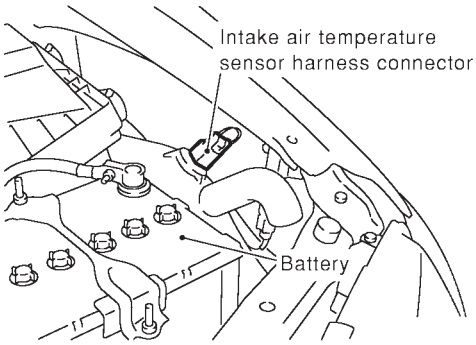
SEF004Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.(Models with intake air temperature sensor on intake air duct) GO TO 3. (Models with intake air temperature sensor in mass air flow sensor)

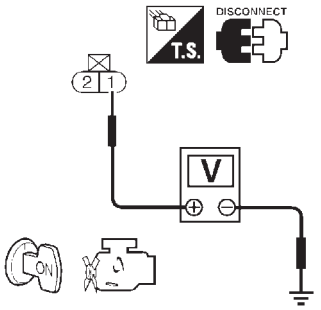
2	CHECK POWER SUPPLY (MODELS WITH INTAKE AIR TEMPERATURE SENSOR ON INTAKE AIR DUCT)

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



SEF602Y

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



Voltage: Approximately 5V

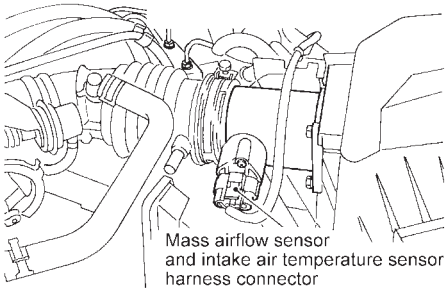
SEF301X

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

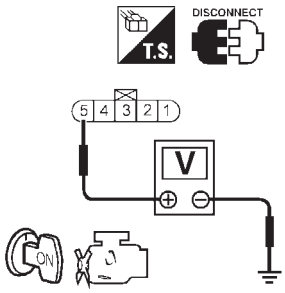
3	CHECK POWER SUPPLY (MODELS WITH INTAKE AIR TEMPERATURE SENSOR IN MASS AIR FLOW SENSOR)

1. Turn ignition switch "OFF".
2. Disconnect intake air temperature sensor (mass air flow sensor) harness connector.



NEF306A

3. Turn ignition switch "ON".
4. Check voltage between terminal 5 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

NEF307A

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E75, F35 (where fitted)
- Harness for open or short between ECM and intake air temperature sensor

	▶	Repair harness or connectors.

5	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between intake air temperature sensor harness connector ground terminal and engine ground.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

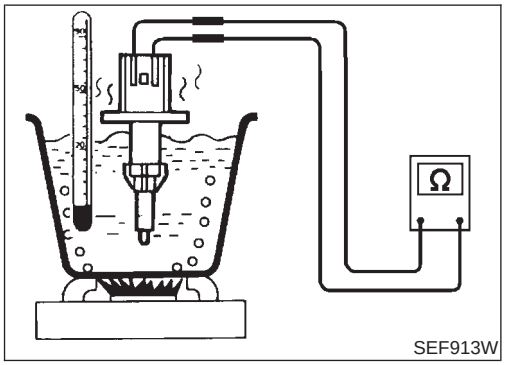
OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-1 (where fitted) ● Harness connectors E75, F35 (where fitted) ● 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 (where fitted)	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTAKE AIR TEMPERATURE SENSOR
Refer to "Component Inspection", EC-943.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Replace intake air temperature sensor.

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF913W

Component Inspection

NLEC1778

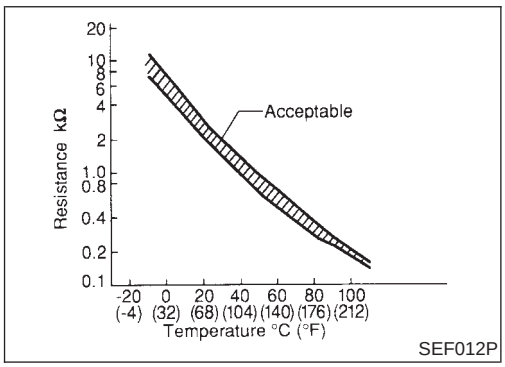
INTAKE AIR TEMPERATURE SENSOR

NLEC1778S01

Models with Intake Air Temperature Sensor on Intake Air Duct

NLEC1778S0101

Check resistance as shown in the figure.

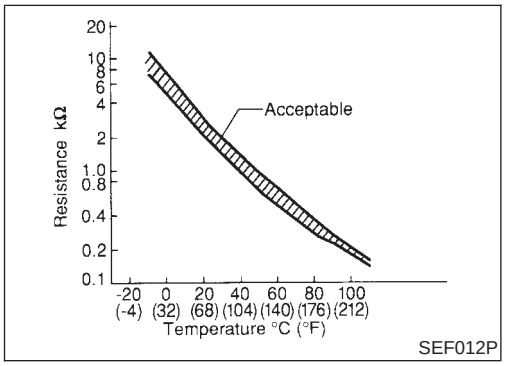


SEF012P

<Reference data>

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

If NG, replace intake air temperature sensor.



SEF012P

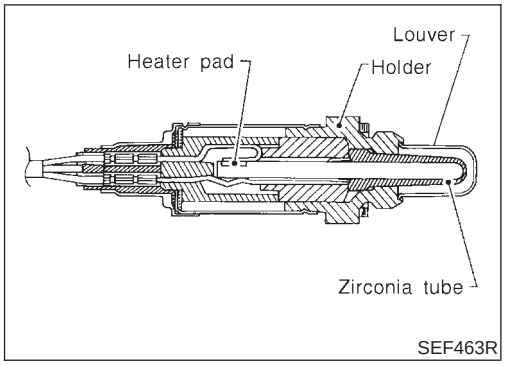
Models with Intake Air Temperature Sensor in Mass Air Flow Sensor

NLEC1778S0102

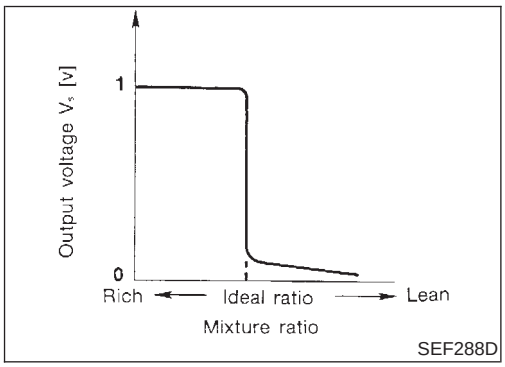
Check resistance between intake air temperature sensor (mass air flow sensor) terminal 3 and 5.
<Reference data>

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

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



SEF463R



SEF288D

Component Description

NLEC1780

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

NLEC1781

Specification data are reference values.

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

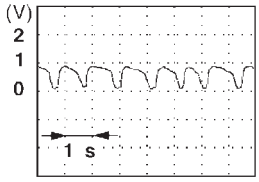
ECM Terminals and Reference Value

NLEC1782

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	W	Heated oxygen sensor 1 (front)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

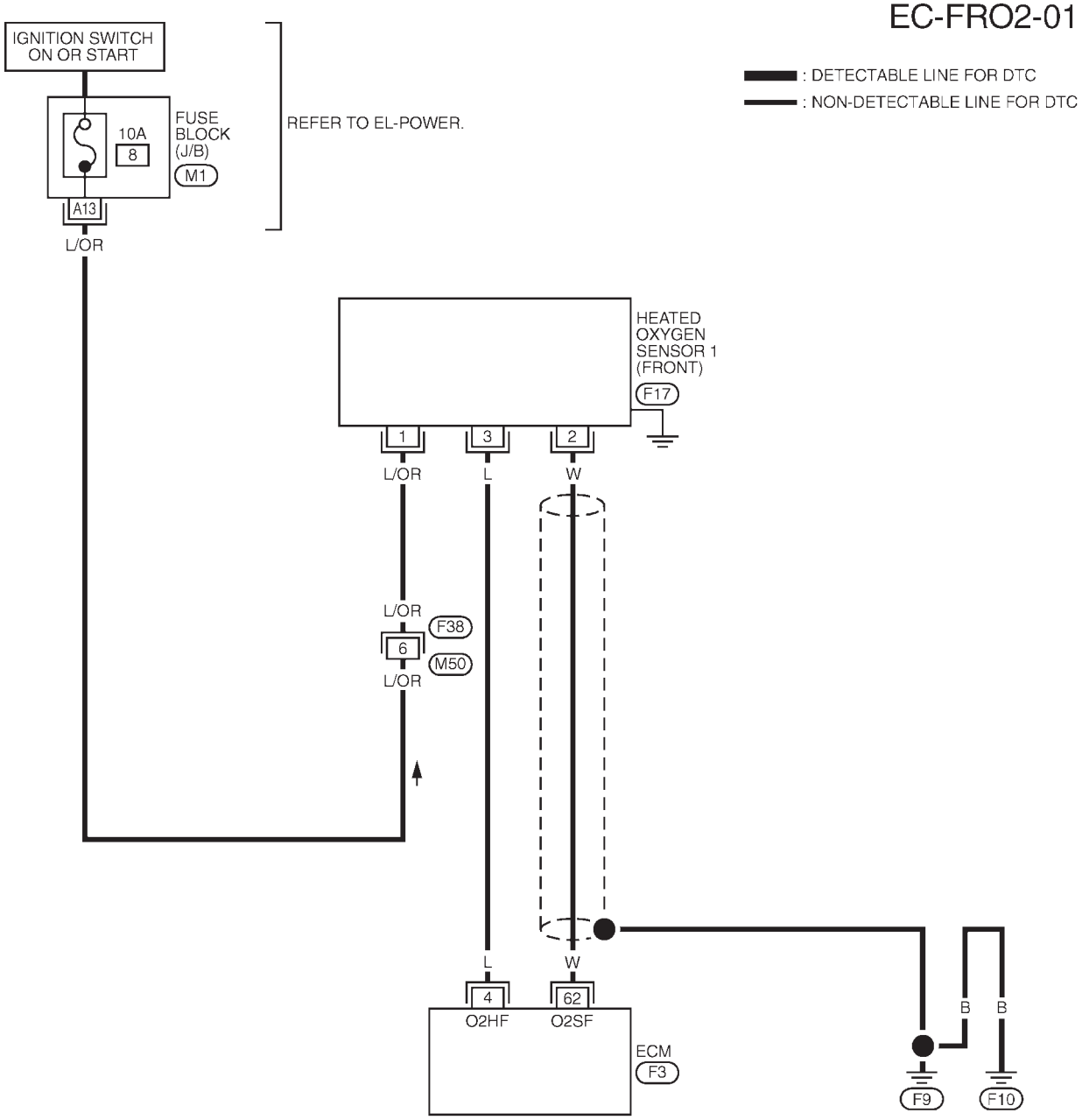
Wiring Diagram

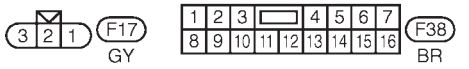
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1786

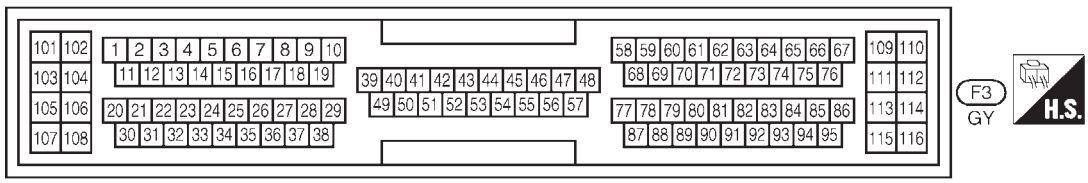
NLEC1786S03

EC-FRO2-01





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

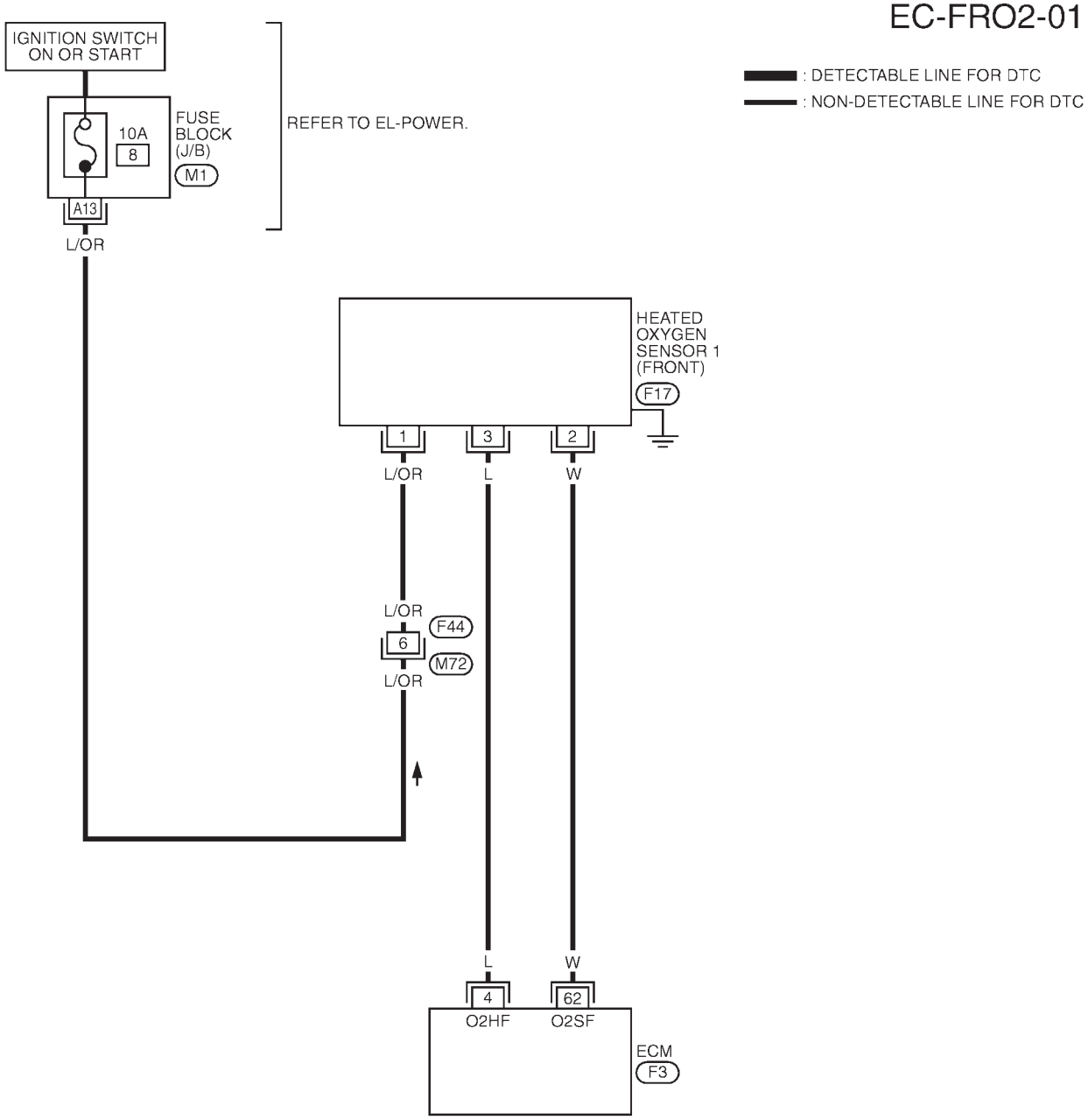


YEC744

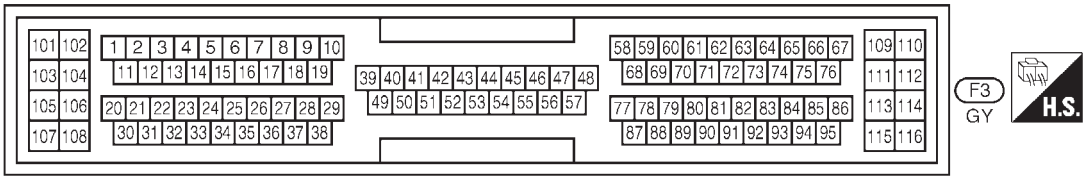
MODELS WITH ECM IN CABIN

NLEC1786S04

EC-FRO2-01



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



YEC931

Diagnostic Procedure

NLEC1789

1	INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes	▶	GO TO 2.
No	▶	GO TO 3.

2	CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 MNTR (B1)” in “DATA MONITOR” mode with CONSULT-II.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuate between LEAN and RICH more than five times in 10 seconds.

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

1 time: RICH → LEAN → RICH
2 times: RICH → LEAN → RICH → LEAN → RICH

SEF218Z

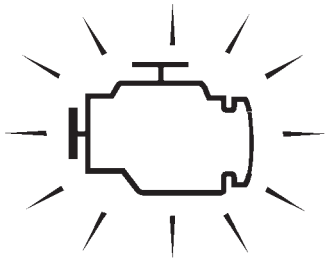
OK or NG

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-600.
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.



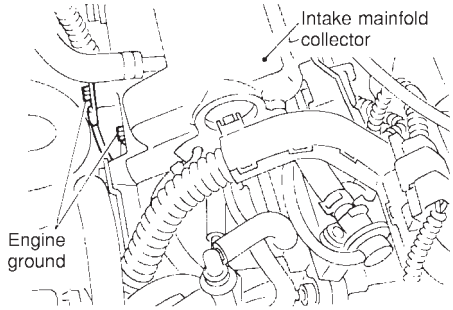
SAT652J

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

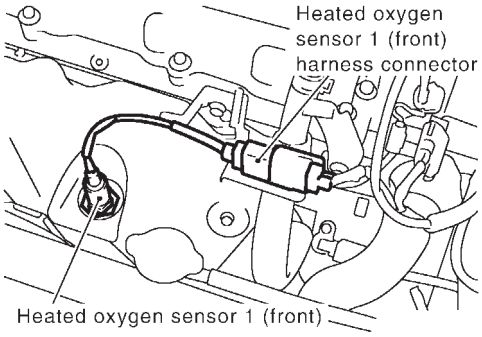
4	RETIGHTEN GROUND SCREWS

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



SEF202X

3. Disconnect heated oxygen sensor 1 (HO2S1) (front) harness connector.



SEF774Z

▶	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 INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 62 and HO2S1 terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 62 (or HO2S1 terminal 2) and ground.
   Continuity should not exist.
4. Also check harness for 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 HEATED OXYGEN SENSOR 1 (FRONT)	
Refer to "Component Inspection", EC-949.		
	OK or NG	
OK	▶	GO TO 8.
NG	▶	Replace heated oxygen sensor 1 (front).

8	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**

2

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

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

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

SEF217YA

Component Inspection

NLEC1790

HEATED OXYGEN SENSOR 1 (FRONT)

NLEC1790S01

With CONSULT-II

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

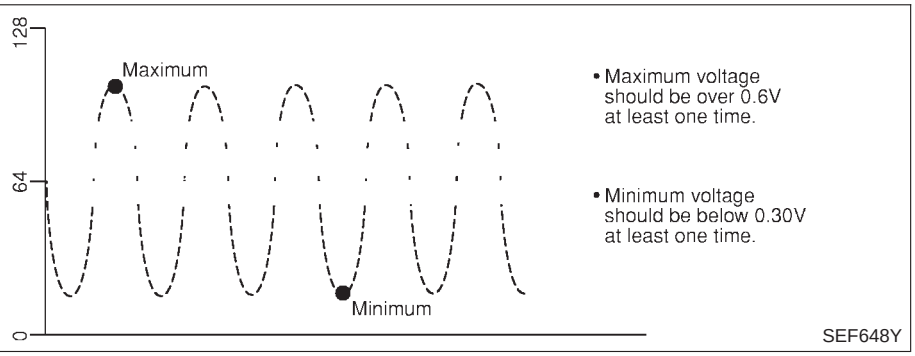
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "HO2S1 MNTR (B1)", "RICH"
  L = "HO2S1 MNTR (B1)", "LEAN"
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

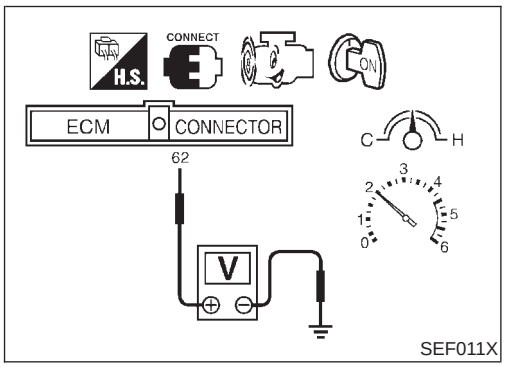
CAUTION:

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

Component Inspection (Cont'd)

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





Without CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (HO2S1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II [HEATED OXYGEN SENSOR 1 MONITOR (FRONT).]
- 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.

CAUTION:

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

Description

NLEC1791

SYSTEM DESCRIPTION

NLEC1791S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Heated oxygen sensor 1 heater (front) control	Heated oxygen sensor 1 heater (front)

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

OPERATION

NLEC1791S02

Engine speed	Heated oxygen sensor 1 heater (front)
Above 3,200 rpm	OFF
Below 3,200 rpm	ON

CONSULT-II Reference Value in Data Monitor Mode

NLEC1792

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine speed: Below 3,200 rpm	ON
	● Engine speed: Above 3,200 rpm	OFF

ECM Terminals and Reference Value

NLEC1793

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	L	Heated oxygen sensor 1 heater (front)	**[Engine is running]** ● Engine speed is below 3,200 rpm.	Approximately 0V
			[Engine is running] ● Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)

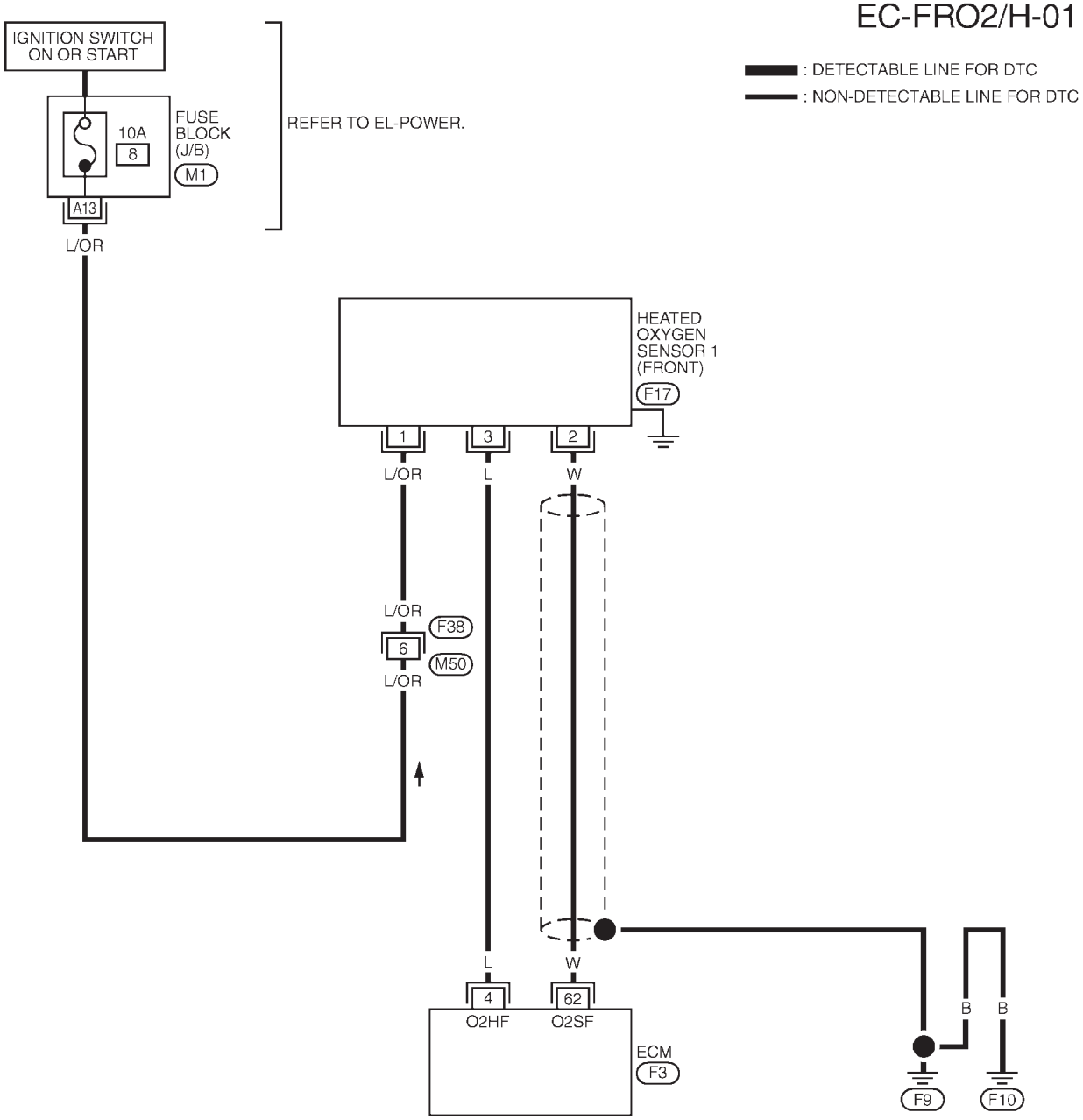
Wiring Diagram

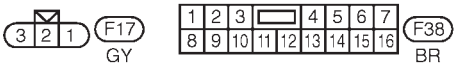
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1794

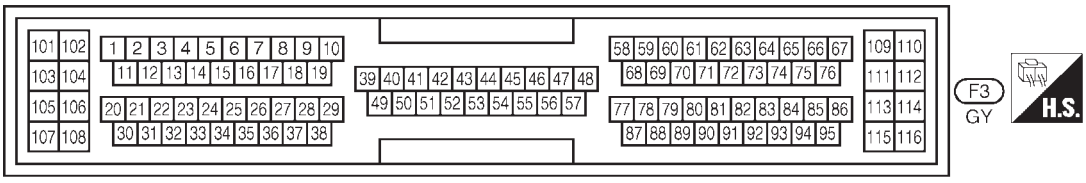
NLEC1794S03

EC-FRO2/H-01





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

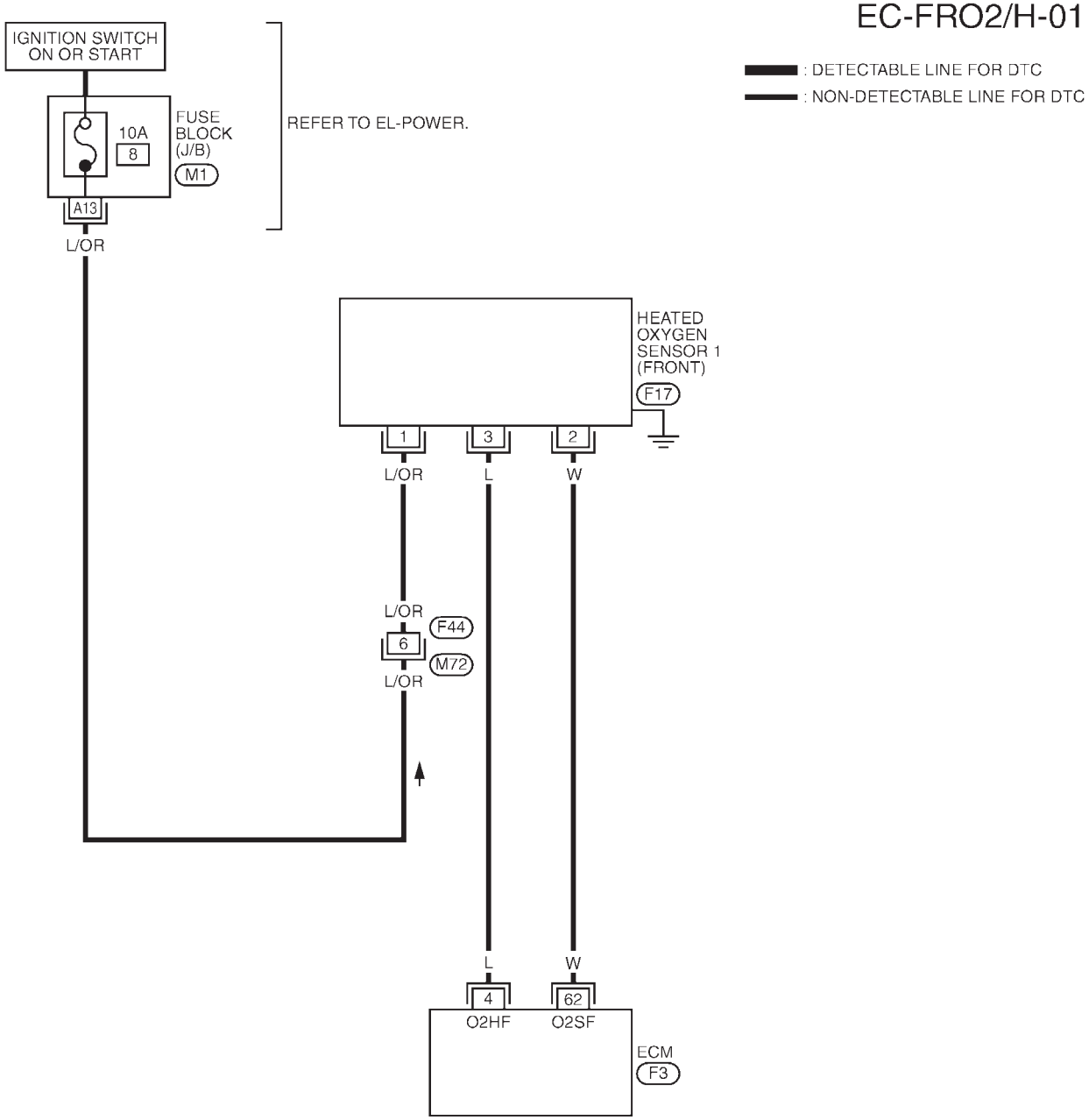


YEC745

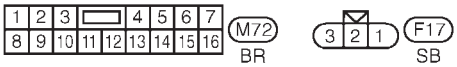
MODELS WITH ECM IN CABIN

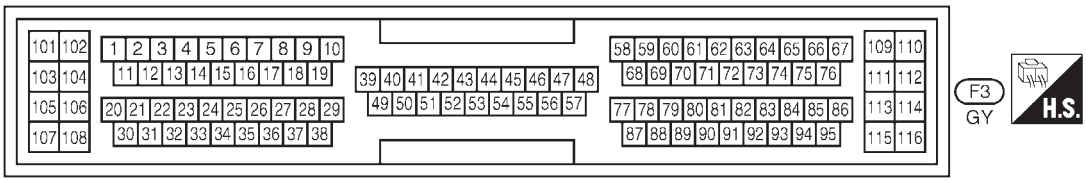
NLEC1794S04

EC-FRO2/H-01



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





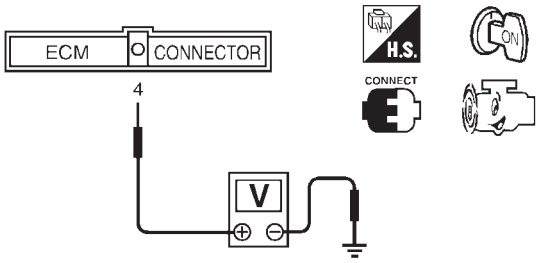
YEC932

Diagnostic Procedure

NLEC1795

1 CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Set the tester probe between ECM terminals 4 [HO2S1 Heater (front) 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 3,200 rpm.	Battery voltage

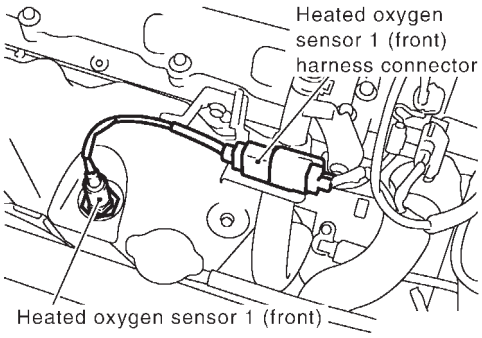
SEF239Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

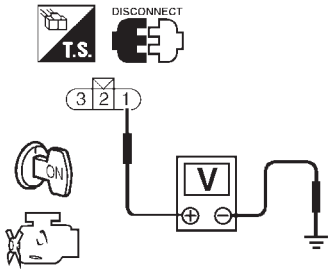
2 CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (front) harness connector.



SEF774Z

3. Turn ignition switch “ON”.
4. Check voltage between HO2S1 terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF934X

OK or NG

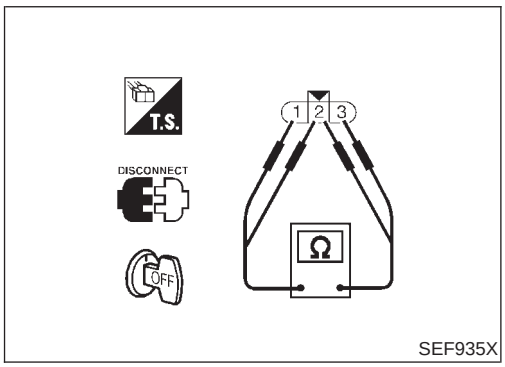
OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F38, M50 (where fitted) ● Harness connectors M72, F44 (where fitted) ● 10A fuse ● Harness for open or short between heated oxygen sensor 1 (front) and fuse	
▶	Repair harness or connectors.

4	CHECK GROUND CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between HO2S1 terminal 3 and ECM 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 HEATED OXYGEN SENSOR 1 HEATER (FRONT)
Refer to "Component Inspection", EC-955.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace heated oxygen sensor 1 (front).

6	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF935X

Component Inspection

NLEC1796

HEATED OXYGEN SENSOR 1 HEATER (FRONT)

NLEC1796S01

Check resistance between terminals 3 and 1.

Resistance: 2.3 - 4.3 Ω at 25°C (77°F)

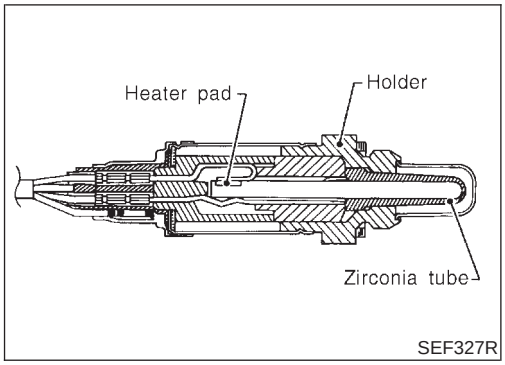
Check continuity between terminals 2 and 1, 3 and 2.

Continuity should not exist.

If NG, replace the heated oxygen sensor 1 (front).

CAUTION:

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



Component Description

NLEC1797

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

NLEC1798

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

ECM Terminals and Reference Value

NLEC1799

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)
63	L	Heated oxygen sensor 2 (rear)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 3,000 rpm	0 - Approximately 1.0V

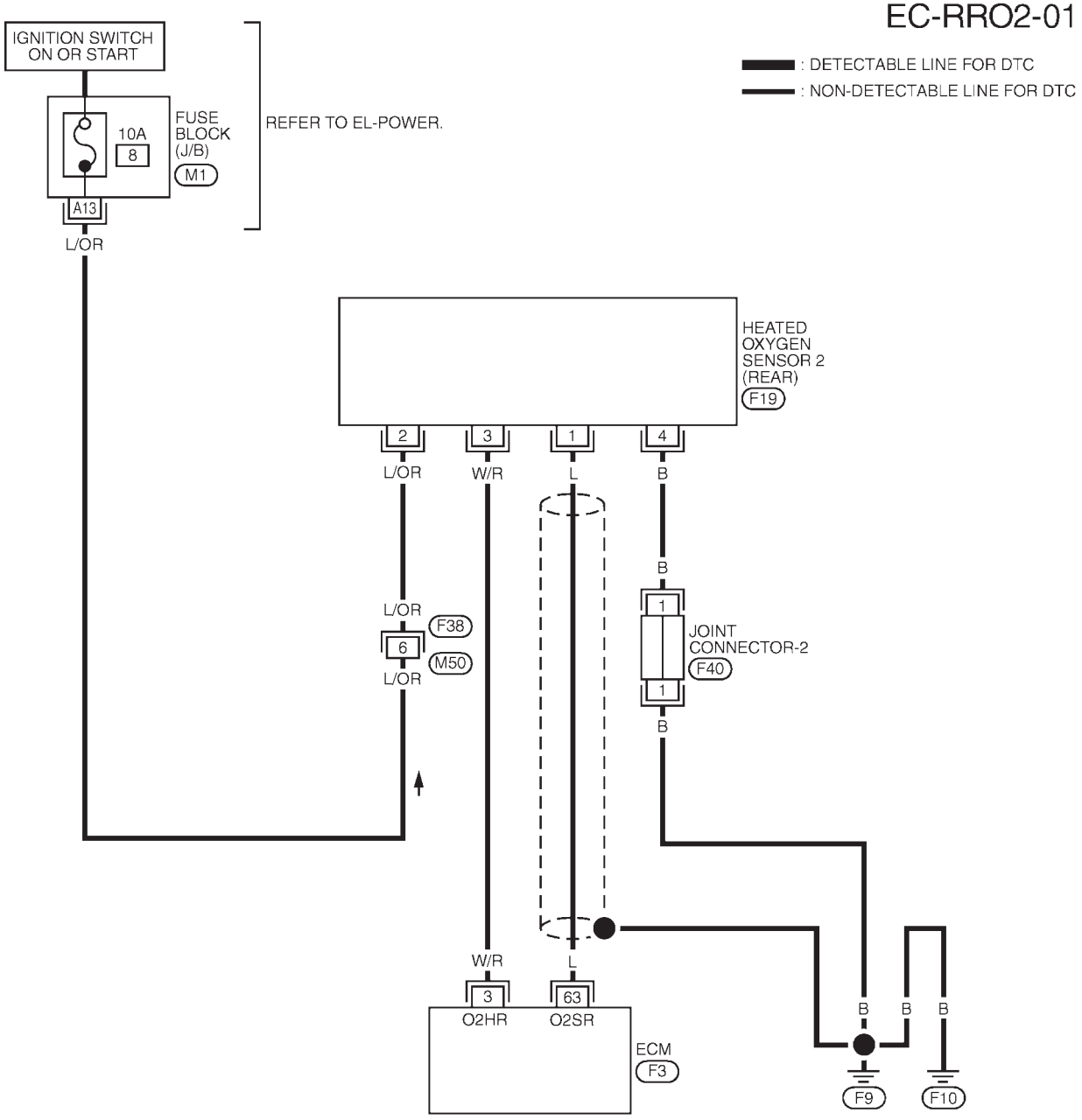
Wiring Diagram

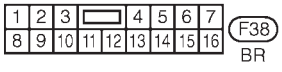
MODELS WITH ECM IN ENGINE COMPARTMENT

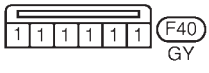
NLEC1800

NLEC1800S03

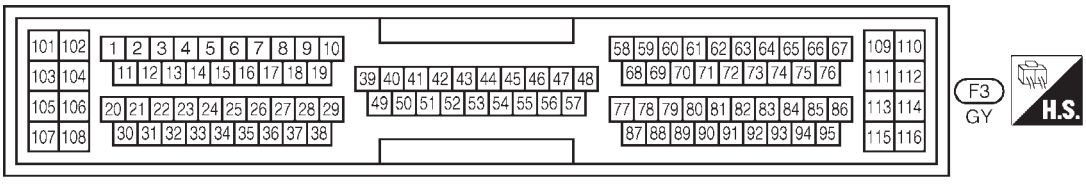
EC-RRO2-01







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

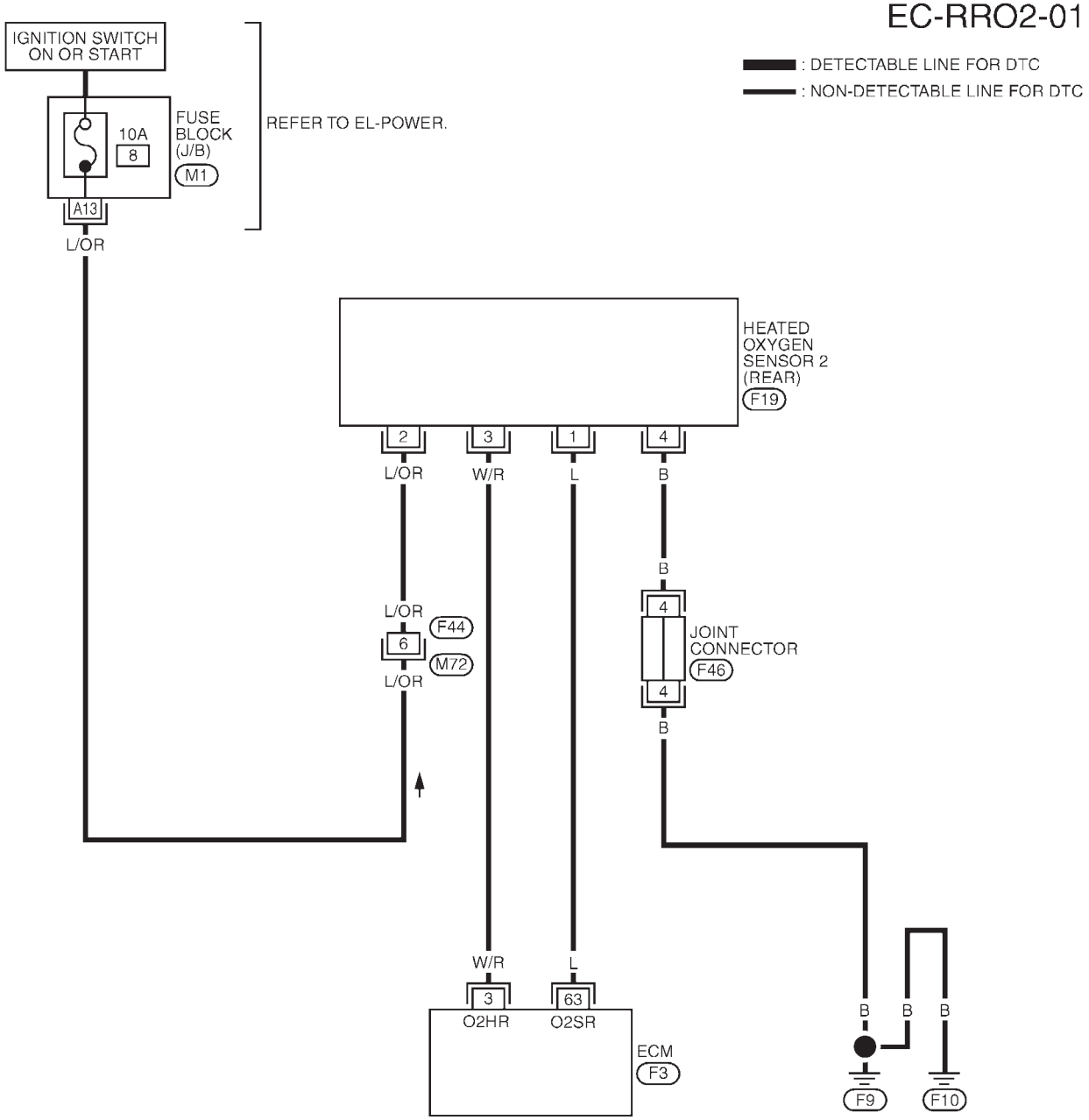


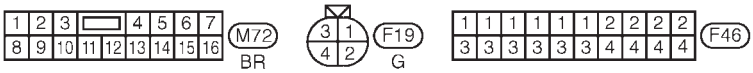
YEC746

MODELS WITH ECM IN CABIN

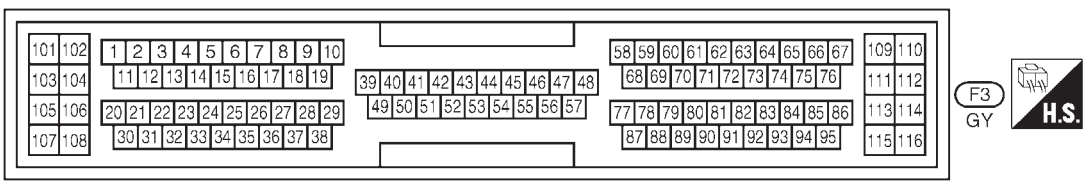
NLEC1800S04

EC-RRO2-01





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



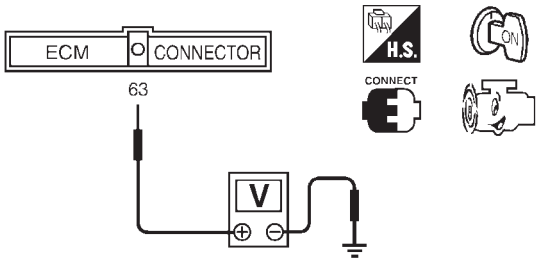
YEC933

Diagnostic Procedure

NLEC1801

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 63 [HO2S2 (B1) 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.

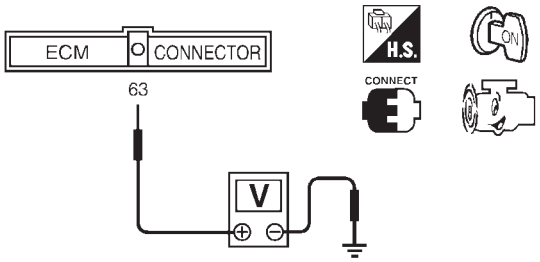
SEF240Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK OVERALL FUNCTION-II

Keep engine at idle for 10 minutes, then check the voltage between ECM terminal 63 and ground, or check the voltage when coasting at 80 km/h (50 MPH) in “D” position with “SPORTS MODE SW” OFF.



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

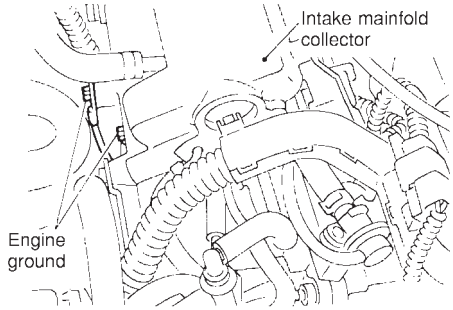
SEF240Z

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.

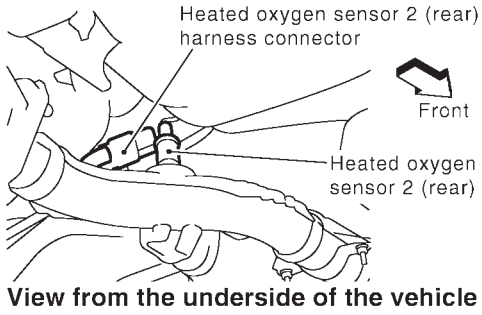


SEF202X

	▶	GO TO 4.

4	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 (HO2S2) (rear) harness connector and ECM harness connector.



View from the underside of the vehicle

SEF639Z

3. Check harness continuity between ECM terminal 63 and HO2S2 terminal 1.
   Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 63 (or HO2S2 terminal 1) and ground.
   Continuity should not exist.
5. Also check harness for short to ground and short to power.

OK or NG

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

5	CHECK GROUND CIRCUIT

1. Check harness continuity between HO2S2 terminal 4 and body ground.
   Refer to wiring diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-2 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between HO2S2 and ECM	
▶	Repair open circuit or short to power in harness or connectors.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)
Refer to "Component Inspection", EC-961.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Replace heated oxygen sensor 2 (rear).

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**

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

SEF662Y

Component Inspection

NLEC1802

HEATED OXYGEN SENSOR 2 (REAR)

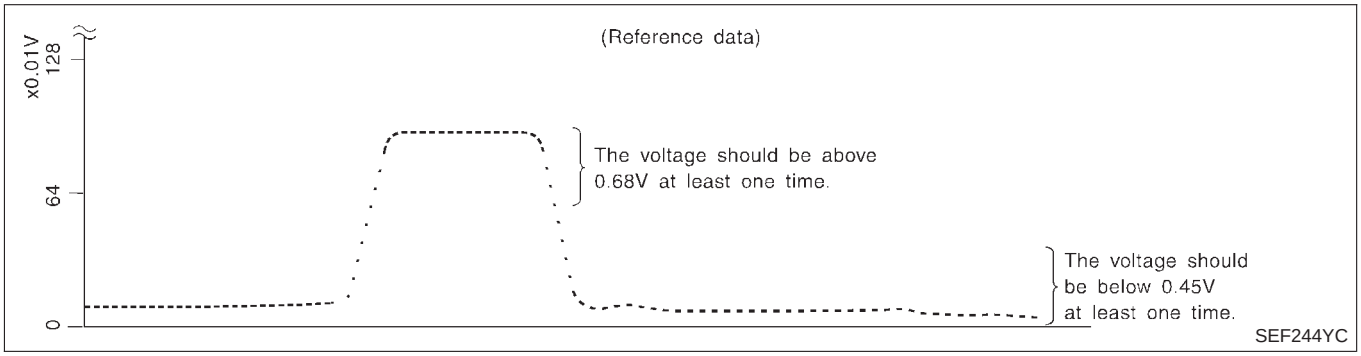
NLEC1802S01

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)" as the monitor item with CONSULT-II.
4) Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)" should be below 0.45V at least once when the "FUEL INJECTION" is −25%.

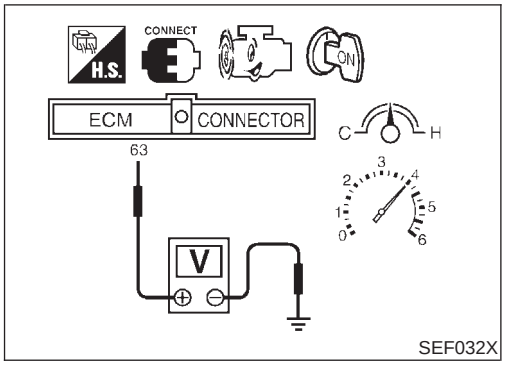
CAUTION:

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



SEF244YC

Component Inspection (Cont'd)



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 terminals 63 (HO2S2 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 0.68V at least once.
   If the voltage is above 0.68V at 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 D position with "SPORTS MODE SW" OFF.
   The voltage should be below 0.45V at least once.

CAUTION:

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

Description

NLEC1803

SYSTEM DESCRIPTION

NLEC1803S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Heated oxygen sensor 2 heater (rear) control	Heated oxygen sensor 2 heater (rear)

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater (rear) corresponding to the engine speed.

OPERATION

NLEC1803S02

Engine condition		Heated oxygen sensor 2 heater (rear)
Engine stopped		OFF
Engine is running.	Engine speed below 3,600 rpm After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	ON
	Engine speed above 3,600 rpm	OFF

CONSULT-II Reference Value in Data Monitor Mode

NLEC1804

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 HTR (B1)	● Engine speed	Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
		Above 3,600 rpm	OFF
	● Ignition switch ON (Engine stopped)		OFF

ECM Terminals and Reference Value

NLEC1805

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	W/R	Heated oxygen sensor 2 heater (rear)	**[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 - 1V
			[Engine is running] ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Engine stopped	

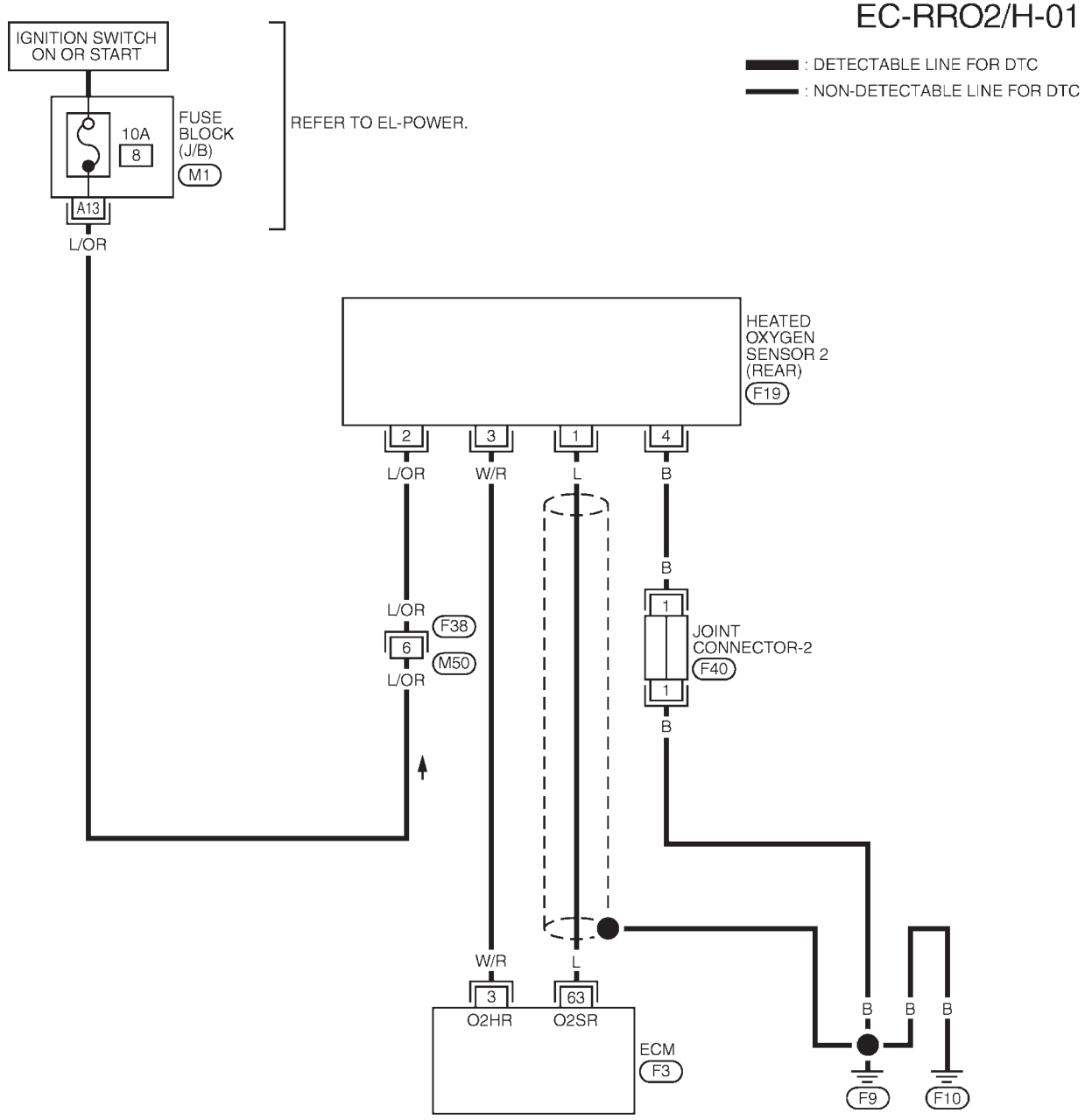
Wiring Diagram

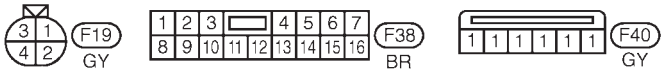
NLEC1806

MODELS WITH ECM IN ENGINE COMPARTMENT

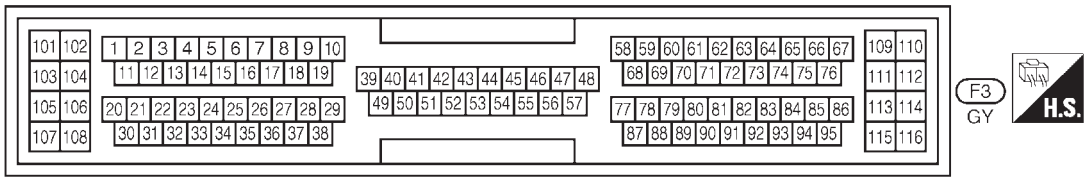
NLEC1806S03

EC-RRO2/H-01





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

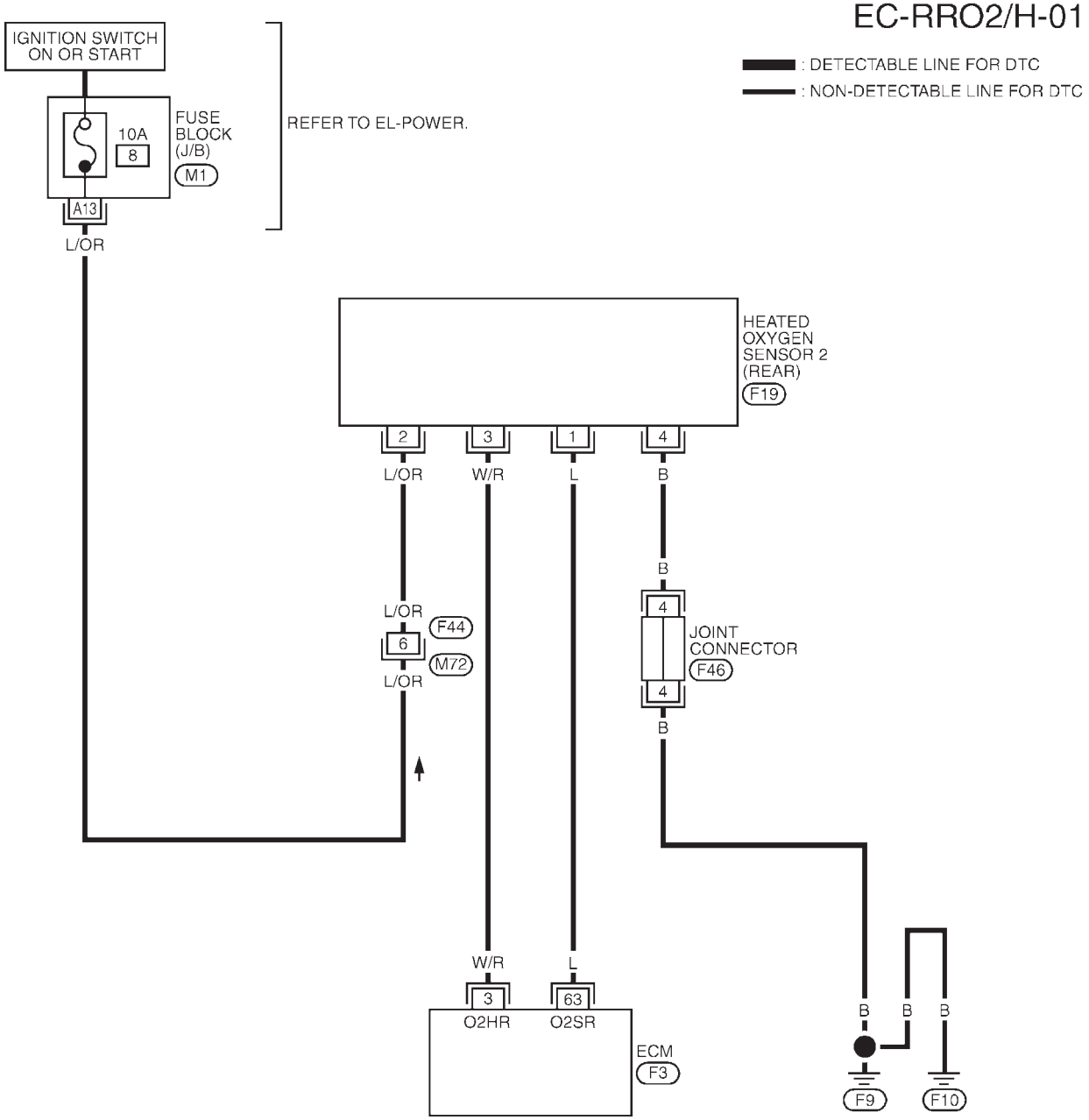


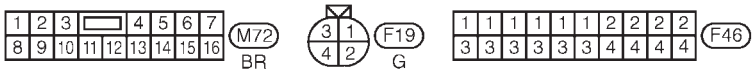
YEC747

MODELS WITH ECM IN CABIN

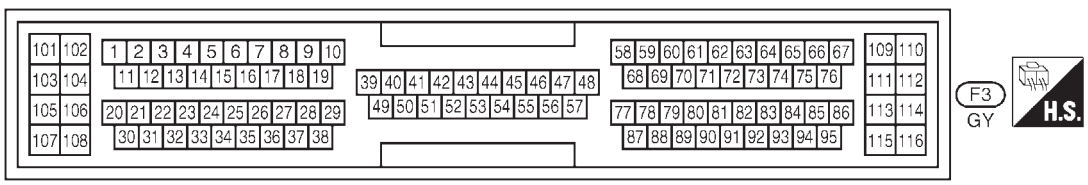
NLEC1806S04

EC-RRO2/H-01





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



YEC934

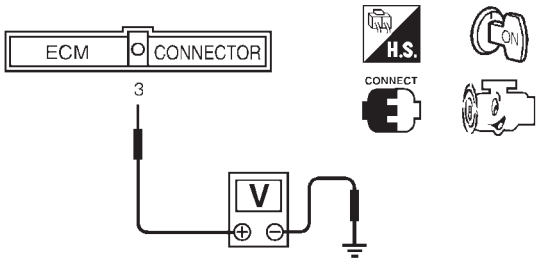
Diagnostic Procedure

NLEC1807

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 3 [HO2S2 HTR (B1) 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

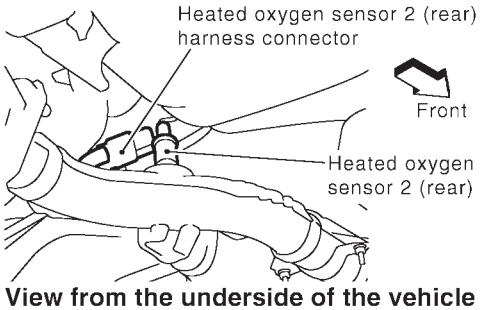
SEF241Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK POWER SUPPLY

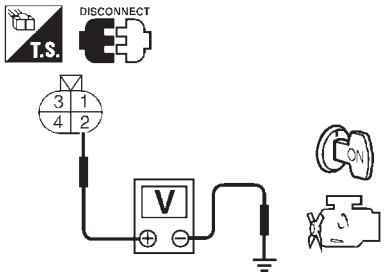
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 (HO2S2) (rear) harness connector.



View from the underside of the vehicle

SEF639Z

3. Turn ignition switch “ON”.
4. Check voltage between HO2S2 terminal 2 and ground.



SEF218W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

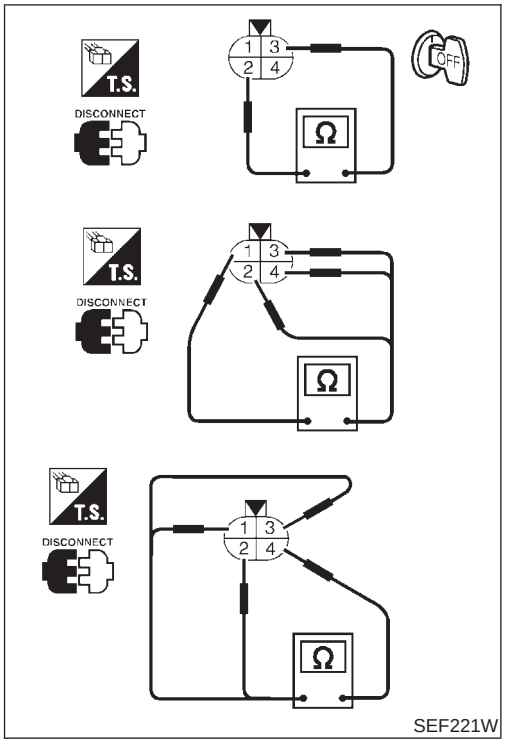
3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F38, M50 (where fitted) ● Harness connectors M72, F44 (where fitted) ● 10A fuse ● Harness for open or short between heated oxygen sensor 2 (rear) and fuse	
▶	Repair harness or connectors.

4	CHECK OUTPUT CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between HO2S2 terminal 3 and ECM 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 harness for open or short between heated oxygen sensor 2 heater (rear) and ECM.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK HEATED OXYGEN SENSOR 2 HEATER (REAR)
Refer to "Component Inspection", EC-968. **OK or NG**	
OK ▶	GO TO 7.
NG ▶	Replace heated oxygen sensor 2 (rear).

7	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF221W

Component Inspection

NLEC1808

HEATED OXYGEN SENSOR 2 HEATER (REAR)

NLEC1808S01

Check the following.

1. Check resistance between terminals 2 and 3.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

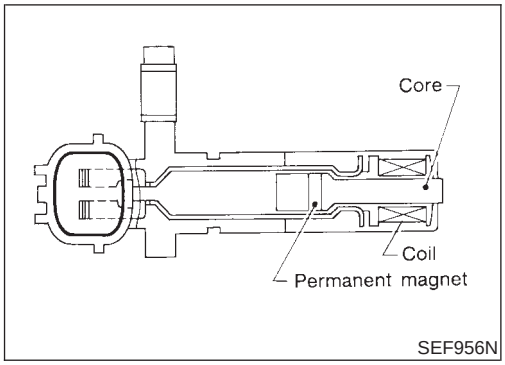
2. Check continuity.

Terminal No.	Continuity
1 and 2, 3, 4	No
4 and 1, 2, 3	

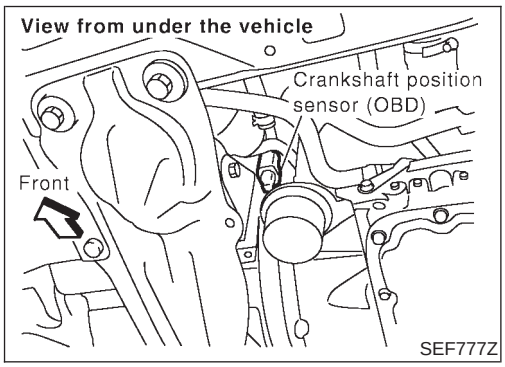
If NG, replace the heated oxygen sensor 2 (rear).

CAUTION:

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



SEF956N



SEF777Z

Component Description

NLEC1809

The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not directly used to control the engine system.

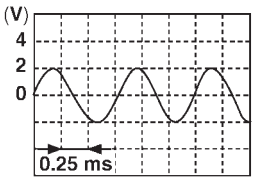
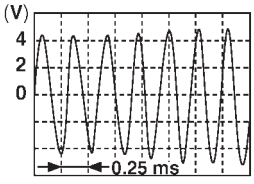
ECM Terminals and Reference Value

NLEC1810

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 (AC Voltage)
65	W	Crankshaft position sensor (OBD)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 1.3V  SEF814Z
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 2.0V  SEF815Z

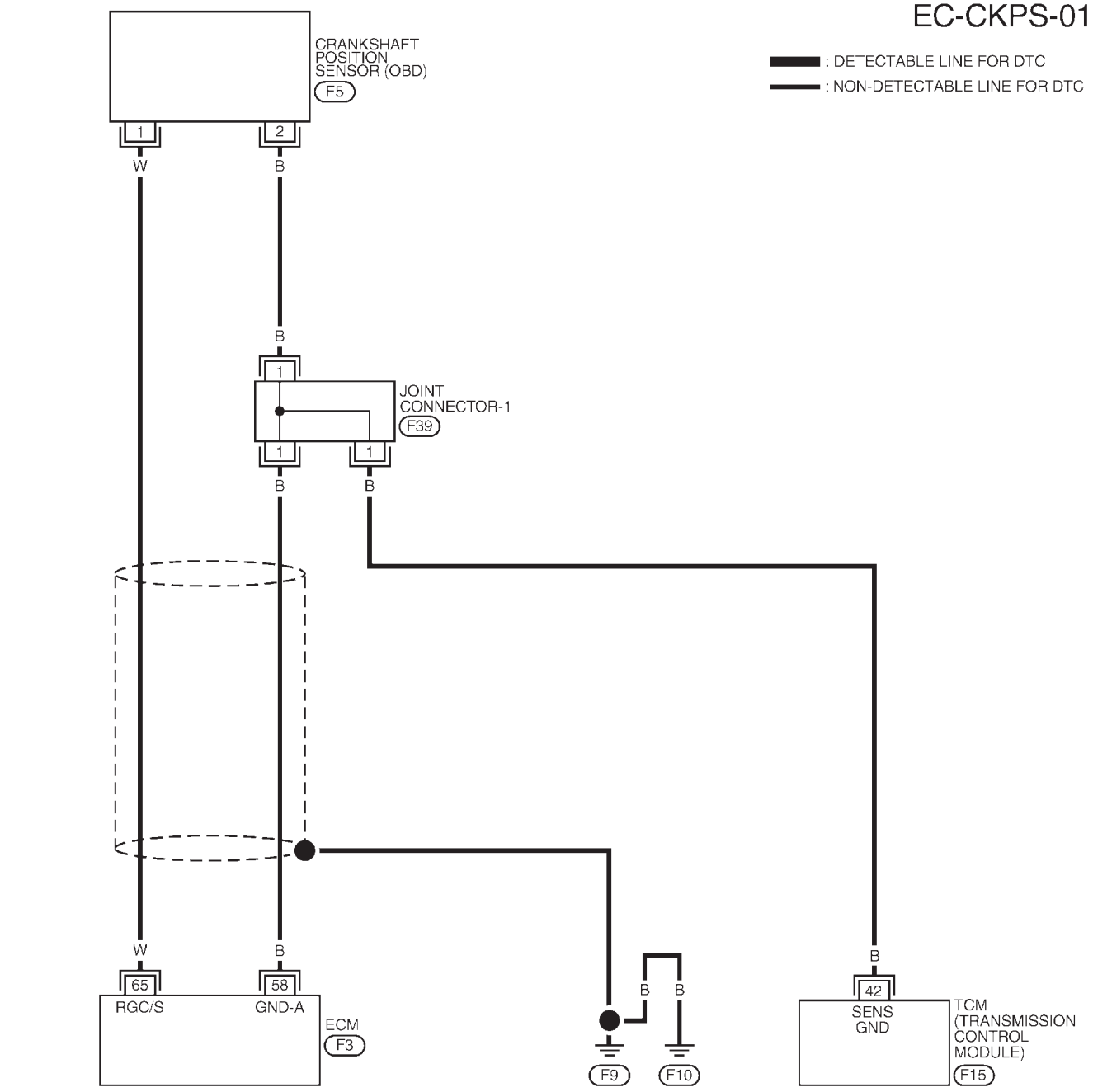
Wiring Diagram

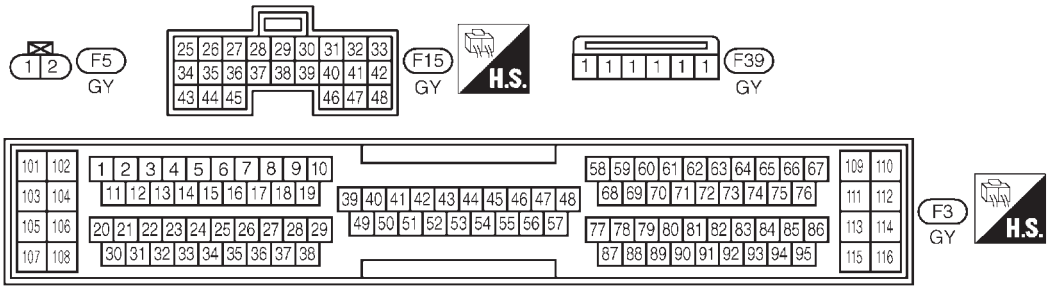
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1813

NLEC1813S01

EC-CKPS-01



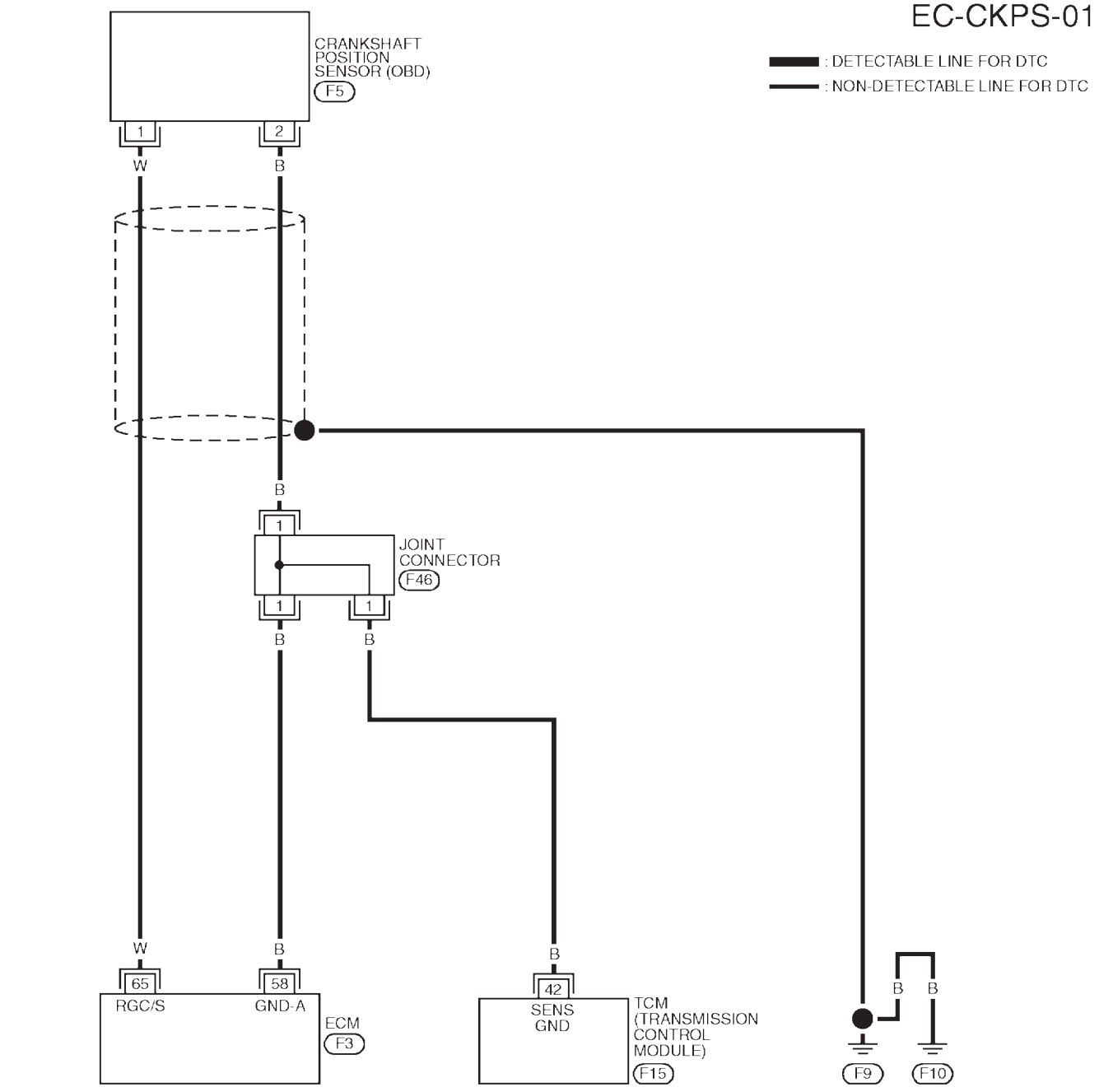


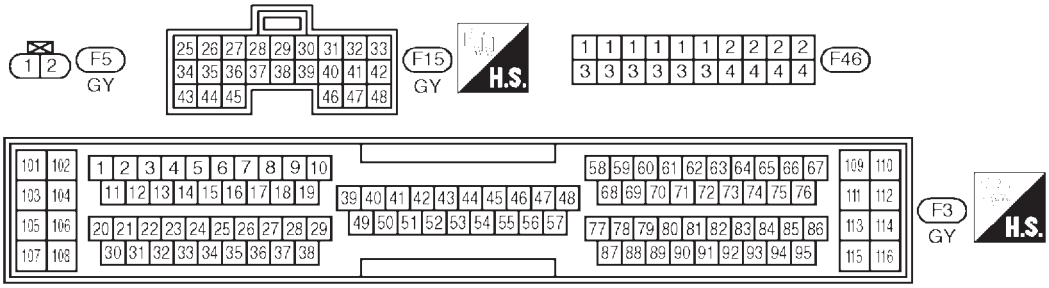
YEC756

MODELS WITH ECM IN CABIN

NLEC1813S02

EC-CKPS-01





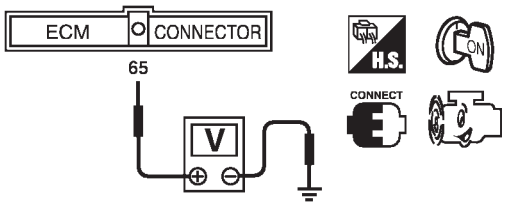
YEC935

Diagnostic Procedure

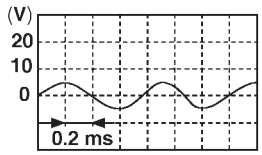
NLEC1816

1	CHECK OVERALL FUNCTION

1. Start engine and let it idle.
2. Check voltage between ECM terminal 65 and ground.



Voltage is approximately 4V.



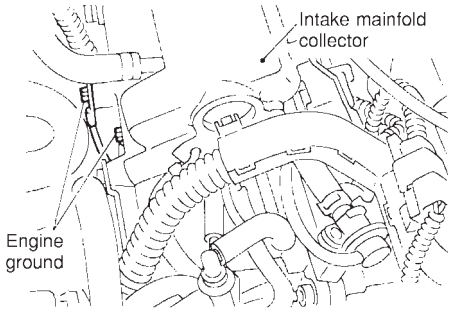
SEF788Z

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.

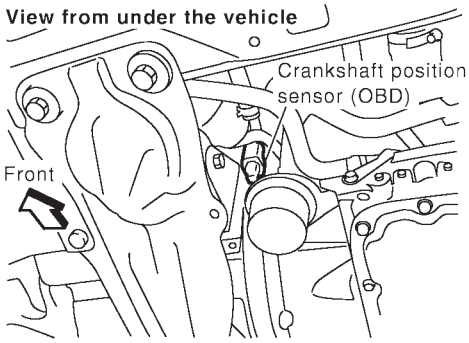


SEF202X

	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.



SEF777Z

2. Check continuity between ECM terminal 65 and CKPS (OBD) 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 harness for open or short between crankshaft position sensor (OBD) and ECM.

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

5	CHECK GROUND CIRCUIT

1. Reconnect ECM harness connector.
2. Check harness continuity between CKPS (OBD) 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 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-1 (where fitted)
- Joint connector F46 (where fitted)
- Harness for open or short between crankshaft position sensor (OBD) and ECM
- Harness for open or short between crankshaft position sensor (OBD) and TCM (Transmission control module)

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

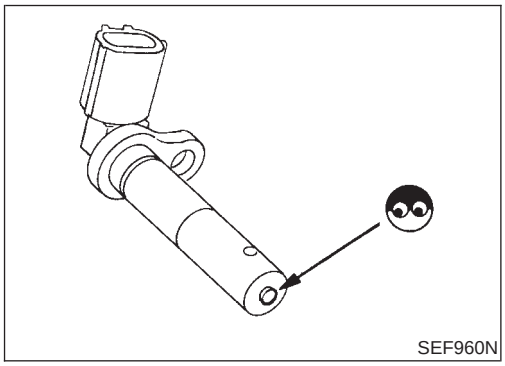
7	CHECK CRANKSHAFT POSITION SENSOR (OBD)

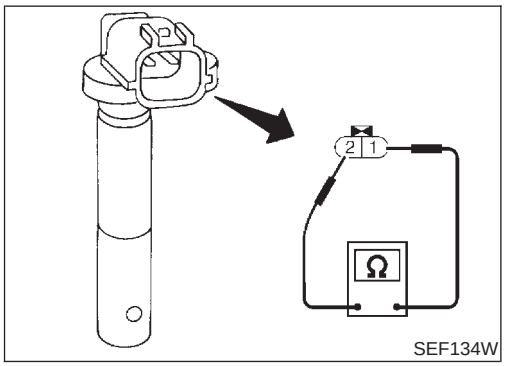
Refer to "Component Inspection", EC-974.

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace crankshaft position sensor (OBD).

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	INSPECTION END


SEF960N



SEF134W

Component Inspection

NLEC1817

CRANKSHAFT POSITION SENSOR (OBD)

NLEC1817S01

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.

5. Check resistance as shown in the figure.
   Resistance: 166 - 204 Ω [at 20°C (68°F)]
   If NG, replace crankshaft position sensor (OBD).

Description

NLEC1818

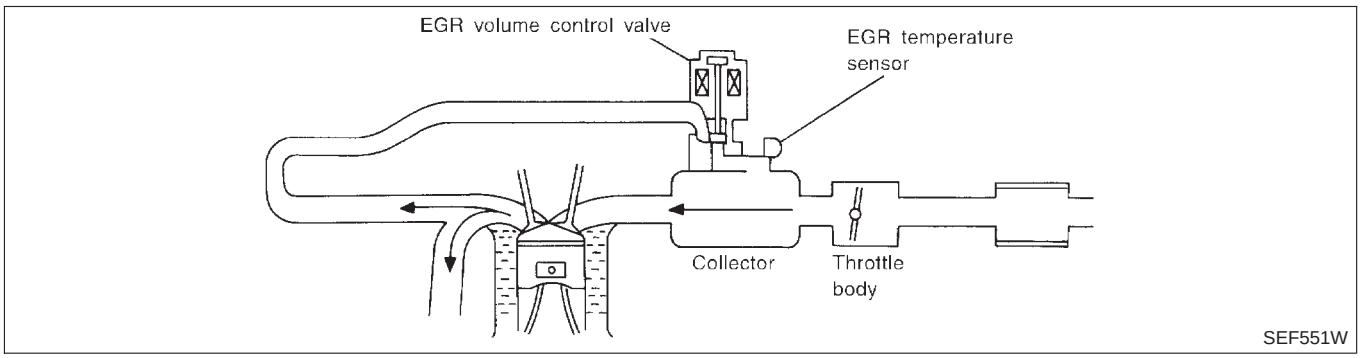
SYSTEM DESCRIPTION

NLEC1818S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	EGR volume control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
PNP switch	Park/Neutral position signal		
TCM (Transmission Control Module)	Gear position, shifting signal		

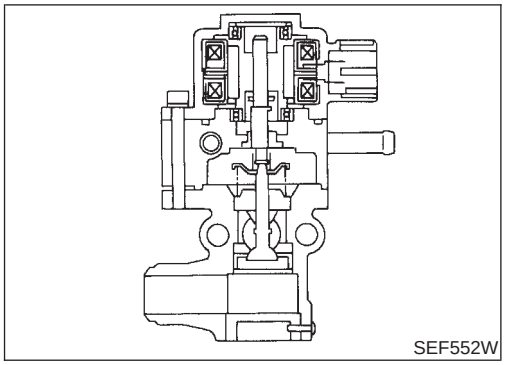
This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

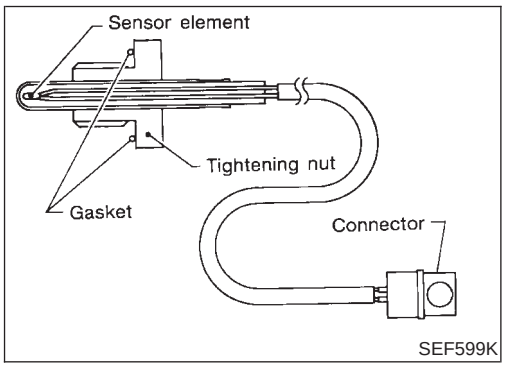
- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Extremely light load engine operation
- Engine idling
- Excessively high engine coolant temperature
- Wide open throttle
- Mass air flow sensor malfunction
- Low battery voltage



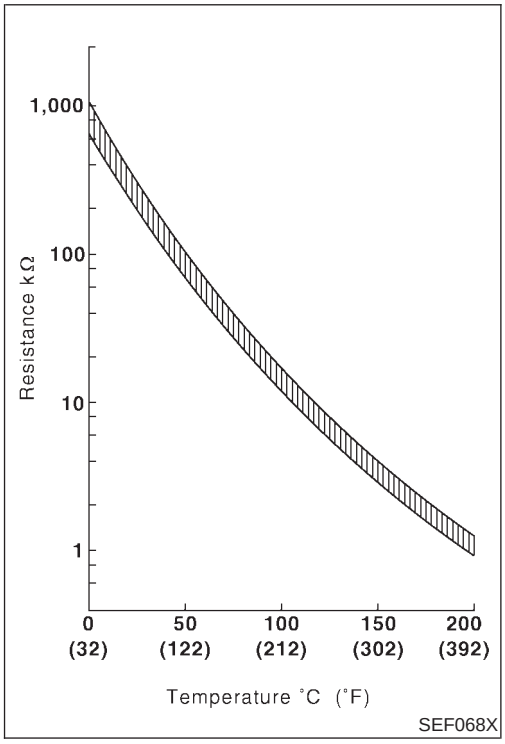
SEF551W

Description (Cont'd)


SEF552W



SEF599K



SEF068X

COMPONENT DESCRIPTION

NLEC1818S02

EGR Volume Control Valve

NLEC1818S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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.

EGR Temperature Sensor

NLEC1818S0203

The EGR temperature sensor detects temperature changes in the EGR passageway. When the EGR volume control valve opens, hot exhaust gases flow, and the temperature in the passageway changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases. This sensor is not used to control the engine system.

<Reference data>

EGR temperature °C (°F)	Voltage* V	Resistance MΩ
0 (32)	4.56	0.73 - 0.89
50 (122)	2.25	0.074 - 0.082
100 (212)	0.59	0.012 - 0.014

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

When EGR system is operating.

Voltage: 0 - 1.5V

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.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1819

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	• Engine: After warming up		Less than 4.5V
EGR VOL CON/V	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

NLEC1820

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

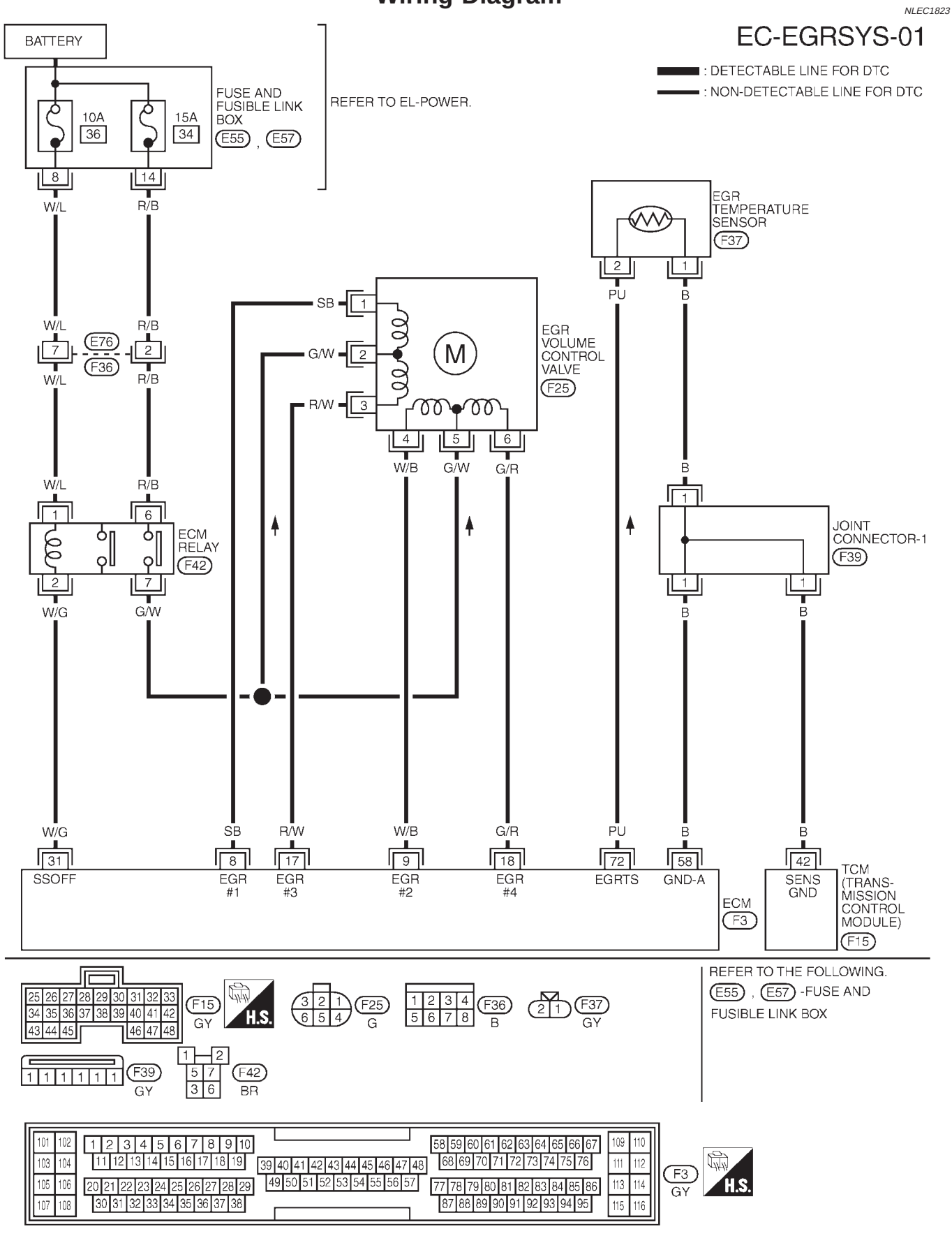
CAUTION:

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)
8 9 17 18	SB W/B R/W G/R	EGR volume control valve	**[Engine is running]** ● Idle speed	0 - 14V
58	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0V
72	PU	EGR temperature sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Less than 4.5V
			[Engine is running] ● **Warm-up condition** ● EGR system is operating.	0 - 1V

Wiring Diagram

NLEC1823



YEC757

Diagnostic Procedure

NLEC1825

1	INSPECTION START	
Do you have CONSULT-II?		
Yes or No		
Yes	▶	GO TO 2.
No	▶	GO TO 4.

2	CHECK OVERALL FUNCTION-I	

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Confirm that “COOLAN TEMP/S” indicates less than 40°C (104°F).
   If the indication is out of range, cool the engine down.

DATA MONITOR	
MONITOR	NO DTC
COOLAN TEMP/S	XXX °C

SEF013Y

4. Start engine and let it idle.
5. Make sure that “EGR TEMP SEN” in “DATA MONITOR” mode indicates more than 3V. Print out the screen or note the indication.

DATA MONITOR	
MONITOR	NO DTC
EGR TEMP SEN	XXX V

SEF014Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 6.

3	CHECK OVERALL FUNCTION-II

With CONSULT-II

1. Warm up engine to normal operating temperature.
2. Select "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Keep engine speed at 2,000 rpm and set the "EGR VOL CONT/V" opening to "20 step".
4. Make sure the "EGR TEMP SEN" indicated is lower than the value indicated in test No. 2 by 1.0V or more.

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF015Y

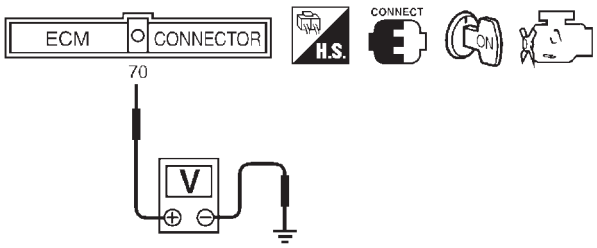
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 6.

4	CHECK OVERALL FUNCTION-I

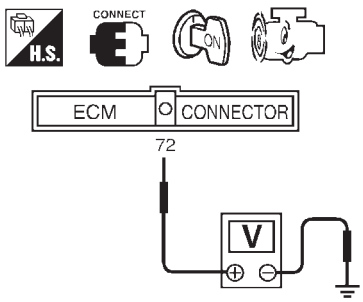
Without CONSULT-II

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 that the voltage between ECM terminal 72 (EGR temperature sensor signal) and ground is more than 3V.



SEF755Z

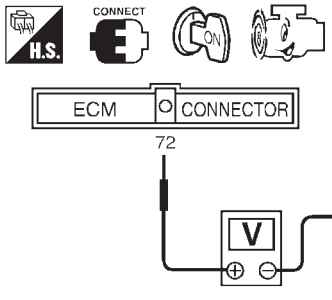
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 6.

5	CHECK OVERALL FUNCTION-II

Without CONSULT-II

1. Warm up engine to normal operating temperature.
2. Rev engine from idle up to about 3,000 rpm two to three times.
3. Make sure the voltage between ECM terminal 72 and ground is lower than the voltage measured in test No. 4 by 1.0V or more.



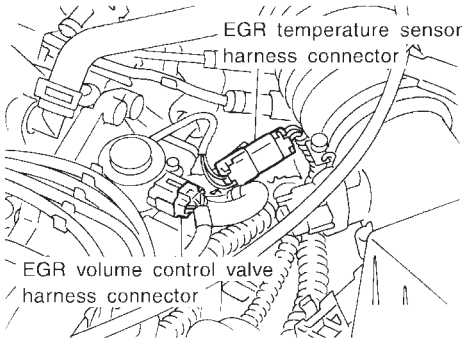
SEF755Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 6.

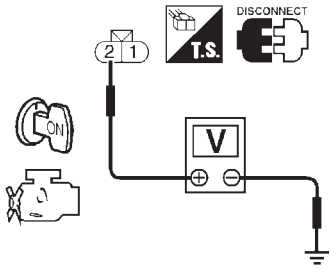
6	CHECK EGR TEMPERATURE SENSOR POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect EGR temperature sensor harness connector.



SEF216X

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



Voltage: Approximately 5V

SEF896X

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair harness or connectors.

Diagnostic Procedure (Cont'd)

7	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between EGR temperature sensor harness 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 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-1
- Harness for open or short between EGR temperature sensor and ECM
- Harness for open or short between EGR temperature sensor and TCM

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

9	CHECK EGR TEMPERATURE SENSOR

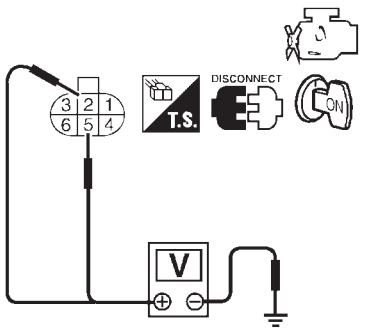
Refer to "Component Inspection", EC-985.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace EGR temperature senosr.

10	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF782Z

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

11	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuse
- Harness connectors E76, F36
- ECM relay
- Harness for open or short between EGR volume control valve and fuse

	▶	Repair harness or connectors.

12	CHECK EGR VOLUME CONTROL VALAVE OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and EGR volume control valve terminal 1,
   ECM terminal 9 and EGR volume control valve terminal 4,
   ECM terminal 17 and EGR volume control valve terminal 3,
   ECM terminal 18 and EGR volume control valve terminal 6.
   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 13.
NG	▶	Repair open circuit, short to ground or short to power in harness connectors.

13	CHECK EGR PASSAGE

Check EGR passage for clogging and cracks.

OK or NG

OK	▶	GO TO 14.
NG	▶	Repair or replace EGR passage.

14	CHECK EGR VOLUME CONTROL VALVE

Refer to "COMPONENT INSPECTION", EC-984.

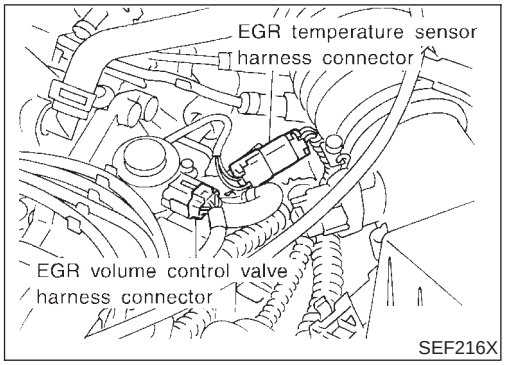
OK or NG

OK	▶	GO TO 15.
NG	▶	Replace EGR volume control valve.

15	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

▶ **INSPECTION END**



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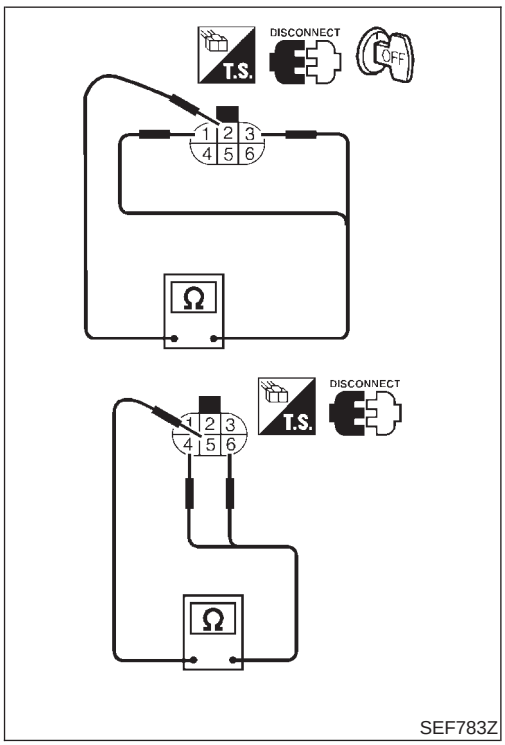
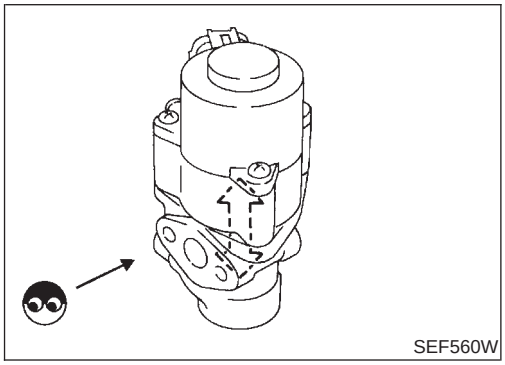


SEF783Z

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
ENG SPEED	XXX rpm
EGR TEMP SEN	XXX V

SEF015Y


SEF560W

Component Inspection

NLEC1826

EGR VOLUME CONTROL VALVE

NLEC1826S01

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20.9 - 23.1

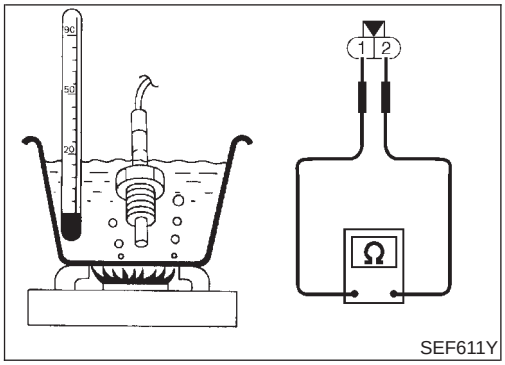
3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON".
6) Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EGR volume control valve.

Without CONSULT-II

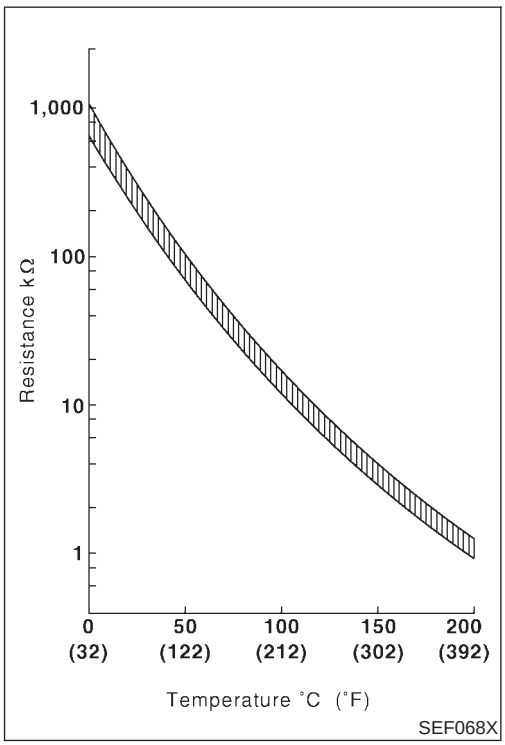
1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20.9 - 23.1

3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.



SEF611Y



SEF068X

EGR TEMPERATURE SENSOR

NLEC1826S07

Check resistance change and resistance value.
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.73 - 0.89
50 (122)	2.25	0.074 - 0.082
100 (212)	0.59	0.012 - 0.014

If NG, replace EGR temperature sensor.

Description

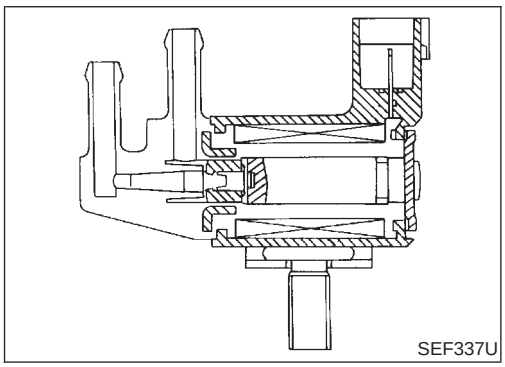
SYSTEM DESCRIPTION

NLEC1827

NLEC1827S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	EVAP canister purge control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage		
Ignition switch	Start signal		
Closed throttle position switch	Closed throttle position		
Throttle position sensor	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

NLEC1827S02

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

NLEC1828

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● No-load	Idle	0%
		Revving engine	—

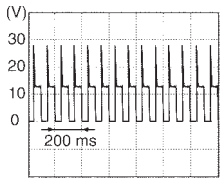
ECM Terminals and Reference Value

=NLEC1829

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

CAUTION:

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

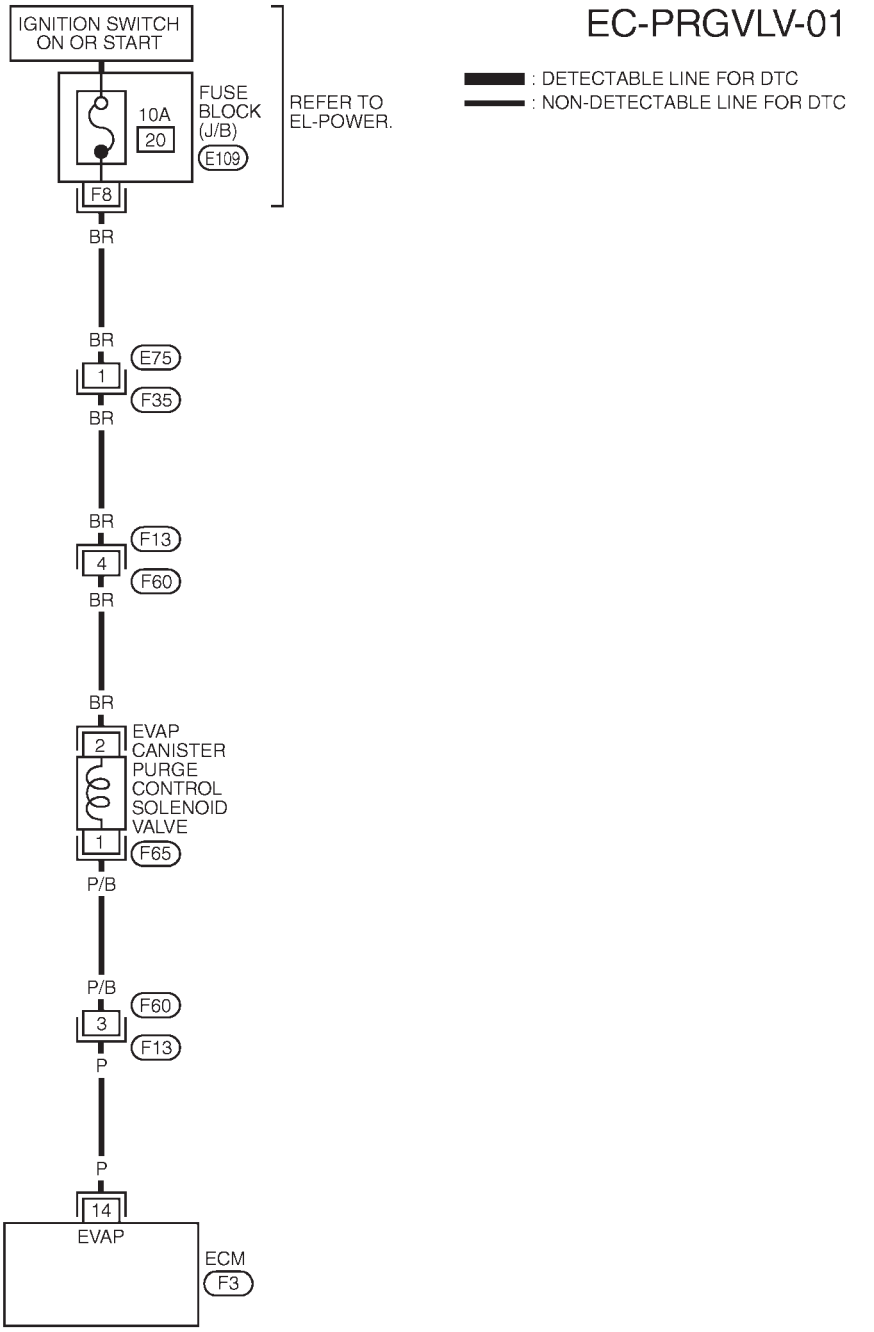
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	P	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● 2,000 rpm	5 - 12V  SEF975W

Wiring Diagram

NLEC1832

MODELS WITH ECM IN ENGINE COMPARTMENT

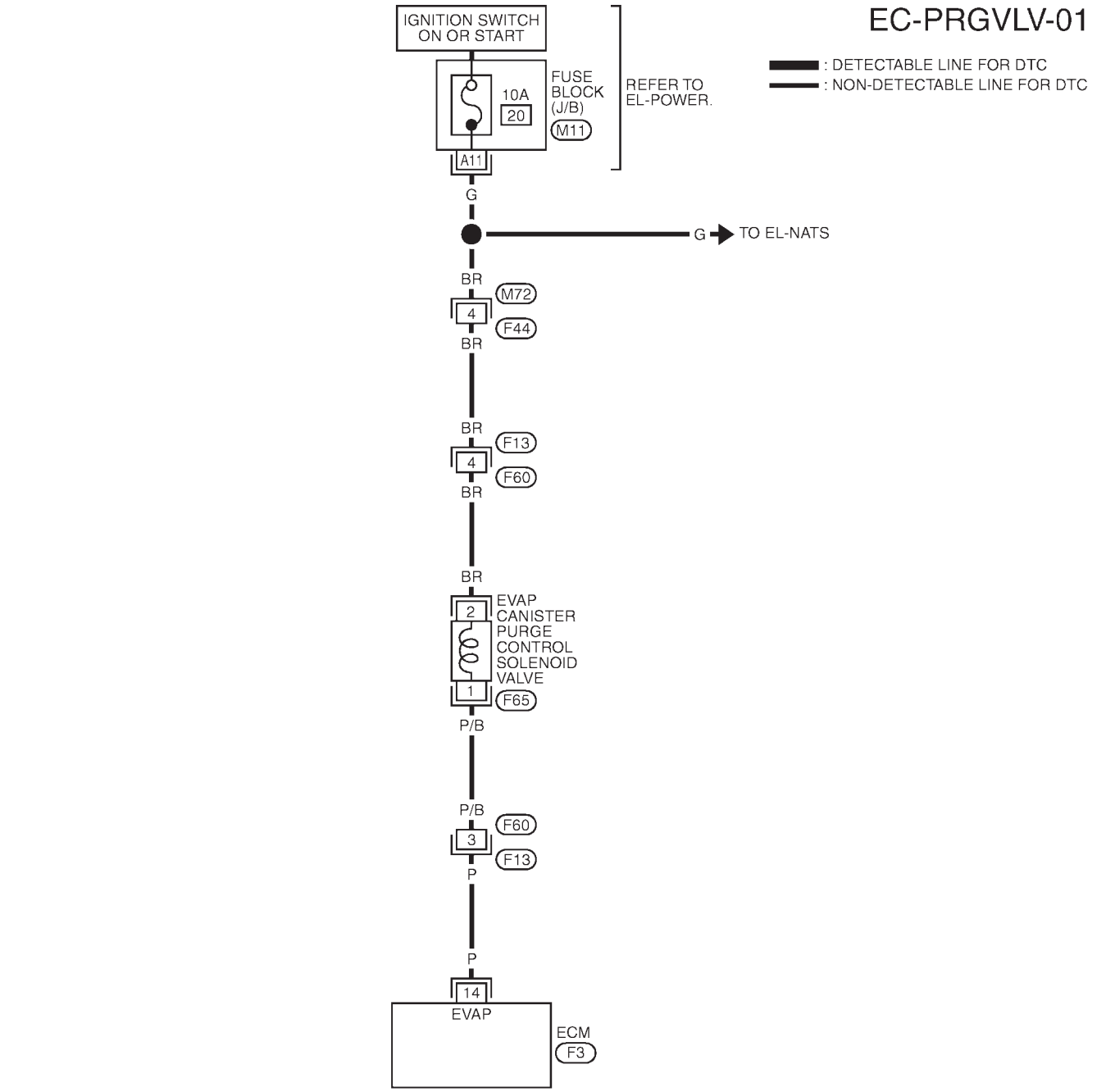
NLEC1832S01



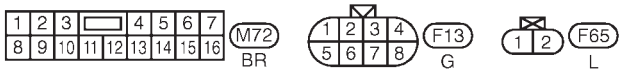
YEC758

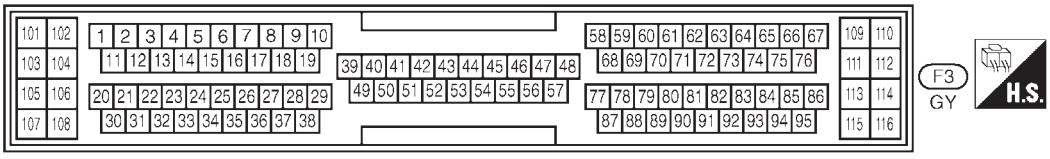
MODELS WITH ECM IN CABIN

NLEC1832S02



REFER TO THE FOLLOWING.
M11 -FUSE BLOCK-
JUNCTION BOX (J/B)





YEC936

Diagnostic Procedure

NLEC1835

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 “ACTIVE TEST” mode with CONSULT-II.
4. Start engine and let it idle.
5. Change the valve opening percentage touching “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	XXX %
HO2S1 MNTR (B1)	LEAN
THRTL POS SEN	XXX V

Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.

SEF789Z

OK or NG

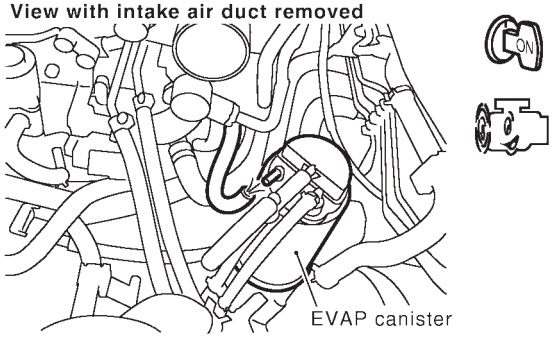
OK ▶	GO TO 4.
NG ▶	GO TO 5.

3	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE CONTROL FUNCTION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect the EVAP purge hose connected to the EVAP canister purge volume control solenoid valve at the EVAP canister.
4. Start engine and let it idle for at least 100 seconds.
5. Check for vacuum existence at the EVAP purge hose under the following conditions.

View with intake air duct removed



Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.

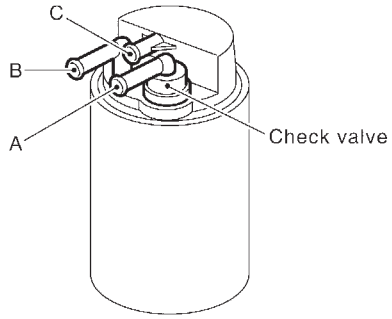
SEF790Z

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 5.

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

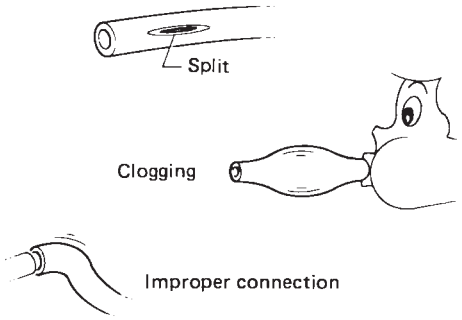
OK or NG

OK	▶	**INSPECTION END**
NG	▶	Replace EVAP canister.

Diagnostic Procedure (Cont'd)

5	CHECK VACUUM HOSES AND TUBES

1. Turn ignition switch "OFF".
2. Disconnect vacuum hoses between the EVAP canister purge volume control solenoid valve and vacuum port, EVAP canister purge volume control solenoid valve and EVAP canister.
3. Check hoses and tubes for cracks, clogging, improper connection or disconnection.



SEF109L

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair hoses or tubes.

6	CHECK VACUUM PORT

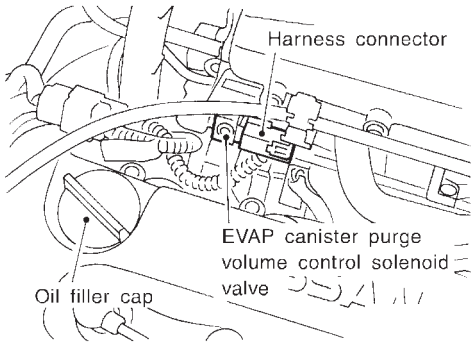
1. Disconnect the vacuum hose connected to the EVAP canister purge volume control solenoid valve at the vacuum port.
2. Blow air into vacuum port.
3. Check that air flows freely.

OK or NG

OK	▶	GO TO 7.
NG	▶	Repair or clean vacuum port.

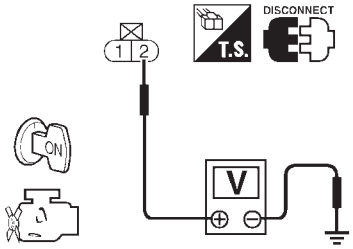
7	CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF219X

3. Turn ignition switch "ON".
4. Check voltage between EVAP canister purge volume control solenoid valve terminal 2 and engine ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF333X

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F35 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors F13, F60
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

	▶	Repair harness or connectors.

9	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 14 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	▶	GO TO 11.
NG	▶	GO TO 10.

Diagnostic Procedure (Cont'd)

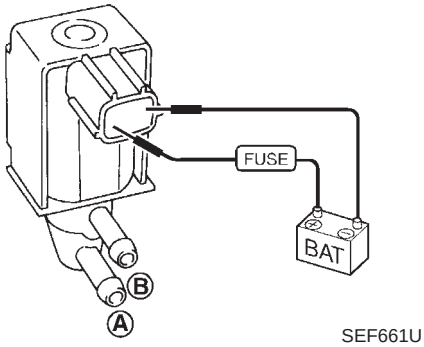
10	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F60, F13 ● Harness for open or short between EVAP canister purge volume control solenoid valve and ECM.	
▶	Repair copen circuit or short to ground or short to power in harness or connectors.

11	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Refer to "Component Inspection" EC-994.	
OK or NG	
OK ▶	GO TO 12.
NG ▶	Replace EVAP canister purge volume control solenoid valve.

12	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN
THRTL POS SEN	XXX V

SEF801Y



SEF661U

Component Inspection

NLEC1834

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

NLEC1834S01

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.
   If OK, inspection end. If NG, go to following step.
3) Check air passage continuity.

Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

If NG or operation takes more than 1 second, replace the EVAP canister purge volume control solenoid valve.

Without CONSULT-II

Check air passage continuity.

Condition	Air passage continuity between A and B
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace the EVAP canister purge volume control solenoid valve.

Description

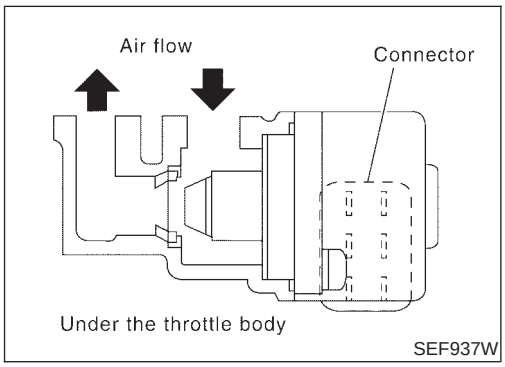
NLEC1836

SYSTEM DESCRIPTION

NLEC1836S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Idle air control	IACV-AAC valve
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		
Intake air temperature sensor	Intake air temperature		
Cooling fan	Cooling fan operation		
Electrical load	Electrical load signal		

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 camshaft position sensor 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

NLEC1836S02

IACV-AAC Valve

NLEC1836S0201

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

NLEC1837

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	5 - 20 steps
		2,000 rpm	—

ECM Terminals and Reference Value

NLEC1838

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.

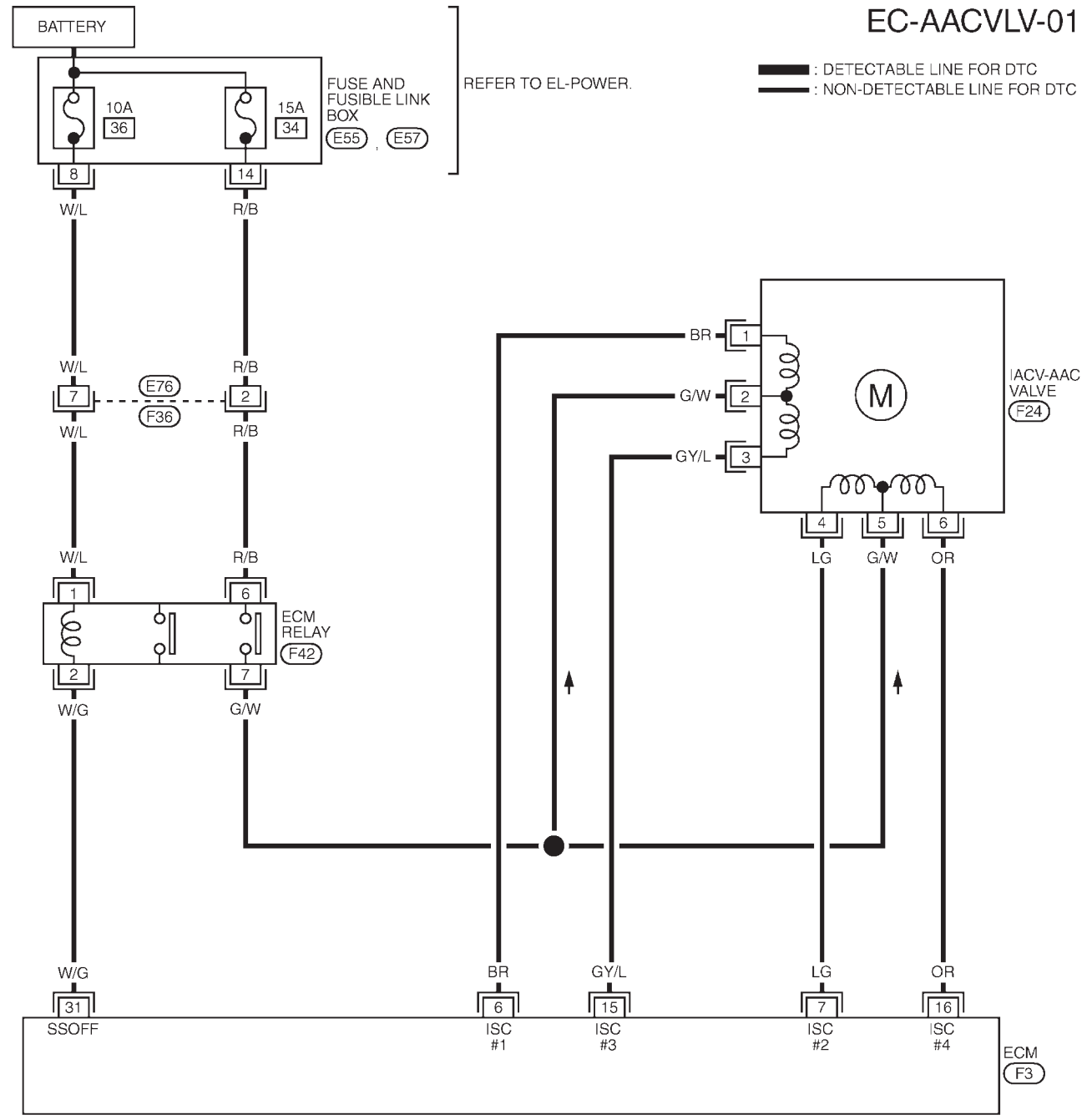
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6 7 15 16	BR LG GY/L OR	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V

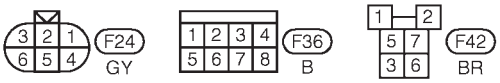
Wiring Diagram

NLEC1841

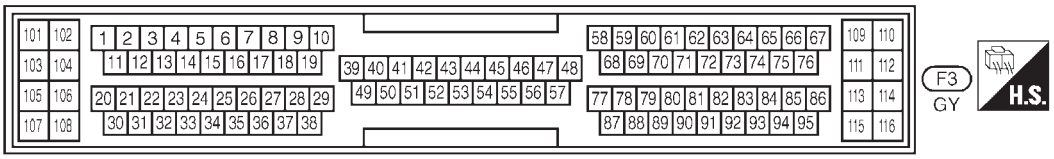
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1841S01





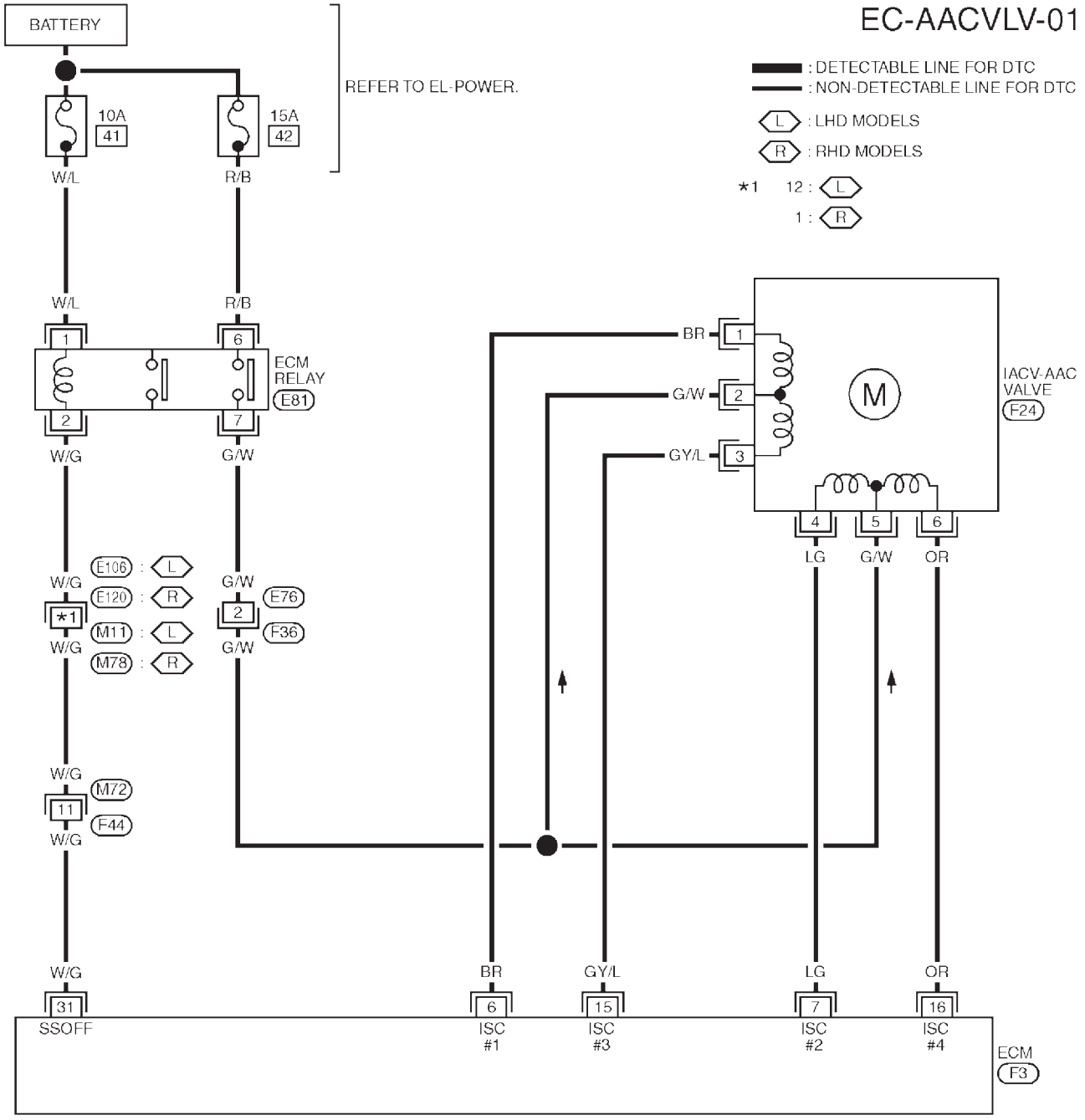
REFER TO THE FOLLOWING.
E55 , E57 -FUSE AND FUSIBLE LINK BOX

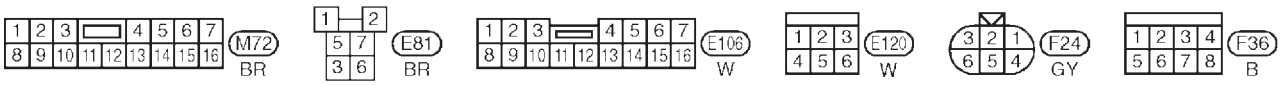


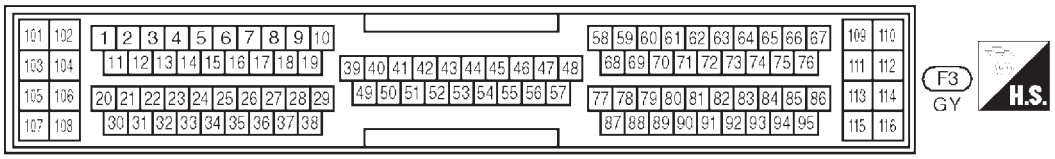
YEC759

MODELS WITH ECM IN CABIN

NLEC1841S02







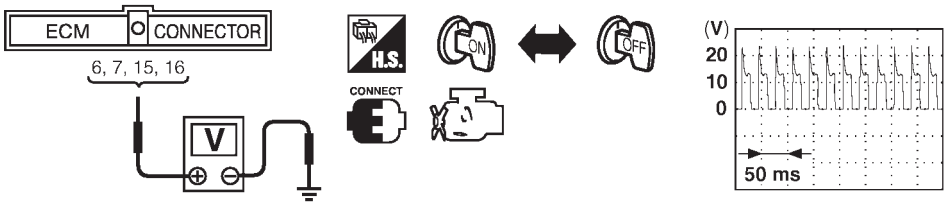
YEC937

Diagnostic Procedure

NLEC1842

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “OFF”.
2. Read the voltage signal between ECM terminals 6, 7, 15, 16 (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”.



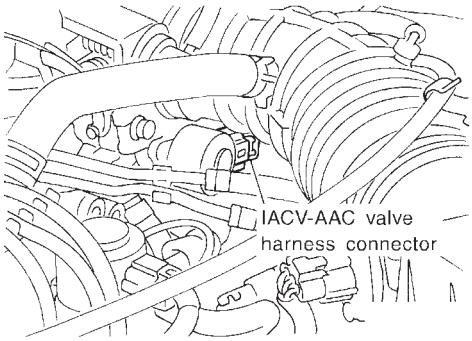
SEF756Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

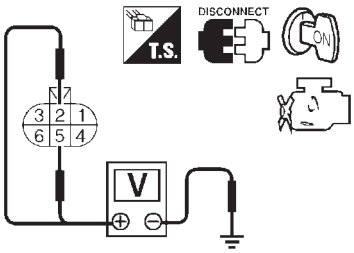
2	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect IACV-AAC valve harness connector.



SEF221X

3. Turn ignition switch “ON”.
4. Check voltage between terminal 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

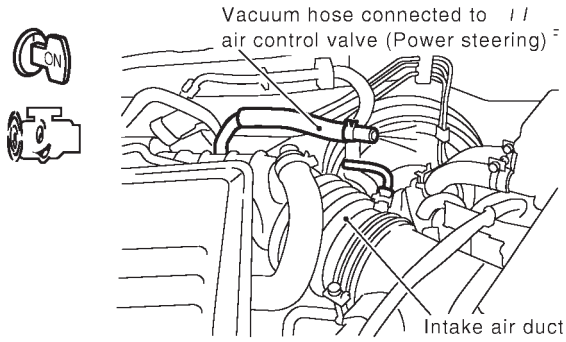
SEF343X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

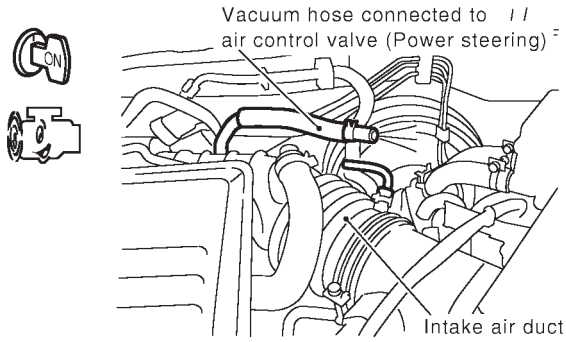
3	DETECT MALFUNCTIONING PART
Check the following. ● 15A fuse ● Harness connectors E76, F36 ● Harness for open or short between fuse and ECM relay ● ECM relay ● Harness for open or short between IACV-AAC and ECM relay	
▶	Repair harness or connectors or replace fuse or ECM relay.

4	CHECK OUTPUT SIGNAL CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 6 and IACV-AAC valve terminal 1, ECM terminal 7 and IACV-AAC valve terminal 4, ECM terminal 15 and IACV-AAC valve terminal 3, ECM terminal 16 and IACV-AAC valve terminal 6. 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 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 intake air duct. 3. Start engine and let it idle. 4. Check vacuum hose for vacuum existence.  SEF778Z **Vacuum does not exist or slightly 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.



SEF778Z

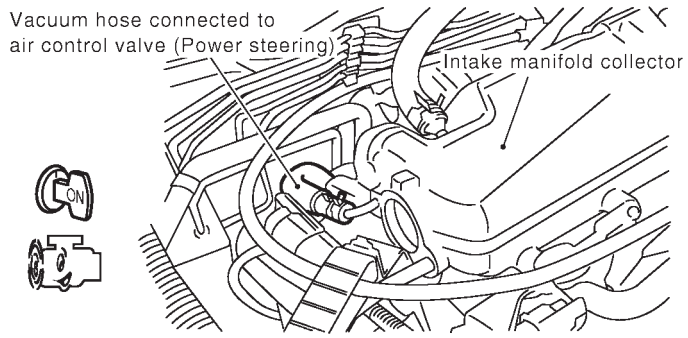
Vacuum should exist.

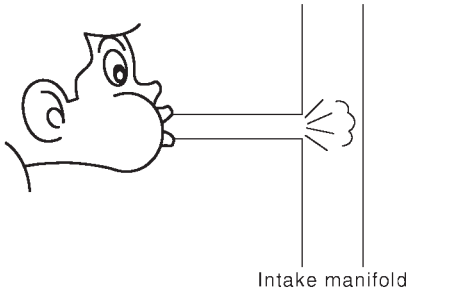
OK or NG

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.





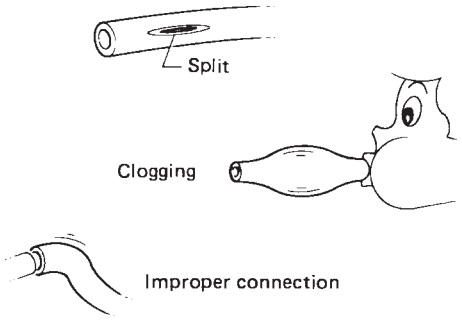
SEF779Z

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

Refer to "Component Inspection", EC-1003.

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-581.

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 models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "CVT" system indicates less than 0.9V.
- For models without CONSULT-II, drive vehicle for 10 minutes.

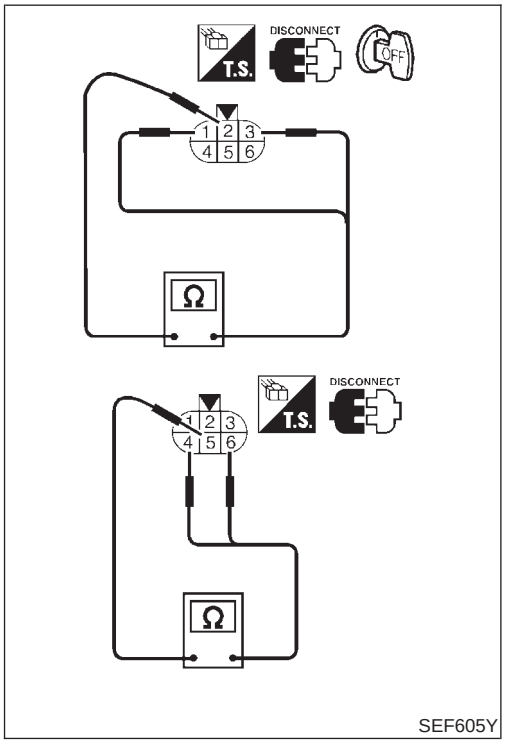
5. Stop vehicle with engine running.
6. Check target idle speed.

750±50 rpm

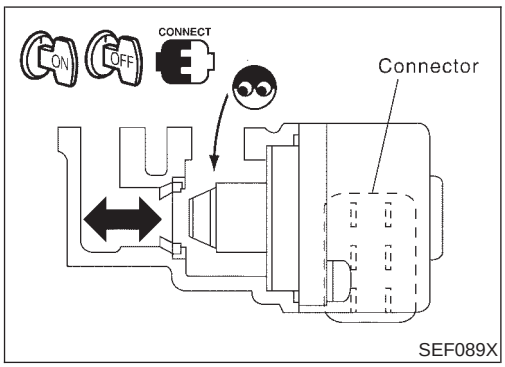
OK or NG

OK	▶	GO TO 12.
NG	▶	Perform "Idle Air Volume Learning", EC-581.

12	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	INSPECTION END



SEF605Y



SEF089X

Component Inspection

NLEC1843

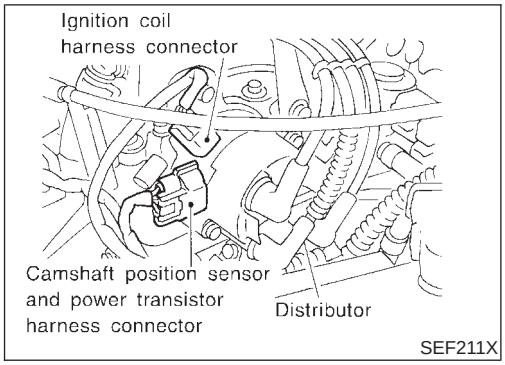
IACV-AAC VALVE

NLEC1843S01

1) Disconnect IACV-AAC valve harness connector.
2) Check IACV-AAC valve resistance.

Condition	Resistance
Terminal 2 and terminals 1, 3	20 - 24Ω [at 20°C (68°F)]
Terminal 5 and terminals 4, 6	

3) Reconnect IACV-AAC valve harness connector.
4) Remove idle air adjusting unit assembly (IACV-AAC valve is built-in) from throttle body.
   (The IACV-AAC valve harness connector should remain connected.)
5) Turn ignition switch "ON" and "OFF", and ensure the IACV-AAC valve shaft smoothly moves forward and backward, according to the ignition switch position.
   If NG, replace the IACV-AAC valve.



Component Description

NLEC1924

IGNITION COIL & POWER TRANSISTOR (BUILT INTO DISTRIBUTOR)

NLEC1924S01

The ignition coil is built into distributor. The ignition signal from the ECM is sent to the power transistor. The power transistor switches on and off the ignition coil primary circuit. As the primary circuit is turned on and off, the proper high voltage is induced in the coil secondary circuit.

The distributor is not repairable and must be replaced as an assembly except distributor cap and rotor head.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1925

MONITOR ITEM	CONDITION		SPECIFICATION
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	15°±2° BTDC
		2,000 rpm	More than 25° BTDC

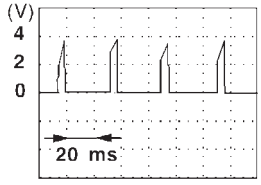
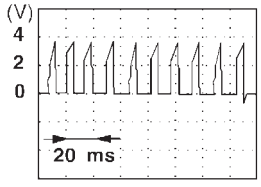
ECM Terminals and Reference Value

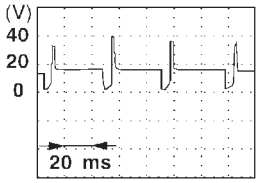
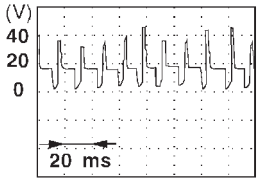
NLEC1926

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

CAUTION:

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W/B	Ignition signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.3V  SEF996V
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 0.8V  SEF997V

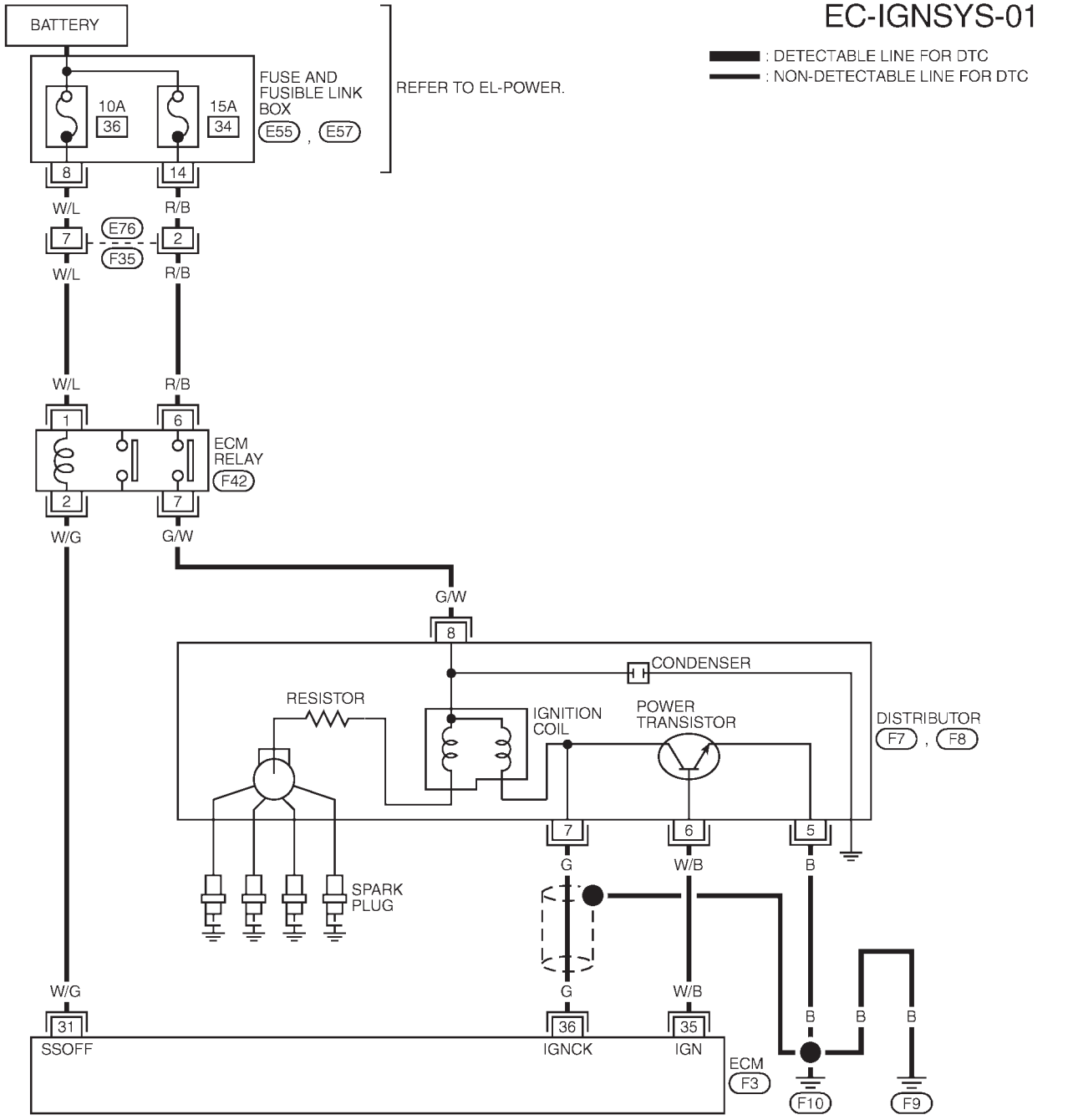
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
36	G	Ignition check	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 13V  SEF998V
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 12V  SEF999V

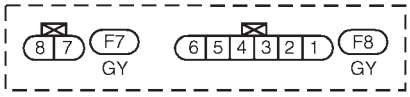
Wiring Diagram

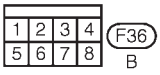
MODELS WITH ECM IN ENGINE COMPARTMENT

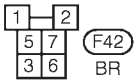
NLEC1927

NLEC1927S01

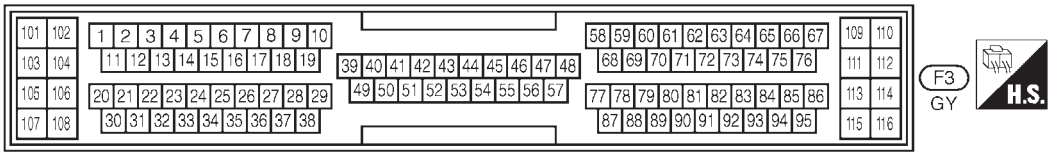








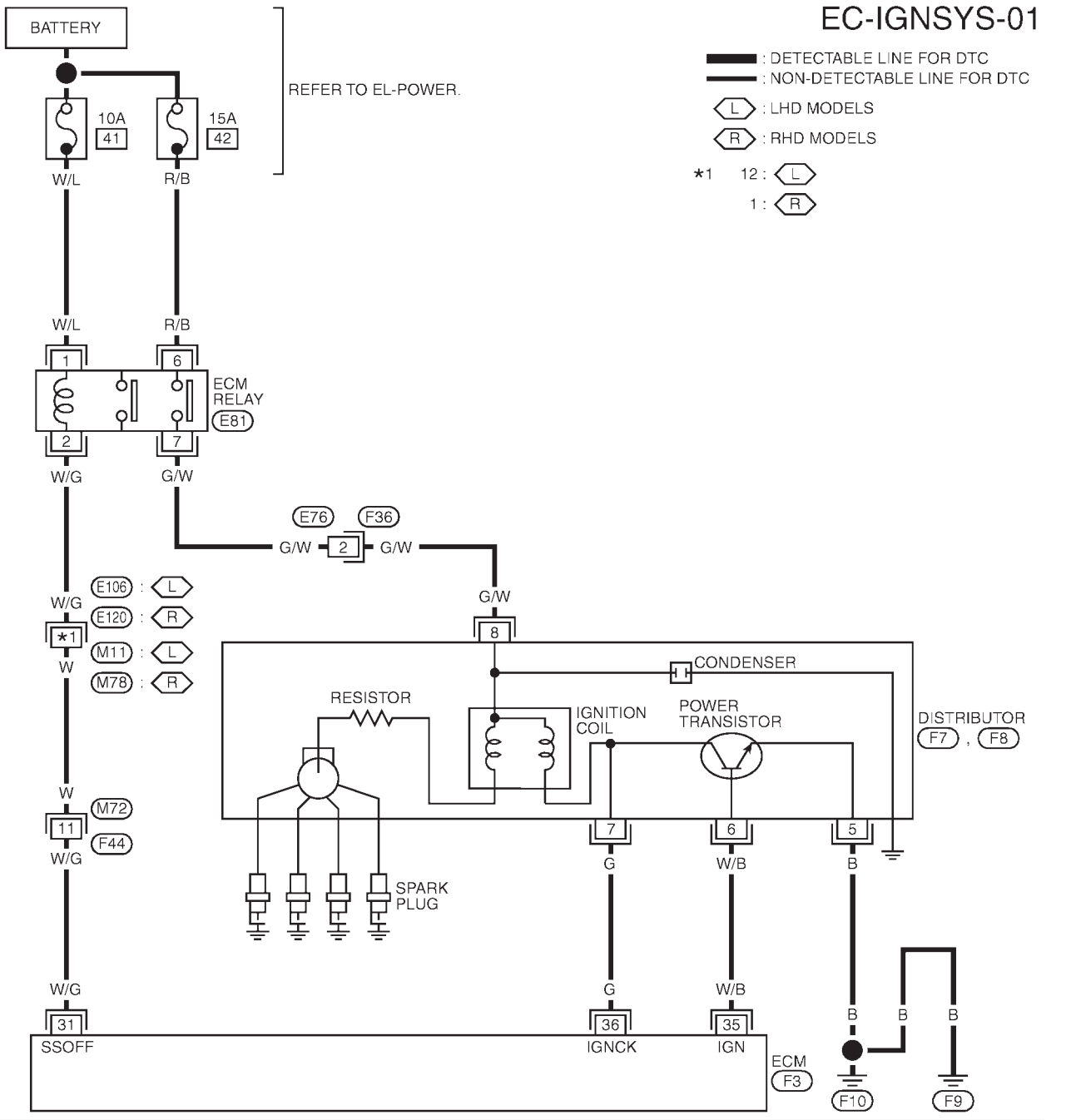
REFER TO THE FOLLOWING.
E55 , E57 -FUSE AND FUSIBLE LINK BOX

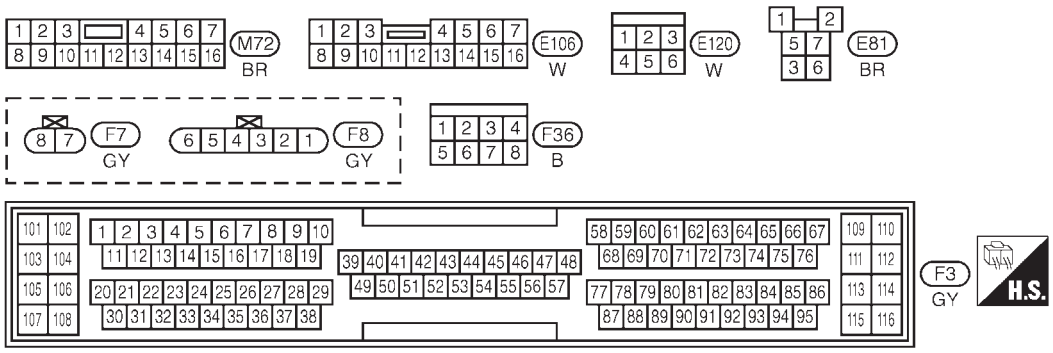


YEC761

MODELS WITH ECM IN CABIN

NLEC1927S02





YEC938

Diagnostic Procedure

NLEC1928

1	CHECK ENGINE START

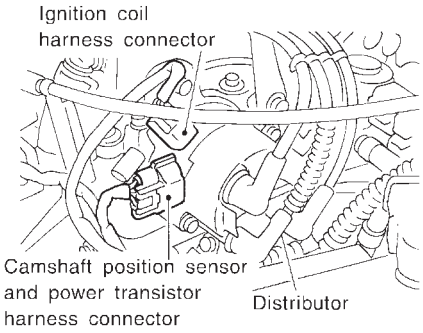
Turn ignition switch “OFF”, and restart engine.
Is engine running?

Yes or No

Yes	▶	GO TO 7.
No	▶	GO TO 2.

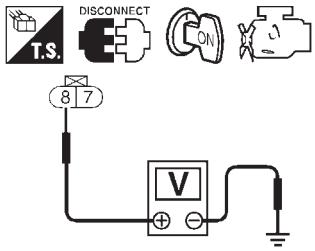
2	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.



SEF211X

3. Turn ignition switch “ON”.
4. Check voltage between ignition coil terminal 8 and ground with CONSULT-II or tester.



SEF257W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F36
- ECM relay
- 15A fuse
- Harness for open or short between ignition coil and fuse

	▶	Repair harness or connectors.

4	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect camshaft position sensor harness connector.
3. Check harness continuity between CMPS terminal 5 and engine ground.
   Refer to "Wiring Diagram", EC-1006.
   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 INPUT SIGNAL CIRCUIT-I

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 35 and CMPS terminal 6.
   Refer to "Wiring Diagram", EC-1006.
   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 IGNITION COIL, POWER TRANSISTOR

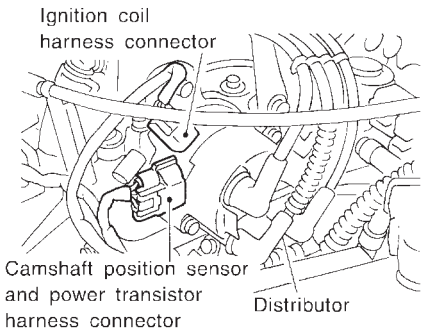
Refer to "Component Inspection", EC-1010.

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace malfunctioning component(s).

7	CHECK INPUT SIGNAL CIRCUIT-II

1. Stop engine.
2. Disconnect ignition coil harness connector and ECM harness connector.



SEF211X

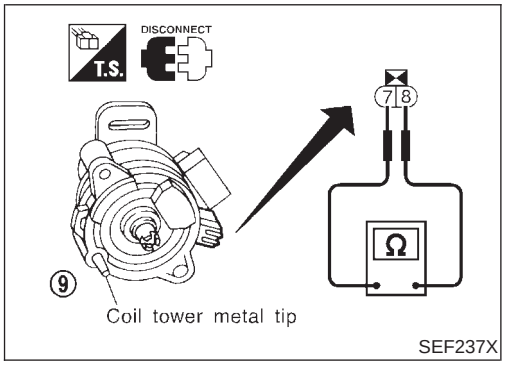
3. Check harness continuity between ignition coil terminal 7 and ECM terminal 36.
   Refer to "Wiring Diagram", EC-1006.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

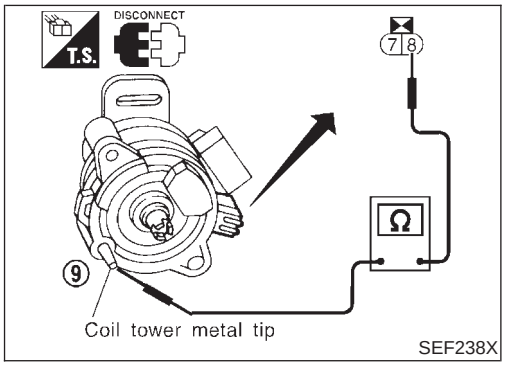
OK	▶	GO TO 8.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK RESISTOR	
Refer to "Component Inspection" EC-1011.		
OK or NG		
OK	▶	GO TO 9.
NG	▶	Replace distributor cap.

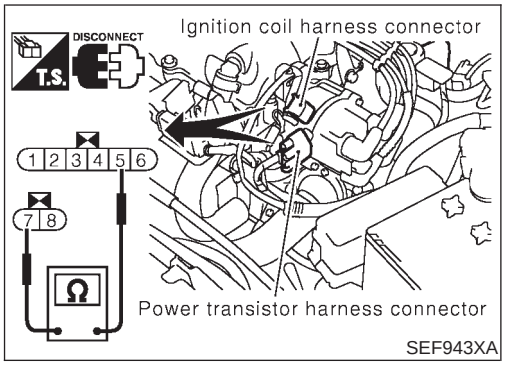
9	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	INSPECTION END



SEF237X



SEF238X



SEF943XA

Component Inspection

IGNITION COIL

NLEC1929

NLEC1929S01

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.
3. For checking secondary coil, remove distributor cap.
4. Check resistance between ignition coil harness connector terminal 8 and coil tower metal tip 9 (secondary terminal) on the distributor head.

Terminal	Resistance [at 25°C (77°F)]
7 - 8 (Primary coil)	Approximately 2.2Ω
8 - secondary terminal on distributor head (Secondary coil)	Approximately 17 kΩ

If NG, replace distributor.

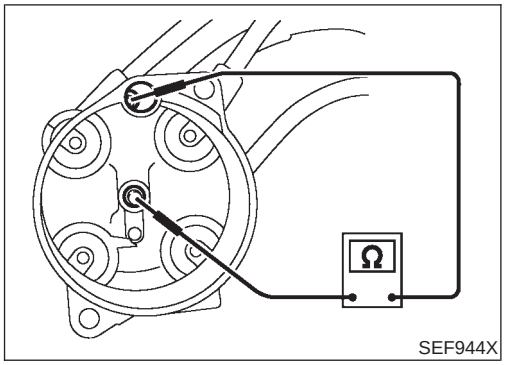
POWER TRANSISTOR

NLEC1929S02

1. Disconnect power transistor harness connector and ignition coil harness connector.
2. Check power transistor resistance between terminals 5 and 7.

Terminals	Resistance	Result
5 and 7	Except 0Ω	OK
	0Ω	NG

If NG, replace distributor.



RESISTOR

NLEC1929S03

1. Disconnect resistor harness connector.
2. Check resistance as shown in the figure.

Resistance: Approximately 5 kΩ [at 25°C (77°F)]

If NG, replace distributor cap.

System Description

NLEC1844

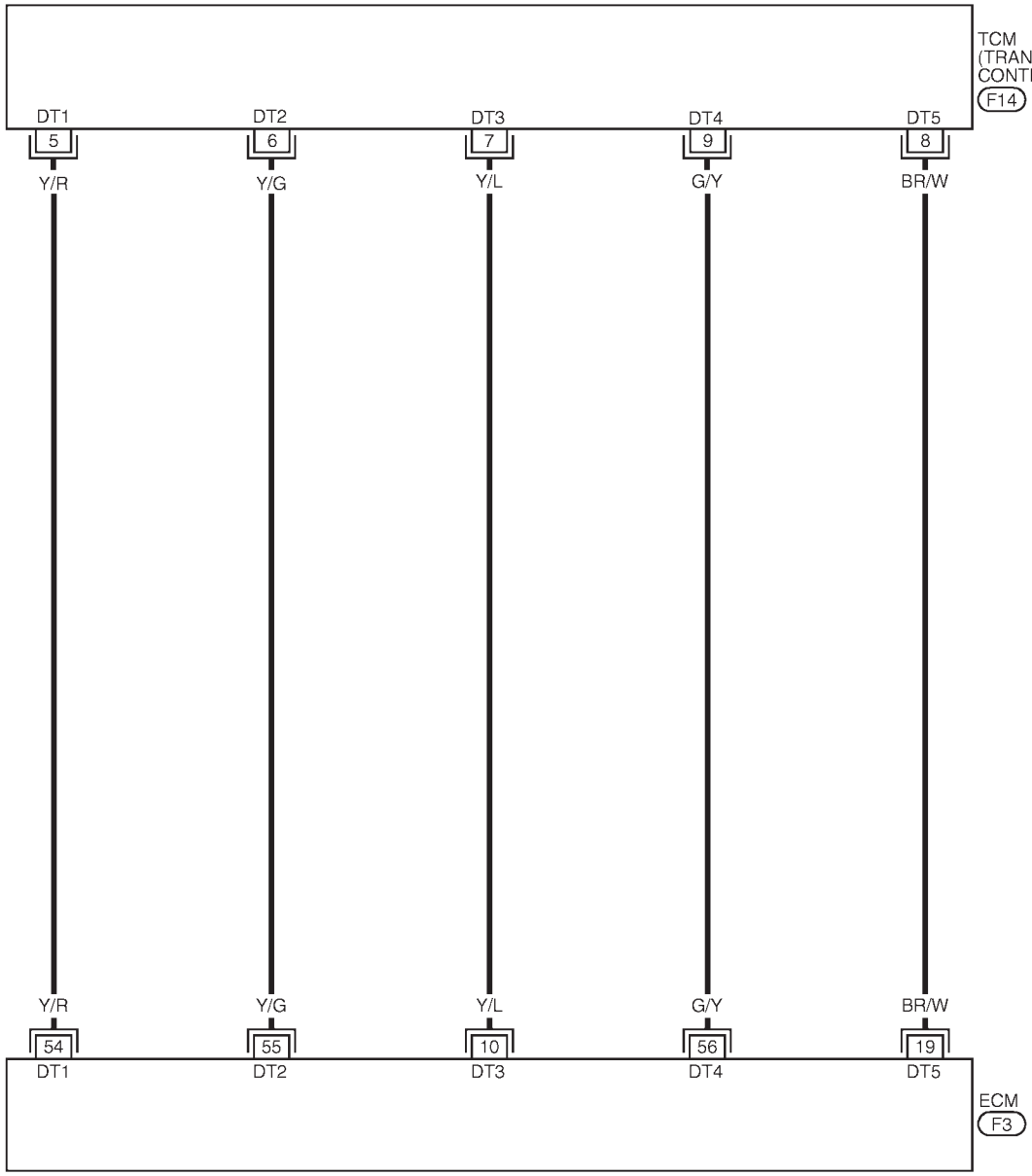
These circuit lines are used to control the smooth shifting up and down of CVT during the hard acceleration/ deceleration.
Voltage signals are exchanged between ECM and TCM (Transmission Control Module).

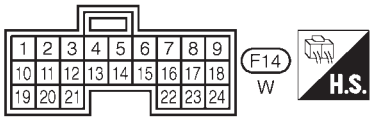
Wiring Diagram

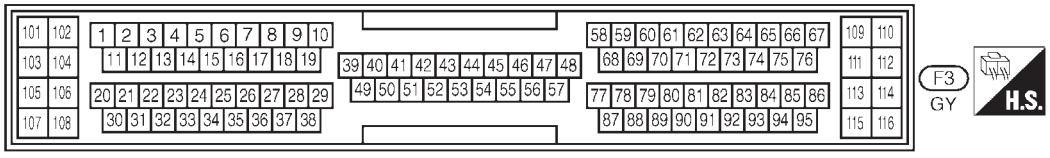
=NLEC1845

EC-ATCONT-01

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







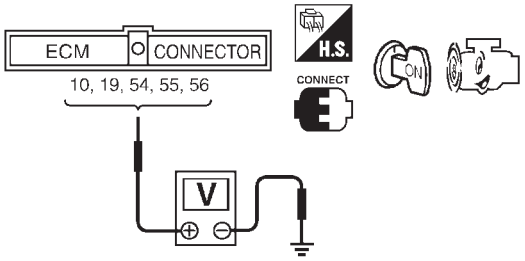
YEC719

Diagnostic Procedure

NLEC1846

1	CHECK OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM terminals 10, 19, 54, 55, 56 and ground.



Voltage should fluctuate between 0 to 5V.

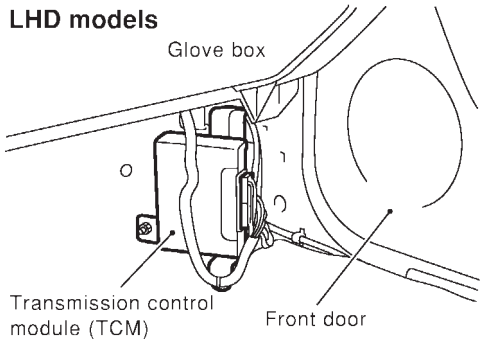
SEF791Z

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.



SEF116Y

3. Check harness continuity between the following terminals.

ECM	TCM
54	5
55	6
10	7
19	8
56	9

MTBL0574

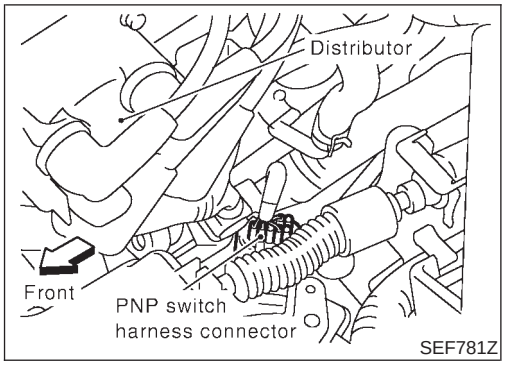
Refer to Wiring Diagram.
Continuity should exist.

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 10, 19, 54, 55, 56 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-670.		
	▶	**INSPECTION END**



Component Description

NLEC1847

When the gear position is “P” or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the park/neutral position when continuity with ground exists.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1848

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

ECM Terminals and Reference Value

NLEC1849

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)
42	G/OR	PNP switch	**[Ignition switch “ON”]** ● Gear position is “N” or “P”	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)

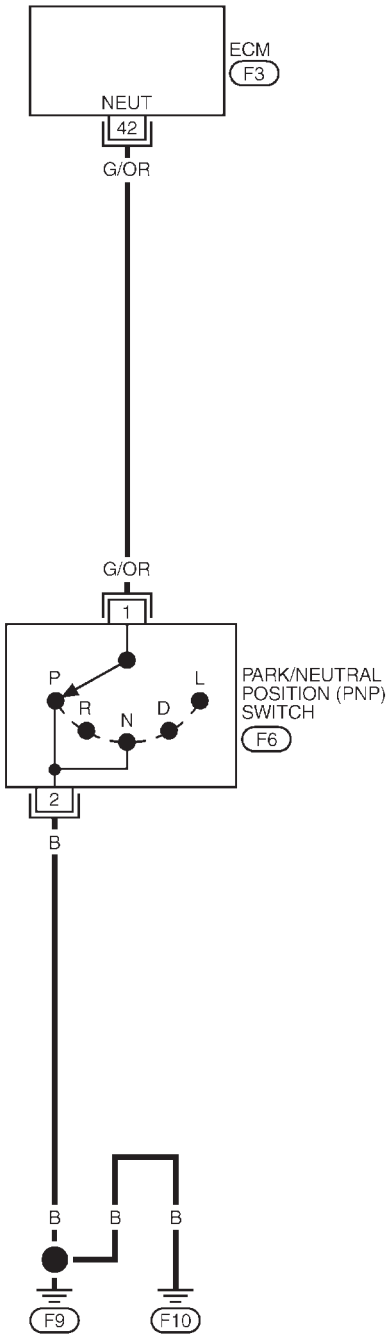
Wiring Diagram

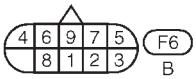
TYPE-1

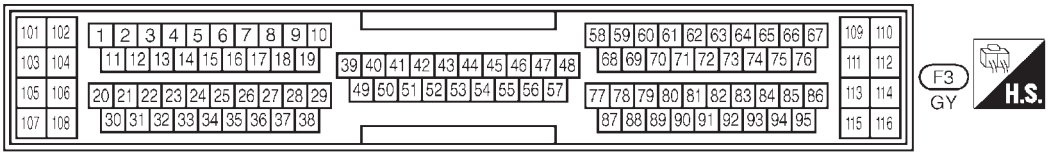
NLEC1853

NLEC1853S01

EC-PNPSW1-01





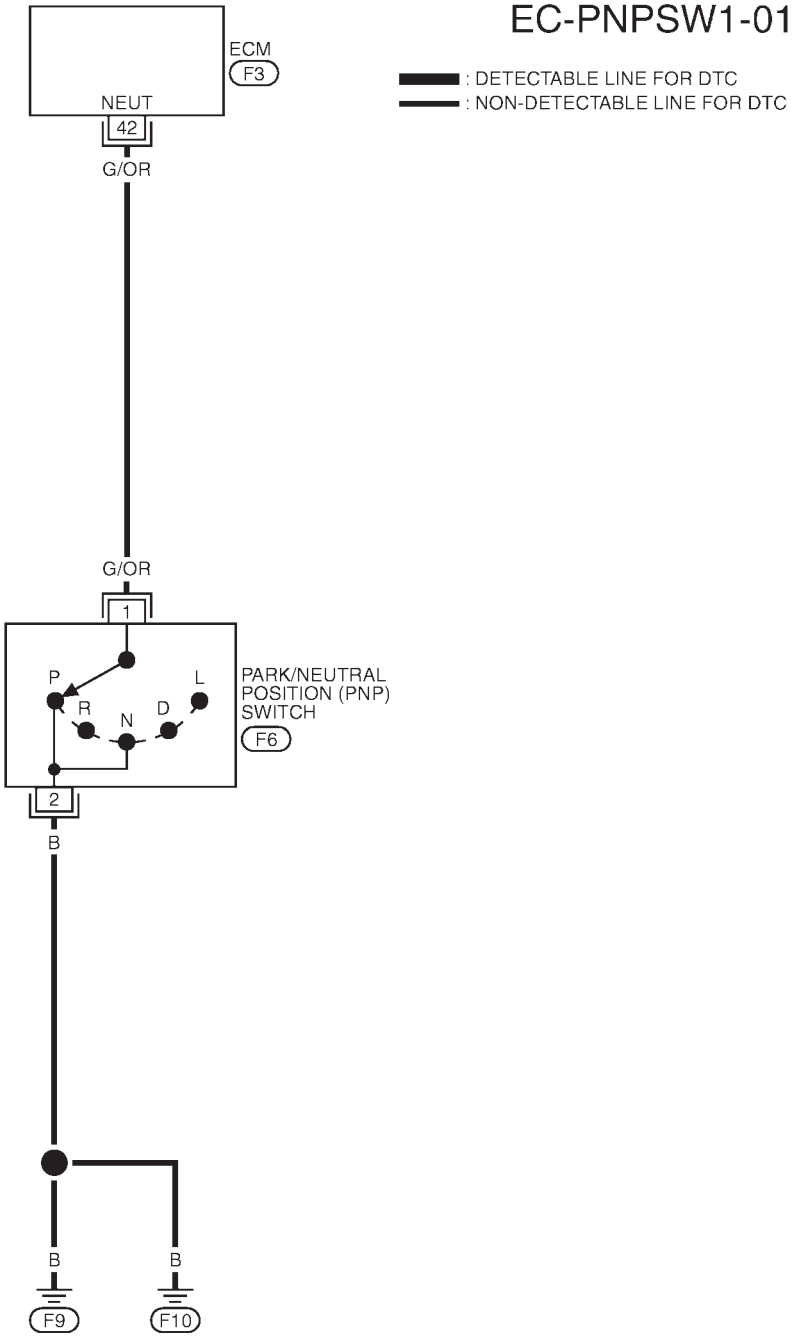


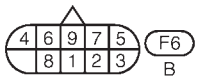
YEC760

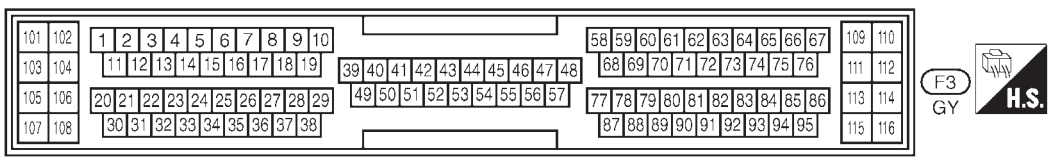
TYPE-2

NLEC1853S02

EC-PNPSW1-01







YEC939

Diagnostic Procedure

NLEC1854

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

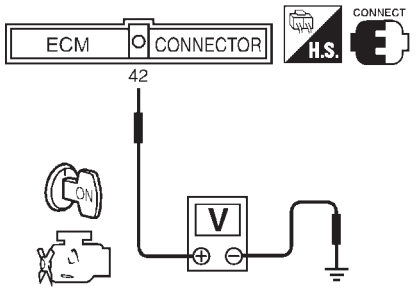
OK or NG

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 42 and ground under the following conditions.



Selector lever position	Voltage
“P” and “N” position	Apporox. 0V
Except the above position	Battery voltage

SEF811Z

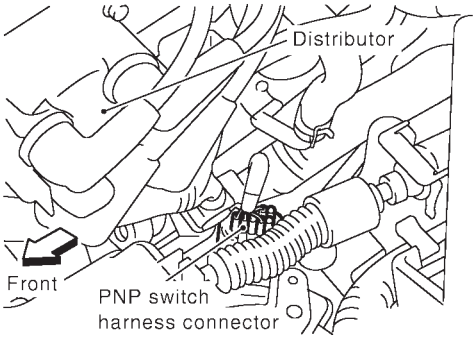
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

4	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.



SEF781Z

3. Check harness continuity between PNP switch harness connector terminal 2 and body ground.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the harness for open or short between PNP switch and body ground.

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

6	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 42 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 harness for open or short between ECM and PNP switch.

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

8	CHECK PNP SWITCH

Refer to AT-66, "PARK/NEUTRAL POSITION (PNP) SWITCH".

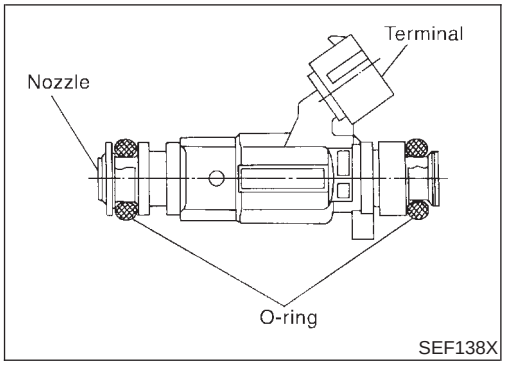
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace PNP switch.

9	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.

	▶	**INSPECTION END**



Component Description

NLEC1855

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

NLEC1856

MONITOR ITEM	CONDITION		SPECIFICATION
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	2.4 - 3.2 msec
		2,000 rpm	1.4 - 2.8 msec

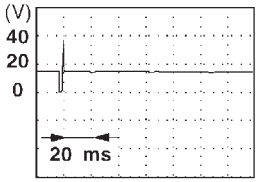
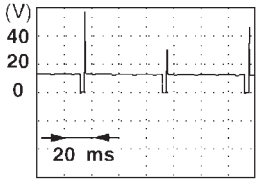
ECM Terminals and Reference Value

NLEC1857

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

CAUTION:

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

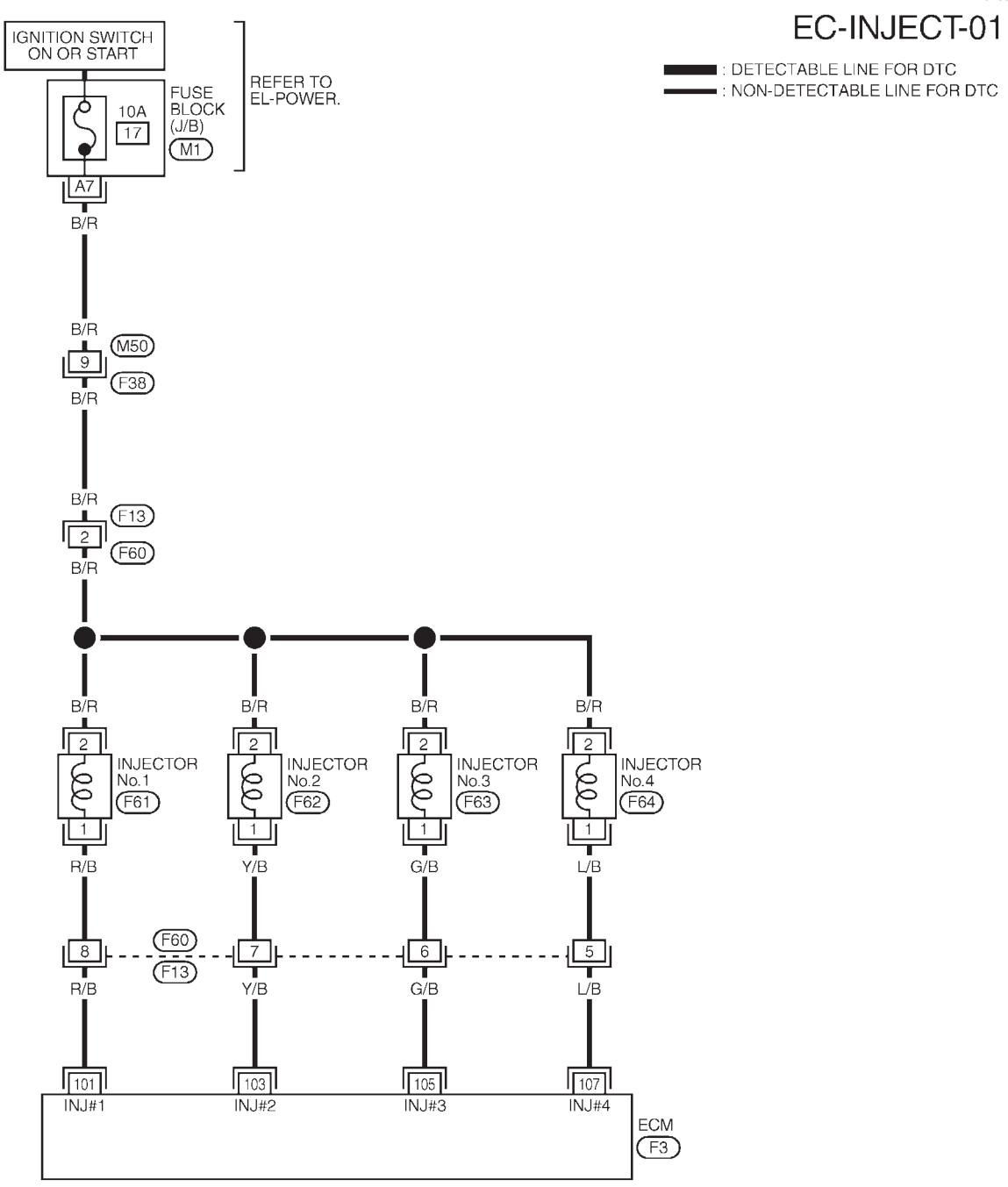
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101 103 105 107	R/B Y/B G/B L/B	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF011W
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  SEF012W

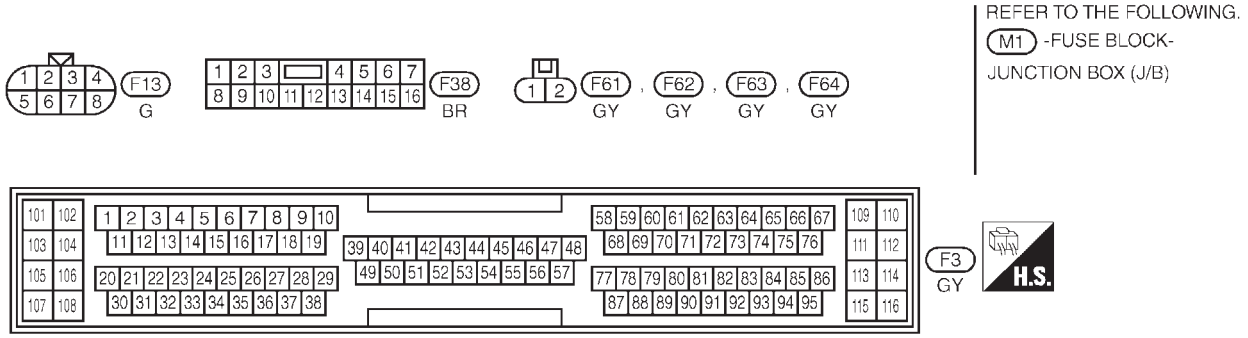
Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1858

NLEC1858S01

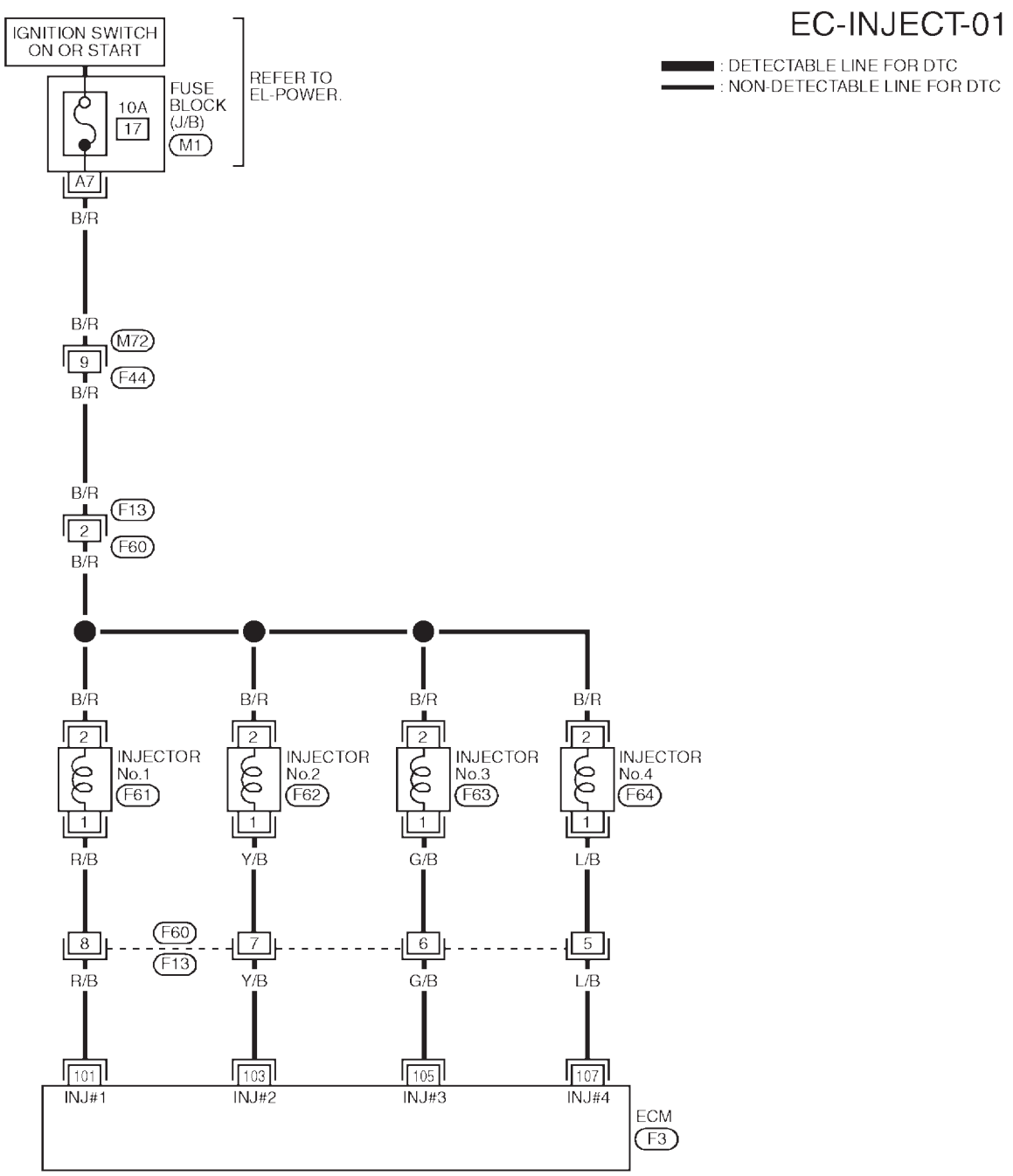




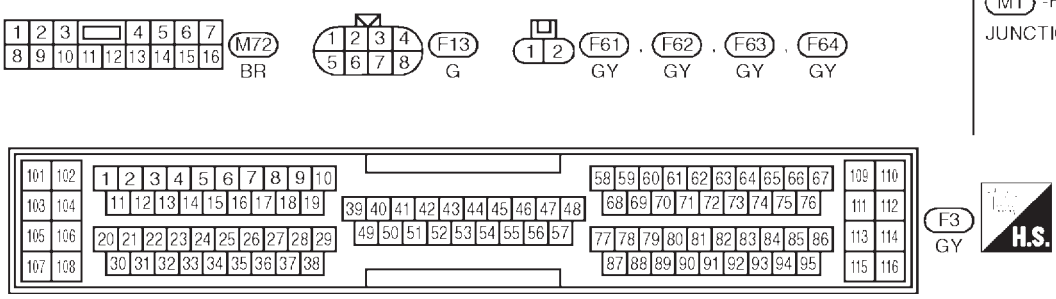
YEC711

MODELS WITH ECM IN CABIN

NLEC1858S02



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



YEC940

Diagnostic Procedure

NLEC1859

1	CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.

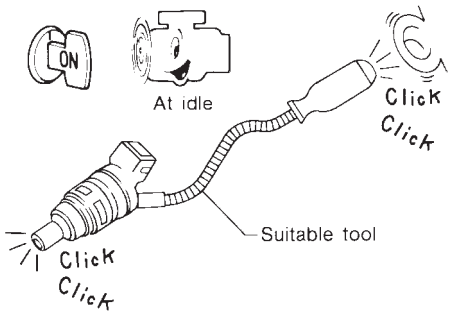
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

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

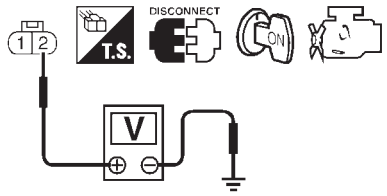
Clicking noise should be heard.

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK POWER SUPPLY

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT-II or tester.



SEF986W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness connectors F38, M50 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors F13, F60
- Harness for open or short between injector and fuse

	▶	Repair harness or connectors.

4	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal 1 and ECM terminals 101, 103, 105, 107. 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

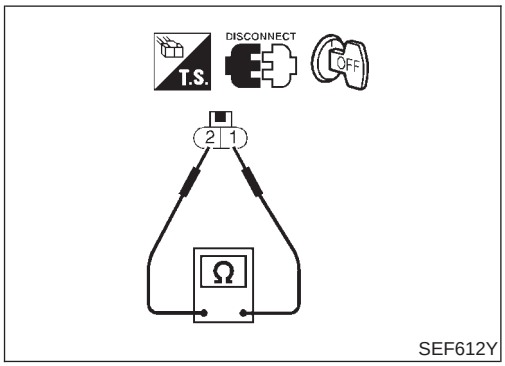
Check the following.
- Harness connectors F60, F13
- Harness for open or short between ECM and injector.

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

Diagnostic Procedure (Cont'd)

6	CHECK INJECTOR	
Refer to "Component Inspection", EC-1026.		
	OK or NG	
OK	▶	GO TO 7.
NG	▶	Replace injector.

7	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



Component Inspection

NLEC1860

INJECTOR

NLEC1860S01

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

   Resistance: 13.1 - 16.0Ω [at 25°C (77°F)]

   If NG, replace injector.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1861

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

ECM Terminals and Reference Value

NLEC1862

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.

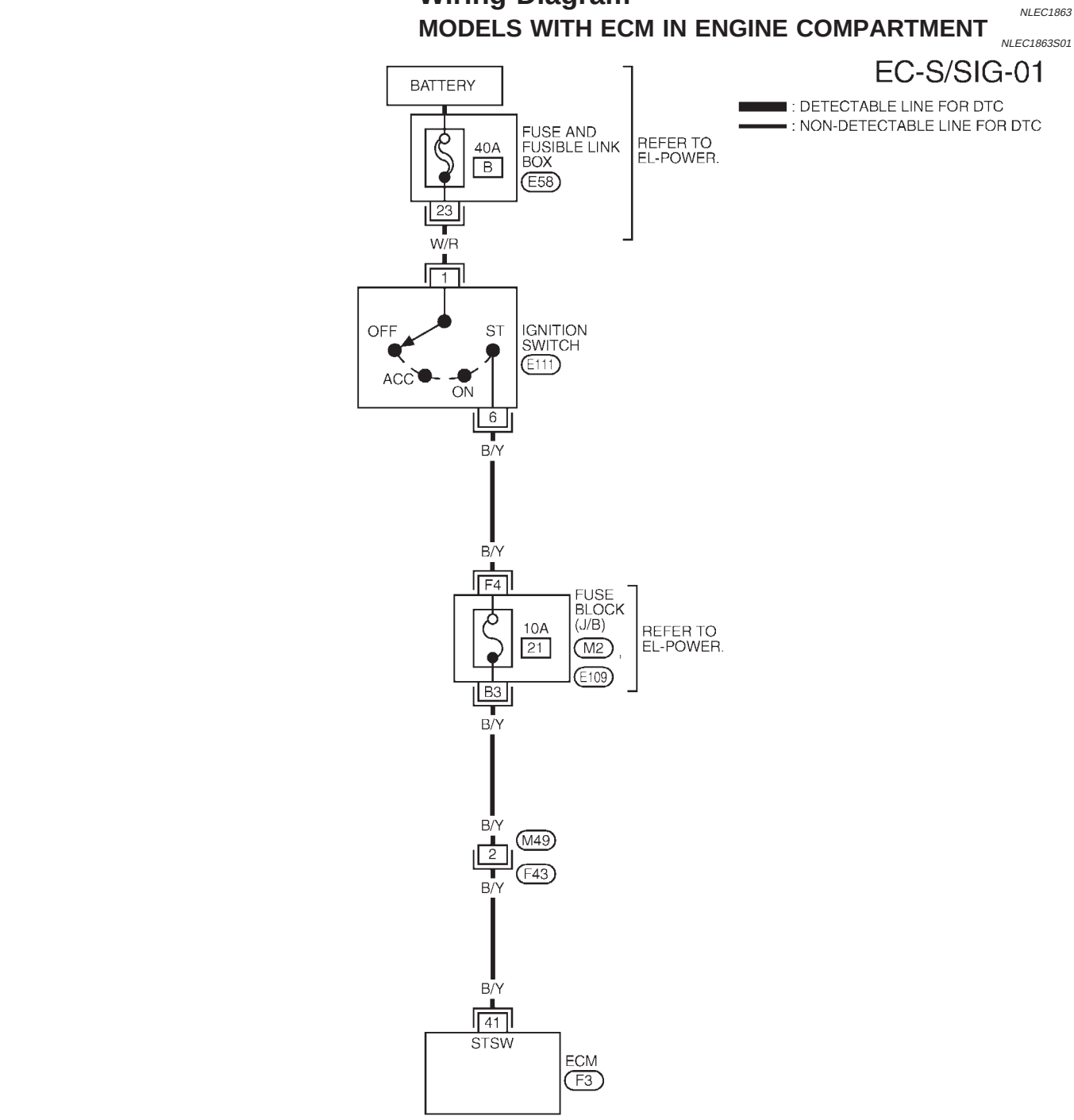
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V

Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1863

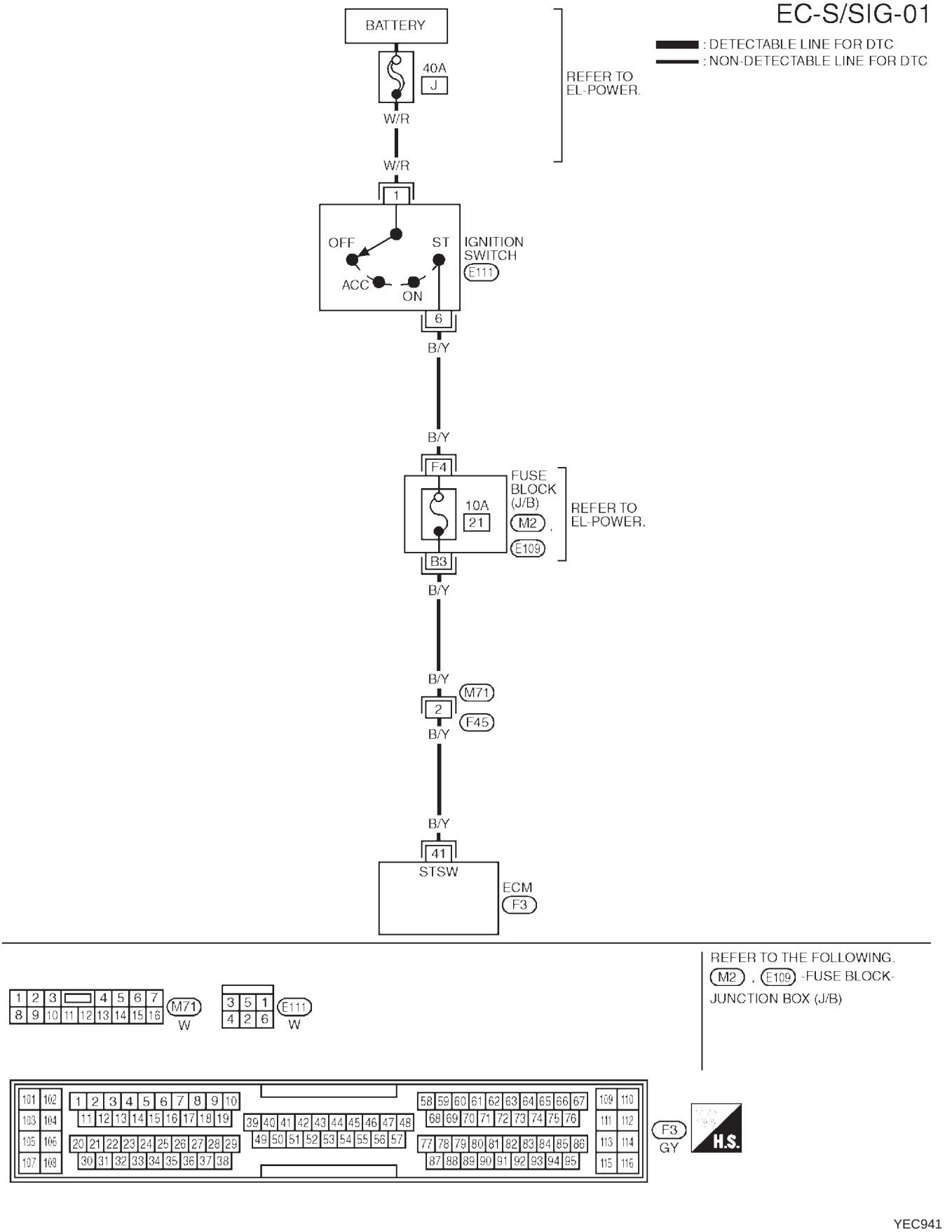
NLEC1863S01



YEC713

MODELS WITH ECM IN CABIN

NLEC1863S02



YEC941

Diagnostic Procedure

=NLEC1864

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

Condition	“START SIGNAL”
Ignition switch “ON”	OFF
Ignition switch “START”	ON

SEF227Y

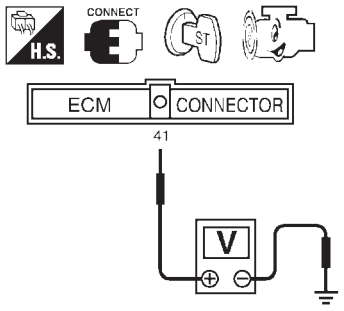
OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Turn ignition switch to “START”.
2. Check voltage between ECM terminal 41 and ground under the following conditions.



Condition	Voltage
Ignition switch “START”	Battery Voltage
Except above	Approximately 0V

SEF613Y

OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

4	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors M49, F43 (where fitted) ● Harness connectors M71, F45 (where fitted) ● 10A fuse ● Harness for open or short between ECM and ignition switch		
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 INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.		
	▶	**INSPECTION END**

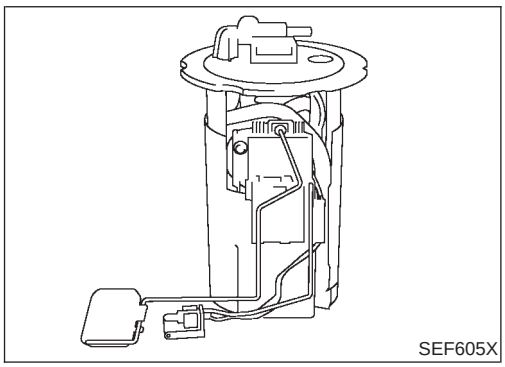
System Description

NLEC1865

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Fuel pump control	Fuel pump relay
Ignition switch	Ignition signal and 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 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° 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 (Signal is not sent from crankshaft position sensor and camshaft position sensor.)	Stops in 1.5 seconds
Except as shown above	Stops


SEF605X

Component Description

NLEC1866

A turbine type design fuel pump is used in the fuel tank.

CONSULT-II Reference Value in Data Monitor Mode

NLEC1867

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 1 second) ● Engine running and cranking ● When engine is stopped (stops in 1.5 seconds)	ON
	● Except as shown above	OFF

ECM Terminals and Reference Value

=NLEC1868

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.

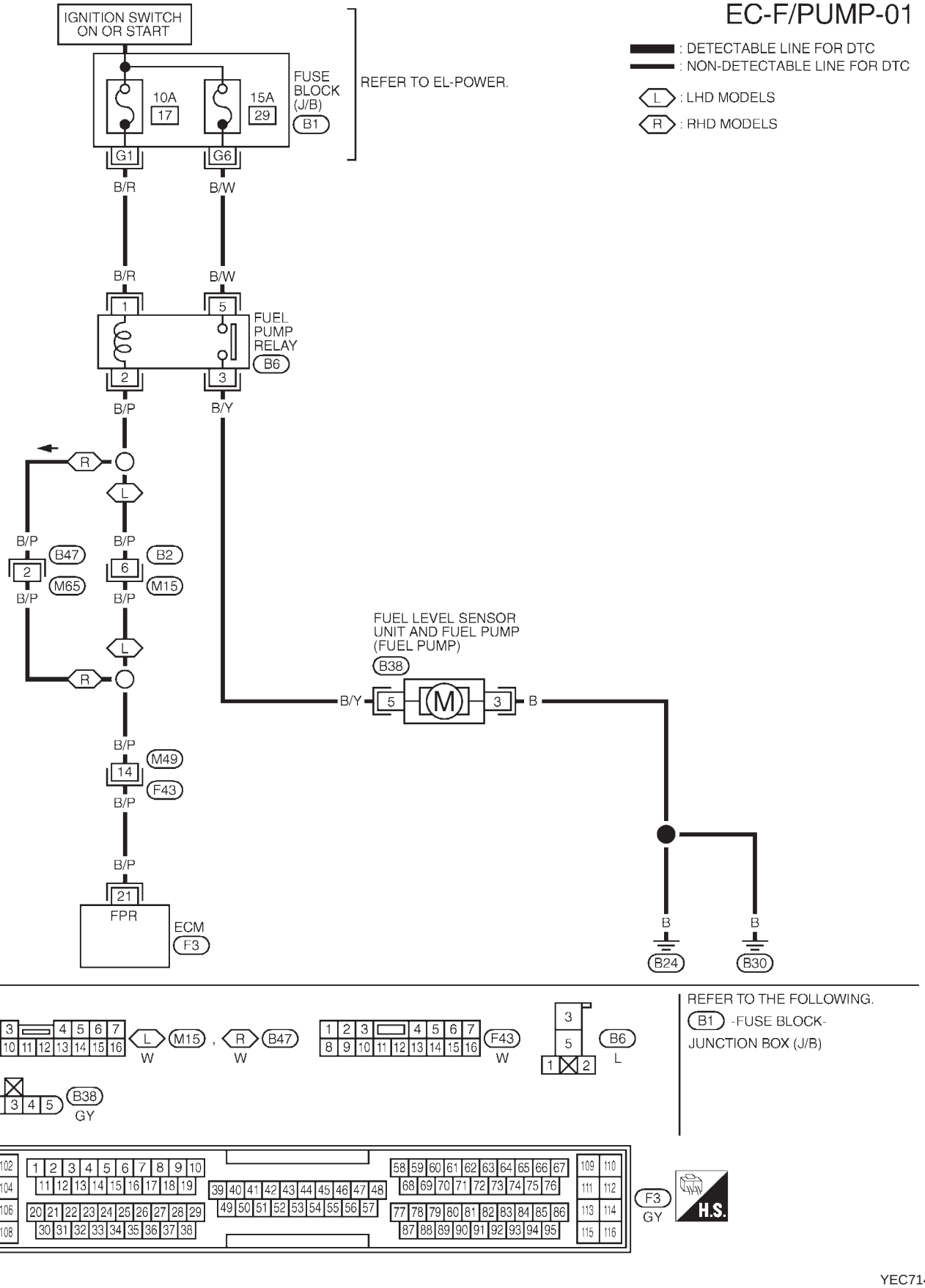
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1869

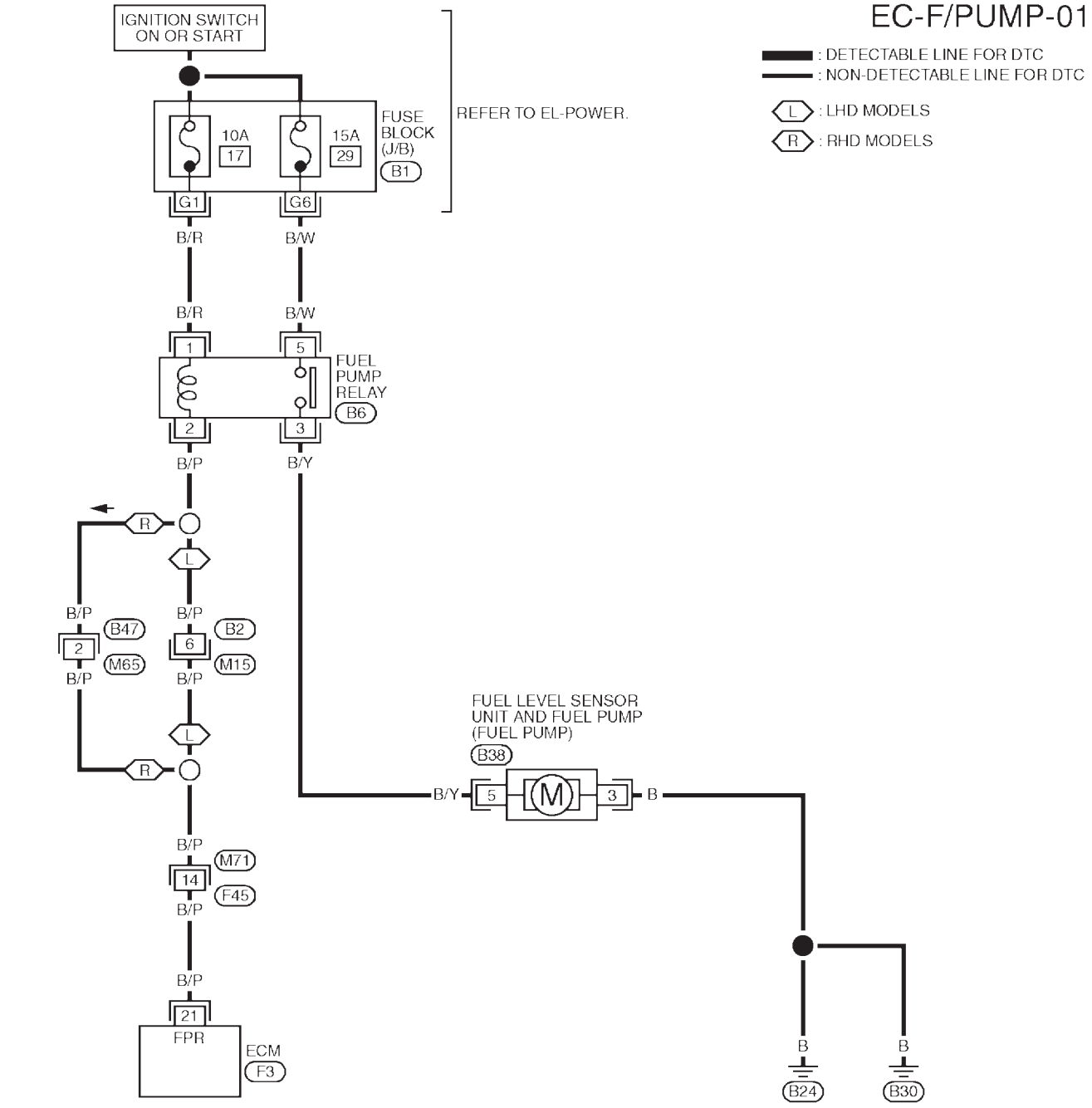
NLEC1869S01

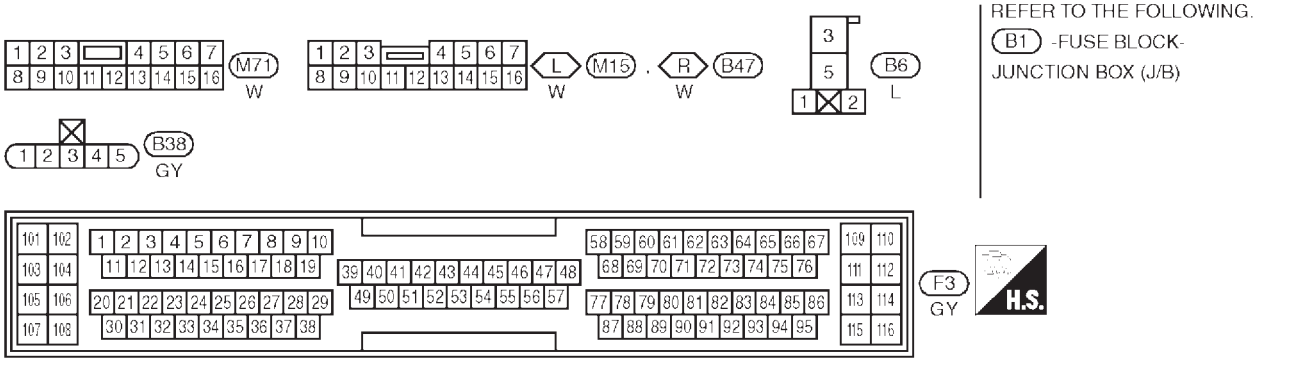


YEC714

MODELS WITH ECM IN CABIN

NLEC1869S02





REFER TO THE FOLLOWING.
B1 -FUSE BLOCK-
JUNCTION BOX (J/B)

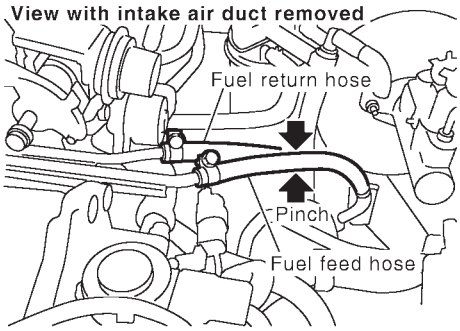
YEC942

Diagnostic Procedure

NLEC1870

1	CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Pinch fuel feed hose with fingers.



SEF812Z

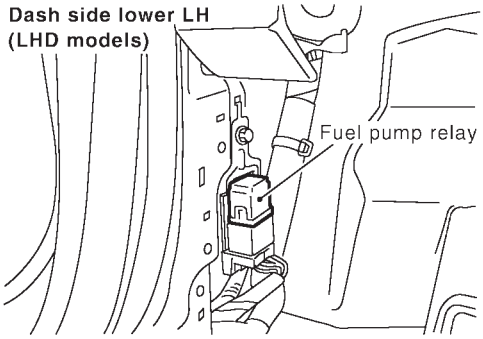
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned “ON”.

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

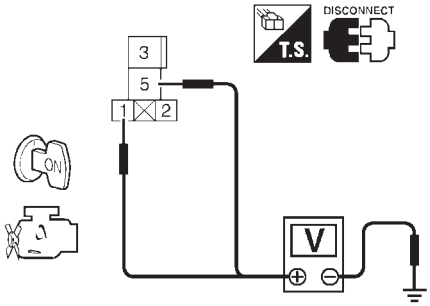
2	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect fuel pump relay.



SEF633Z

3. Turn ignition switch “ON”.
4. Check voltage between terminals 1, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF607X

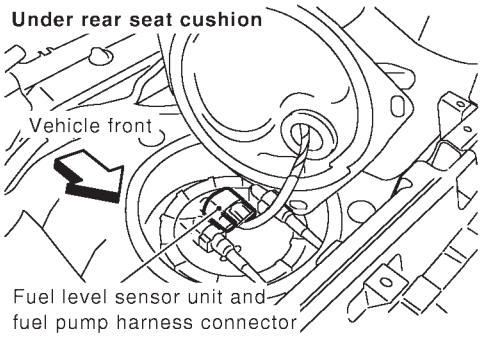
OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● 10A fuse ● 15A fuse ● Harness for open or short between fuse and fuel pump relay	
▶	Repair harness or connectors.

4	CHECK POWER GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF632Z

3. Check harness continuity between fuel level sensor unit and fuel pump terminal 3 and body ground, fuel level sensor unit and fuel pump terminal 5 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 level sensor unit and fuel pump and body ground ● Harness for open or short between fuel level sensor unit and fuel pump and fuel pump relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 21 and fuel pump relay connector 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.

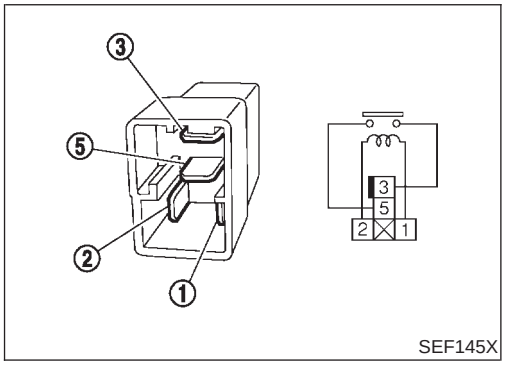
Diagnostic Procedure (Cont'd)

7	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors B2, M15 (LHD models), B47, M65 (RHD models) ● Harness connectors M49, F43 (where fitted) ● Harness connectors M71, F45 (where fitted) ● Harness for open or short between ECM and fuel pump relay	
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

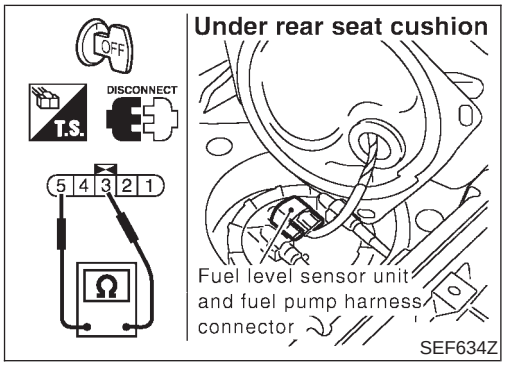
8	CHECK FUEL PUMP RELAY
Refer to "Component Inspection", EC-1038.	
OK or NG	
OK ▶	GO TO 9.
NG ▶	Replace fuel pump relay.

9	CHECK FUEL PUMP
Refer to "Component Inspection", EC-1038.	
OK or NG	
OK ▶	GO TO 10.
NG ▶	Replace fuel pump.

10	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
▶	**INSPECTION END**



SEF145X



SEF634Z

Component Inspection

FUEL PUMP RELAY

NLEC1871

NLEC1871S01

Check continuity between terminals 3 and 5.

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

If NG, replace relay.

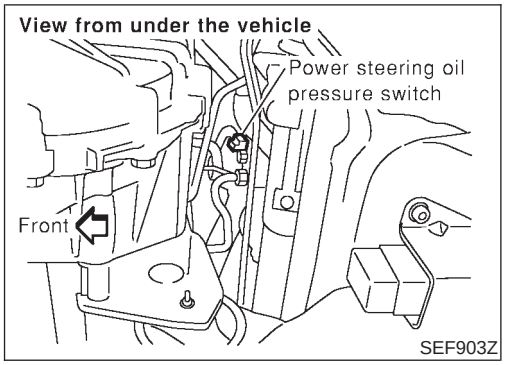
FUEL PUMP

NLEC1871S02

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between terminals 3 and 5.

   Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]

   If NG, replace fuel pump.



Component Description

NLEC1872

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

NLEC1873

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

ECM Terminals and Reference Value

NLEC1874

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

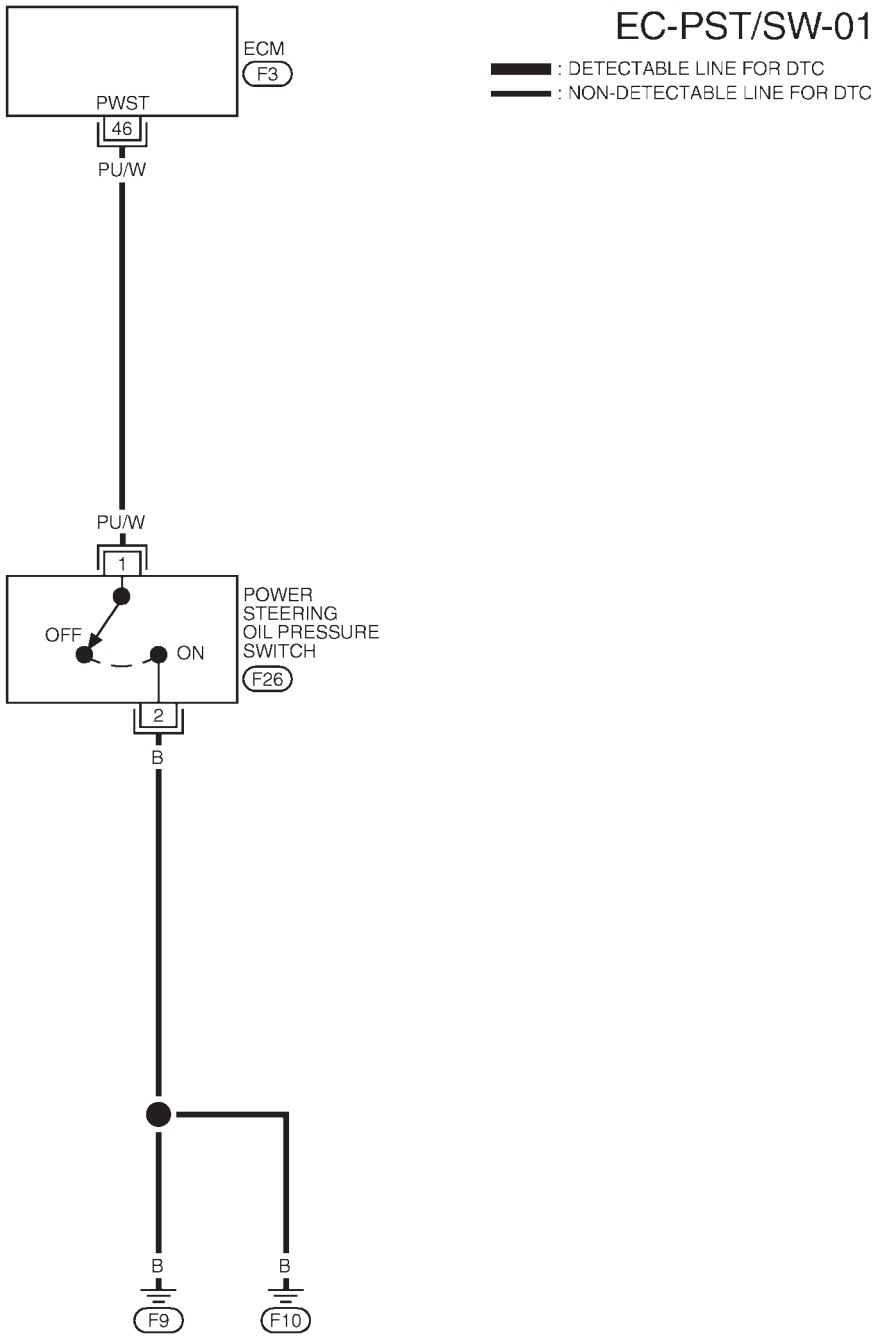
CAUTION:

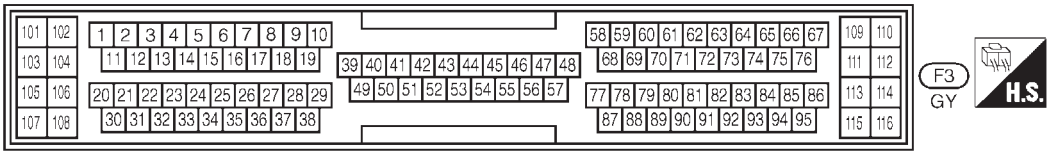
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	PU/W	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is fully turned	Approximately 0V
			[Engine is running] ● Steering wheel is not turned	Approximately 5V

Wiring Diagram

NLEC1875





YEC715

Diagnostic Procedure

=NLEC1876

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

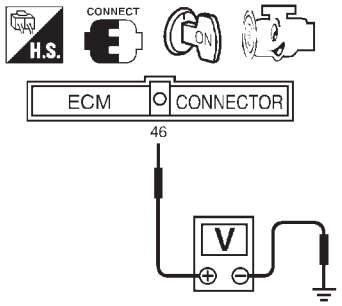
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 46 and ground under the following conditions.



Condition	Voltage
When steering wheel is turned quickly	Approximately 0V
Except above	Approximately 5V

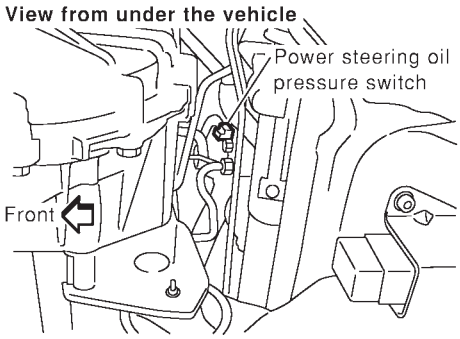
SEF614Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.



SEF903Z

3. Check harness continuity between power steering oil pressure 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 5.
NG	▶	Repair open circuit or short to power in harness or connectors.

5	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 46 and power steering oil pressure 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 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the harness for open or short between ECM and power steering oil pressure switch.	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK POWER STEERING OIL PRESSURE SWITCH
Refer to "Component Inspection", EC-1043.	

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace power steering oil pressure switch.

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-670.	
	▶ **INSPECTION END**

Component Inspection

NLEC1877

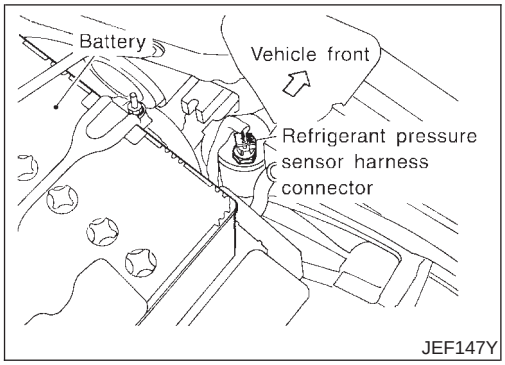
POWER STEERING OIL PRESSURE SWITCH

NLEC1877S01

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals 1 and 2.
   Refer to wiring diagram.

Conditions	Continuity
Steering wheel is being fully turned.	Yes
Steering wheel is not being turned.	No

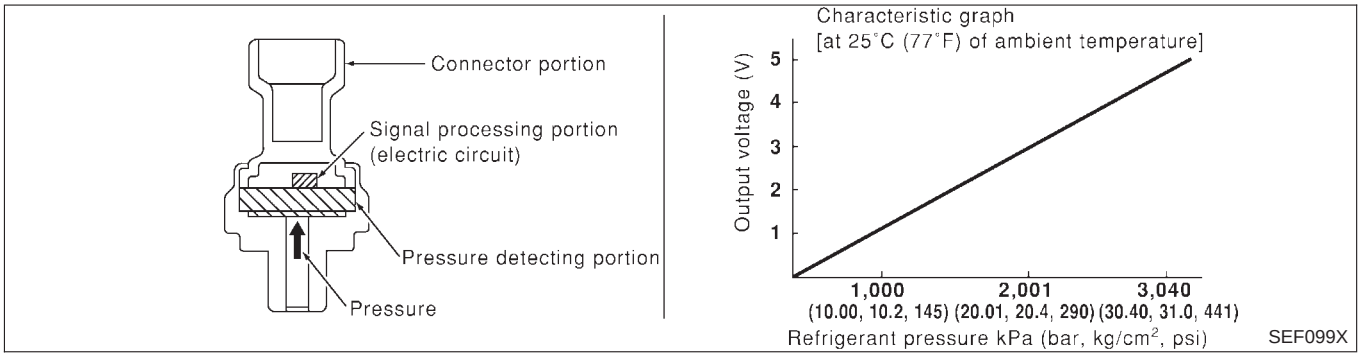
If NG, replace power steering oil pressure switch.



Description

NLEC1878

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.



ECM Terminals and Reference Value

NLEC1879

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.

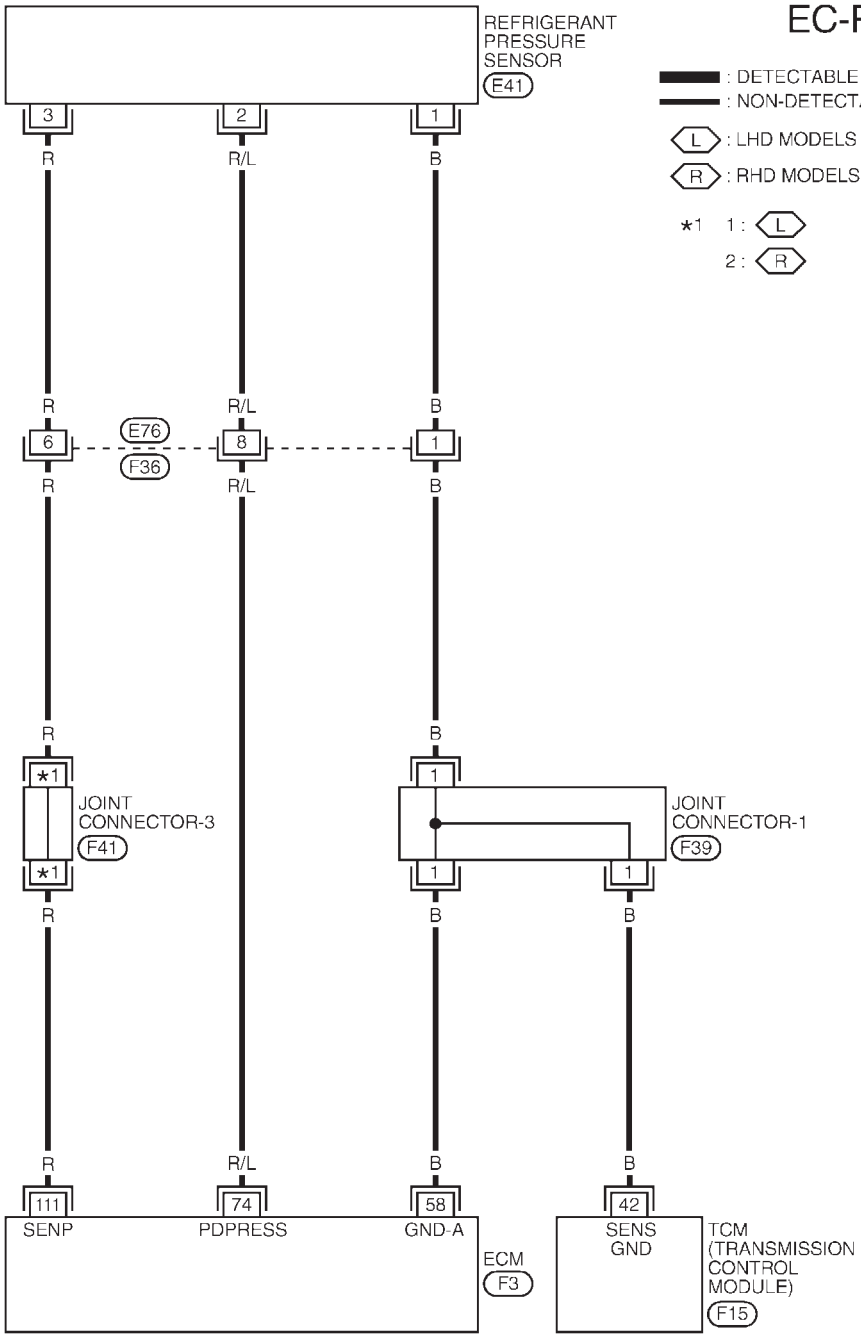
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	R/L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON" (Compressor operates.)	1.0 - 4.0V
111	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V

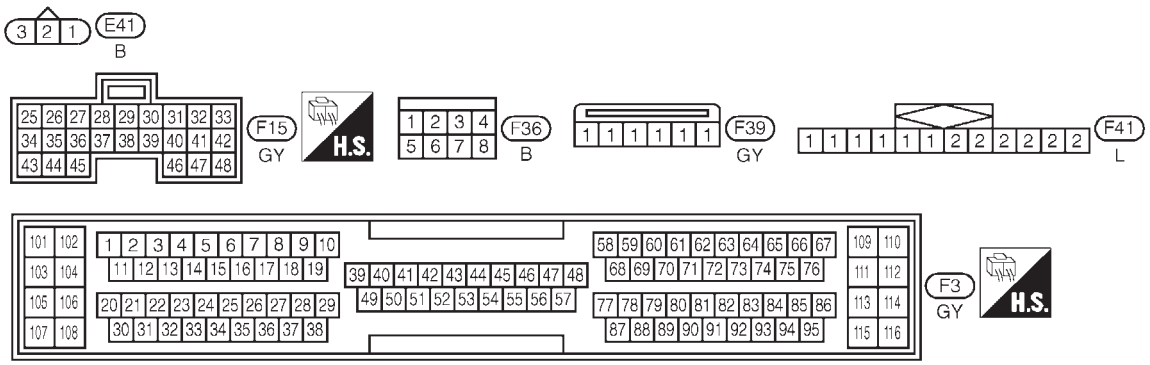
Wiring Diagram

NLEC1880

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1880S03



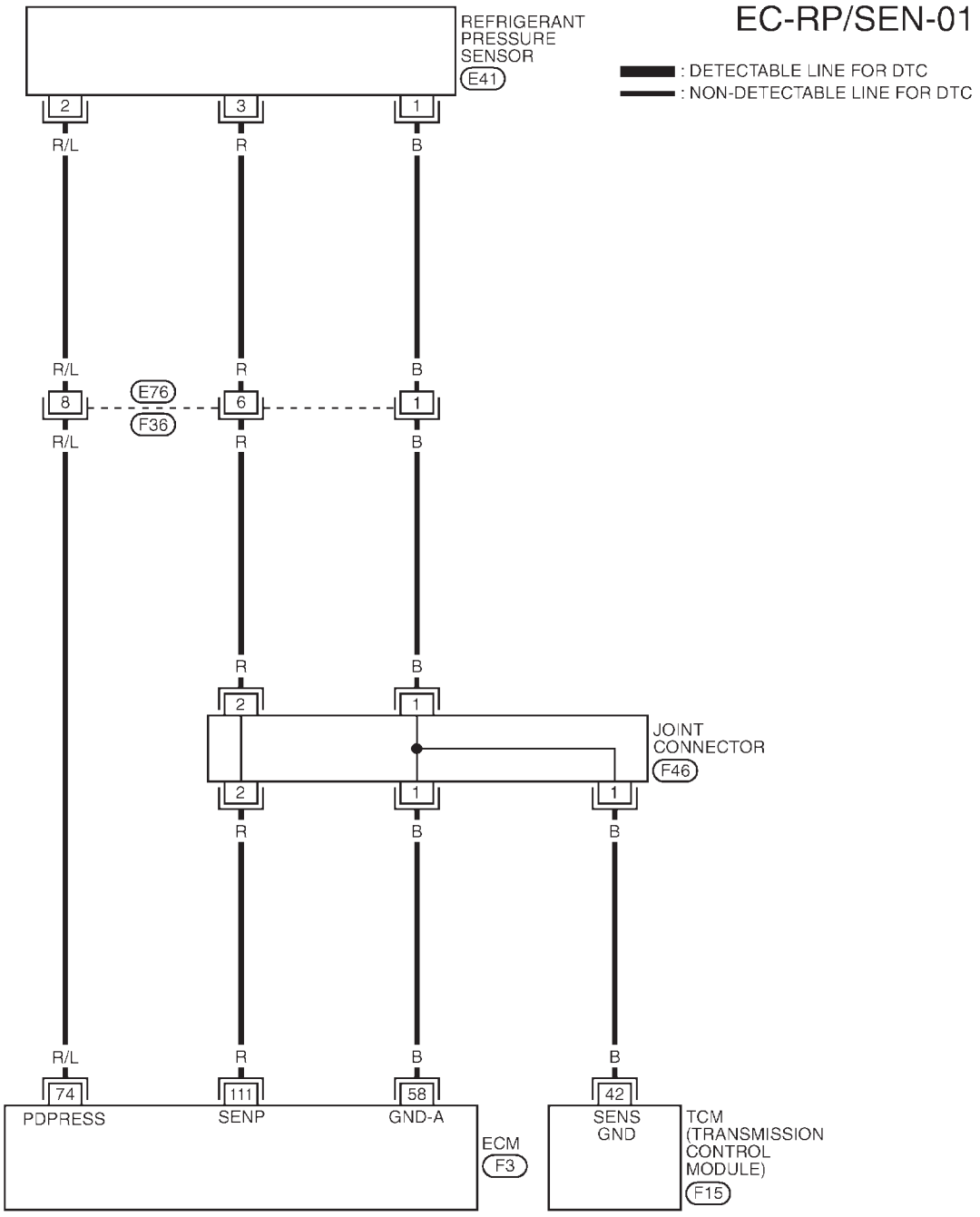


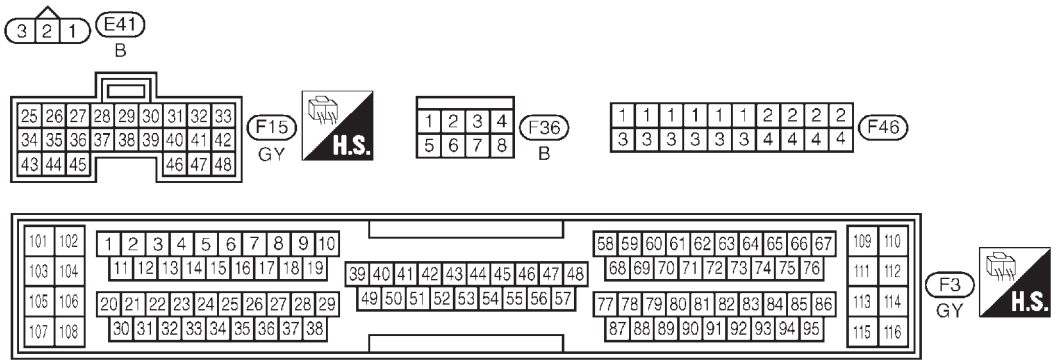
YEC707

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC1880S04





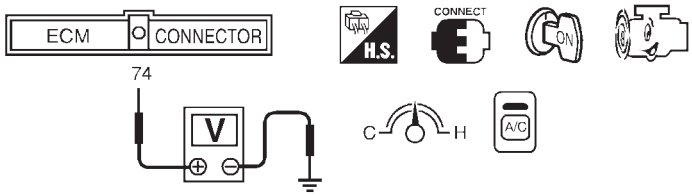
YEC943

Diagnostic Procedure

NLEC1881

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 74 and ground with CONSULT-II or tester.



Voltage: 1.0 - 4.0V

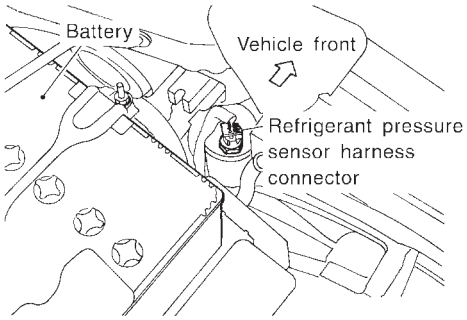
SEF952XA

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

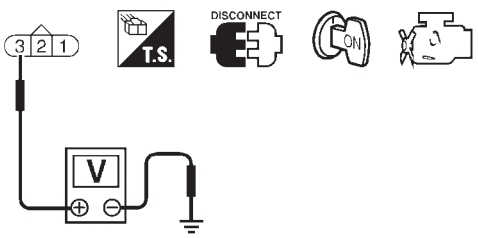
2	CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.



JEF147Y

4. Turn ignition switch “ON”.
5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF953X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E76, F36 ● Joint connector-3 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between ECM and refrigerant pressure sensor	
▶	Repair harness or connectors.

4	CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT	
1. Turn ignition switch "OFF". 2. Check harness continuity between refrigerant pressure 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 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E76, F36 ● Joint connector-1 (where fitted) ● Joint connector F46 (where fitted) ● Harness for open or short between ECM and refrigerant pressure sensor	
▶	Repair open circuit or short to power in harness or connectors.

6	CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 74 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 E76, F36 ● Harness for open or short between ECM and refrigerant pressure sensor	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK REFRIGERANT PRESSURE SENSOR	
Refer to HA-12 or HA-74, "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-670.	
▶	**INSPECTION END**

CONSULT-II Reference Value in Data Monitor Mode

NLEC1882

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger is operating and/or lighting switch is on.	ON
		Rear window defogger is not operating and lighting switch is not on.	OFF
HEATER FAN SW	● Ignition switch: ON	Heater fan motor is operating.	ON
		Heater fan motor is not operating.	OFF

ECM Terminals and Reference Value

NLEC1883

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.

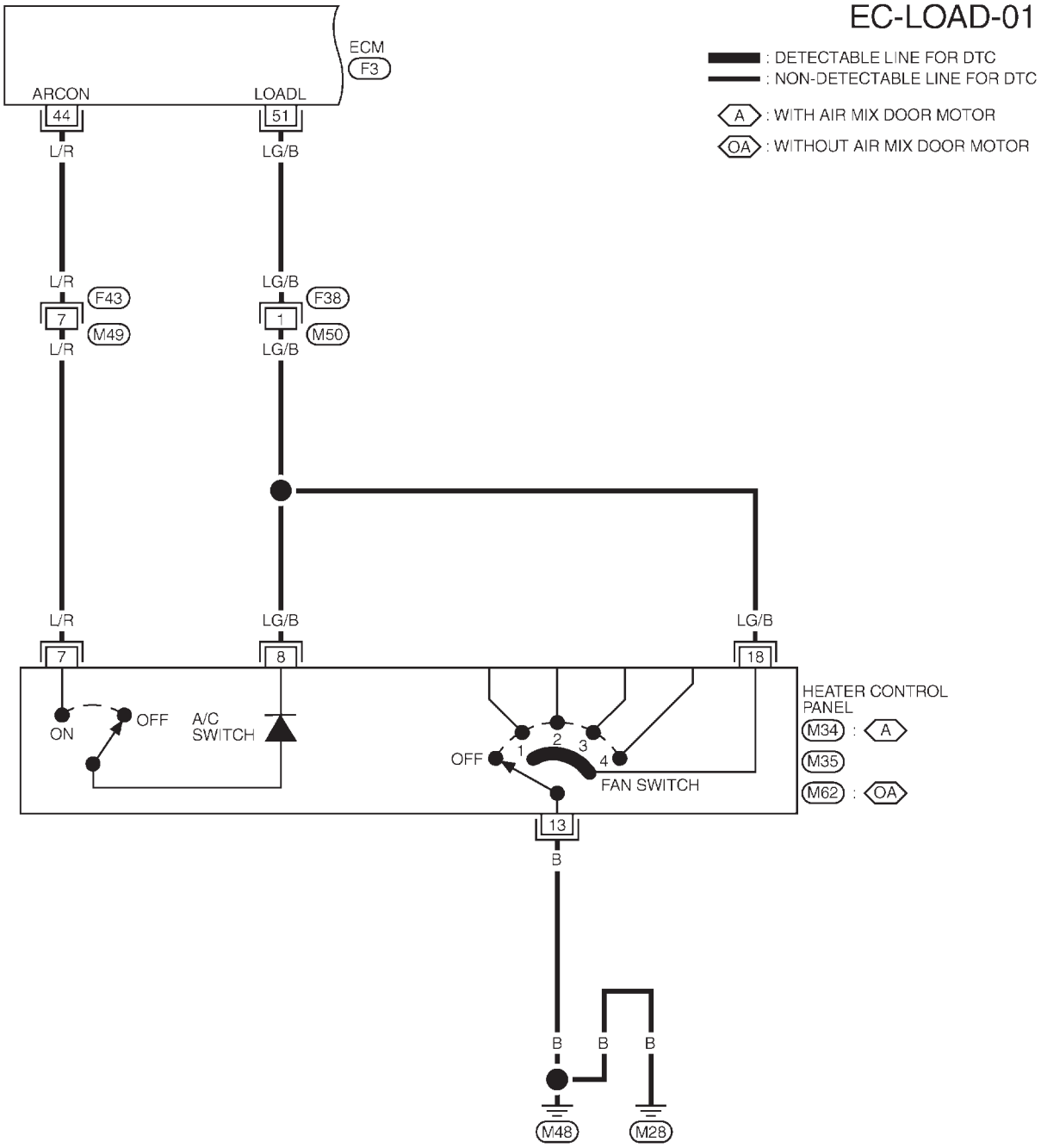
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
50	L/B	Electric load signal (Load switch)	**[Ignition switch "ON"]** ● Rear window defogger is operating and/or lighting switch is on	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Rear window defogger is not operating and lighting switch is not on	Approximately 0V
51	LG/B	Heater fan motor switch	**[Ignition switch "ON"]** ● Heater fan motor is operating	Approximately 0V
			[Ignition switch "ON"] ● Heater fan motor is not operating	Approximately 5V

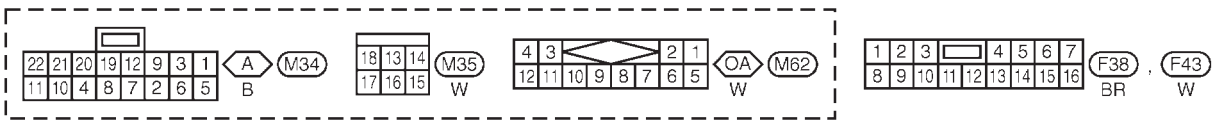
Wiring Diagram

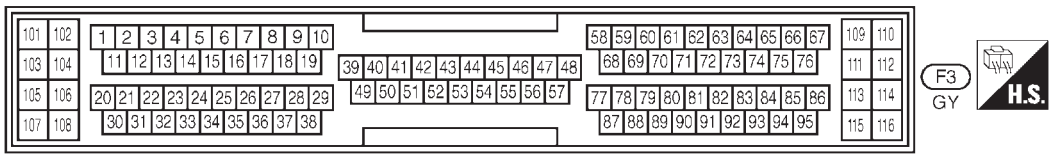
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1884

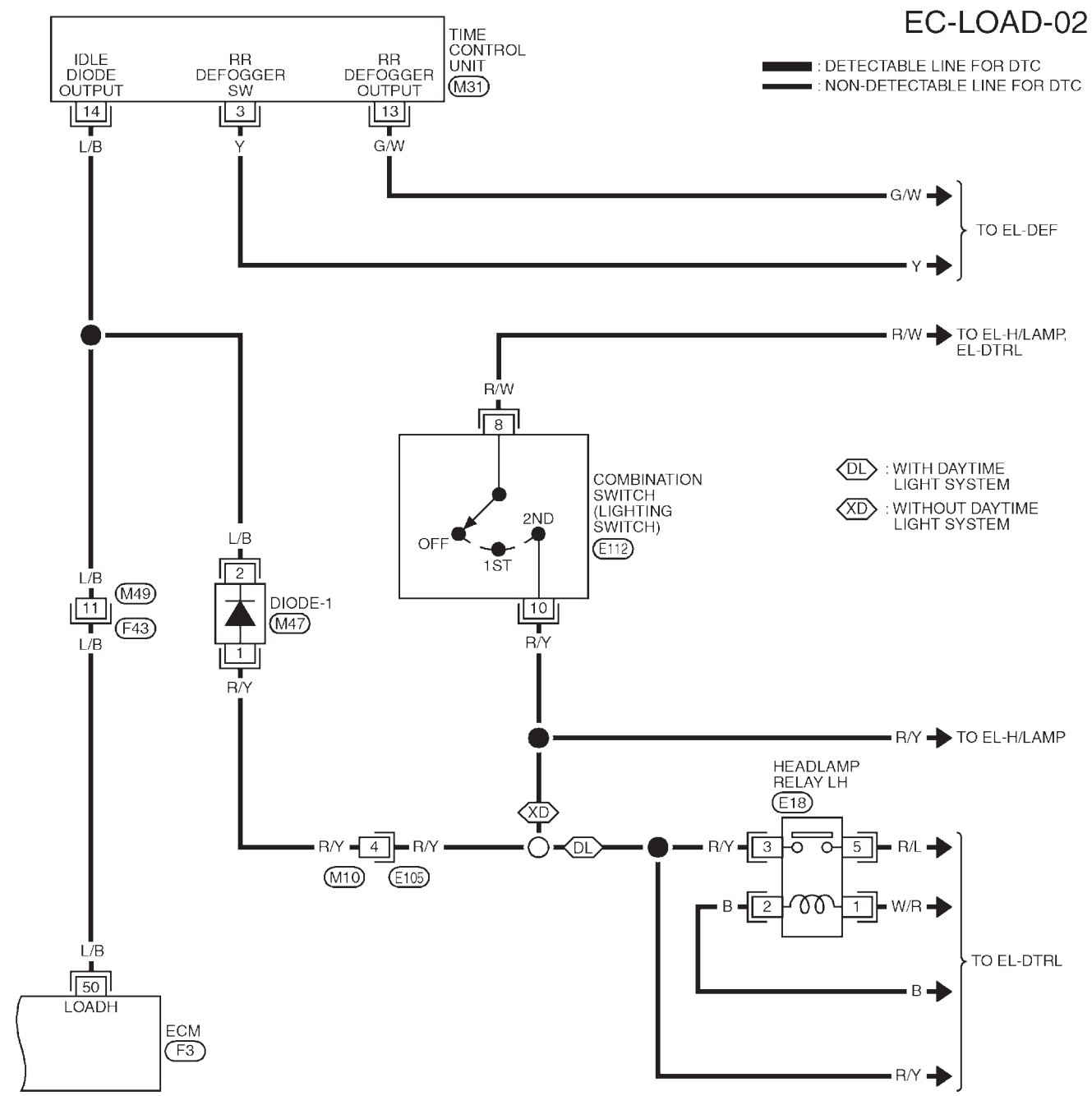
NLEC1884S04

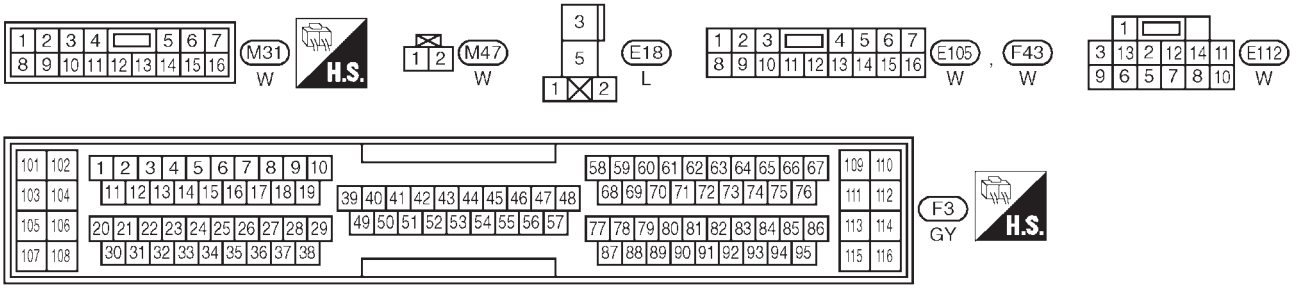






YEC716

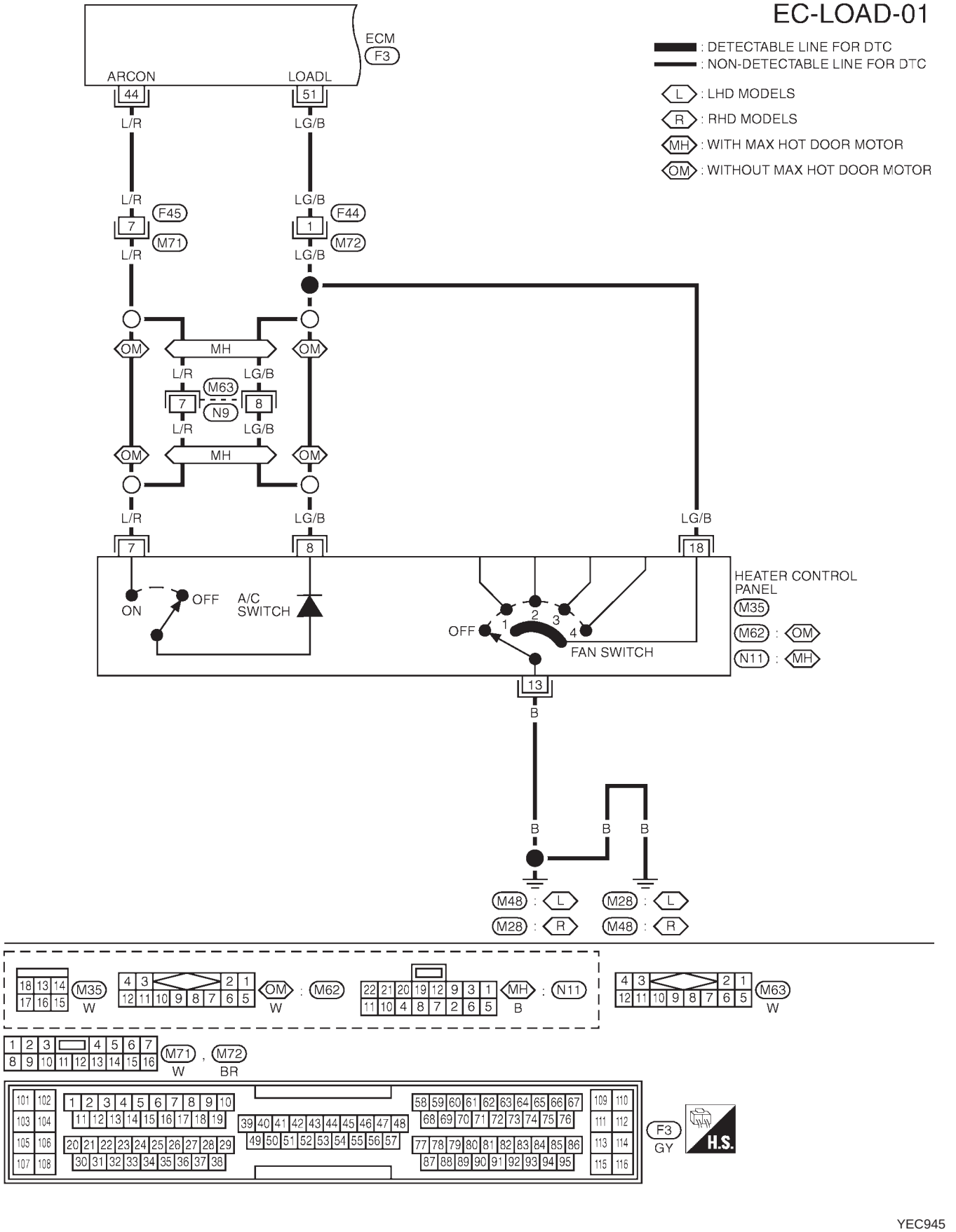

EC-LOAD-02
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
TIME CONTROL UNIT
M31
IDLE DIODE OUTPUT
RR DEFOGGER SW
RR DEFOGGER OUTPUT
14
3
13
L/B
Y
G/W
G/W
Y
TO EL-DEF
R/W
TO EL-H/LAMP, EL-DTRL
R/W
8
COMBINATION SWITCH (LIGHTING SWITCH)
E112
OFF
1ST
2ND
10
R/Y
DL : WITH DAYTIME LIGHT SYSTEM
XD : WITHOUT DAYTIME LIGHT SYSTEM
L/B
2
DIODE-1
M47
1
R/Y
L/B
11
M49
F43
L/B
R/Y
TO EL-H/LAMP
HEADLAMP RELAY LH
E18
XD
R/Y
4
R/Y
M10
E105
DL
R/Y
3
5
R/L
B
2
1
W/R
B
R/Y
TO EL-DTRL
L/B
50
LOADH
ECM
F3


M31
W
H.S.
M47
W
E18
L
E105
W
F43
W
E112
W
F3
GY
H.S.

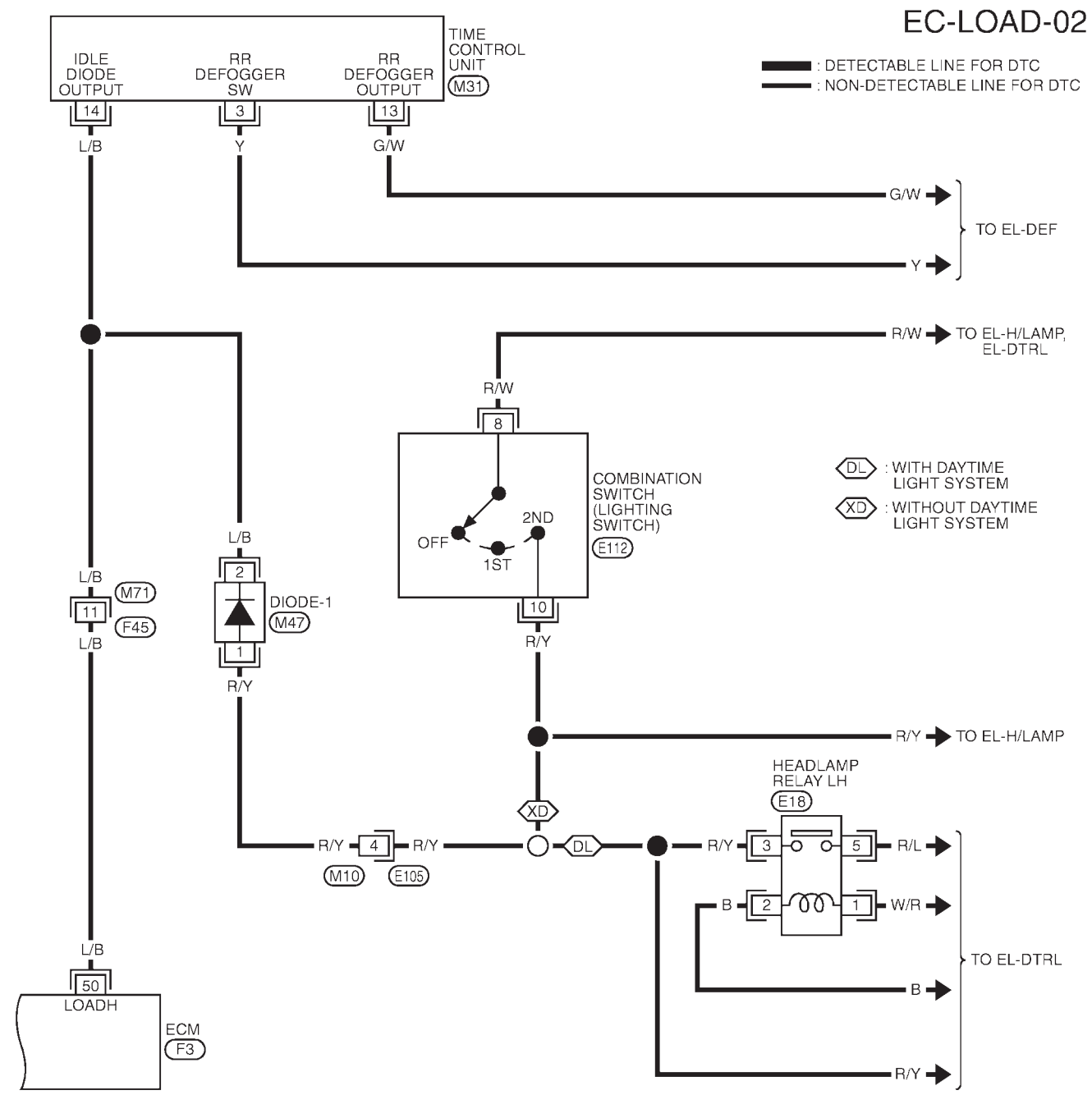
YEC717

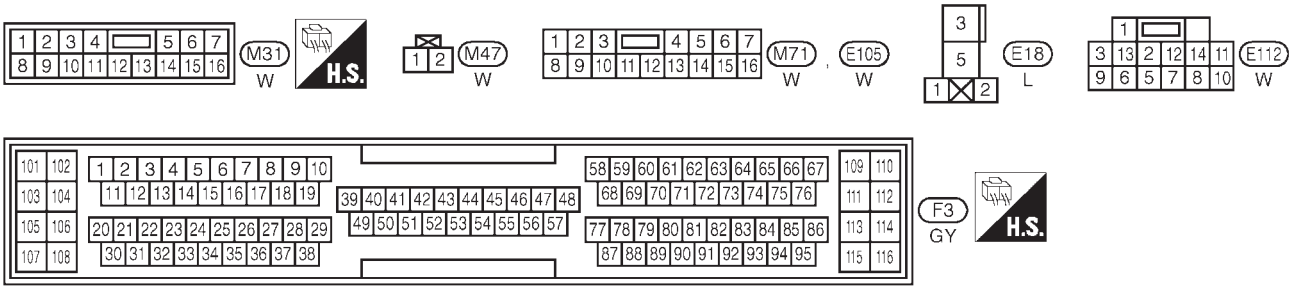
MODELS WITH ECM IN CABIN

NLEC1884S05



YEC945


EC-LOAD-02
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
TIME CONTROL UNIT
M31
IDLE DIODE OUTPUT
RR DEFOGGER SW
RR DEFOGGER OUTPUT
14
3
13
L/B
Y
G/W
G/W
Y
TO EL-DEF
R/W
TO EL-H/LAMP, EL-DTRL
R/W
8
COMBINATION SWITCH (LIGHTING SWITCH)
E112
OFF
2ND
1ST
10
R/Y
DL : WITH DAYTIME LIGHT SYSTEM
XD : WITHOUT DAYTIME LIGHT SYSTEM
L/B
2
DIODE-1
M47
1
R/Y
L/B
M71
11
F45
L/B
R/Y
TO EL-H/LAMP
HEADLAMP RELAY LH
E18
XD
R/Y
4
R/Y
M10
E105
DL
R/Y
3
5
R/L
B
2
1
W/R
B
R/Y
TO EL-DTRL
L/B
50
LOADH
ECM
F3


M31
W
H.S.
M47
W
M71
W
E105
W
E18
L
E112
W
F3
GY
H.S.

YEC946

Diagnostic Procedure — Load Signal —

NLEC1885

1	INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes	▶	GO TO 2.
No	▶	GO TO 4.

2	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
LOAD SIGNAL	ON

Rear window defogger switch "ON"	ON
Rear window defogger switch "OFF"	OFF

SEF954X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 6.

3	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
LOAD SIGNAL	ON

Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF

SEF955X

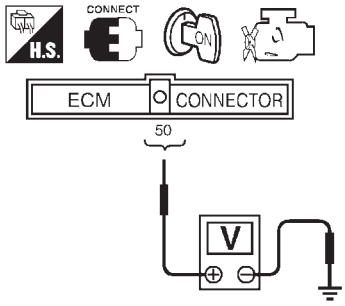
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 9.

4	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 50 and ground under the following conditions.



Condition	Voltage
Rear window defogger switch "ON"	BATTERY VOLTAGE
Rear window defogger switch "OFF"	0V

SEF956X

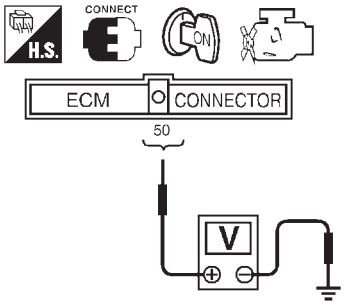
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 6.

5	CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 50 and ground under the following conditions.



Condition	Voltage
Lighting switch "ON" at 2nd position	BATTERY VOLTAGE
Lighting switch "OFF"	0V

SEF957X

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 9.

6	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 7.
No	▶	Refer to EL-198, "Rear Window Defogger".

7	CHECK REAR WINDOW DEFOGGER INPUT SIGNAL CIRCUIT

1. Stop engine
2. Disconnect ECM harness connector.
3. Disconnect time control unit harness connector.
4. Check harness continuity between ECM terminal 50 and time control unit harness connector terminal 14. Refer to wiring diagram.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	Refer to EL-326, "TIME CONTROL UNIT".
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M49, F43 (where fitted)
- Harness connectors M71, F45 (where fitted)
- Harness open and short between ECM and time control unit connectors

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

9	CHECK HEADLAMP FUNCTION

1. Start engine.
2. Turn the lighting switch "ON".
3. Check that headlamps are illuminated.
   Do the headlamps illuminate in both "High" and "Low" positions?

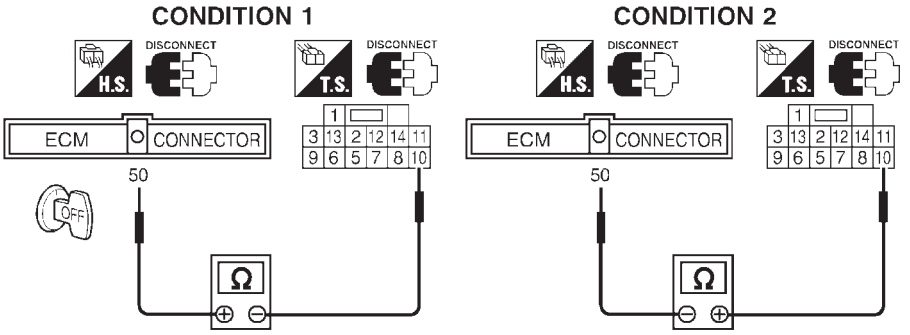
Yes or No

Yes	▶	GO TO 10.
No	▶	Refer to EL-69, "HEADLAMP SYSTEM".

10	CHECK HEADLAMP INPUT SIGNAL CIRCUIT

Without Daytime Light system

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch connector.
4. Check harness continuity between ECM terminal 50 and lighting switch connector terminal 10 under the following conditions.



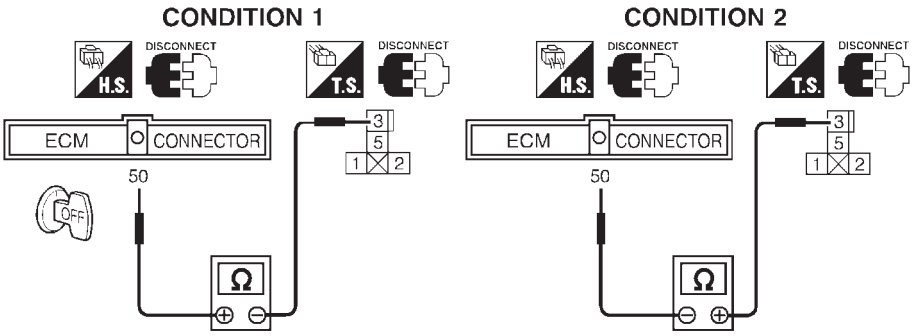
CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF161Z

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

With Daytime Light system

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect headlamp relay LH connector.
4. Check harness continuity between ECM terminal 50 and headlamp relay LH connector terminal 3 under the following conditions.



CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF445Z

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 M49, F43 (where fitted)
- Harness connectors M71, F45 (where fitted)
- Harness connectors M10, E105
- Diode 1
- Harness for open and short between ECM and lighting switch connector
- Harness for open and short between ECM and headlamp relay LH

	▶	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-670.

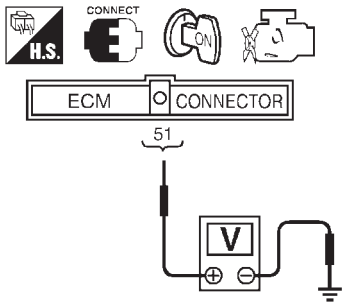
	▶	**INSPECTION END**

Diagnostic Procedure — Heater Control Panel (Fan Switch) —

NLEC1886

1	CHECK CIRCUIT OVERALL FUNCTION

1. Start engine.
2. Heater fan motor switch “ON”.
3. Check voltage between ECM terminal 51 and ground under the following conditions.



Condition	Voltage
Heater fan motor switch “ON”	0V
Heater fan motor switch “OFF”	Approximatly 5V

SEF620Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect heater control panel fan switch harness connector.
4. Check harness continuity between ECM terminal 51 and heater fan switch terminal 18.
   Refer to wiring diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	Refer to HA-55, HA-61, “BLOWER MOTOR”.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F38, M50 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness for open and short between ECM and heater fan motor switch

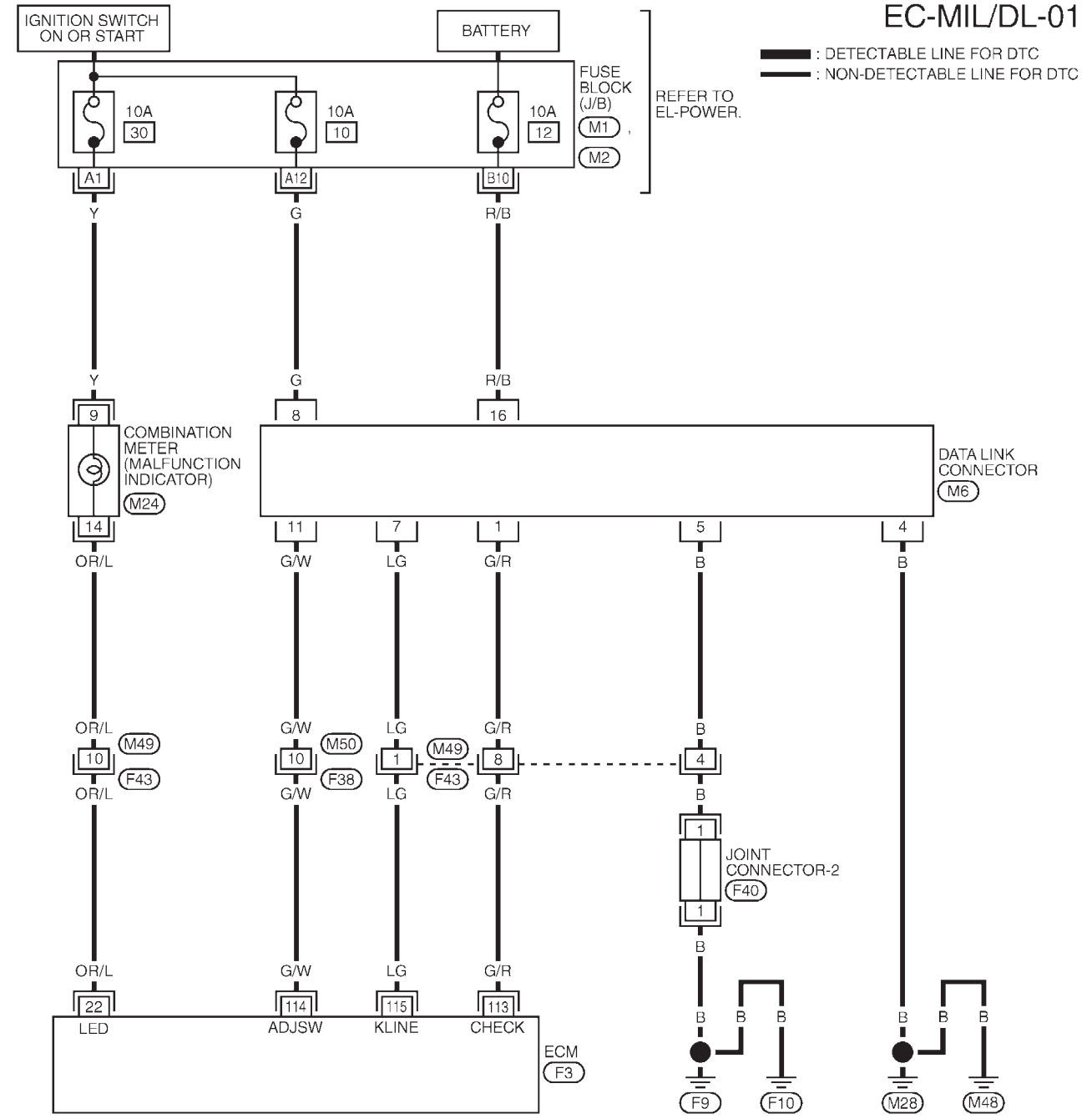
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

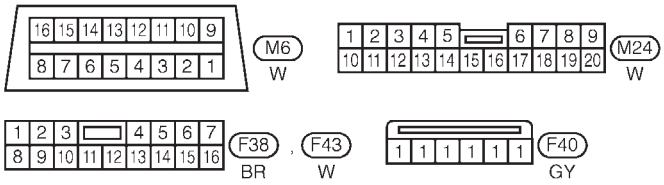
Wiring Diagram

NLEC1725

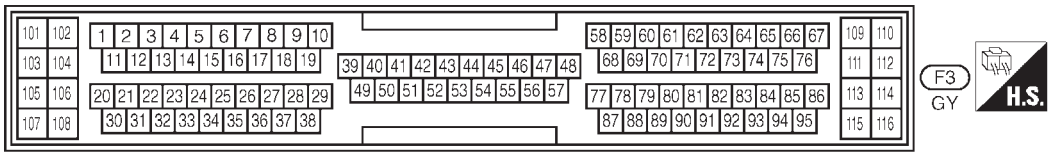
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1725S01





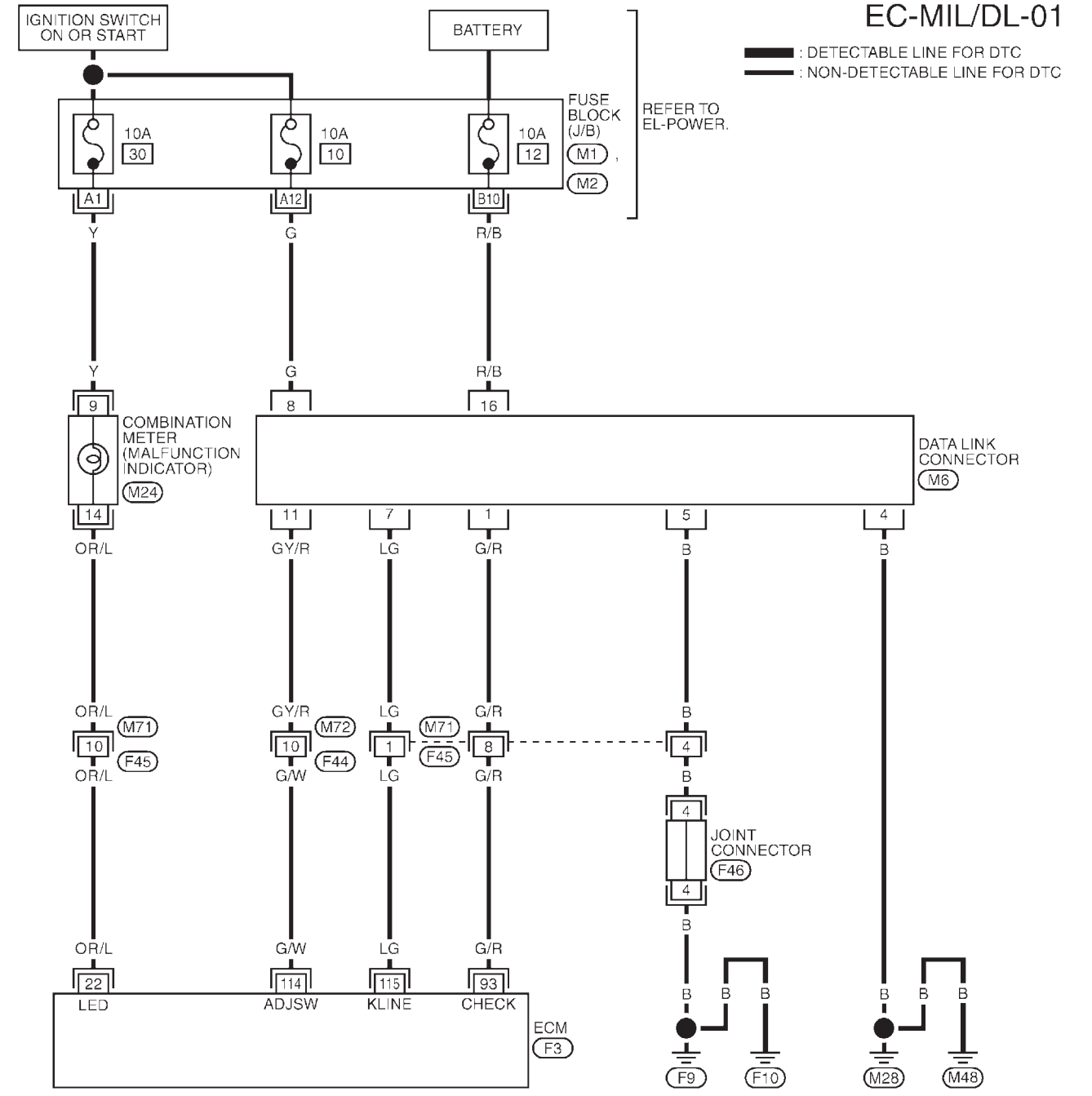
REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK-JUNCTION BOX (J/B)

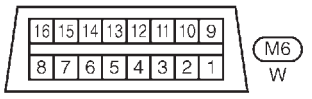


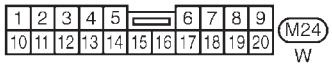
YEC718

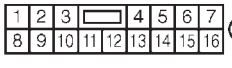
MODELS WITH ECM IN CABIN

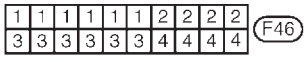
NLEC1725S02



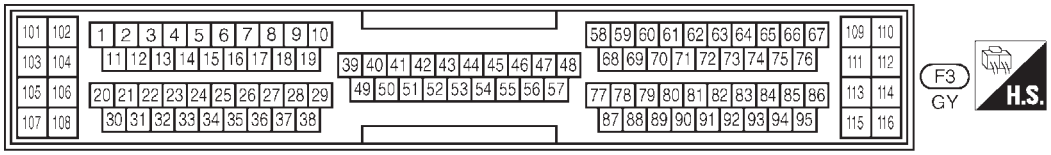








REFER TO THE FOLLOWING.
M1, M2 -FUSE BLOCK-
JUNCTION BOX (J/B)



YEC944

Fuel Pressure Regulator

NLEC1887

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

NLEC1888

Target idle speed*1 rpm	No-load*3 (in “P” or “N” position)	750±50
Air conditioner: ON rpm	In “P” or “N” position	825±50
Ignition timing*2	In “P” or “N” position	15°±2° BTDC
Throttle position sensor idle position V		0.15 - 0.85

*1: Throttle position sensor harness connector connected
*2: Throttle position sensor harness connector disconnected
*3: Under the following conditions:

- Air conditioner switch: OFF
- Electrical load: OFF (Lights & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Ignition Coil

NLEC1889

Primary voltage V	Battery voltage (11 - 14)
Primary resistance [at 25°C (77°F)] Ω	Approximately 2.2
Secondary resistance [at 25°C (77°F)] kΩ	Approximately 17

Mass Air Flow Sensor

NLEC1890

Supply voltage V	Battery voltage (11 - 14)
Output voltage V	1.3 - 1.7*
Mass air flow (Using CONSULT-II or GST) g·m/sec	2.5 - 5.0 at idle* 7.1 - 12.5 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and idling under no-load.

Engine Coolant Temperature Sensor

NLEC1891

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

EGR Volume Control Valve (where fitted)

NLEC1905

Resistance [at 20°C (68°F)] Ω Between terminals 1-2, 2-3, 4-5 and 5-6	20.9 - 23.1

EGR Temperature Sensor (where fitted)

NLEC1892

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.73 - 0.89
50 (122)	2.25	0.074 - 0.082
100 (212)	0.59	0.012 - 0.014

Fuel Pump

NLEC1893

Resistance [at 25°C (77°F)] Ω	0.2 - 5.0

IACV-AAC Valve

NLEC1894

Resistance [at 20°C (68°F)] Ω	20 – 24

Injector

NLEC1895

Resistance [at 20°C (68°F)] Ω	13.1 – 16.0

Resistor

NLEC1896

Resistance [at 25°C (77°F)] kΩ	Approximately 5

Throttle Position Sensor

NLEC1897

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

Heated Oxygen Sensor 1 (Front) Heater

NLEC1898

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

Intake Air Temperature Sensor

NLEC1900

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

EVAP Canister Purge Volume Control Valve

NLEC1901

Resistance [at 20°C (68°F)] Ω	31 - 35

Heated Oxygen Sensor 2 (Rear) Heater

NLEC1902

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

Crankshaft Position Sensor (OBD)

NLEC1903

Resistance [at 20°C (68°F)] Ω	166 - 204

Alphabetical & P No. Index for DTC

NLEC0600

ALPHABETICAL INDEX FOR DTC

NLEC0600S01

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC		MI illumination	Reference page
	CONSULT-II	ECM		
ACCEL POS SENSOR	P0120	0403	X	EC-1155
BATTERY VOLTAGE	P1660	0502	—	EC-1262
BRAKE SW	P0571	0807	X	EC-1177
COOLANT TEMP SEN	P0115	0103	X	EC-1150
CRANK POS SEN (TDC)	P0335	0407	X	EC-1166
ECM RLY	P1620	0902	X	EC-1255
ECM 2	P1607	0301	X	EC-1253
ECM 10	P1107	0802	X	EC-1185
ECM 12	P1603	0901	X	EC-1253
ECM 15	P1621	0903	—	EC-1260
FUEL CUT SYSTEM2	P1202	1002	X	EC-1194
MASS AIR FLOW SEN	P0100	0102	X	EC-1143
NATS MALFUNCTION	P1610 - P1615*	—	—	EC-1097
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0505**	—	—
OVER HEAT	P1217	0208	X	EC-1201
P1·CAM POS SEN	P1341	0701	X	EC-1239
P2·TDC PULSE SIG	P1337	0702	X	EC-1232
P3·PUMP COMM LINE	P1600	0703	X	EC-1246
P4·SPILL/V CIRC	P1251	0704	X	EC-1225
P5·PUMP C/MODULE	P1690	0705	X	EC-1264
P7·F/INJ TIMG FB	P1241	0707	X	EC-1218
P9·FUEL TEMP SEN	P1180	0402	X	EC-1187
VEHICLE SPEED SEN	P0500	0104	X	EC-1172

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

P NO. INDEX FOR DTC

=NLEC0600S02

X: Applicable —: Not applicable

DTC		MI illumination	Items (CONSULT-II screen terms)	Reference page
CONSULT-II	ECM			
P0000	**0505**	—	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—
P0100	0102	X	MASS AIR FLOW SEN	EC-1143
P0115	0103	X	COOLANT TEMP SEN	EC-1150
P0120	0403	X	ACCEL POS SENSOR	EC-1155
P0335	0407	X	CRANK POS SEN (TDC)	EC-1166
P0500	0104	X	VEHICLE SPEED SEN	EC-1172
P0571	0807	X	BRAKE SW	EC-1177
P1107	0802	X	ECM 10	EC-1185
P1180	0402	X	P9·FUEL TEMP SEN	EC-1187
P1202	1002	X	FUEL CUT SYSTEM2	EC-1194
P1217	0208	X	OVER HEAT	EC-1201
P1241	0707	X	P7·F/INJ TIMG FB	EC-1218
P1251	0704	X	P4·SPILL/V CIRC	EC-1225
P1337	0702	X	P2·TDC PULSE SIG	EC-1232
P1341	0701	X	P1·CAM POS SEN	EC-1239
P1600	0703	X	P3·PUMP COMM LINE	EC-1246
P1603	0901	X	ECM 12	EC-1253
P1607	0301	X	ECM 2	EC-1253
P1610 - P1615*	—	—	NATS MALFUNCTION	EC-1097
P1620	0902	X	ECM RLY	EC-1255
P1621	0903	—	ECM 15	EC-1260
P1660	0502	—	BATTERY VOLTAGE	EC-1262
P1690	0705	X	P5·PUMP C/MODULE	EC-1264

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

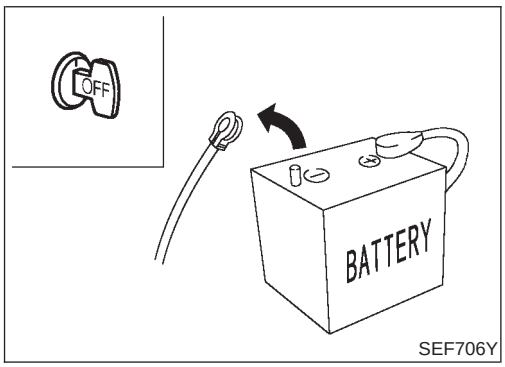
Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

NLEC1263

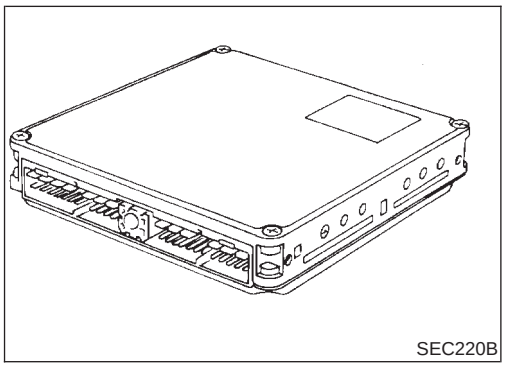
The Supplemental Restraint System “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
In addition to the supplemental air bag modules for a frontal collision, the supplemental side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The supplemental side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (one of components of supplemental air bags for a frontal collision), wiring harness, warning lamp (one of components of supplemental 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 must 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.**
- **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).**



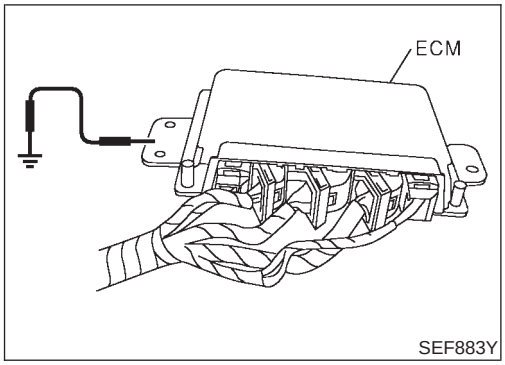
SEF706Y


SEC220B

Engine Fuel & Emission Control System

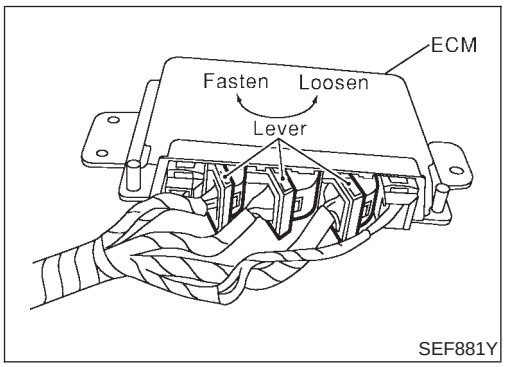
NLEC0602

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cable while engine is running.**
- **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.**
- **Before removing parts, turn off ignition switch and then disconnect battery ground cable.**
- **Do not disassemble ECM.**
- **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.



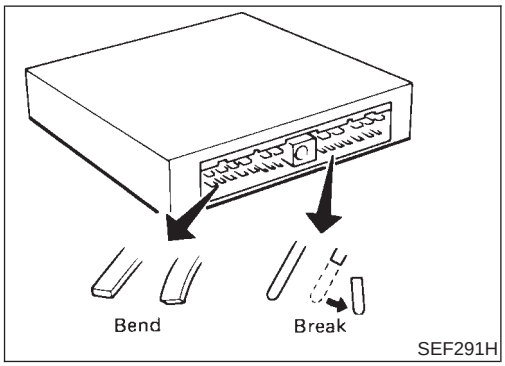
SEF883Y

- **When ECM is removed for inspection, make sure to ground the ECM mainframe.**



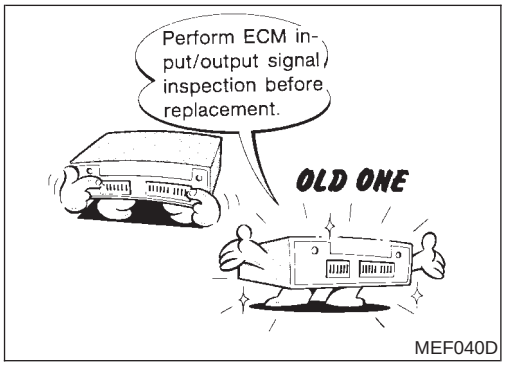
SEF881Y

- **When connecting ECM harness connectors, push in both sides of the connector until you hear a click. Maneuver the lever until you hear the three connectors on the inside click. Refer to the figure at left.**



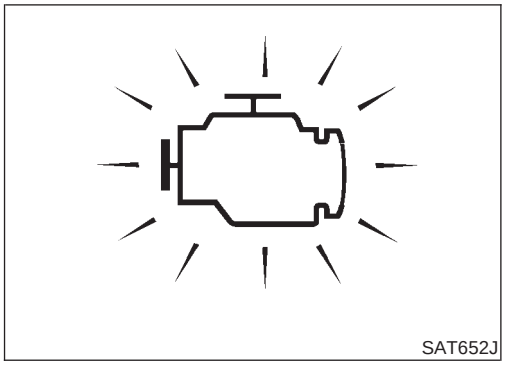
SEF291H

- **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.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in the circuit, 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.**

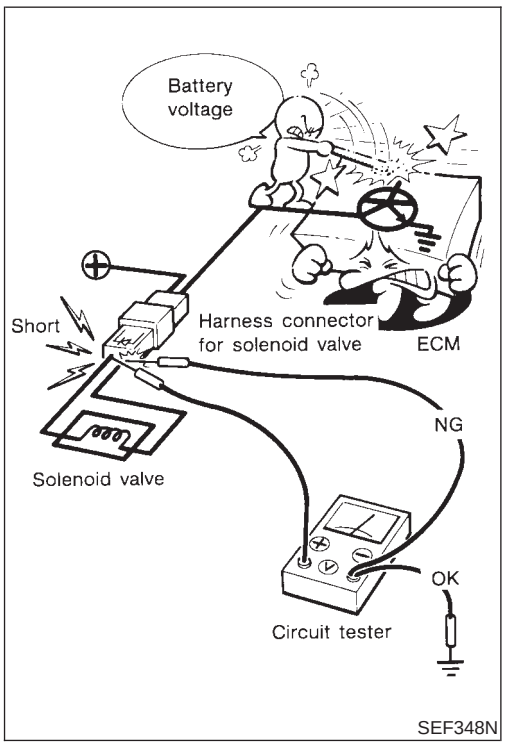


MEF040D

- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-1129.**

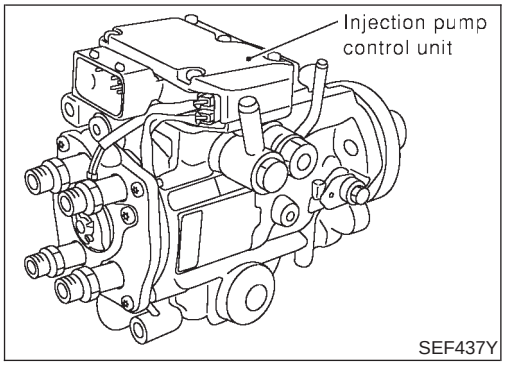

SAT652J

- **If MI illuminates or blinks irregularly when engine is running, water may have accumulated in fuel filter. Drain water from fuel filter. If this does not correct the problem, perform specified trouble diagnostic procedures.**
- **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.



SEF348N

- **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.**
- **Install the break-out box between ECM and ECM harness connectors when measuring ECM input/output voltage.**

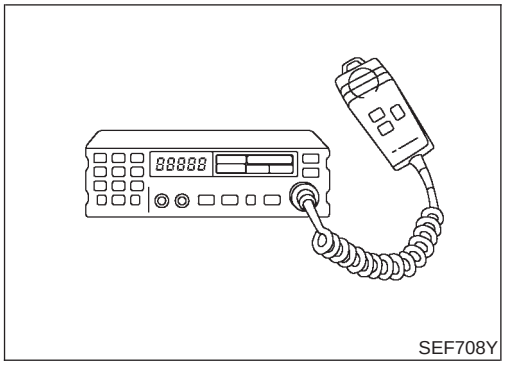


SEF437Y

- **Do not disconnect electronic control fuel injection pump harness connector with engine running.**
- **Do not disassemble electronic control fuel injection pump. If NG, take proper action.**
- **Do not disassemble injection nozzle.**
  If NG, replace injection nozzle.
- **Even a slight leak in the air intake system can cause serious problems.**
- **Do not shock or jar the crankshaft position sensor (TDC).**


SEF709Y

- **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.**


SEF708Y

- **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 as possible away 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.**

Wiring Diagrams and Trouble Diagnosis

NLEC0604

When you read Wiring diagrams, refer to the following:

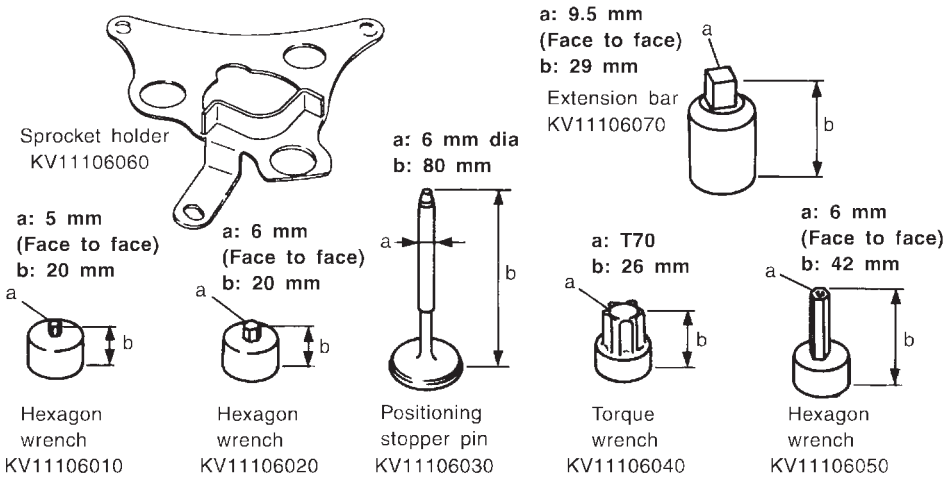
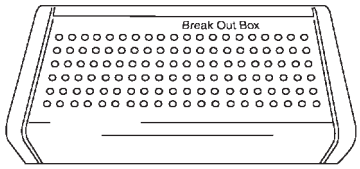
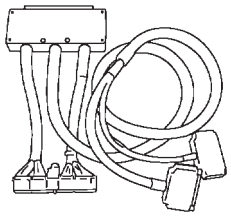
- GI-11, "HOW TO READ WIRING DIAGRAMS"
- EL-10, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

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

Special Service Tools

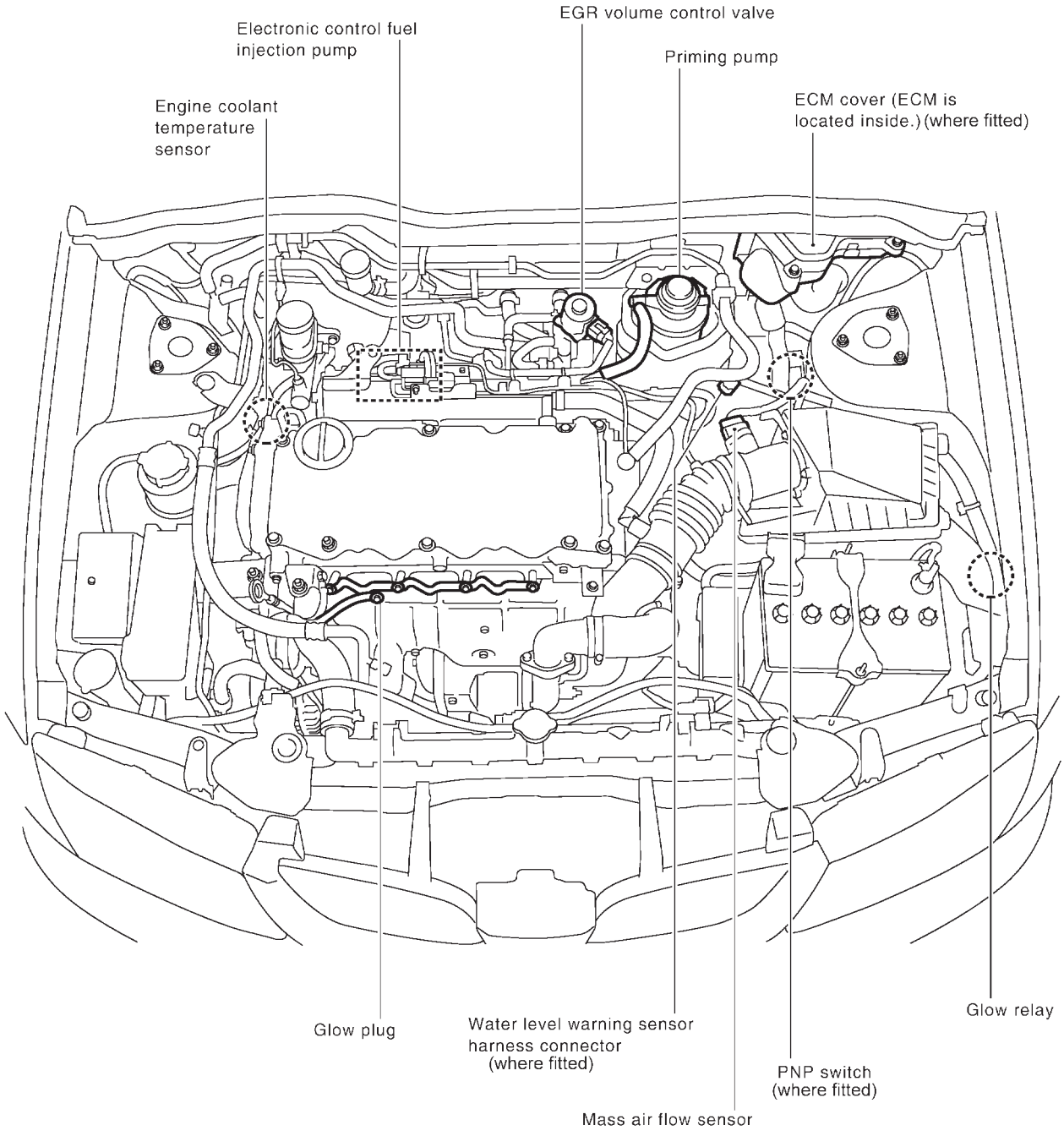
NLEC0605

Tool number Tool name	Description
KV111060S0 Removal/Installation tool kit for fuel injection pump	 NT814
KV109E0010 Break-out box	 NT825
KV109E0050 Y-cable adapter	 NT826

Engine Control Component Parts Location

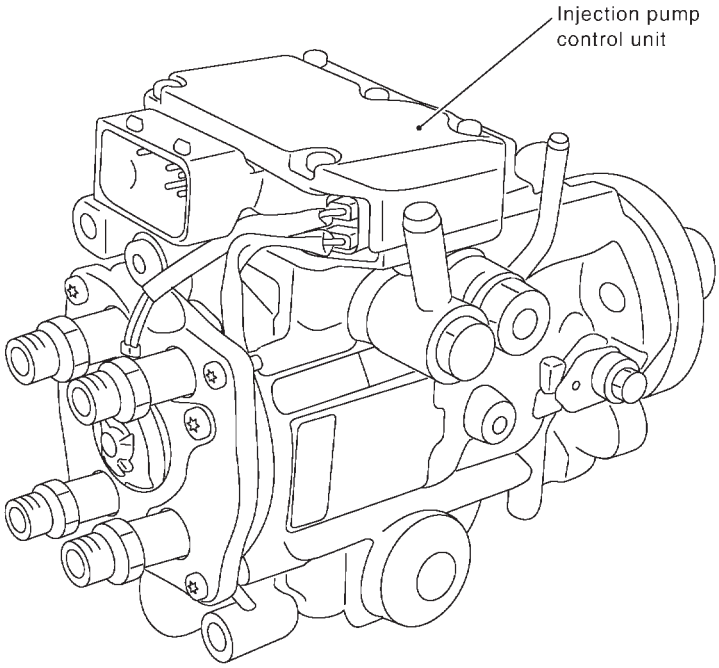
NLEC0607

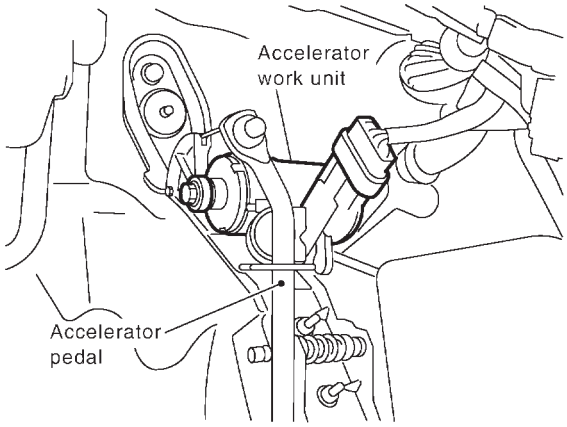
For details of ECM location, refer to “ELECTRICAL UNIT LOCATION” in EL section (EL-442).

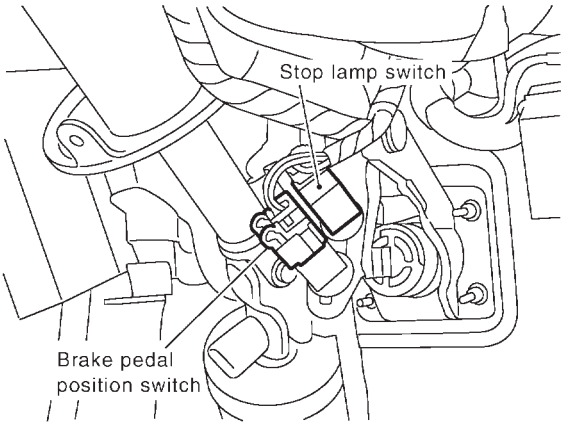


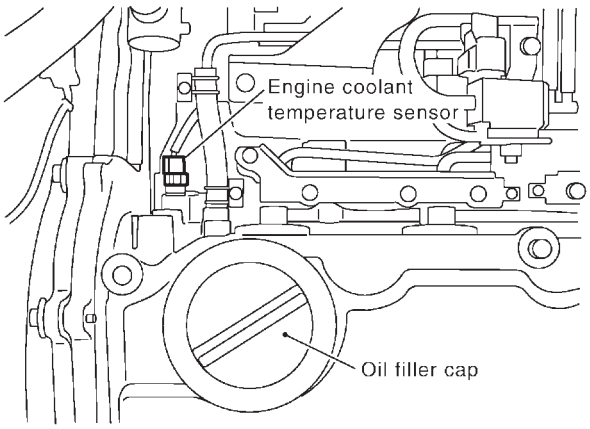
NEF322A

Electronic control fuel injection pump

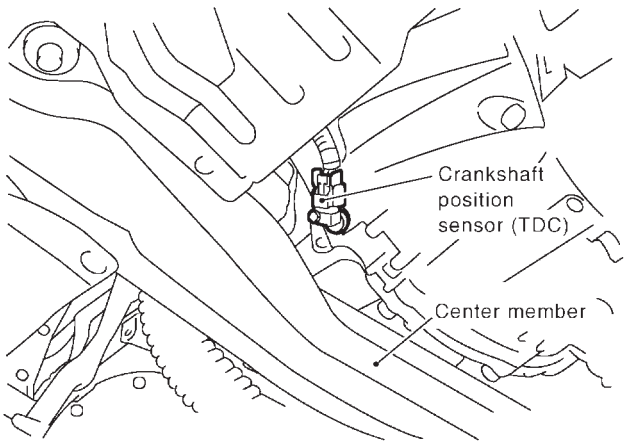




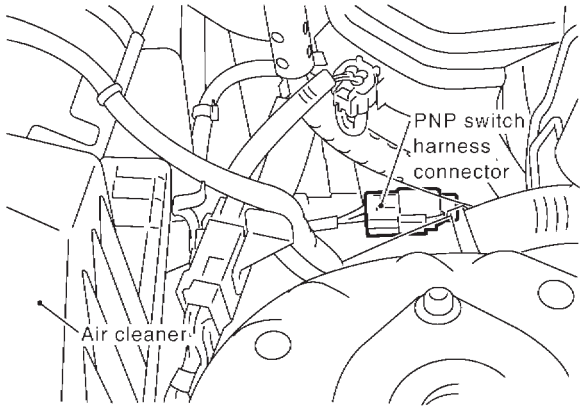


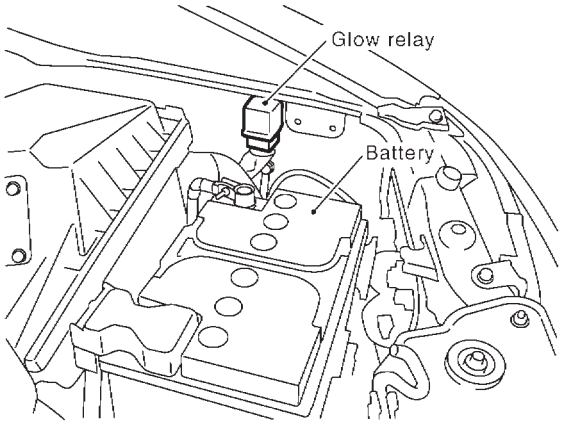


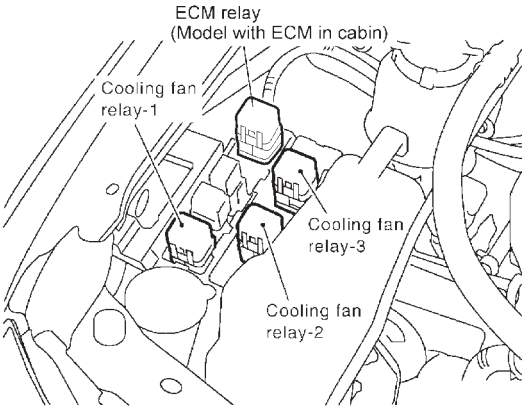
View from under vehicle

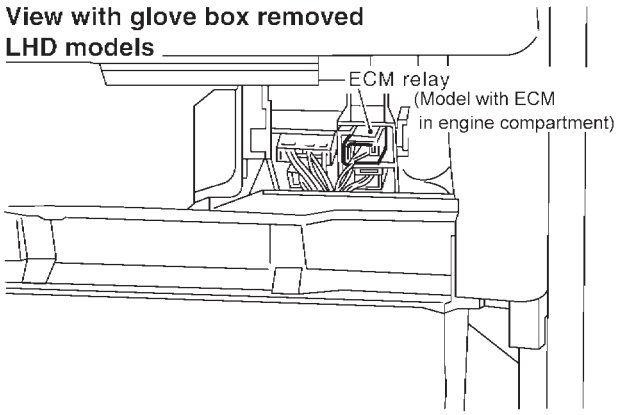


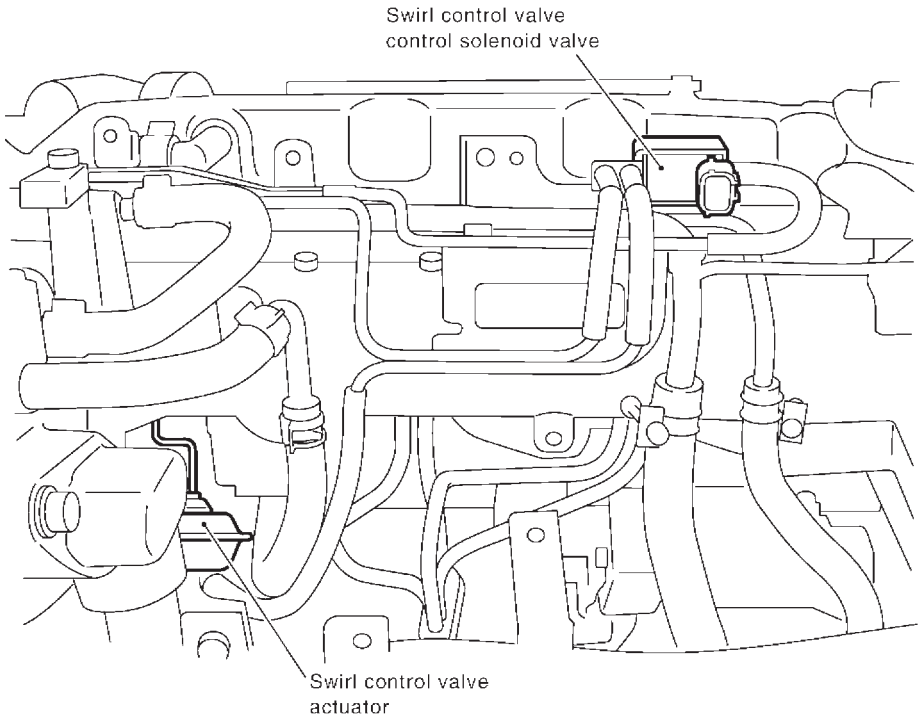
SEF747Z


PNP switch harness connector
Air cleaner


Glow relay
Battery


ECM relay
(Model with ECM in cabin)
Cooling fan relay-1
Cooling fan relay-3
Cooling fan relay-2


View with glove box removed
LHD models
ECM relay
(Model with ECM in engine compartment)


Swirl control valve control solenoid valve
Swirl control valve actuator

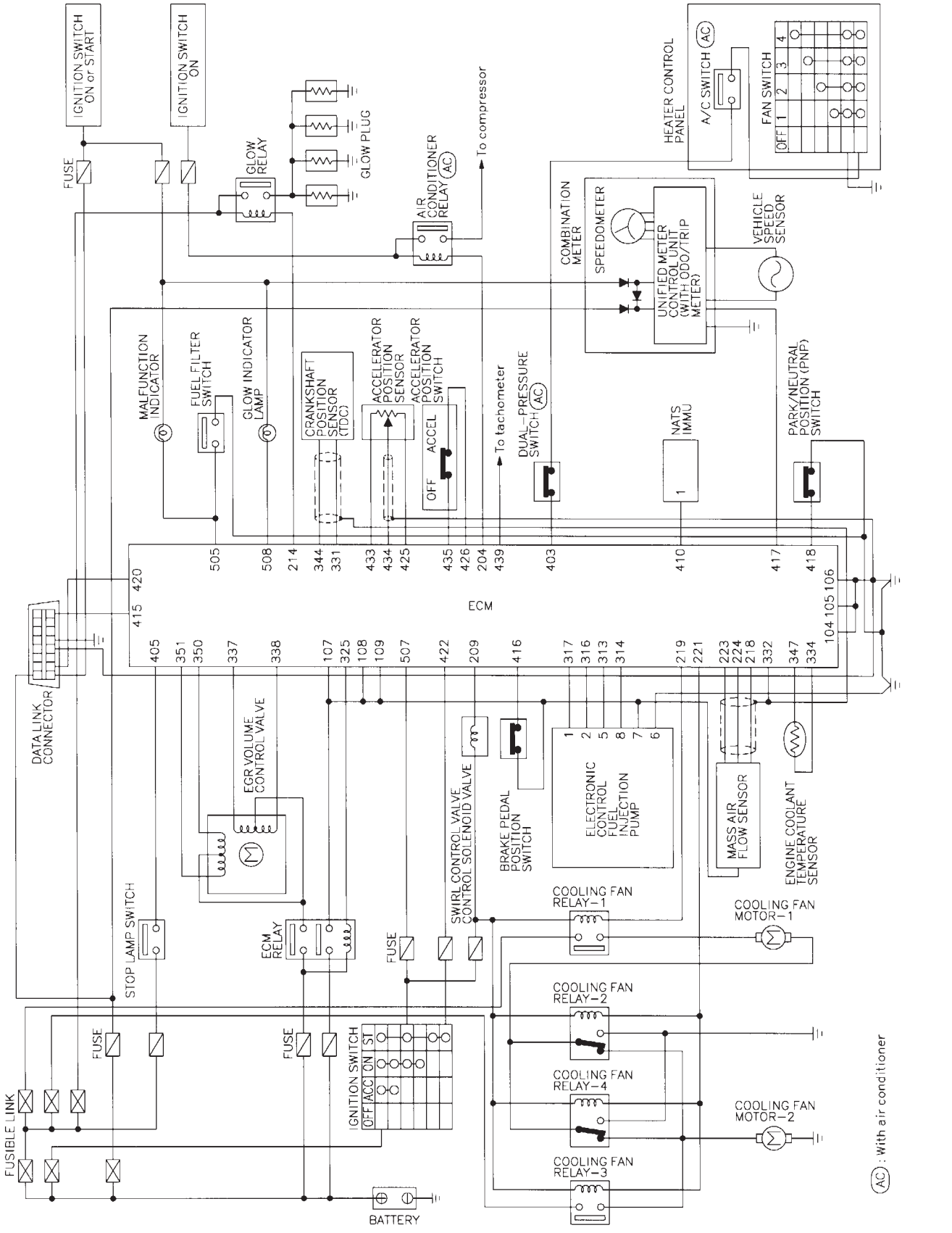
NEF323A

Circuit Diagram

NLEC0608

MODELS WITH ECM IN ENGINE COMPARTMENT

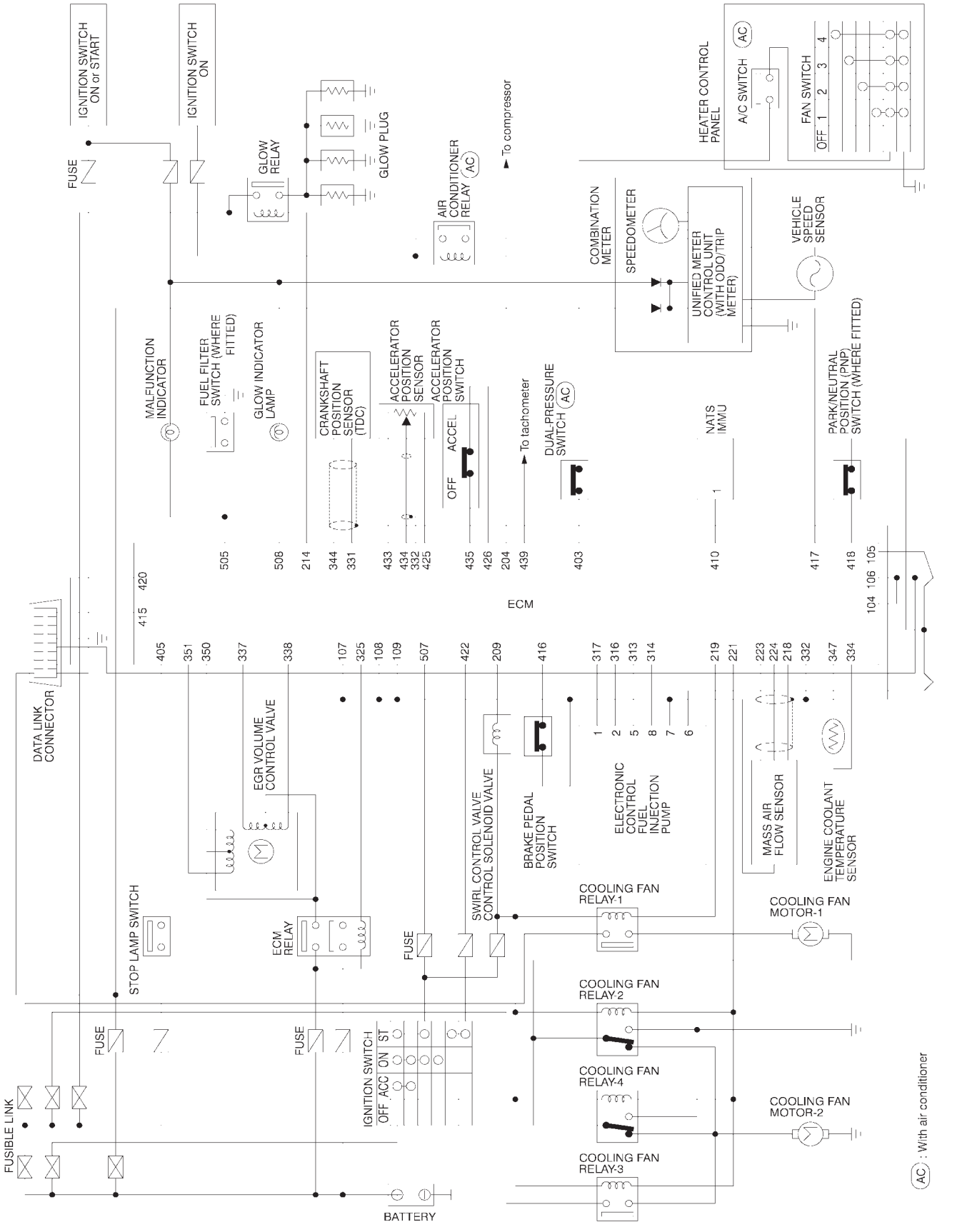
NLEC0608S03



YEC720

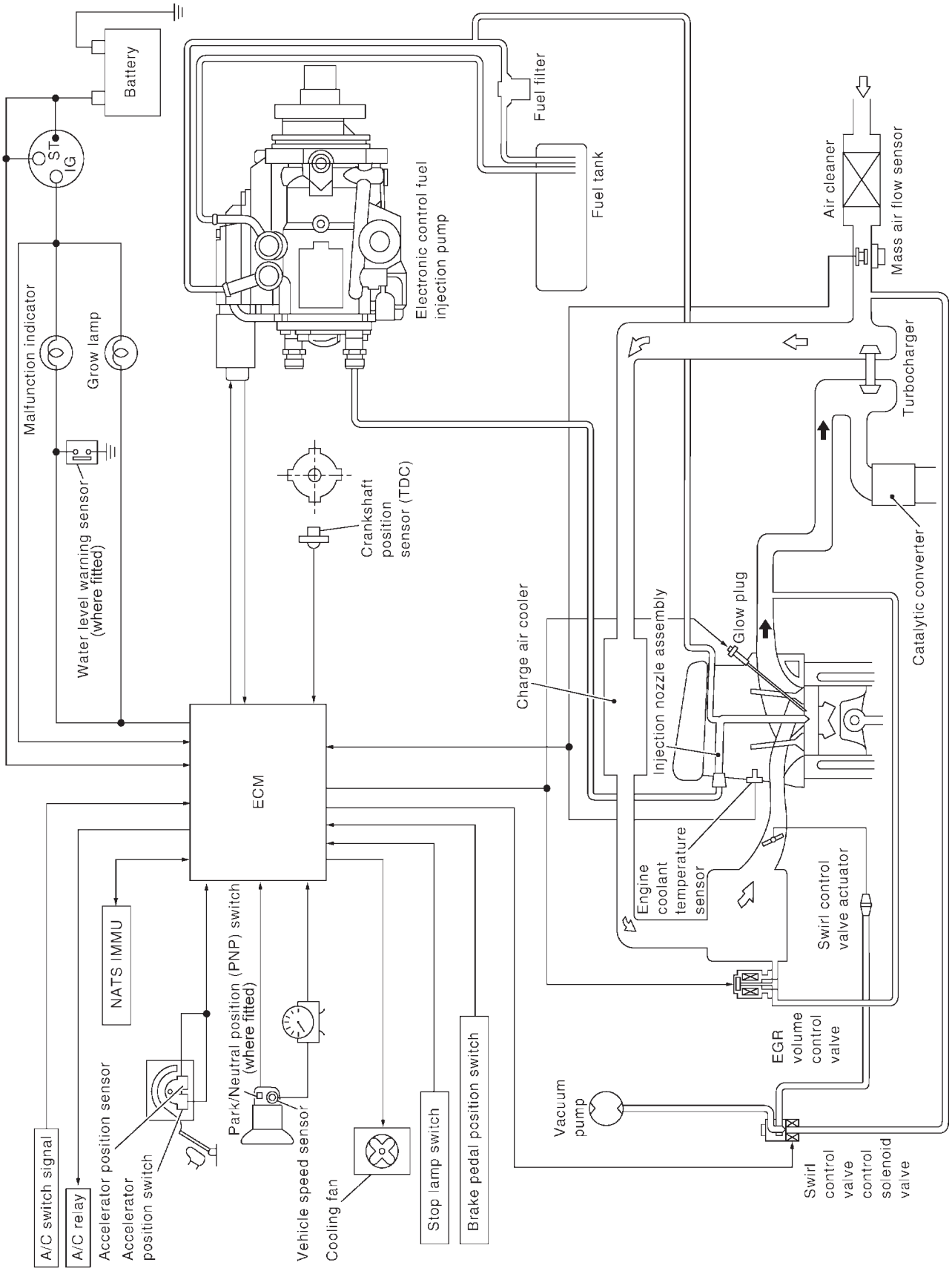
MODELS WITH ECM IN CABIN

NLEC0608S04



System Diagram

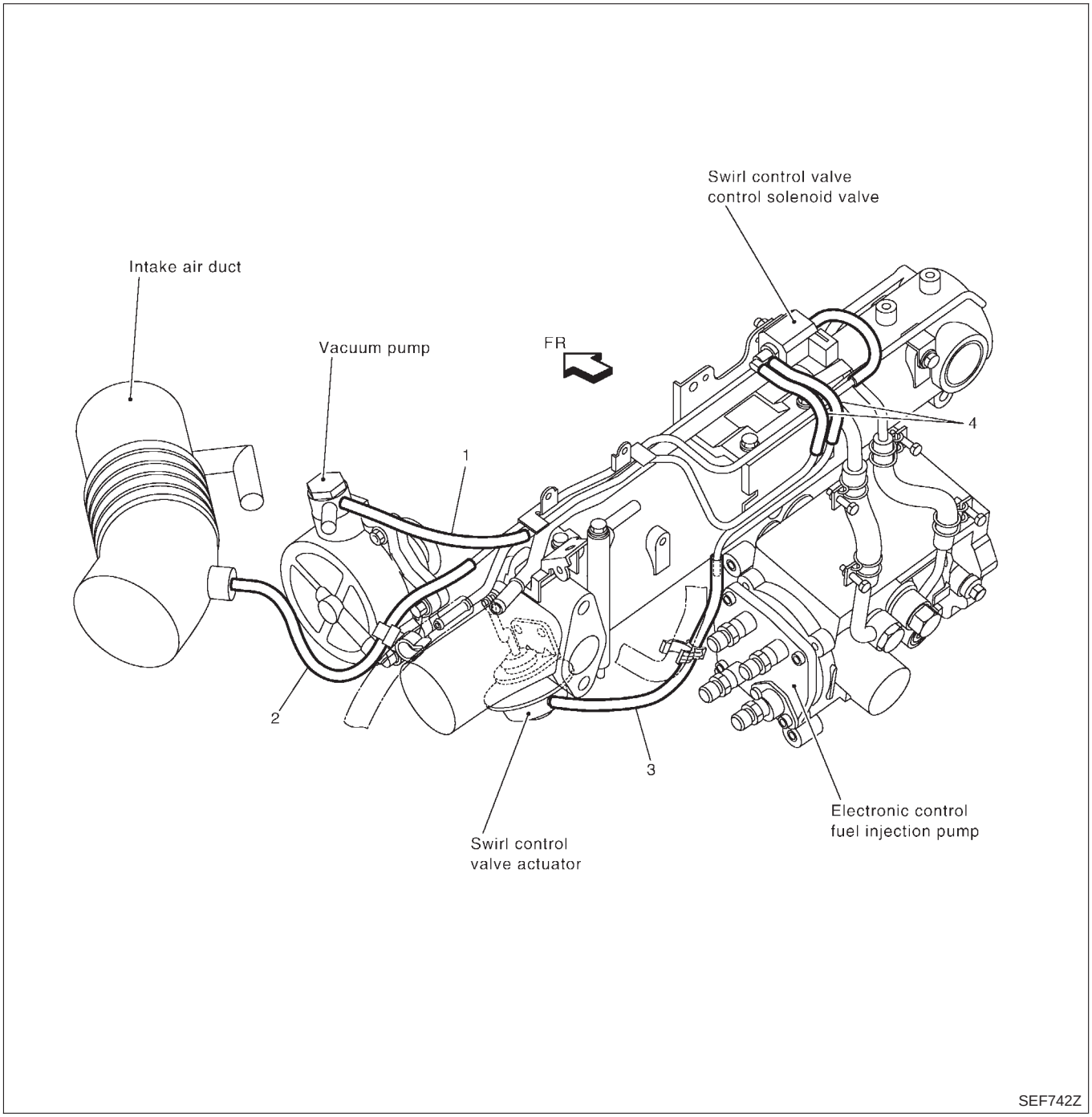
NLEC0609



NEF324A

Vacuum Hose Drawing

NLEC1264



1. Vacuum pump to vacuum gallery
2. Intake air duct to vacuum gallery
3. Swirl control valve actuator to vacuum gallery
4. Swirl control valve control solenoid valve to vacuum gallery

Refer to “System Diagram”, EC-1076 for vacuum control system.

System Chart

NLEC0611

Input (Sensor)	ECM Function	Output (Actuator)
● Electronic control fuel injection pump ● Crankshaft position sensor (TDC) ● Engine coolant temperature sensor ● Accelerator position sensor ● Accelerator position switch ● Park/Neutral position (PNP) switch (where fitted) ● Ignition switch ● Battery voltage ● Vehicle speed sensor ● Air conditioner switch ● Mass air flow sensor ● Stop lamp switch	Fuel injection control	Electronic control fuel injection pump
	Fuel injection timing control	Electronic control fuel injection pump
	Fuel cut control	Electronic control fuel injection pump
	Glow control system	Glow relay & glow lamp
	On board diagnostic system	MI (On the instrument panel)
	EGR volume control	EGR volume control valve
	Swirl control valve control	Swirl control valve control solenoid valve
	Cooling fan control	Cooling fan relay
	Air conditioning cut control	Air conditioner relay

Fuel Injection Control System

DESCRIPTION

NLEC0612

System Description

NLEC0612S01

Three types of fuel injection control are provided to accommodate engine operating conditions; normal control, idle control and start control. The ECM determines the appropriate fuel injection control. Under each control, the amount of fuel injected is compensated to improve engine performance.
Pulse signals are exchanged between ECM and electronic control fuel injection pump (control unit is built-in). The fuel injection pump control unit performs duty control on the spill valve (built into the fuel injection pump) according to the input signals to compensate the amount of fuel injected to the preset value.

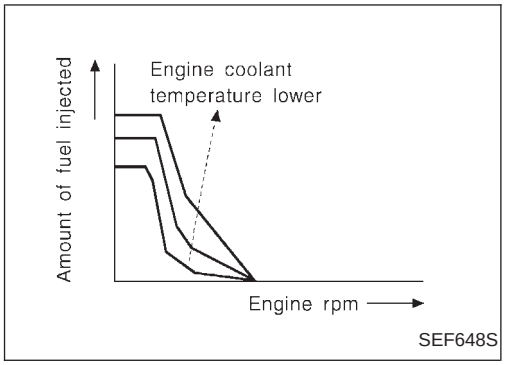
Start Control

NLEC0612S02

Input/Output Signal Chart

NLEC0612S0201

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (start control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		
Ignition switch	Start signal		



When the ECM receives a start signal from the ignition switch, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed and engine coolant temperature.
For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches the specific value, and shifts the control to the normal or idle control.

Idle Control

NLEC0612S03

Input/Output Signal Chart

NLEC0612S0301

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (Idle control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		
Battery	Battery voltage		
Accelerator position switch	Idle position		
Vehicle speed sensor	Vehicle speed		
Air conditioner switch	Air conditioner signal		

When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. The ECM also provides the system with a fast idle control in response to the engine coolant temperature signal.

Fuel Injection Control System (Cont'd)

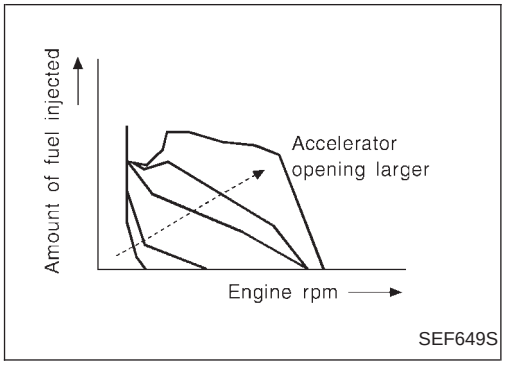
Normal Control

NLEC0612S04

Input/Output Signal Chart

NLEC0612S0401

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	Fuel injection control (Normal control)	Electronic control fuel injection pump
Accelerator position sensor	Accelerator position		



The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed and the accelerator position sensor detects accelerator position. These sensors send signals to the ECM.
The fuel injection data, predetermined by correlation between various engine speeds and accelerator positions, are stored in the ECM memory, forming a map. The ECM determines the optimal amount of fuel to be injected using the sensor signals in comparison with the map.

Maximum Amount Control

NLEC0612S05

Input/Output Signal Chart

NLEC0612S0501

Sensor	Input Signal to ECM	ECM Function	Actuator
Mass air flow sensor	Amount of intake air	Fuel injection control (Maximum amount control)	Electronic control fuel injection pump
Engine coolnat temperature sensor	Engine coolant temperature		
Crankshaft position sensor (TDC)	Engine speed		
Accelerator position sensor	Accelerator position		

The maximum injection amount is controlled to an optimum by the engine speed, intake air amount, engine coolant temperature, and accelerator opening in accordance with the driving conditions.
This prevents the oversupply of the injection amount caused by decreased air density at a high altitude or during a system failure.

Deceleration Control

NLEC0612S06

Input/Output Signal Chart

NLEC0612S0601

Sensor	Input Signal to ECM	ECM Function	Actuator
Accelerator position switch	Accelerator position	Fuel injection control (Deceleration control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		

The ECM sends a fuel cut signal to the electronic control fuel injection pump during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator position switch and crankshaft position sensor (TDC).

Fuel Injection Timing Control System

DESCRIPTION

NLEC0613

The target fuel injection timing in accordance with the engine speed and the fuel injection amount are recorded as a map in the ECM beforehand. The ECM and the injection pump control unit exchange signals and perform feedback control for optimum injection timing in accordance with the map.

Air Conditioning Cut Control

DESCRIPTION

NLEC0614

Input/Output Signal Chart

NLEC0614S01

Sensor	Input Signal to ECM	ECM Function	Actuator
Air conditioner switch	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Accelerator position sensor	Accelerator valve opening angle		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		

System Description

NLEC0614S02

This system improves acceleration when the air conditioner is used.
When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.
When engine coolant temperature becomes excessively high, the air conditioner is turned off. This continues until the engine coolant temperature returns to normal.

Fuel Cut Control (at no load & high engine speed)

DESCRIPTION

NLEC0615

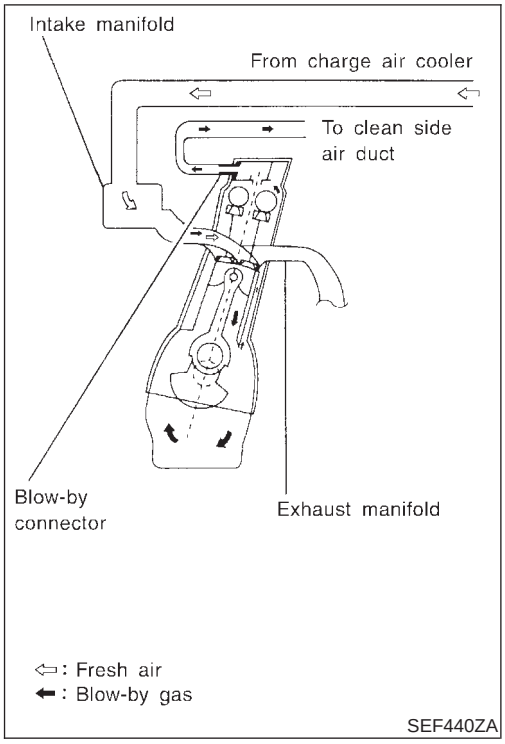
Input/Output Signal Chart

NLEC0615S01

Sensor	Input Signal to ECM	ECM Function	Actuator
Vehicle speed sensor	Vehicle speed	Fuel cut control	Electronic control fuel injection pump
Accelerator position switch	Accelerator position		
Crankshaft position sensor (TDC)	Engine speed		

If the engine speed is above 2,800 rpm with no load (for example, in neutral and engine speed over 2,800 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 “Fuel Injection Control System”, EC-1079.

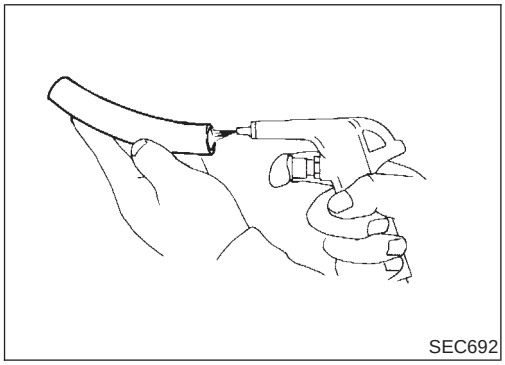


Crankcase Ventilation System

DESCRIPTION

NLEC0616

In this system, blow-by gas is sucked into the air duct after oil separation by oil separator in the rocker cover.



INSPECTION

NLEC0617

Ventilation Hose

NLEC0617S01

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.

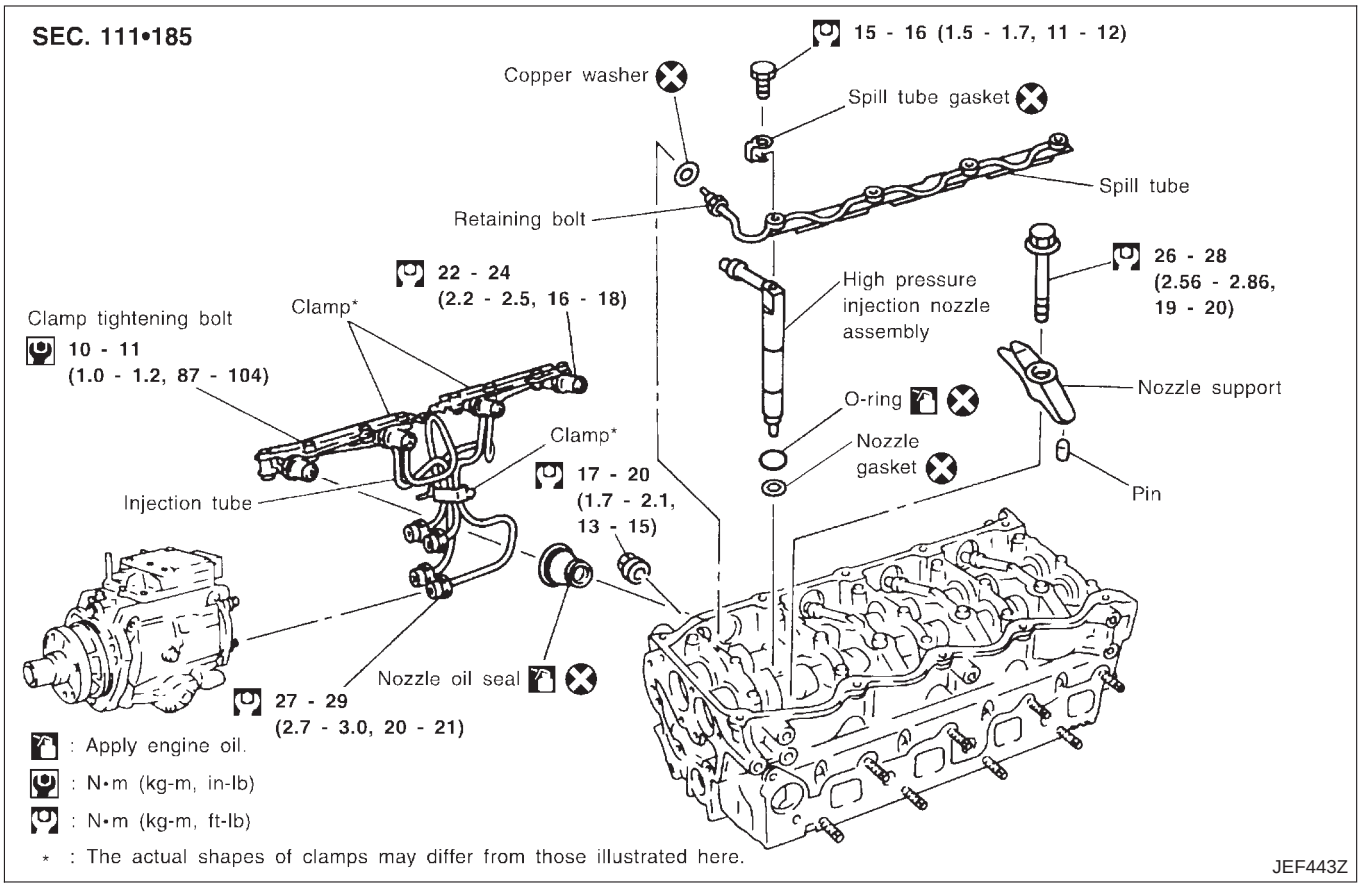
Injection Tube and Injection Nozzle

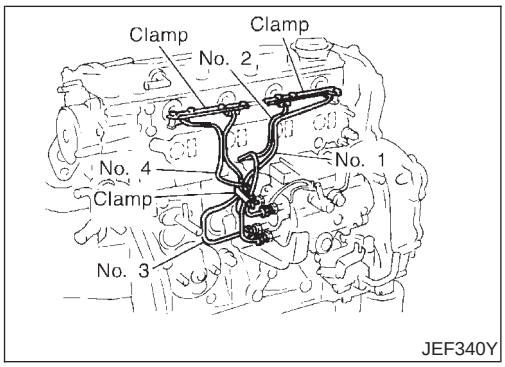
REMOVAL AND INSTALLATION

NLEC0618

CAUTION:

- **Do not disassemble injection nozzle assembly. If NG, replace injection nozzle assembly.**
- **Plug flare nut with a cap or rag so that no dust enters the nozzle. Cover nozzle tip to protect it.**





Injection Tube

NLEC0618S01

Removal

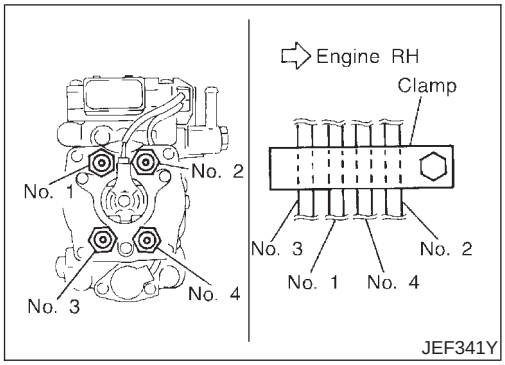
NLEC0618S0101

1. Mark the cylinder Nos. to the injection tubes, then disconnect them.

- **Marking should be made at proper locations and by the proper method, so that they are not erased by fuel, etc.**

2. Remove the clamps, then disconnect the tubes one by one.

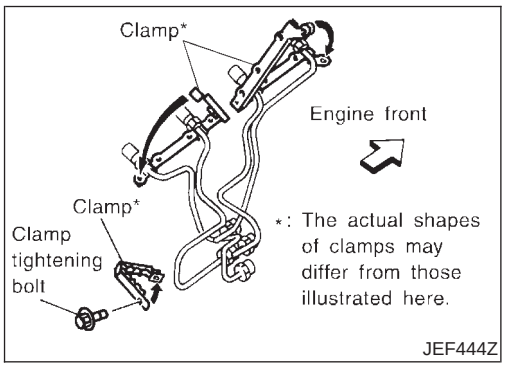
- The intake manifold is removed for explanation in the figure.



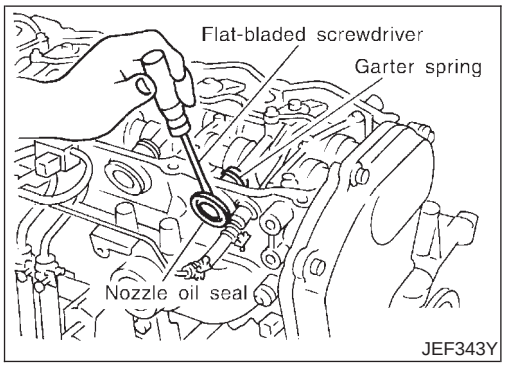
Installation

NLEC0618S0102

1. Referring to the figure and the marking which were made for installation, connect the injection tubes to all the cylinders.
2. Connect temporarily the tubes to the cylinder head side only by screwing 2 to 3 turns. Make sure that all tubes can be connected to the pump side also.
3. Then, tighten the flare nuts of the cylinder head side and pump side, starting from the opposite side from you.



4. Attach the injection tube clamp in the direction shown in the figure.
5. Insert tightening bolts of the clamp (4-tube type) from the rear to the front of the engine.



Injection Nozzle Oil Seal

NLEC0618S02

Removal

NLEC0618S0201

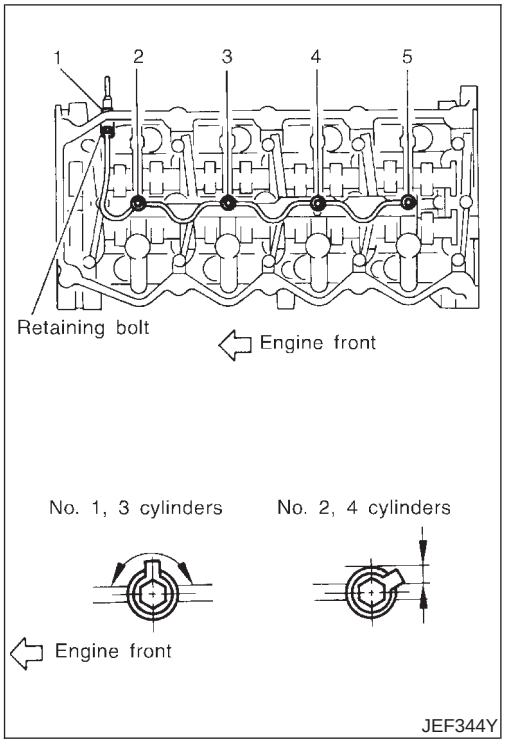
Using a tool such as a flat-bladed screwdriver, pry the flange of the seal, then remove it.

Installation

NLEC0618S0202

1. After the high-pressure injection nozzle assembly is installed, push the seal from the cylinder head side until it contacts the flange.
2. Make sure that the garter spring of the seal on the high-pressure injection nozzle assembly side is not falling.

- **Replace the oil seal with new one when the high-pressure injection nozzle assembly is removed. (It is not necessary to replace the oil seal when only injection tubes are removed.)**



Spill Tube

NLEC0618S03

Removal

NLEC0618S0301

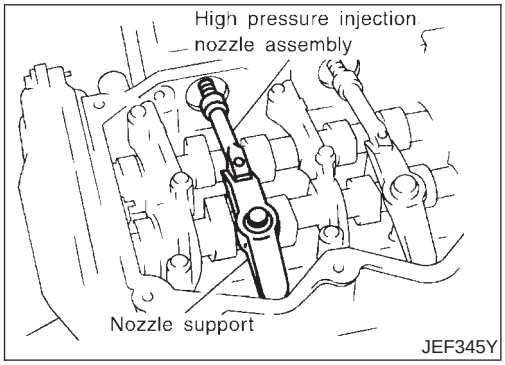
Loosen and remove the mounting bolts and flare nuts in the reverse order of the numbers in the figure.

- When the flare nuts are loosened, hold the head of hexagonal retaining bolts (head inside) using a wrench.

Installation

NLEC0618S0302

1. Tighten the flare nuts and mounting bolts in the numerical order shown in the figure.
   - When the flare nuts are tightened, hold the head of the hexagonal retaining bolts (head inside) using a wrench.
2. To prevent interference with the rocker cover, place the spill gasket joint within the range shown by the arrow, then tighten the mounting bolts. (Be especially careful about No. 2 and 4 cylinders.)
   - **After the spill tube is installed, check the airtightness of the spill tube.**
   - After the bolts are tightened, the joint of the spill tube gasket might be broken. However, this will not affect function.



High Pressure Injection Nozzle Assembly

NLEC0618S04

Removal

NLEC0618S0401

1. Remove the nozzle support, then pull out the high-pressure injection nozzle assembly by turning it clockwise/counterclockwise.
2. Using a tool such as a flat-head screwdriver, remove the copper washer inside the cylinder head.

CAUTION:

Do not disassemble the high-pressure injection nozzle.

Installation

NLEC0618S0402

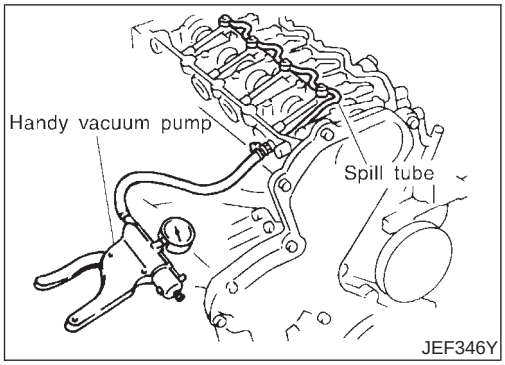
1. Insert the nozzle gasket to the cylinder head hole.
2. Attach the O-ring to the mounting groove of the nozzle side, then insert it in the cylinder head.

TEST AND ADJUSTMENT

NLEC0619

WARNING:

When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to contact your hands or body, and make sure your eyes are properly protected with goggles.



Inspection for Spill Tube Airtightness

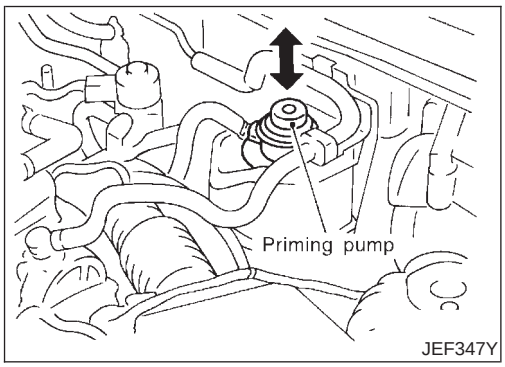
NLEC0619S01

Before the rocker cover is installed, perform the inspection as follows.

1. Connect the handy vacuum pump to the spill hose.
2. Check that the airtightness is maintained after the negative pressure shown below is applied.

Standard:

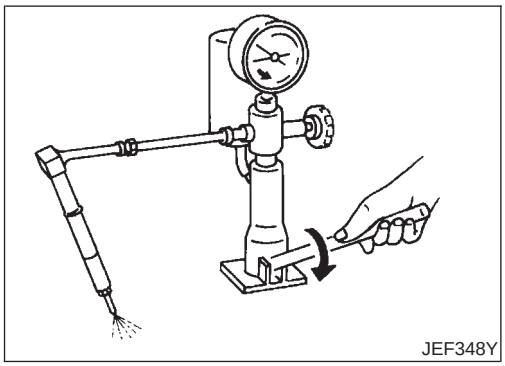
–53.3 to –66.7 kPa (–533 to –667 mbar, –400 to –500 mmHg, –15.75 to –19.69 inHg)



Air Bleeding of Fuel Piping

NLEC0619S02

After the repair, bleed air in the piping by pumping the priming pump up and down until it becomes heavy.



Injection Pressure Test

NLEC0619S03

1. Install injection nozzle assembly to injection nozzle tester and bleed air from flare nut.
2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:

New

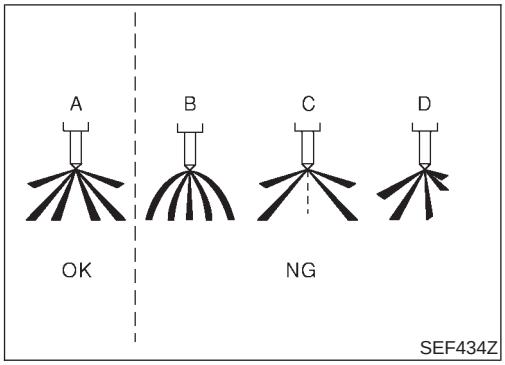
21,476 - 22,457 kPa (214.7 - 224.5 bar, 219 - 229 kg/cm^2, 3,114 - 3,256 psi)

Limit

18,275 kPa (182.7 bar, 186 kg/cm^2, 2,650 psi)

- The injection nozzle assembly has a 2-stage pressure injection function. However, the judgement should be made at the first stage of the valve opening pressure.

Always check initial injection pressure using a new nozzle.



Spray Pattern Test

NLEC0619S05

1. Check spray pattern by pumping tester handle one full stroke per second.

   NG spray pattern:

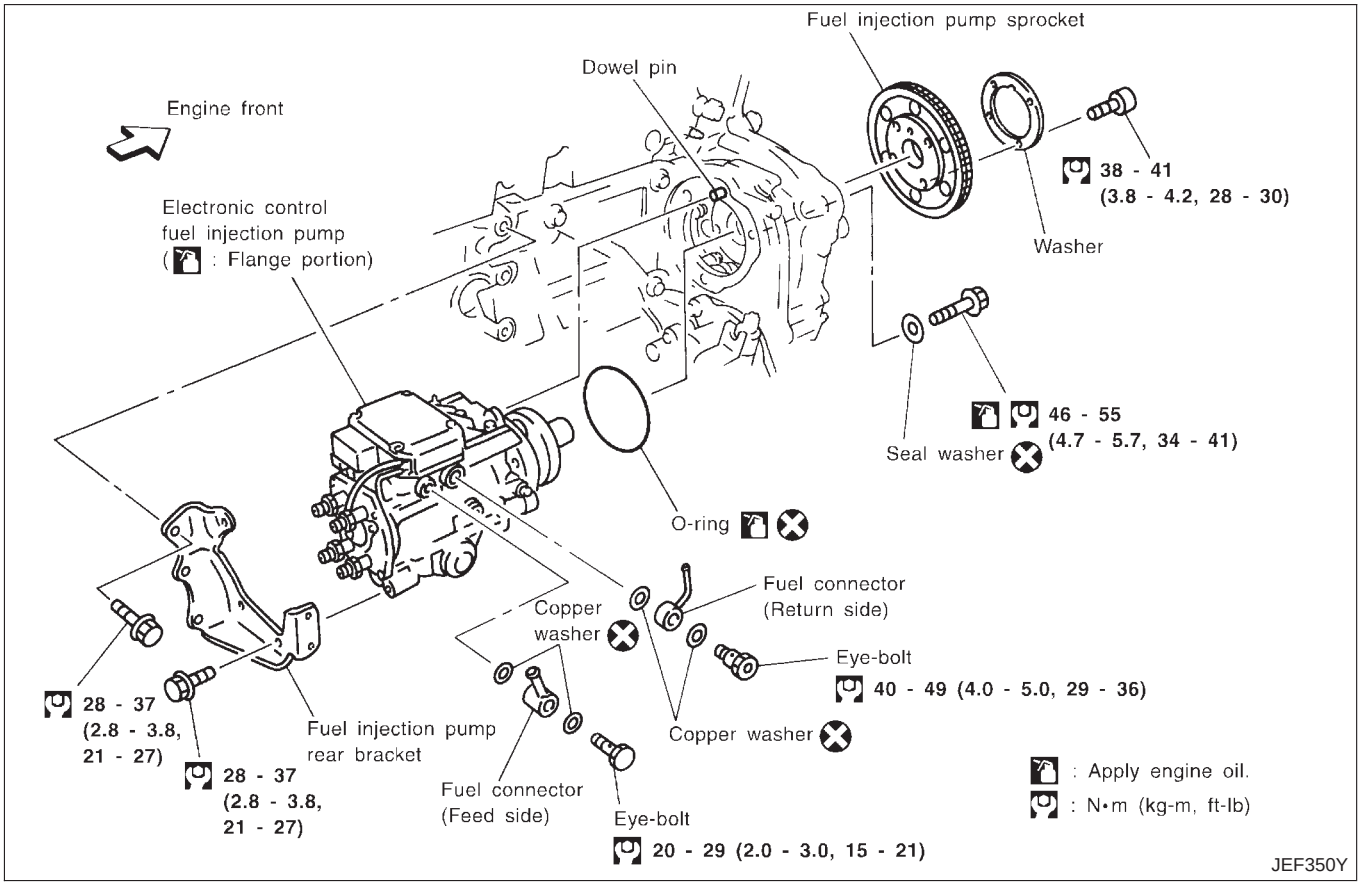
   Does not inject straight and strong (B in the figure).
   Fuel drips (C in the figure).
   Does not inject evenly (D in the figure).

2. If the spray pattern is not correct, replace injection nozzle assembly.

Electronic Control Fuel Injection Pump

REMOVAL AND INSTALLATION

NLEC0620

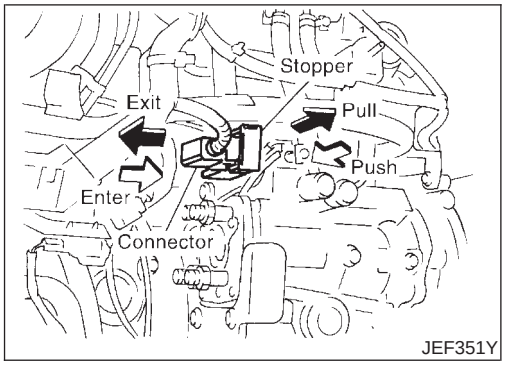


Removal

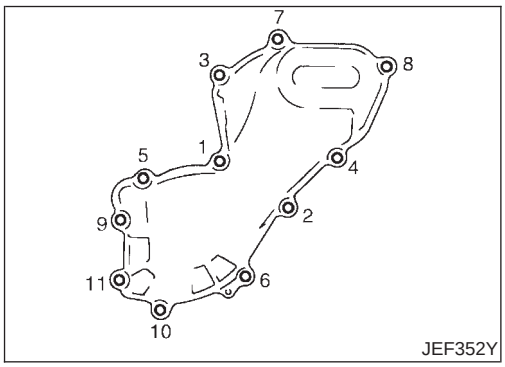
NLEC0620S01

1. Remove the parts shown below.

- Engine hood
- Engine coolant (drain)
- Engine cover
- Heater pipe under intake manifold
- Injection tubes
- Right splash cover (with undercover)
- Right front wheel

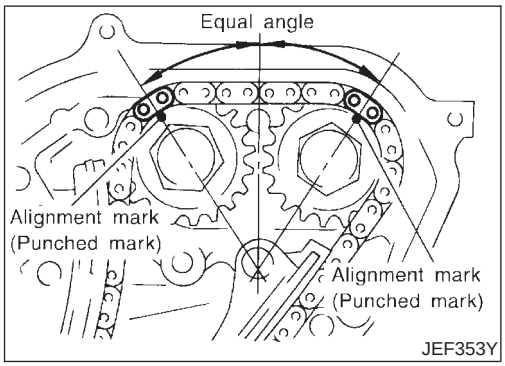


2. Disconnect the fuel hoses from the fuel injection pump.
3. Disconnect the harness connector from the fuel injection pump.
- Disconnect the connector by pulling the connector stopper fully.
- When the stopper is fully pulled, the connector will be disconnected together. For installation, push the connector half way first, then press the stopper until it locks, so that the connector is connected together.
4. Remove the fuel injection pump rear bracket.

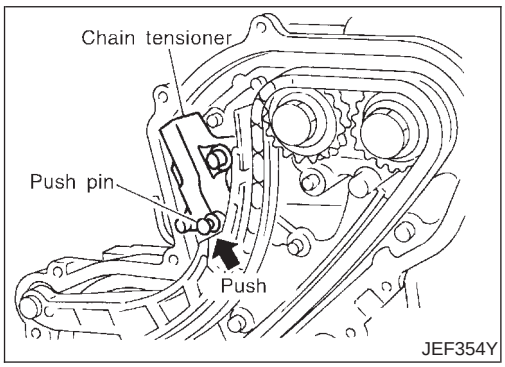


5. Remove the front chain case.
- Move the power steering fluid reservoir tank from the bracket.
- Loosen and remove the mounting bolts in the reverse order of the numbers shown in the figure.
- As for bolts 6, 10, and 11, remove with rubber washer because there is not enough space for removing only the bolts.

CAUTION:
To prevent foreign objects from getting in the engine, cover the opening during the removal of the front chain case.

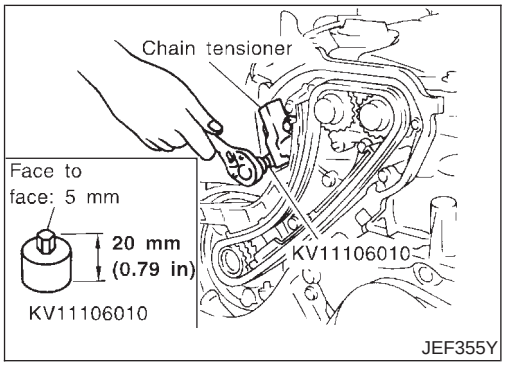


6. Adjust the No. 1 cylinder to the top dead center position.
- Turn the crankshaft pulley clockwise, then align the alignment mark (punched mark) of the camshaft sprocket to the position shown in the figure.
- There is no indicator on the crankshaft pulley.
- It is not necessary to mark the secondary timing chain for removal because it can be matched by the link color for installation. However, the alignment mark on the fuel injection pump sprocket is difficult to see; mark it if necessary.

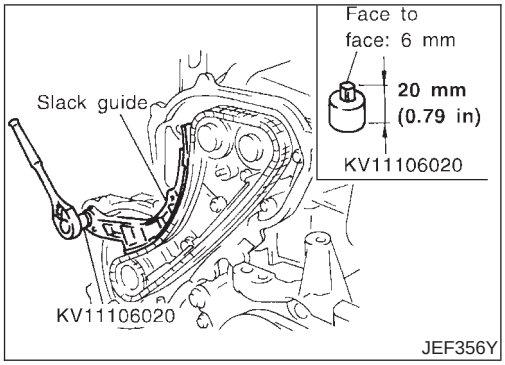


7. Remove the chain tensioner.

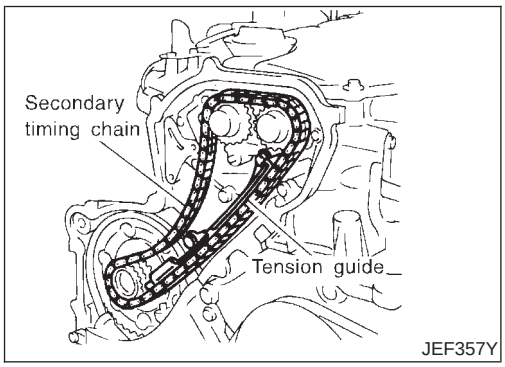
a. Push the plunger of the chain tensioner, then fix it with a tool such as a push pin.



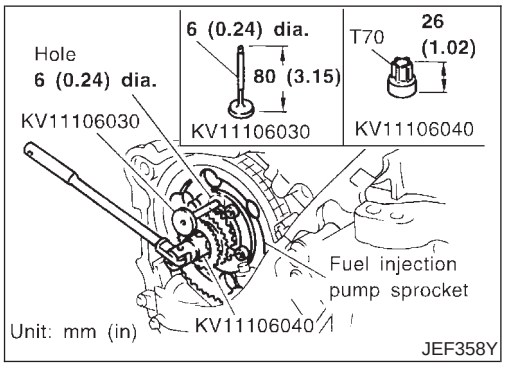
b. Using the hexagon wrench (face to face: 5 mm) (SST), remove the mounting bolts, then remove the chain tensioner.
- A multi-purpose tool may also be used.



8. Remove the timing chain slack guide.
- Using the hexagon wrench (face to face: 6 mm, short-type) (SST), remove the mounting bolts, then remove the timing chain slack guide.



9. Remove the timing chain tension guide.
10. Remove the secondary timing chain.
- Only the timing chain can be removed without removing the sprockets.

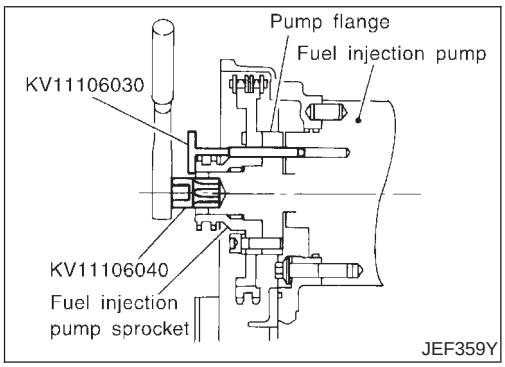


11. Fix the fuel injection pump sprocket.

a. Insert the positioning stopper pin (SST) in the 6 mm (0.24 in) dia. hole of the fuel injection pump sprocket.

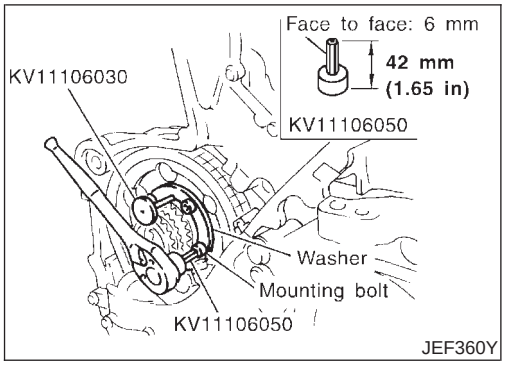
b. Using the torx wrench (SST), turn the pump shaft gradually to adjust the hole position of the fuel injection pump sprocket.

c. Insert the positioning stopper pin through the fuel injection pump body to fix the sprocket.

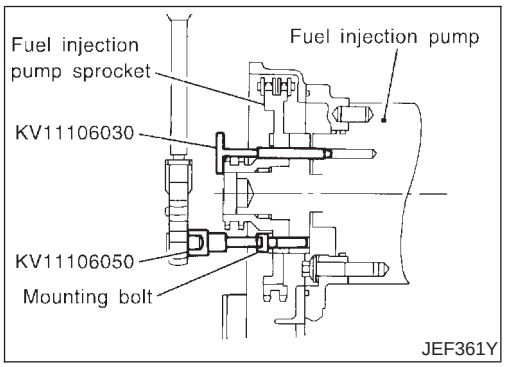


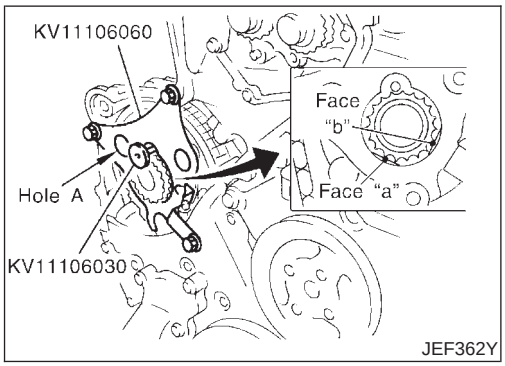
- Insert the positioning stopper pin until its flange contacts the fuel injection pump sprocket.

d. Remove the torx wrench (SST).



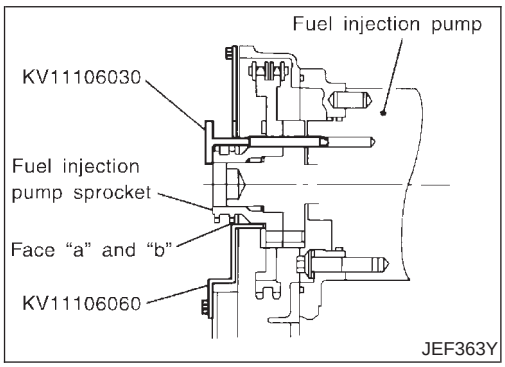
12. Using the hexagon wrench (face to face: 6 mm, long-type) (SST), remove the mounting bolts of the fuel injection pump sprocket.
- It is not necessary to remove the washer of the fuel injection pump sprocket.





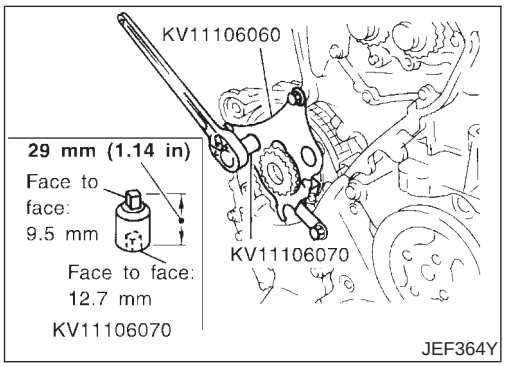
13. Using the sprocket holder (SST), hold the fuel injection pump sprocket to prevent falling.
- When the sprocket holder is installed, if the positioning stopper pin interferes, pull out the stopper pin approximately 10 mm (0.39 in), then install it.
- After the sprocket holder is installed temporarily, insert the extension bar (SST) and Torx socket in the three holes A. After positioning the holes, tighten the holder mounting bolts. (Refer to the step 14 about the tool.)
- The length of the sprocket holder mounting bolts should be approximately 15 mm (0.59 in) (M6 thread length).
- Make sure that the a- and b-faces of the sprocket holder contact the bottom side of the sprocket 15 mm (0.59 in) (small diameter side).

CAUTION:
Do not remove the sprocket holder until the fuel injection pump is installed.

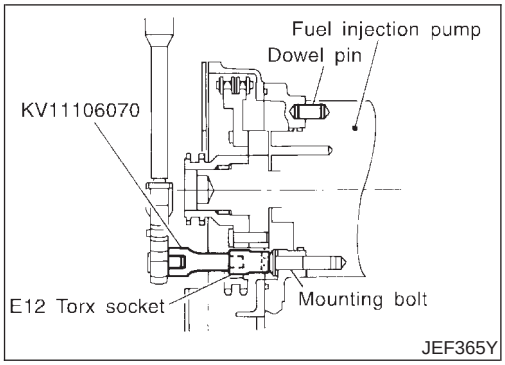


- After the sprocket holder is installed, pull out the positioning stopper pin (SST) from the fuel injection pump sprocket.

14. Using the extension bar [SST: whole length 43 mm (1.69 in)] and the Torx socket (Q6-E12: commercially available), remove the mounting bolts, them remove the fuel injection pump toward the rear of the engine.
- Even after all the mounting bolts are removed, the fuel injection pump is still held by a dowel pin.



CAUTION:
Do not disassemble or adjust the fuel injection pump.



15. Remove the fuel injection pump mounting bolts.
- The seal washer of the mounting bolts cannot be reused.

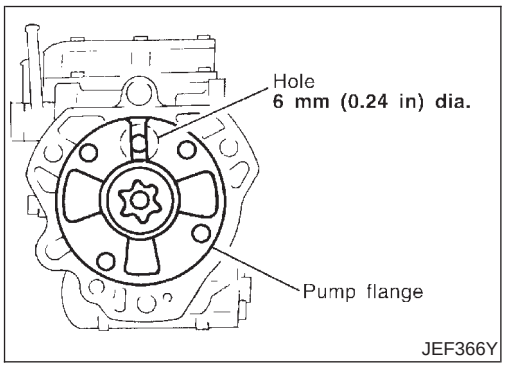
CAUTION:
For removal, be careful not to drop the seal washer into the engine.

Installation

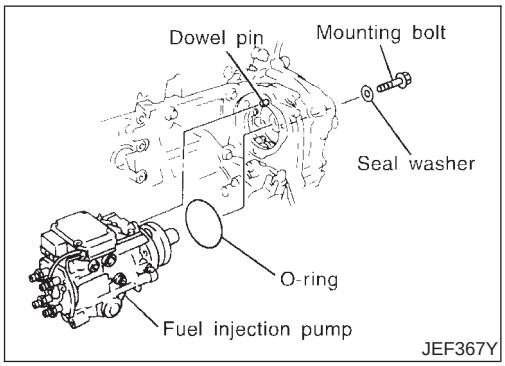
NLEC0620S02

- It is not necessary to adjust the injection timing by changing the installation angle which used to be performed with conventional fuel injection pumps. The installation position can be simply decided by the dowel pin and the mounting bolts.

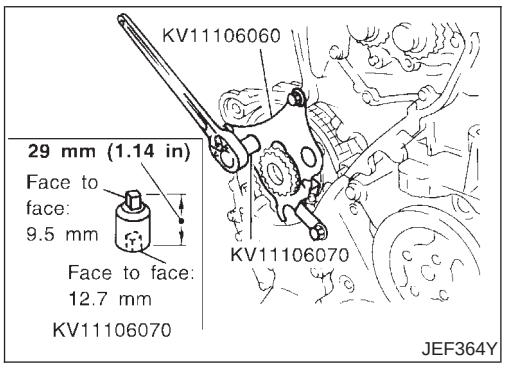
1. Before the fuel injection pump is installed, check that the notch of its flange and the 6 mm (0.24 in) dia. hole on the body are aligned.



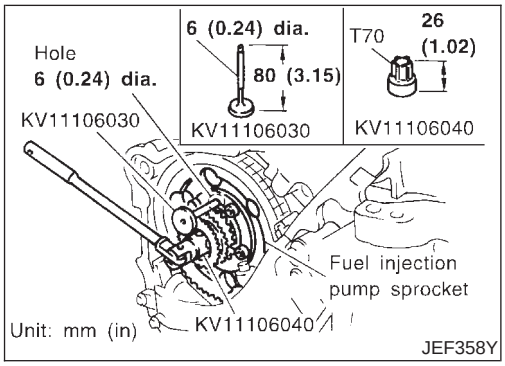
2. Insert the fuel injection pump to the mounting position from the rear of the engine.
- Adjust the fuel injection pump bracket position to the dowel pin, then install it.

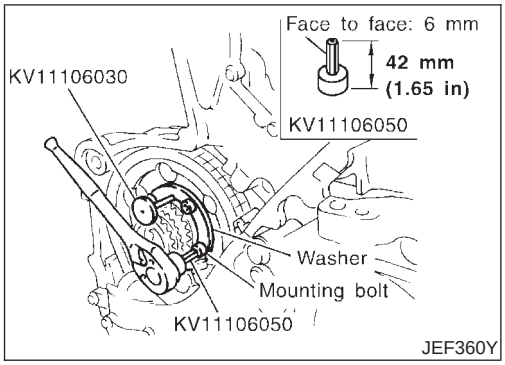


3. Using the extension bar (SST) and the Torx socket, tighten the mounting bolts of the fuel injection pump.
4. Remove the sprocket holder (SST).



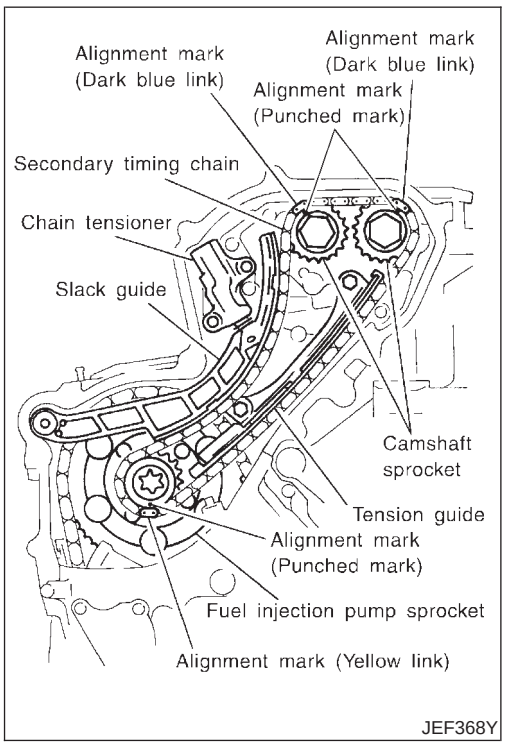
5. Using the torx wrench (SST), turn the pump shaft gradually to adjust the position of the flange. Then, insert the positioning stopper pin (SST) to the 6 mm (0.24 in) dia. hole of the fuel injection pump sprocket through the pump flange and the pump body.
6. Remove the torx wrench (SST).





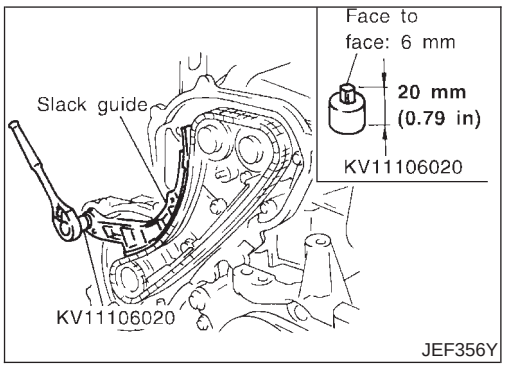
7. Using the hexagon wrench (face to face: 6 mm, long-type) (SST), tighten the sprocket mounting bolt.
- When the washer of the fuel injection pump sprocket is removed, install it with the marking "F" (front) facing the front of the engine.

8. Pull out the positioning stopper pin (SST).

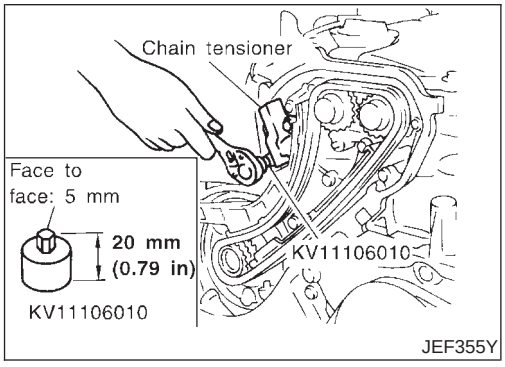


9. Install the secondary timing chain.
- Align the alignment marks of the sprockets and those of the chain, then install it.
- The figure shows the installation state and names of the secondary timing chain and other related parts.

10. Install timing chain tension guide.
- The upper installation bolt is longer than the lower.



11. Using a hexagon wrench (face to face: 6 mm, short-type) (SST), install the timing chain slack guide.

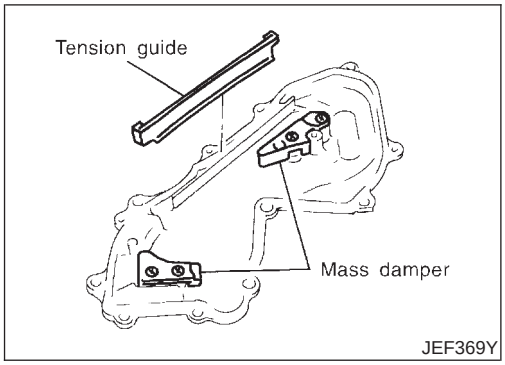


12. Install the chain tensioner.

a. Push the plunger of the chain tensioner, then hold it with a tool such as a push pin, and install it.

b. Using a hexagon wrench (face to face: 5 mm) (SST), tighten the mounting bolts.
- Installation is possible by a multi-purpose tool also.

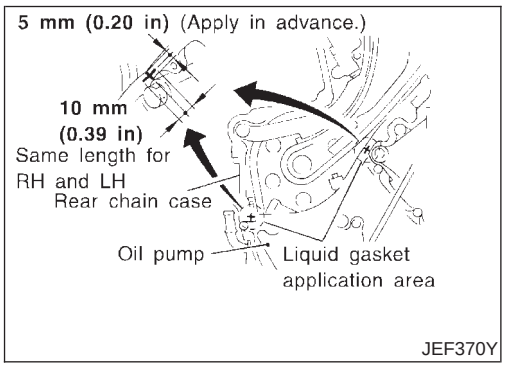
c. Pull out the tool such as a push pin which holds the plunger.
- **Make sure that the alignment marks of the sprockets and timing chain are aligned.**



13. Install the front chain case.

a. Install the tension guide to the back side of the front chain case.

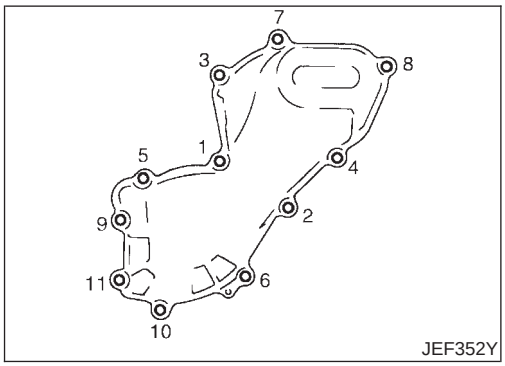
- If the front chain case is tilted, the tension guide may fall off. Therefore, when installing the front chain case, hold it vertically.



b. Apply Three Bond 1207C (KP510 00150) to both ends of the arch area of the oil pump (contact surface of rear chain case) as shown in the figure.

c. Install the front chain case.

- Align the dowel pin of the oil pump case to the pin hole, then install it.
- Install bolts 6, 10, and 11 (shown in the figure) with the rubber washer to the front chain case.

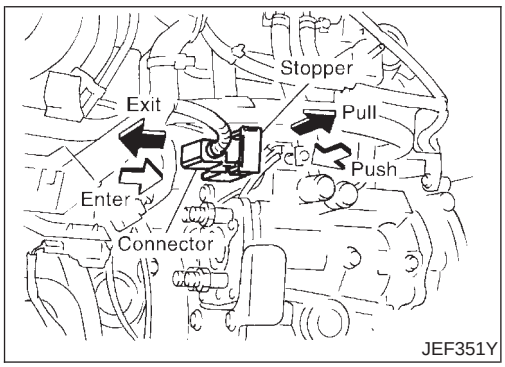


d. Tighten the mounting bolts in the numerical order shown in the figure.

e. After all bolts are tightened, tighten the mounting bolts in the numerical order shown in the figure again.

14. Install the fuel injection pump rear bracket.

- Tighten all the bolts temporarily, then tighten them securely with the mounting face securely contacting the fuel injection pump and the pump bracket.



15. Connect the fuel injection pump harness connector.

- Insert the harness connector securely until the stopper locks.
- Push the connector half way first, then press the stopper until it locks, so that the connector is connected together.

16. Connect the fuel hoses.

- When the hoses are disconnected at the fuel gallery side, insert until the hoses contact the valve, then install the clamp securely.

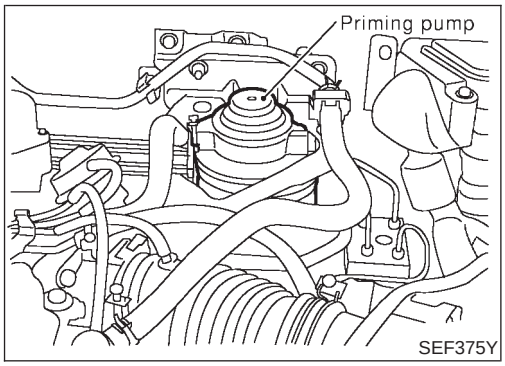
17. Install other parts in the reverse order of removal.

Fuel Filter

DESCRIPTION

NLEC0623

A water draining cock is on the lower side and a priming pump for bleeding air is on the upper side.



AIR BLEEDING

NLEC0624

1. After the repair, bleed air from the piping by pumping the priming pump up and down until it becomes heavy.
2. To start the engine, rotate the starter for a maximum of 30 seconds. To start the engine more quickly, crank the engine while pumping the priming pump (requires two workers).
3. If the engine does not start after rotating the starter for a maximum of 30 seconds, stop it once, and pump the priming pump again until it becomes heavy.
4. Rotate the starter again until the engine starts running.
5. After the engine starts, let it idle for at least 1 minute to stabilize the behavior.

- **When air is bled completely, the pumping of the priming pump suddenly becomes heavy. Stop the operation at that time.**
- **If it is difficult to bleed air by the pumping of the priming pump (the pumping of the priming pump does not become heavy), disconnect the fuel supply hose between the fuel filter and the injection pump. Then, perform the operation described above, and make sure that fuel comes out. (Use a pan, etc. so as not to spill fuel. Do not let fuel get on engine and other parts.) After that, connect the hose, then bleed air again.**
- **Start engine and let it idle for at least one minute after performing air bleeding.**

WATER DRAINING

NLEC0625

- If the MI lights up (not flashes) during the engine operation, drain the water as follows. (If fuel filter switch is equipped.)

1. Remove the fuel filter, filter bracket, protector assembly from the dash panel as follows.

a. Remove the air cleaner case (upper), air duct assembly, and vacuum hose for brake booster (between the vacuum pump and vacuum pipe).

CAUTION:

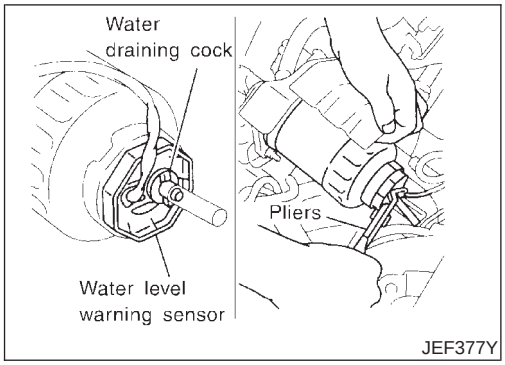
After the duct is removed, cover the opening with gum tape, etc. to prevent foreign object from getting into the engine during the operation.

b. Disconnect the water level warning sensor harness connector.

c. Remove the mounting nuts on the dash panel, then remove the fuel filter, filter bracket, and protector assembly from the dash panel.

- It is not necessary to disconnect the fuel hose.

2. Using a tool such as a pliers, loosen the water draining cock at the bottom of the water level warning sensor located under the fuel filter.



3. Install the fuel filter, filter bracket, and protector assembly temporarily. Then, drain the water by pumping the priming pump with the filter standing straight.

- Extend the drain hose if necessary.

Water amount when the MI lights up:
65 - 100 mℓ (2.2 - 3.5 Imp fl oz)

CAUTION:
When the water is drained, the fuel is also drained. Use a pan, etc. to avoid fuel adherence to the rubber parts such as the engine mount insulator.

4. Tighten the water draining cock, then install the fuel filter, filter bracket, protector assembly in the reverse order of removal.

CAUTION:
Do not over-tighten the water draining cock. This will damage the cock thread, resulting in water or fuel leak.

5. Bleed air of the fuel filter. Refer to EC-1094.

- **Start engine and let it idle for at least one minute after performing air bleeding.**

6. Start the engine, then check that the MI goes off. (If fuel filter switch is equipped.)

DTC and MI Detection Logic

NLEC0626

When a malfunction is detected, the malfunction (DTC) is stored in the ECM memory.
The MI will light up each time the ECM detects malfunction. For diagnostic items causing the MI to light up, refer to “TROUBLE DIAGNOSIS — INDEX”, EC-1064.

Diagnostic Trouble Code (DTC)

NLEC0627

HOW TO READ DTC

NLEC0627S01

The 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: 0103, 0807, 1002, etc.

With CONSULT-II

CONSULT-II displays the DTC in “SELF-DIAG RESULTS” mode. Examples: P0115, P0571, P1202, etc. These DTCs are prescribed by ISO15031-6.
(CONSULT-II also displays the malfunctioning component or system.)

- **Output of the trouble code means that the indicated circuit has a malfunction. However, in the Mode II it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal.**
  CONSULT-II can identify them. Therefore, using CONSULT-II (if available) is recommended.

HOW TO ERASE DTC

NLEC0627S02

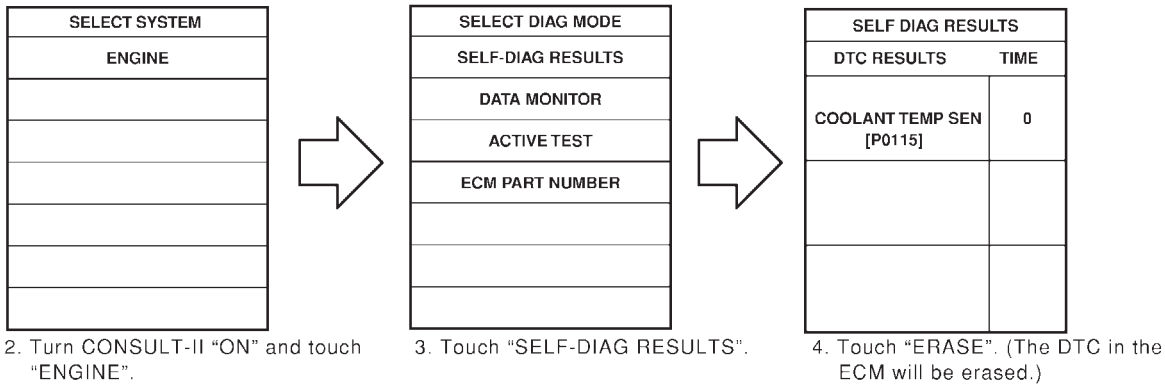
How to Erase DTC (With CONSULT-II)

NLEC0627S0201

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 5 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 5 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.)

SEF246Z

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)

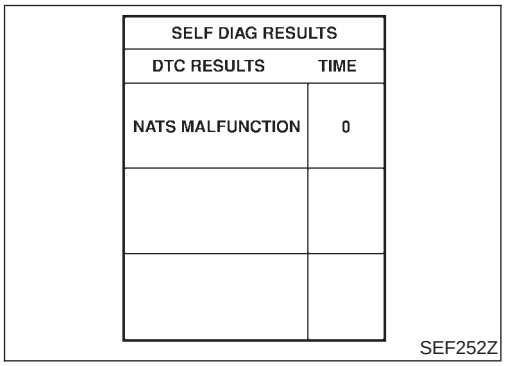
NLEC0627S0202

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 5 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-1099.)

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.**



NATS (Nissan Anti-Theft System)

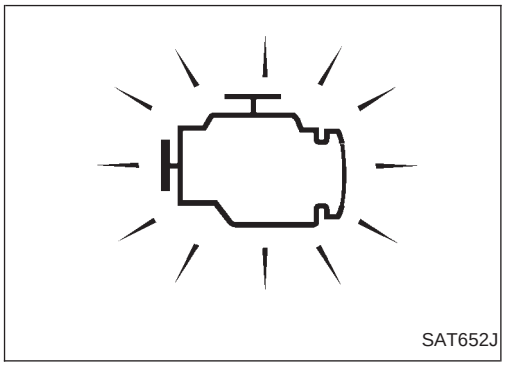
NLEC1265

- **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 "NATS (Nissan Anti-Theft System)" in EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  Therefore, be sure to receive all keys from vehicle owner.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

Malfunction Indicator (MI)

DESCRIPTION

NLEC0628



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-10, "WARNING LAMPS" or see EC-1303.

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

If MI illuminates or blinks irregularly after starting engine, water may have accumulated in fuel filter. Drain water from fuel filter. Refer to "WATER DRAINING", EC-1094.

Malfunction Indicator (MI) (Cont'd)

On Board Diagnostic System Function

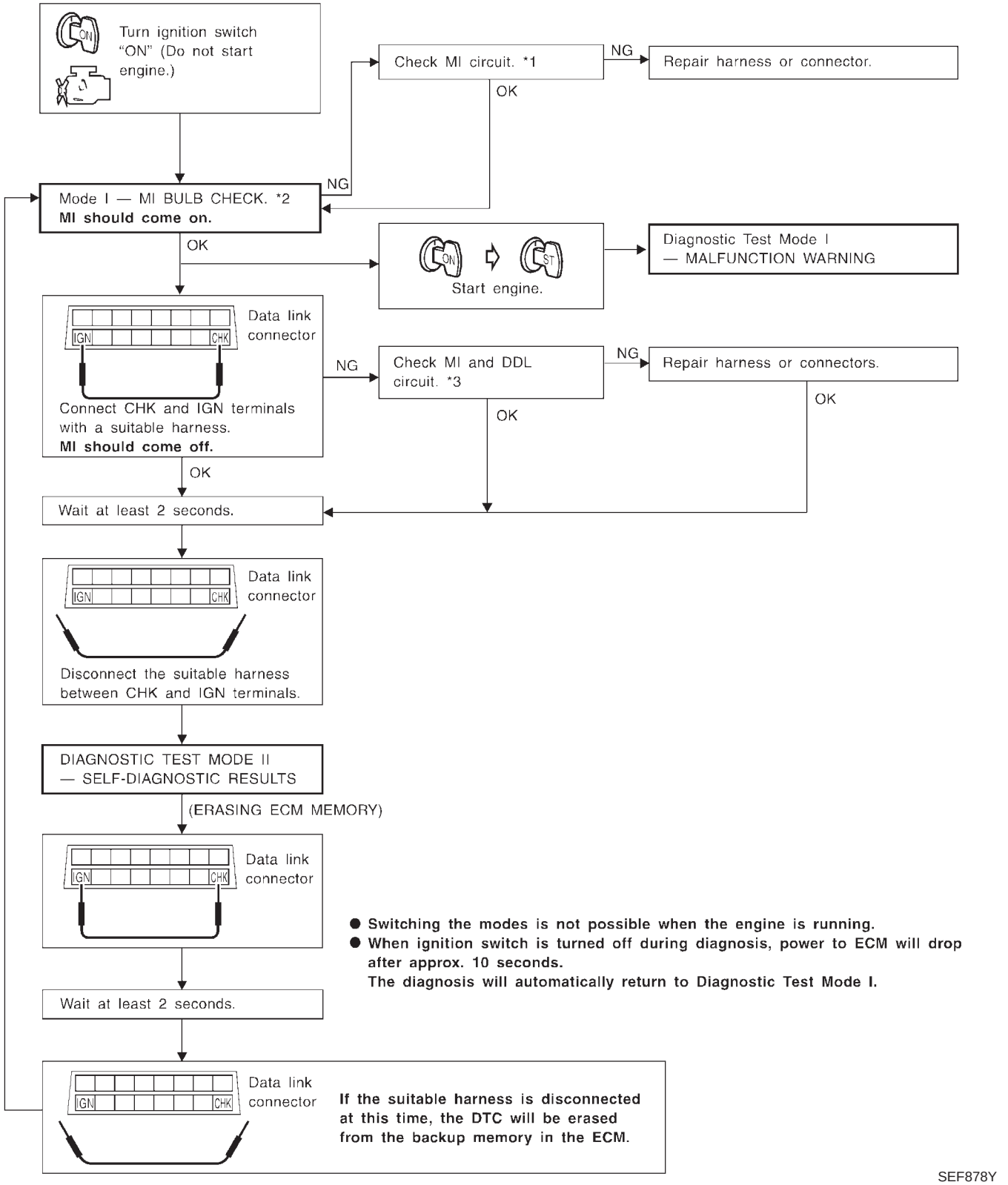
NLEC0628S01

The on board diagnostic system has the following three 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-1303.)
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When ECM detects a malfunction, 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 to be read.

How to Switch Diagnostic Test Modes

NLEC0628S02



- **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.

SEF878Y

*1: EC-1303 *2: EC-1098 *3: EC-1303

Diagnostic Test Mode I — Bulb Check

NLEC0628S03

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL-10, "WARNING LAMPS" or see EC-1303.

Diagnostic Test Mode I — Malfunction Warning

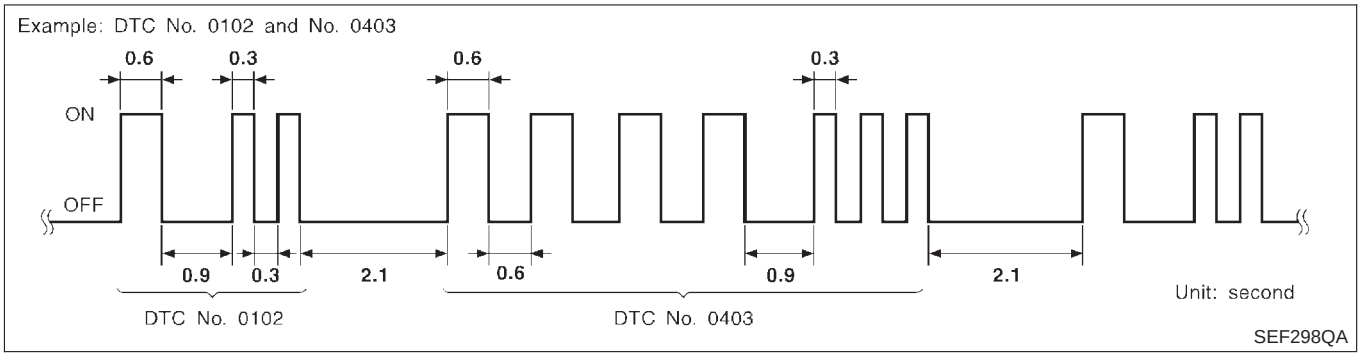
NLEC0628S04

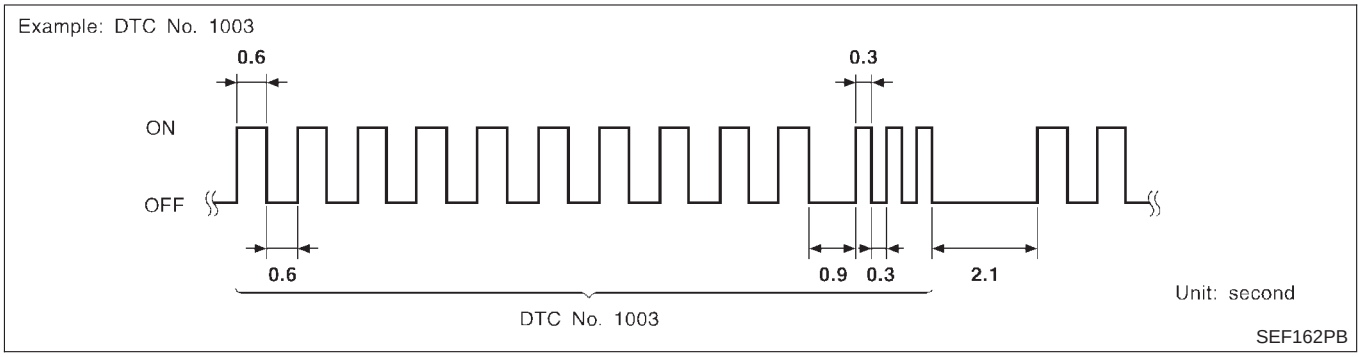
MI	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

Diagnostic Test Mode II — Self-diagnostic Results

NLEC0628S05

In this mode, DTC is indicated by the number of blinks of the MI as shown below.





Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the MI blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "1003".
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0505" refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-1064.)

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

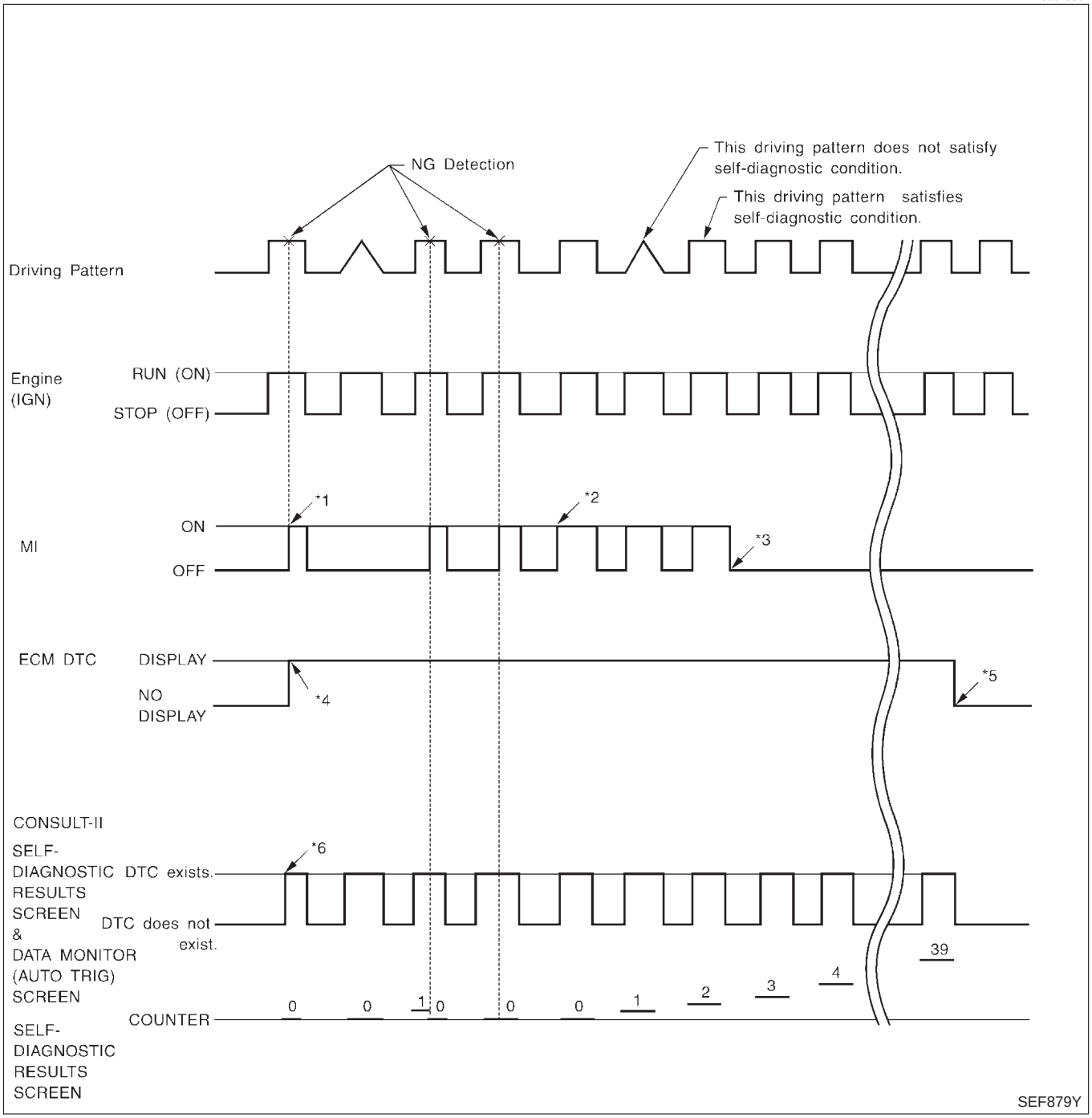
NLEC0628S06

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-1099.)

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

Relationship Between MI, DTC, CONSULT-II and Driving Patterns

NLEC0628S07



*1: When a malfunction is detected, MI will light up.

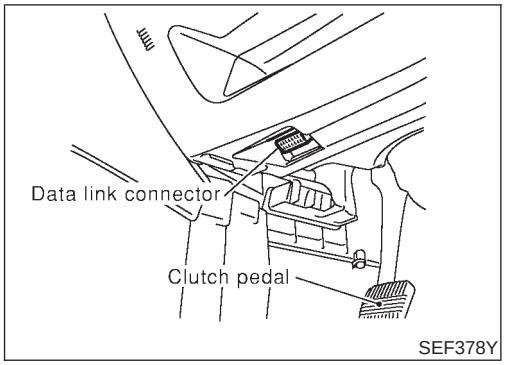
*2: When the same malfunction is detected in two consecutive driving patterns, MI will stay lit up.

*3: MI will go off after vehicle is driven three times without any malfunctions.

*4: When a malfunction is detected for the first time, the DTC will be stored in ECM.

*5: The DTC will not be displayed any longer after vehicle is driven 40 times without the same malfunction. (The DTC still remain in ECM.)

*6: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.



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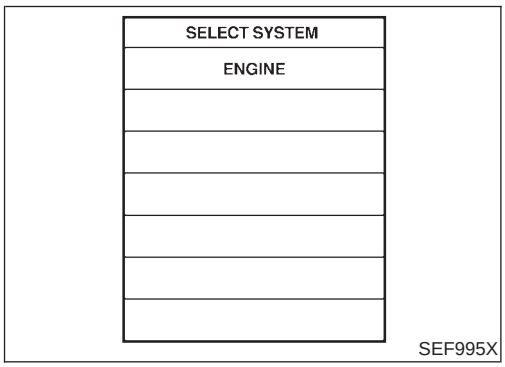
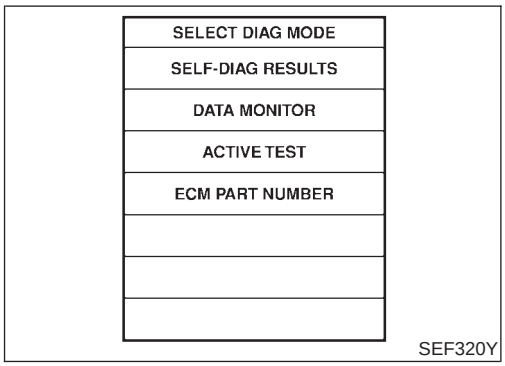


SEF995X



SEF320Y

CONSULT-II

NLEC0629

CONSULT-II INSPECTION PROCEDURE

NLEC0629S01

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector. (Data link connector is located under the driver side dash panel.)
3. Turn ignition switch ON.
4. Touch “START”.
5. Touch “ENGINE”.
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

=NLEC0629S02

		Item	DIAGNOSTIC TEST MODE		
			SELF-DIAG RESULTS	DATA MONITOR	ACTIVE TEST
ENGINE CONTROL COMPONENT PARTS	INPUT	Engine coolant temperature sensor	X	X	
		Vehicle speed sensor	X	X	
		Accelerator position sensor	X	X	
		Accelerator position switch	X	X	
		Crankshaft position sensor (TDC)	X	X	
		Ignition switch (start signal)		X	
		Park/Neutral position (PNP) switch (where fitted)		X	
		Battery voltage	X	X	
		Mass air flow sensor	X	X	
		Stop lamp switch	X	X	
	OUTPUT	Glow relay		X	X
		EGR volume control valve		X	X
		Cooling fan relay		X	X

X: Applicable

SELF-DIAGNOSTIC MODE

NLEC0629S03

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "TROUBLE DIAGNOSIS — INDEX", EC-1064.

DATA MONITOR MODE

NLEC0629S04

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CKPS·RPM (TDC) [rpm]	○	○	• The engine speed computed from the crankshaft position sensor (TDC) signal is displayed.	
CMPS·RPM·PUMP [rpm]	○	○	• The engine speed computed from the pulse signal sent from electronic control fuel injection pump is displayed.	
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.
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	
FUEL TEMP SEN [°C] or [°F]	○	○	• The fuel temperature (sent from electronic control fuel injection pump) is displayed.	
ACCEL POS SEN [V]	○	○	• The accelerator position sensor signal voltage is displayed.	
OFF ACCEL SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the accelerator position switch signal.	

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
SPILL/V [°CA]		○	● The control position of spill valve (sent from electronic control fuel injection pump) is displayed.	
BATTERY VOLT [V]	○	○	● The power supply voltage of ECM is displayed.	
P/N POSI SW [ON/OFF] (where fitted)	○	○	● Indicates [ON/OFF] condition from the park/neutral position switch signal.	
START SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
BRAKE SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the stop lamp switch signal.	
BRAKE SW2 [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the brake pedal position switch signal.	
IGN SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from ignition switch signal.	
MAS AIR/FL SE [V]	○	○	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
INT/A VOLUME [mg/]			● The intake air volume computed from the mass air flow sensor signal is displayed.	
F/CUT SIGNAL [ON/OFF]		○	● The [ON/OFF] condition from deceleration fuel cut signal (sent from electronic control fuel injection pump) is displayed. OFF···Fuel is cut off. ON···Fuel is not cut off.	
GLOW RLY [ON/OFF]		○	● The glow relay control condition (determined by ECM according to the input signal) is displayed.	
COOLING FAN [LOW/HI/OFF]		○	● Indicates the control condition of the cooling fans (determined by ECM according to the input signal). ● LOW ... Operates at low speed. HI ... Operates at high speed. OFF ... Stopped.	
BARO SEN [kPa]	○	○	● The barometric pressure (determined by the signal voltage from the barometric pressure sensor built into the ECM) is displayed.	
EGR VOL CON/V [step]		○	● Indicates the EGR volume control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	

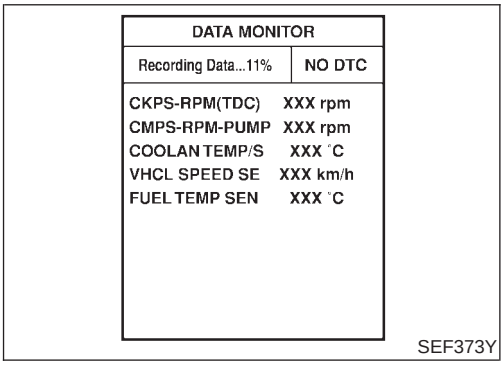
NOTE:

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

ACTIVE TEST MODE

NLEC0629S05

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
COOLING FAN	● Ignition switch: ON ● Operate the cooling fan at "LOW", "HI" speed and turn "OFF" using CONSULT-II.	Cooling fan moves at "LOW", "HI" speed and stops.	● Harness and connector ● Cooling fan motor ● Cooling fan relay
EGR VOL CONT/V	● Ignition switch: ON ● Change EGR volume control valve opening step using CONSULT-II.	EGR volume control valve makes an operating sound.	● Harness and connector ● EGR volume control valve
GLOW RLY	● Ignition switch: ON (Engine stopped) ● Turn the glow relay "ON" and "OFF" using CONSULT-II and listen to operating sound.	Glow relay makes the operating sound.	● Harness and connector ● Glow relay



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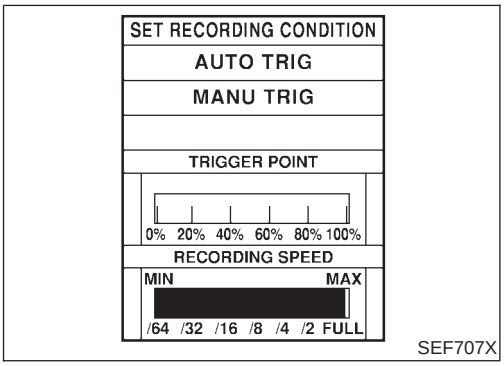

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REAL TIME DIAGNOSIS IN DATA MONITOR MODE

NLEC0629S06

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 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 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:

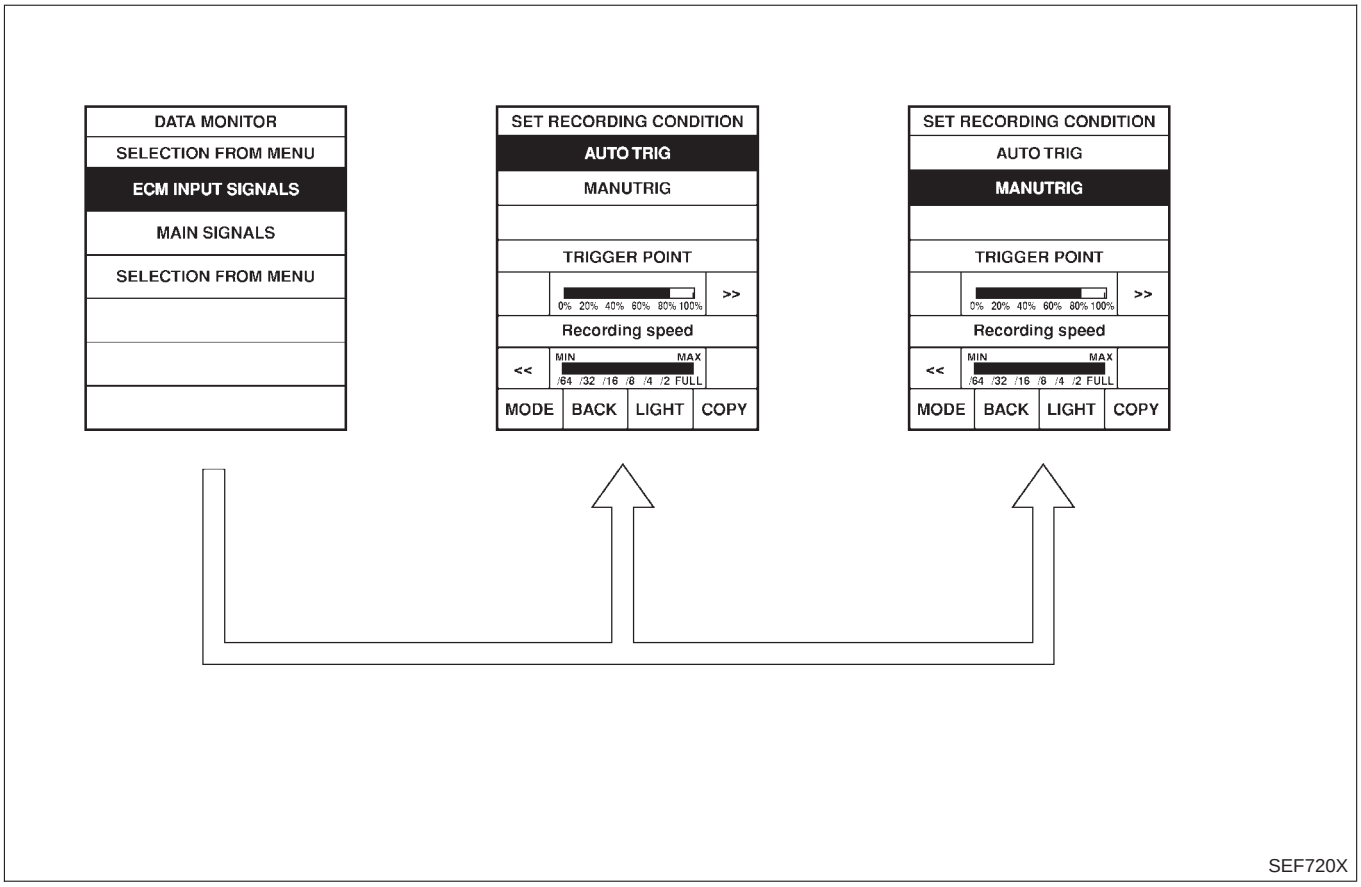
1) "AUTO TRIG"

- While trying to detect the DTC 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 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.



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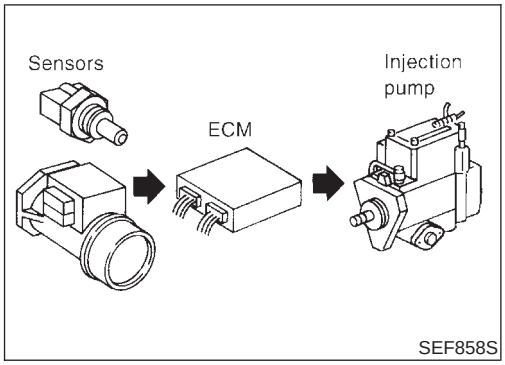

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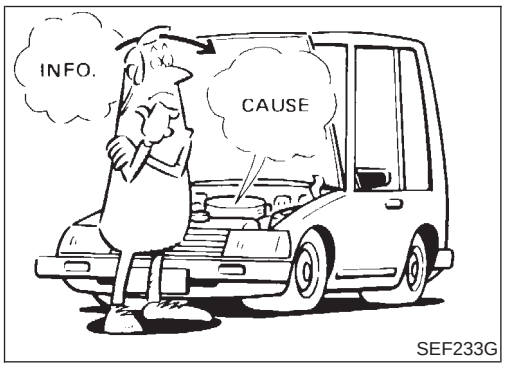

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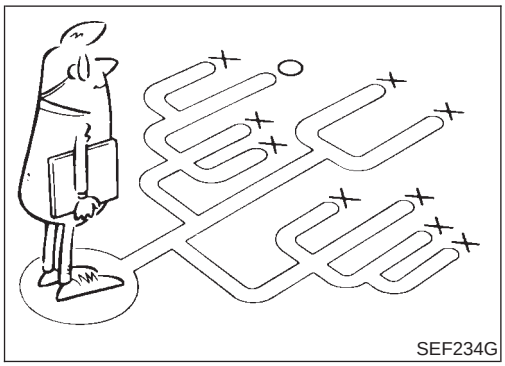
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KEY POINTS

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

SEF907L

Introduction

NLEC0630

The engine has an ECM to control major systems such as fuel injection control, fuel injection timing control, glow control system, etc. The ECM accepts input signals from sensors and instantly drives electronic control fuel injection pump. 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, 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”, EC-1109.

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

NLEC0630S01

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

In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one shown below in order to organize all the information for troubleshooting.

Worksheet Sample

NLEC0630S0101

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

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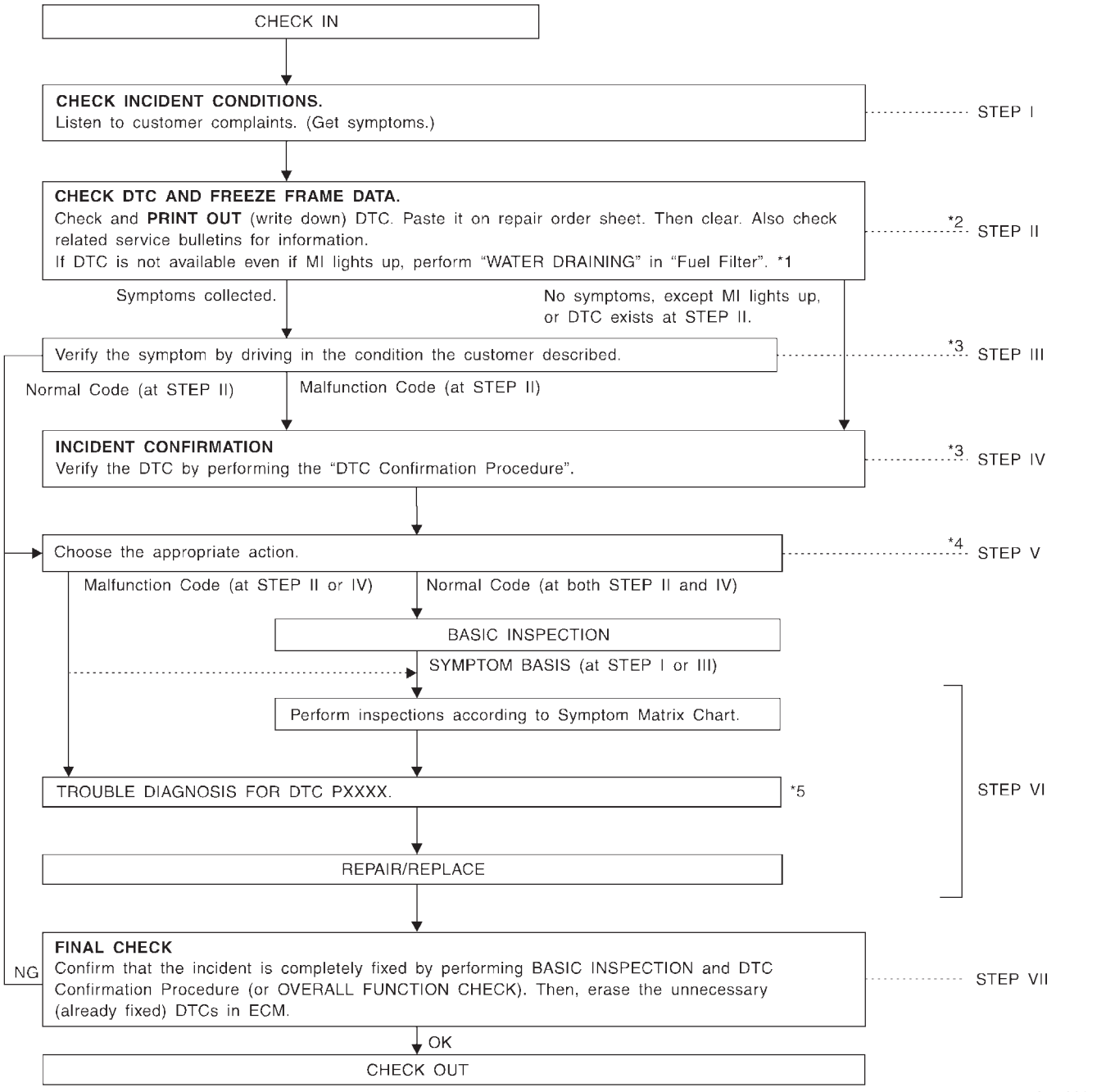
Work Flow

NLEC0631



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*1 EC-1094

*2 If time data of "SELF-DIAG RESULTS" is other than "0", perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

*3 If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

*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-1136.

*5 If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

Work Flow (Cont'd)

DESCRIPTION FOR WORK FLOW

NLEC0631S01

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET", EC-1107.
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the DTC, then erase the DTC. Refer to EC-1096. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135. Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. Refer to EC-1116.) 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" is 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-1135. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the DTC by driving in (or performing) the "DTC Confirmation Procedure". Check and read the DTC by using CONSULT-II. During the 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-1135. In case the "DTC Confirmation Procedure" is not available, perform the "Overall Function Check" instead. The 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 DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the Basic Inspection, EC-1111. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-1116.
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-1129 or EC-1126. 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 the malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.
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 P0000 or 0505) 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) DTC in ECM. (Refer to EC-1096.)

Basic Inspection

NLEC0632

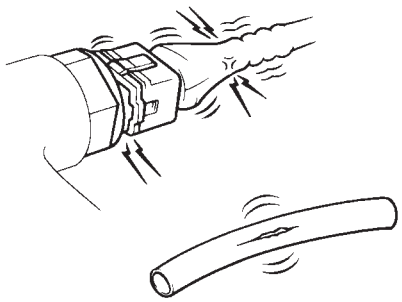
Precaution:
Perform Basic Inspection without electrical or mechanical loads applied;

- **Headlamp switch is OFF,**
- **On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.**
- **Air conditioner switch is OFF,**
- **Rear defogger switch is OFF,**
- **Steering wheel is in the straight-ahead position, etc.**

1	INSPECTION START

1. Check service records for any recent repairs that may indicate a related problem.
2. Check the current need for scheduled maintenance, especially for fuel filter and air cleaner filter. Refer to MA-4 or MA-9, "Periodic Maintenance".
3. Open engine hood and check the following:

- Harness connectors for improper connections
- Vacuum hoses for splits, kinks, or improper connections
- Wiring for improper connections, pinches, or cuts



SEF142I

4. Start engine and warm it up to the normal operating temperature.

▶	GO TO 2.

2	PREPARATION FOR CHECKING IDLE SPEED

With CONSULT-II
Connect CONSULT-II to the data link connector.

Without CONSULT-II
Install diesel tacho tester to the vehicle.

▶	GO TO 3.

3	CHECK IDLE SPEED

With CONSULT-II

1. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
2. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

Without CONSULT-II

Check idle speed.

750±25 rpm

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

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	BLEED AIR FROM FUEL SYSTEM

1. Stop engine.
2. Use priming pump to bleed air from fuel system. Refer to "AIR BLEEDING", EC-1094.

	▶	GO TO 6.

6	CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
3. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

Without CONSULT-II

1. Start engine and let it idle.
2. Check idle speed.
   750±25 rpm

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 7.

7	DRIN WATER FROM FUEL FILTER

Drain water from fuel filter. Refer to "WATER DRAINING", EC-1094.

	▶	GO TO 8.

8	CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
3. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

Without CONSULT-II

1. Start engine and let it idle.
2. Check idle speed.
   750±25 rpm

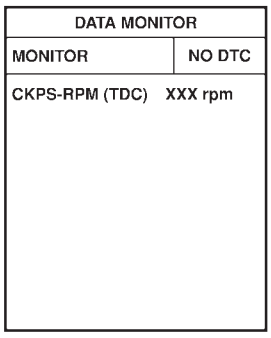
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 9.

9	CHECK AIR CLEANER FILTER	
Check air cleaner filter for clogging or braks.		
OK or NG		
OK	▶	GO TO 10.
NG	▶	Replace air cleaner filter.

10	CHECK FUEL INJECTION NOZZLE	
Check fuel injection nozzle opening pressure. Refer to "Injection Pressure Test", EC-1086.		
OK or NG		
OK	▶	GO TO 11.
NG	▶	Replace fuel injection nozzle assembly.

11	CHECK IDLE SPEED AGAIN	
With CONSULT-II 1. Start engine and let it idle. 2. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II. 3. Read idle speed.		



SEF817Y

Without CONSULT-II
1. Start engine and let it idle.
2. Check idle speed.
   750±25 rpm

OK or NG		
OK	▶	**INSPECTION END**
NG	▶	GO TO 12.

12	CHECK COMPRESSION PRESSURE	
Check compression pressure. Refer to EM-164, "MEASUREMENT OF COMPRESSION PRESSURE".		
OK or NG		
OK	▶	GO TO 13.
NG	▶	Follow the instruction of "MEASUREMENT OF COMPRESSION PRESSURE".

13	CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
3. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

Without CONSULT-II

1. Start engine and let it idle.
2. Check idle speed.
   750±25 rpm

OK or NG

OK	▶	**INSPECTION END**
NG	▶	Replace electronic control fuel injection pump.

Symptom Matrix Chart

NLEC1257

SYSTEM — Basic engine control system	SYMPTOM													Reference page	Feature of symptom, Check point
	HARD/NO START/RESTART (EXCP. HA)				ENGINE STALL			HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE		
	NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING								
Warranty symptom code	AA				AB			AC	AD	AE		AF			
Electronic control fuel injection pump mainframe	4	4	4	4	4	4	4	4	4	5	5	4	4	—	*1
Injection nozzle	3	3	3	3	3	3	3	3	3	4	4	3	3	EC-1083	*2
Glow system	1	1	1	1					1					EC-1267	
Engine body	3	3	3	3	3	3	3		3	4	4		3	EM section	*3
EGR system										3	3			EC-1277	
Swirl control system										3	3			EC-1285	
Air cleaner and ducts										3	3			MA section	*4

1 - 5: The numbers refer to the order of inspection.

(continued on next page)

*1: Fuel injection system malfunction or fuel injection timing control system malfunction may be the cause.

*2: Depends on open-valve pressure and spray pattern.

*3: Caused mainly by insufficient compression pressure.

*4: Symptom varies depending on off-position of air duct, etc.

SYSTEM — Basic engine control system	SYMPTOM											Reference page	Feature of symptom, Check point
	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR		DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.	Can be detected by CONSULT-II?		
							BLACK SMOKE	WHITE SMOKE					
Warranty symptom code	AG	AH	AJ	AK	AL	AM	AP		HA				
Electronic control fuel injection pump mainframe	4	4	3		4		5	4		3	3	—	*1
Injection nozzle	3	3			3		4	3				EC-1083	*2
Glow system								1		1		EC-1267	
Engine body	3	3		3	3	3		3				EM section	*3
EGR system							3					EC-1277	
Swirl control system					3		3	3				EC-1285	
Air cleaner and ducts							3				3	MA section	*4

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*1: Fuel injection system malfunction or fuel injection timing control system malfunction may be the cause.
*2: Depends on open-valve pressure and spray pattern.
*3: Caused mainly by insufficient compression pressure.
*4: Symptom varies depending on off-position of air duct, etc.

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: HARD/NO START/RESTART (EXCP. HA): NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	ENGINE STALL: AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	Reference page	Feature of symptom, Check point
Warranty symptom code			AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	Electronic control fuel injection pump circuit	*a, *b		1		1	1	1	1	1	1	1	1	1	1	—	
		*c, *d															
	Mass air flow sensor circuit	*a, *c								1		1	1			EC-1143	
		*b															
	Engine coolant temperature sensor circuit	*a, *b			1		1		1						1	EC-1150	*1
	Vehicle speed sensor circuit	*a, *b											1			EC-1172	

1 - 5: The numbers refer to the order of inspection.

(continued on next page)

*a: Open

*b: Short

*c: Ground short

*d: Noise

*1: Compensation according to engine coolant temperature does not function.

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM											Reference page	Feature of symptom, Check point
			ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR: BLACK SMOKE	ABNORMAL SMOKE COLOR: WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.	Can be detected by CONSULT-II?		
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA				
ENGINE CONTROL	Electronic control fuel injection pump circuit	*a, *b	1				1			1		1	1	—	
		*c, *d							1						
	Mass air flow sensor circuit	*a, *c											1	EC-1143	
		*b							1						
	Engine coolant temperature sensor circuit	*a, *b	1	1		1						1	1	EC-1150	*1
	Vehicle speed sensor circuit	*a, *b											1	EC-1172	

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*1: Compensation according to engine coolant temperature does not function.

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: HARD/NO START/RESTART (EXCP. HA) — NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	ENGINE STALL — AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	Reference page	Feature of symptom, Check point
Warranty symptom code			AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	Fuel cut system line	*a, *c														EC-1194	
		*b		1			1	1	1								*2
	Accelerator position sensor circuit	*a, *b								1		1	1			EC-1155	
	Crankshaft position sensor (TDC) circuit	*a, *b			1	1	1	1	1	1	1	1	1			EC-1166	
		*d															

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*2: Engine runs on after turning ignition switch OFF.

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM											Reference page	Feature of symptom, Check point
			ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR		DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.	Can be detected by CONSULT-II?		
									BLACK SMOKE	WHITE SMOKE					
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA				
ENGINE CONTROL	Fuel cut system line	*a, *c										1	1	EC-1194	
		*b													*2
	Accelerator position sensor circuit	*a, *b										1	1	EC-1155	
	Crankshaft position sensor (TDC) circuit	*a, *b	1	1								1	1	EC-1166	
		*d													

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*2: Engine runs on after turning ignition switch OFF.

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: HARD/NO START/RESTART (EXCP. HA): NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	SYMPTOM: ENGINE STALL: AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	Reference page	Feature of symptom, Check point
Warranty symptom code			AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	Start signal circuit	*a, *b	1	1	1	1										EC-1293	*3
	Accelerator position switch (Idle) circuit	*a, *c			1	1	1		1						1	EC-1155	
		*b								1		1	1				*4
	Ignition switch circuit	*a		1			1	1	1							EC-1136	
		*b															*5
	Power supply for ECM circuit	*a		1			1	1	1							EC-1136	
		*b															

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*3: Start control does not function.
*4: Accelerator position sensor NG signal is output.
*5: Engine does not stop.

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM											Reference page	Feature of symptom, Check point
			ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR		DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.	Can be detected by CONSULT-II?		
									BLACK SMOKE	WHITE SMOKE					
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA				
ENGINE CONTROL	Start signal circuit	*a, *b												EC-1293	*3
	Accelerator position switch (Idle) circuit	*a, *c												EC-1155	
		*b										1	1		*4
	Ignition switch circuit	*a												EC-1136	
		*b													*5
	Power supply for ECM circuit	*a										1	1	EC-1136	
		*b													

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*3: Start control does not function.
*4: Accelerator position sensor NG signal is output.
*5: Engine does not stop.

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: HARD/NO START/RESTART (EXCP. HA): NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	ENGINE STALL: AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	Reference page	Feature of symptom, Check point
Warranty symptom code			AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	EGR volume control valve circuit	*a, *b														EC-1277	
		*c								1		1	1				*6
	Glow relay circuit	*a	1	1	1	1										EC-1267	*7
		*b															*8
	ECM relay (Self-shutoff) circuit	*a		1			1	1	1							EC-1255	
		*b															*9
	ECM, Connector circuit	*a, *b	2	2	2	2	2	2	2	2	2	2	2	2	2	EC-1253, 1185	
	Air conditioner relay circuit	*a														EC-1301	*10
		*b											1				*11
	Air conditioner switch circuit	*a, *c														EC-1301	*11
		*b															*12
	Swirl control valve control solenoid valve circuit	*a														EC-1285	
		*b										3	3				

1 - 5: The numbers refer to the order of inspection.

(continued on next page)

*a: Open
*b: Short
*c: Ground short
*d: Noise
*6: Does not stop operating.
*7: Glow lamp does not turn on.
*8: Glow lamp does not turn off.
*9: Ground short makes engine unable to stop.
*10: Air conditioner does not operate.
*11: Air conditioner does not stop operating.
*12: Air conditioner does not work.

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR: BLACK SMOKE	ABNORMAL SMOKE COLOR: WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.	Can be detected by CONSULT-II?	Reference page	Feature of symptom, Check point
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA				
ENGINE CONTROL	EGR volume control valve circuit	*a, *b												EC-1277	
		*c							1						*6
	Glow relay circuit	*a								1				EC-1267	*7
		*b													*8
	ECM relay (Self-shutoff) circuit	*a												EC-1255	
		*b													*9
	ECM, Connector circuit	*a, *b	2	2	2	2	2	2	2	2	2	2	2	EC-1253, 1185	
	Air conditioner relay circuit	*a												EC-1301	*10
		*b													*11
	Air conditioner switch circuit	*a, *c												EC-1301	*11
		*b													*12
	Swirl control valve control solenoid valve circuit	*a												EC-1285	
		*b					3		3	3					

1 - 5: The numbers refer to the order of inspection.
*a: Open
*b: Short
*c: Ground short
*d: Noise
*6: Does not stop operating.
*7: Glow lamp does not turn on.
*8: Glow lamp does not turn off.
*9: Ground short makes engine unable to stop.
*10: Air conditioner does not operate.
*11: Air conditioner does not stop operating.
*12: Air conditioner does not work.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0634

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.

MONITOR ITEM	CONDITION		SPECIFICATION
CKPS·RPM (TDC)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
CMPS·RPM-PUMP			
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT-II value		Almost the same speed as the CONSULT-II value
FUEL TEMP SEN	• Engine: After warming up		More than 40°C (104°F)
ACCEL POS SEN	• Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.30 - 0.50V
		Accelerator pedal: fully depressed	3.0 - 4.3V
OFF ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly open	OFF
SPILL/V	• Engine: After warming up, idle the engine.		Approx. 12 - 13°CA
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
P/N POSI SW	• Ignition switch: ON	Shift lever: Neutral position	ON
		Except above	OFF
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
IGN SW	• Ignition switch: ON → OFF		ON → OFF
BRAKE SW	• Ignition switch: ON	Brake pedal: depressed	ON
		Brake pedal: released	OFF
BRAKE SW2	• Ignition switch: ON	Brake pedal: depressed	ON
		Brake pedal: released	OFF
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: Neutral position • No-load	Idle	1.5 - 2.0V
INT/A VOLUME	• Engine: After warming up, idle the engine.		150 - 450 mg/st
F/CUT SIGNAL	• Engine: After warming up	Idle	ON
GLOW RLY	• Refer to EC-1267.		
COOLING FAN	• When cooling fan is stopped.		OFF
	• When cooling fans operate at low speed.		LOW
	• When cooling fans operate at high speed.		HIGH

MONITOR ITEM	CONDITION		SPECIFICATION
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: Neutral position ● No-load	After one minute at idle	More than 10 steps
		Revving engine from idle to 3,200 rpm	0 steps

Major Sensor Reference Graph in Data Monitor Mode

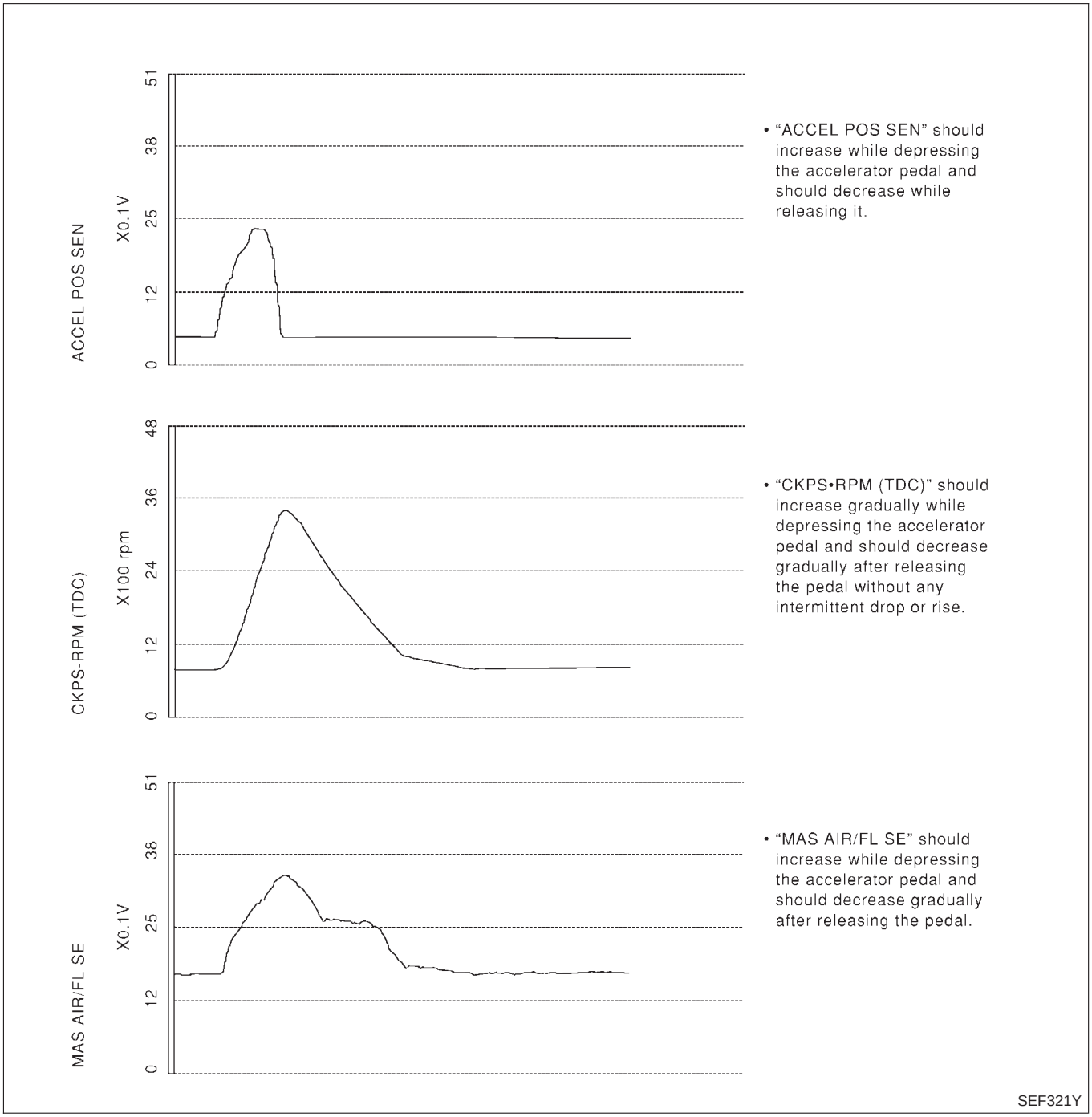
=NLEC0635

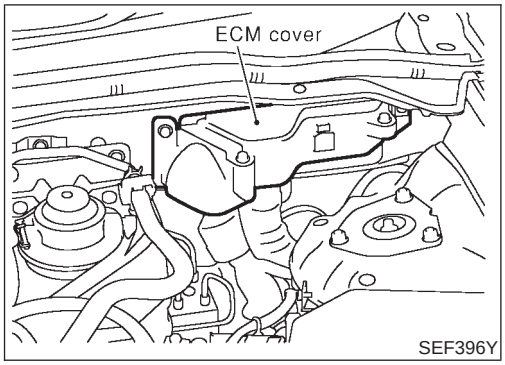
The following are the major sensor reference graphs in “DATA MONITOR” mode.

ACCEL POS SEN, “CKPS·RPM (TDC)”, “MAS AIR/FL SE”

NLEC0635S01

Below is the data for “ACCEL POS SEN”, “CKPS·RPM (TDC)” and “MAS AIR/FL SE” when revving engine quickly up to 3,000 rpm under no load after warming up engine to the normal operating temperature.
Each value is for reference, the exact value may vary.





SEF396Y

ECM Terminals and Reference Value

NLEC0636

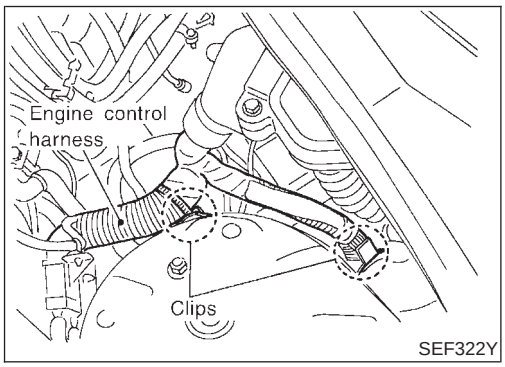
PREPARATION

NLEC0636S01

Models with ECM in engine compartment

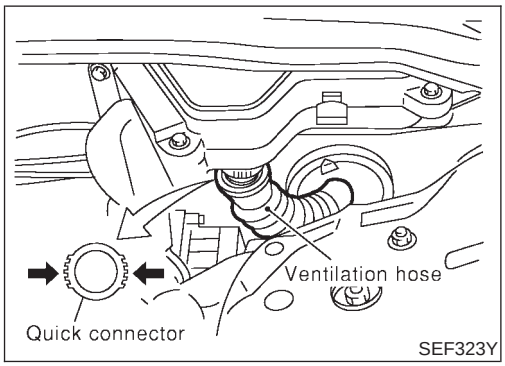
NLEC0636S0101

1. ECM is located under the cowl panel (behind the strut tower). For the inspection, perform the following procedure.



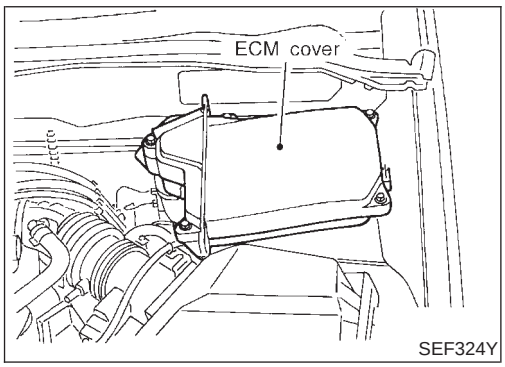
SEF322Y

a. Remove the engine control harness fixing clips.



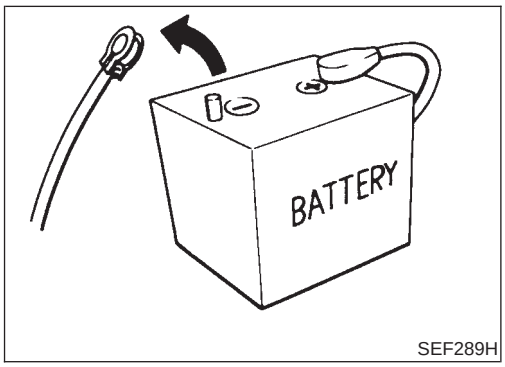
SEF323Y

b. Remove the ventilation hose.
- To release the lock, push the quick connector.



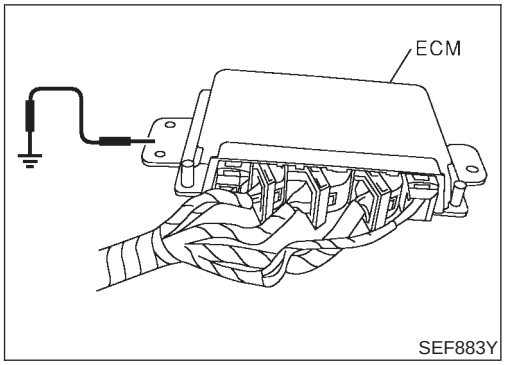
SEF324Y

c. Remove the ECM cover mounting bolts, then remove the ECM cover from the vehicle.
   : 4.0 - 7.8 N·m (0.4 - 0.8 kg-m, 35 - 69 in-lb)
d. Remove the ECM cover bolts, then open the ECM cover.
   : 4.0 - 6.8 N·m (0.4 - 0.7 kg-m, 35 - 60 in-lb)
e. Remove the ECM bolts.
   : 4.2 - 6.7 N·m (0.42 - 0.69 kg-m, 37 - 59 in-lb)
f. Install in the reverse order of removal.



SEF289H

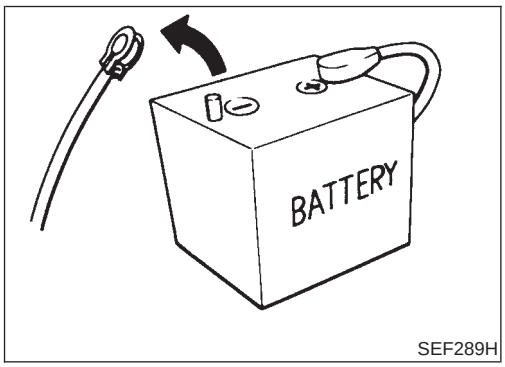
2. Disconnect negative battery terminal.



SEF883Y

3. Connect a break out box (SST) between the ECM and ECM harness connectors.

- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.
- Be sure ECM unit is properly grounded before checking.



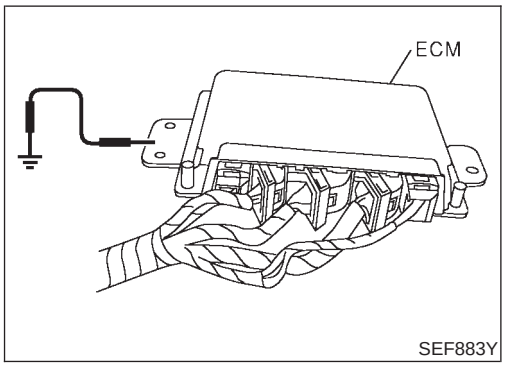
SEF289H

Models with ECM in cabin

NLEC0636S0102

ECM is locating beside of blower unit.

1. Remove the ECM bracket fixing.
2. Remove ECM harness protector.
3. Disconnect negative battery terminal.



SEF883Y

4. Connect a break out box (SST) between the ECM and ECM harness connectors.

- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.
- Be sure ECM unit is properly grounded before checking.

ECM INSPECTION TABLE

NLEC0636S03

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

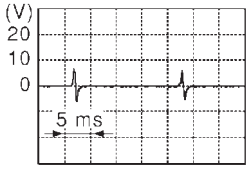
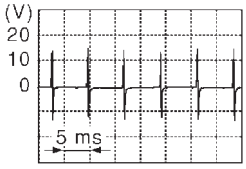
CAUTION:

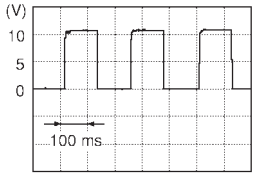
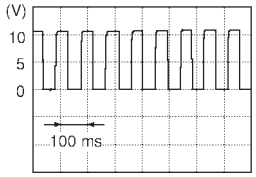
Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
104 105 106	B B B	ECM ground	**[Engine is running]** ● Idle speed	Approximately 0V
107 108 109	R R R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

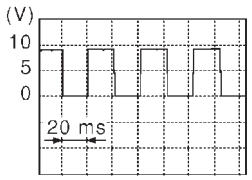
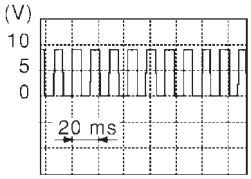
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
204	L	Air conditioner relay	**[Engine is running]** ● Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Both air conditioner switch and blower fan switch are "ON" (Compressor is operating)	Approximately 0.1V
209	G/W	Swirl control valve control solenoid valve	**[Engine is running.]** ● **Warm-up condition** ● Engine speed: 1,500 rpm ● No load	Approximately 0.1V
			[Engine is running.] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
214	W/B	Glow relay	Refer to "Glow Control System", EC-1267.	
218	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
219	LG/R	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	Approximately 0.1V
221	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating ● Cooling fan is operating at low speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating at high speed	Approximately 0.1V
223	W	Mass air flow sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
224	R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.5 - 2.0V
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
325	G	ECM relay (Self-shutoff)	**[Ignition switch "ON"]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	Approximately 0.25V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
331	OR	Crankshaft position sensor (TDC) ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
334	B/R	Engine coolant temperature sensor ground	**[Ignition switch "ON"]**	Approximately 0V
337 338 350 351	W/L PU/W GY OR/B	EGR volume control valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V (Voltage signals of each ECM terminals differ according to the control position of EGR volume control valve.)
344	W	Crankshaft position sensor (TDC)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V  SEF333Y
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 0V  SEF334Y
347	L/B	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
403	R/L	Air conditioner switch	**[Engine is running]** ● Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Both air conditioner switch and blower fan switch are "ON" (Compressor is operating)	Approximately 0.1V
405	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
416	Y/B	Brake pedal position switch	**[Ignition switch "ON"]** ● Brake pedal fully released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Brake pedal depressed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
417	PU/R	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● In 1st gear position ● Vehicle speed is 10 km/h (6 MPH)	0 - Approximately 8V  SEF891Y
			[Engine is running] ● Lift up the vehicle ● In 2nd gear position ● Vehicle speed is 30 km/h (19 MPH)	Approximately 6V  SEF892Y
418	G/OR	Park/Neutral position switch (where fitted)	**[Ignition switch "ON"]** ● Gear position is "Neutral"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)
422	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	BATTERY VOLTAGE (11 - 14V)
425	P/B	Accelerator position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
426	BR/R	Accelerator position switch (Idle) ground	**[Ignition switch "ON"]**	Approximately 0V
433	G/Y	Accelerator position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
434	W	Accelerator position sensor	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.30 - 0.50V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.0 - 4.3V
435	W/G	Accelerator position switch (Idle)	**[Ignition switch "ON"]** ● Accelerator pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Accelerator pedal depressed	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
439	L/OR	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 4.8V  SEF325Y
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 4.6V  SEF326Y
505	OR/L	Malfunction indicator	**[Ignition switch "ON"]**	Approximately 1V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
507	W/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
508	OR	Glow lamp	**[Ignition switch "ON"]** ● Glow lamp is "ON"	Approximately 1V
			[Ignition switch "ON"] ● Glow lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)

Description

NLEC0637

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 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

NLEC0637S01

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than "0".
III	The symptom described by the customer does not recur.
IV	DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for XXXX does not indicate the problem area.

Diagnostic Procedure

NLEC0638

1	INSPECTION START
Erase DTCs. Refer to "HOW TO ERASE DTC", EC-1096.	
▶	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

ECM TERMINALS AND REFERENCE VALUE

NLEC0639

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

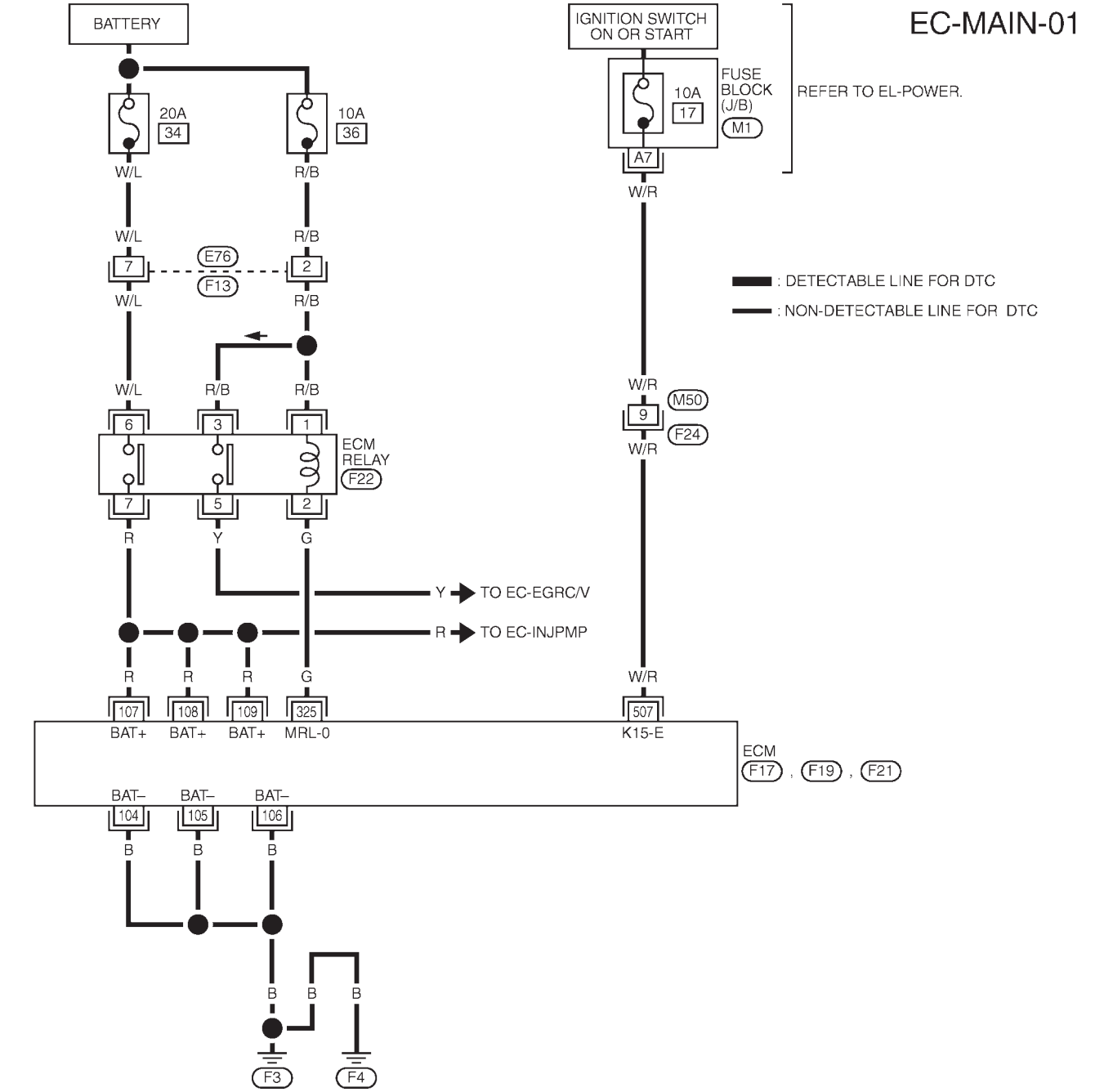
CAUTION:

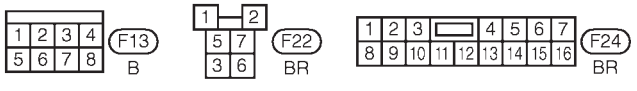
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
104 105 106	B B B	ECM ground	**[Engine is running]** ● Idle speed	Approximately 0V
107 108 109	R R R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
325	G	ECM relay (Self-shutoff)	**[Ignition switch "ON"]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	Approximatley 0.25V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
507	W/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

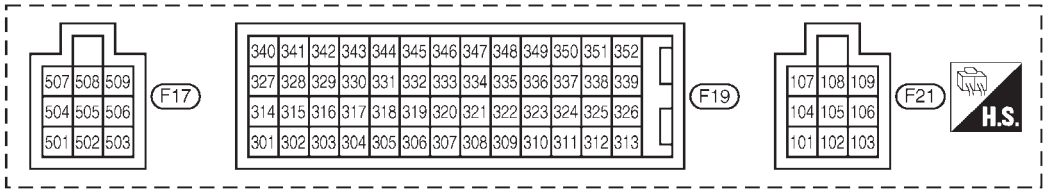
WIRING DIAGRAM (MODELS WITH ECM IN ENGINE COMPARTMENT)

NLEC0640





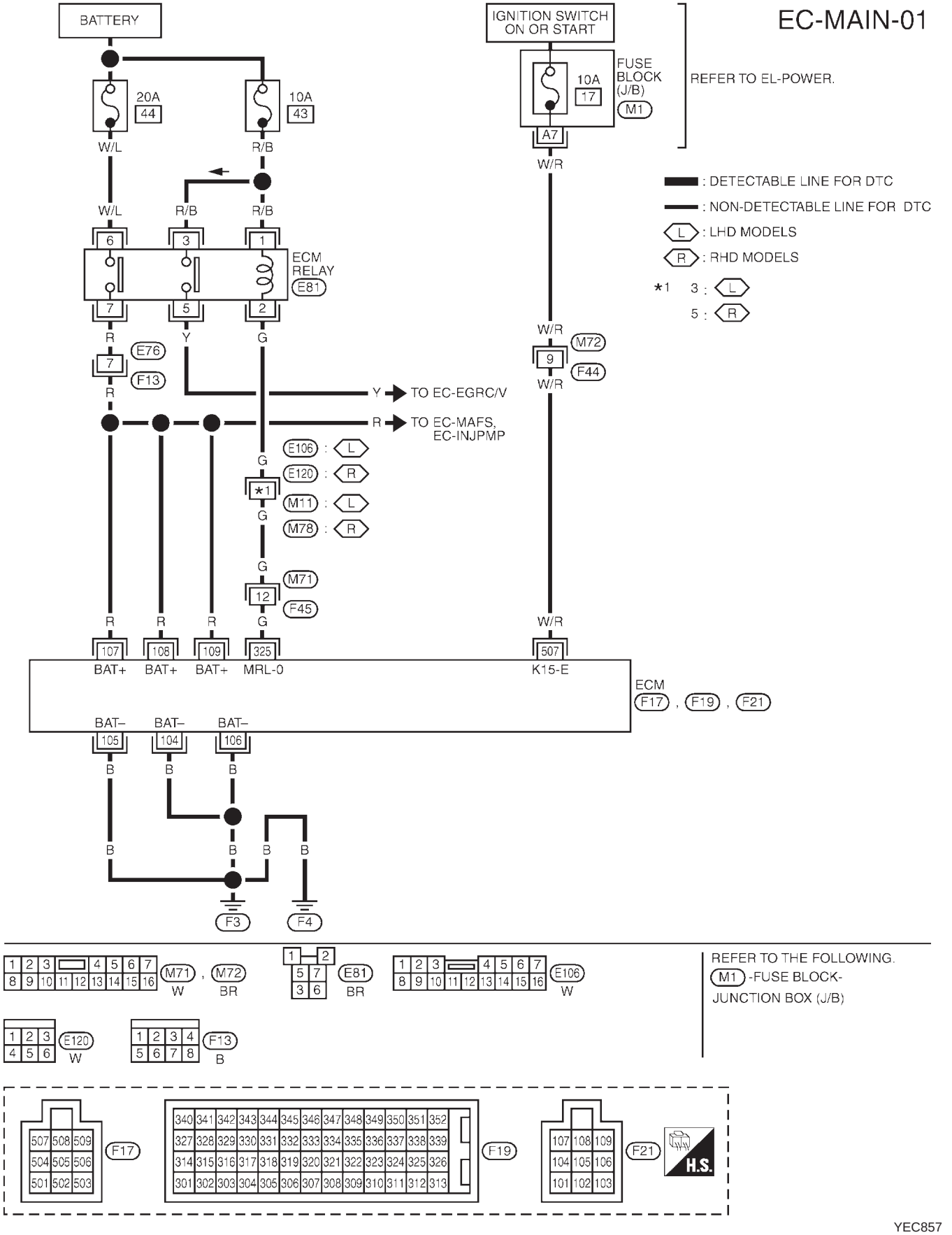
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)



YEC721

WIRING DIAGRAM (MODELS WITH ECM IN CABIN)

NLEC1932



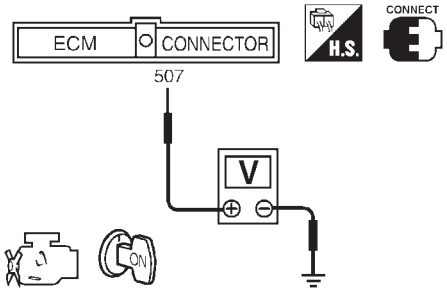
YEC857

DIAGNOSTIC PROCEDURE

NLEC0641

1	INSPECTION START
Start engine. Is engine running? **Yes or No**	
Yes ▶	GO TO 11.
No ▶	GO TO 2.

2	CHECK ECM POWER SUPPLY CIRCUIT-I
1. Turn ignition switch "ON". 2. Check voltage between ECM terminal 507 and ground with CONSULT-II or tester.	



Voltage: Battery voltage

SEF895Y

OK or NG

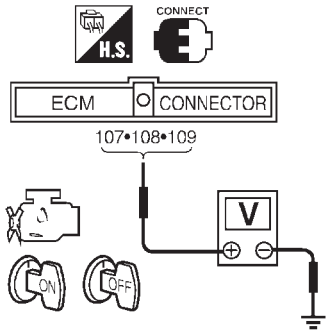
OK ▶	GO TO 4.
NG ▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M50, F24 (where fitted) ● Harness connectors M72, F44 (where fitted) ● Fuse block (J/B) connector M1 ● 10A fuse ● Harness for open or short between ECM and fuse	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminals 104, 105, 106 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 4. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 5.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK ECM POWER SUPPLY CIRCUIT-II

1. Reconnect ECM harness connector.
2. Turn ignition switch "ON" and then "OFF".
3. Check voltage between ECM terminals 107, 108, 109 and ground with CONSULT-II or tester.



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

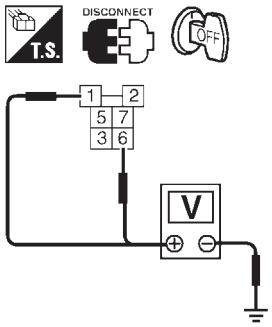
SEF896Y

OK or NG

OK	▶	Check electronic control fuel injection pump power supply circuit. Refer to "Diagnostic Procedure", EC-1251.
NG (Battery voltage does not exist.)	▶	GO TO 6.
NG (Battery voltage exists for more than a few seconds.)	▶	GO TO 10.

6	CHECK ECM POWER SUPPLY CIRCUIT-III

1. Disconnect ECM relay. (For ECM relay location, refer to "Engine control component parts location", EC-1071.)
2. Check voltage between relay terminals 1, 6 and ground with CONSULT-II or tester.



Voltage: Battery Voltage

SEF399Y

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- 10A fuse
- 20A fuse
- Harness for open or short between ECM relay and battery

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

8	CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 325 and ECM 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 9.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

9	CHECK ECM POWER SUPPLY CIRCUIT-IV

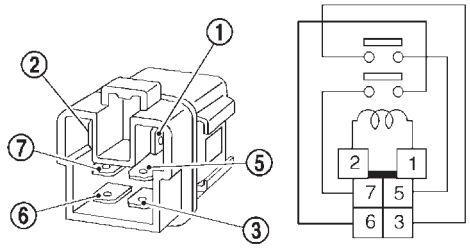
1. Check harness continuity between ECM terminals 107, 108, 109 and ECM relay terminal 7. Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to ground or short to power in 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, 7 and 6.



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

SEF296X

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace ECM relay.

11	CHECK ECM POWER SUPPLY CIRCUIT-V

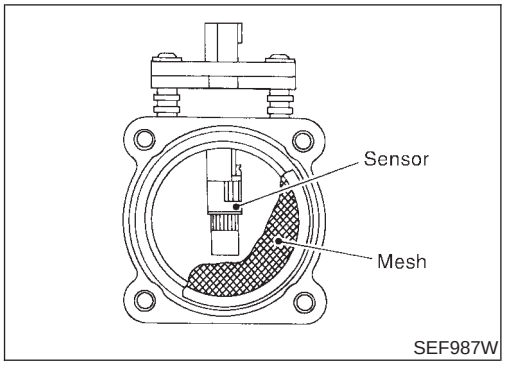
1. Turn ignition switch "OFF".
2. Disconnect ECM relay. (For ECM relay location, refer to "Engine control component parts location", EC-1071.)
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminals 107, 108, 109 and ECM relay terminal 7. Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

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

12	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT
1. Check harness continuity between ECM terminals 104, 105, 106 and engine ground. 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 13.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

13	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**



Component Description

NLEC0642

The mass air flow sensor (MAFS) is placed in the stream of intake air. It measures the intake air flow rate by measuring a part of the entire intake air flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0643

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: Neutral position ● No-load	Idle	1.5 - 2.0V

ECM Terminals and Reference Value

NLEC0644

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)
218	B	Sensor’s ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
223	W	Mass air flow sensor power supply	**[Ignition switch “ON”]**	Approximately 5V
224	R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.5 - 2.0V

On Board Diagnosis Logic

NLEC0645

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0100 0102	● An excessively high or low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

2

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

DTC Confirmation Procedure

NLEC0646

WITH CONSULT-II

NLEC0646S01

1) Turn ignition switch “ON”, and wait at least 6 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 3 seconds.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-1147.

WITHOUT CONSULT-II

NLEC0646S02

1) Turn ignition switch “ON”, and wait at least 6 seconds.
2) Start engine and wait at least 3 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-1147.

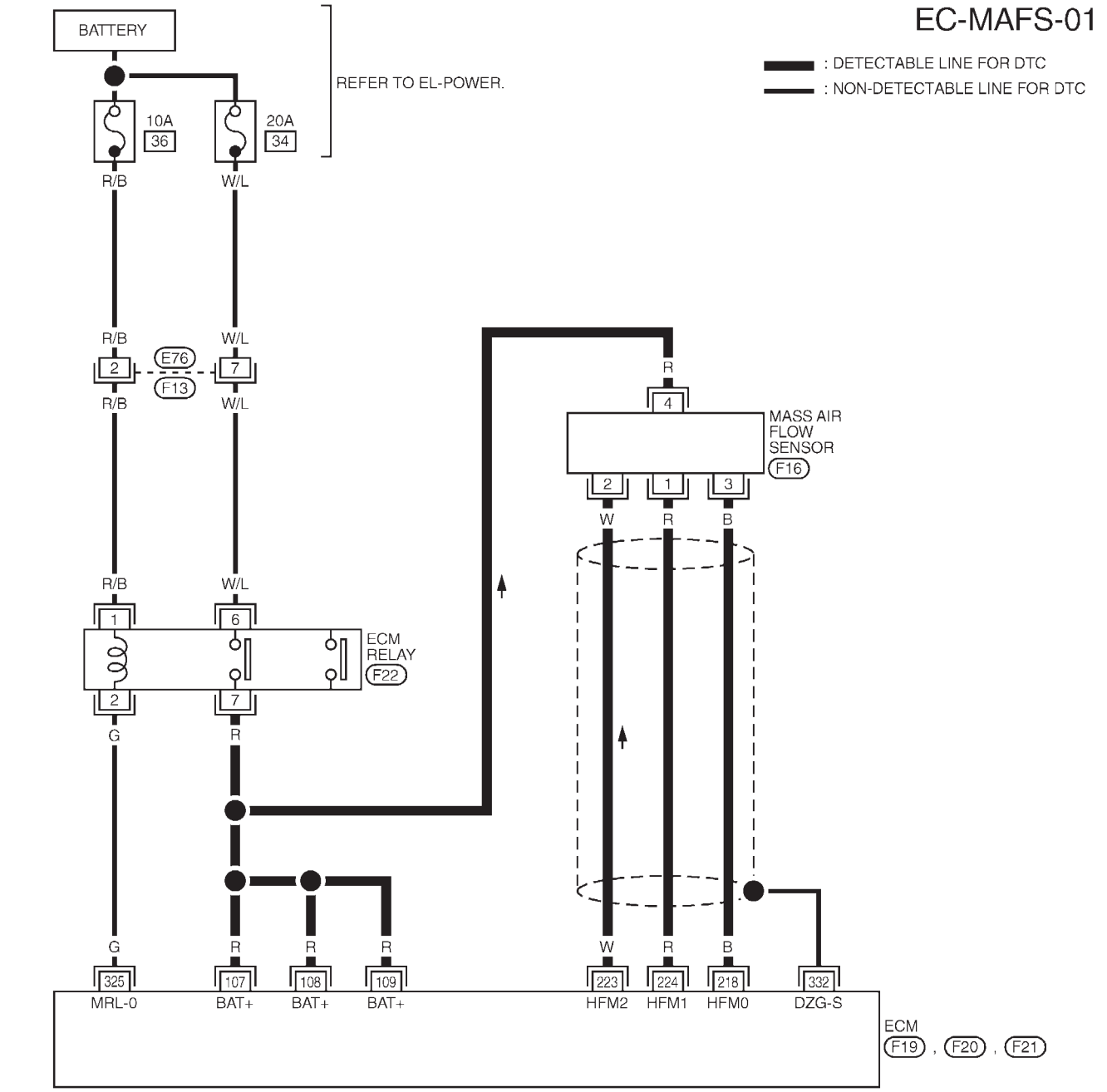
Wiring Diagram

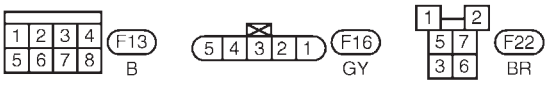
NLEC0647

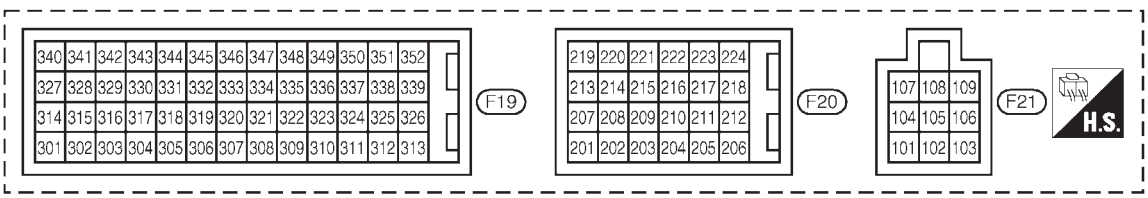
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0647S01

EC-MAFS-01



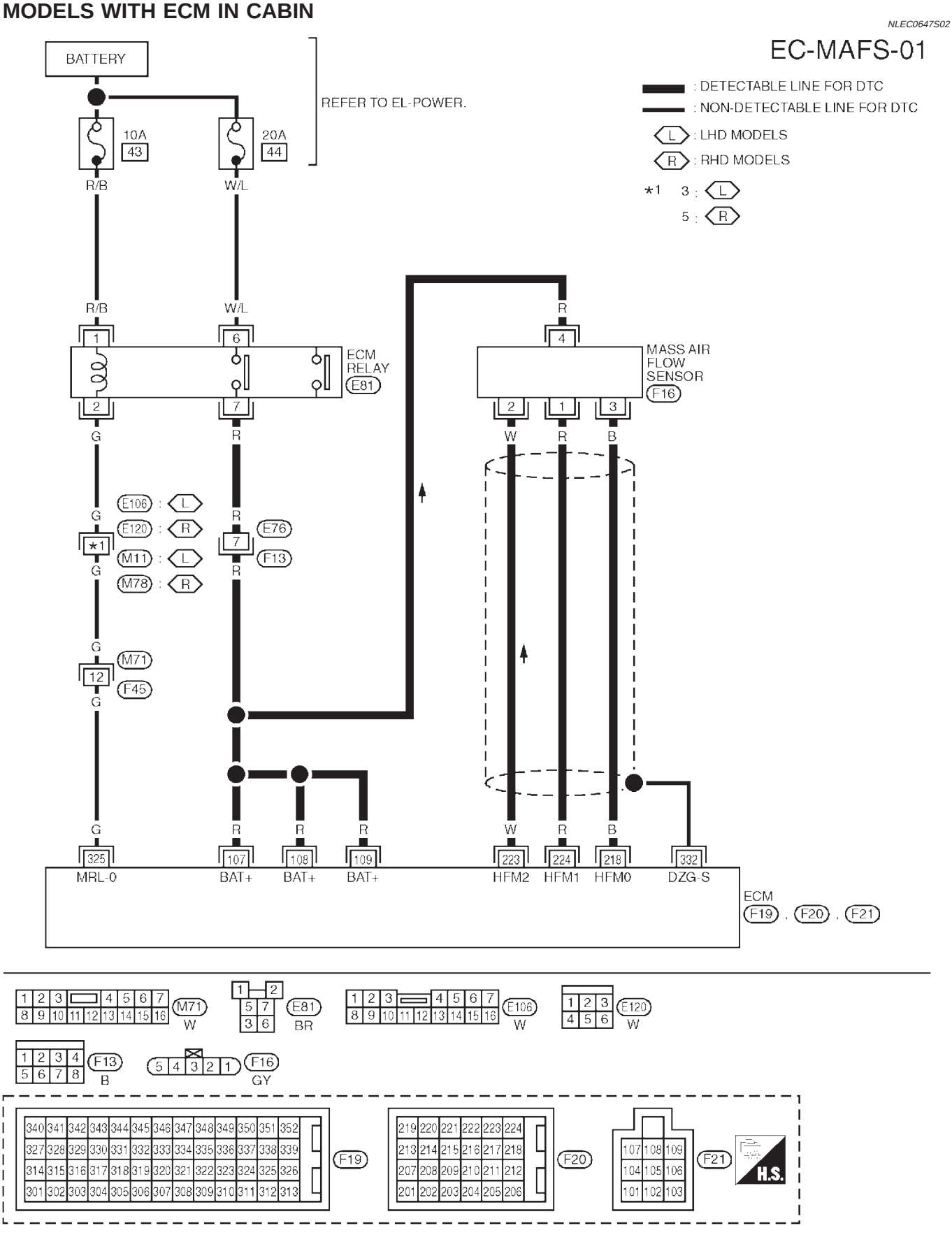




YEC722

MODELS WITH ECM IN CABIN

NLEC0647S02



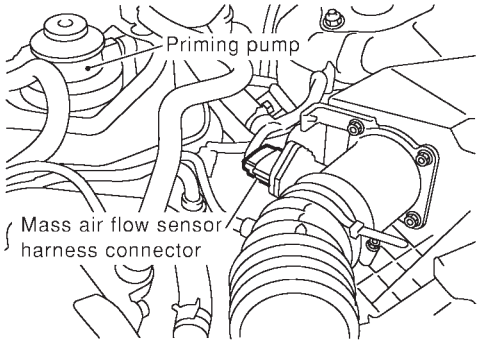
YEC858

Diagnostic Procedure

NLEC0648

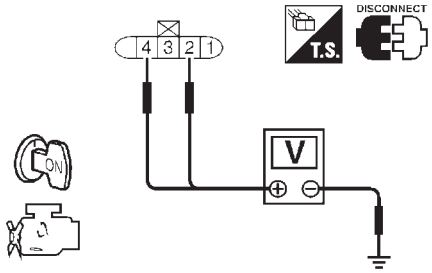
1	CHECK MAFS POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor harness connector.



SEF884Y

3. Turn ignition switch “ON”.
4. Check voltage between mass air flow sensor 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 3.
NG	▶	GO TO 2.

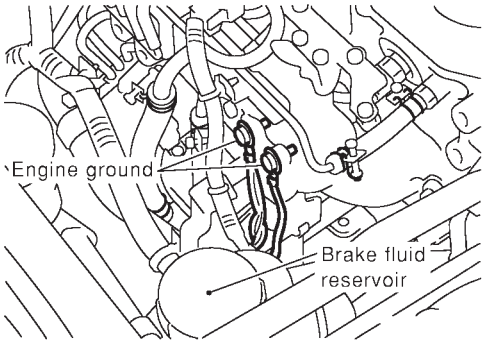
2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

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

3	CHECK MAFS GROUND CIRCUIT FOR OPEN AND SHORT

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



SEF380Y

3. Check harness continuity between mass air flow sensor terminal 3 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check harness for open or short between mass air flow sensor and ECM.

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

5	CHECK MAFS INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

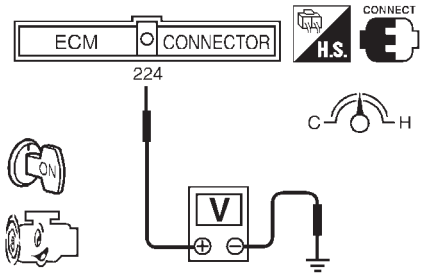
1. Disconnect ECM harness connector.
2. Check harness continuity between mass air flow sensor terminal 1 and ECM terminal 224. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

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 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 224 (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.)	1.5 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

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

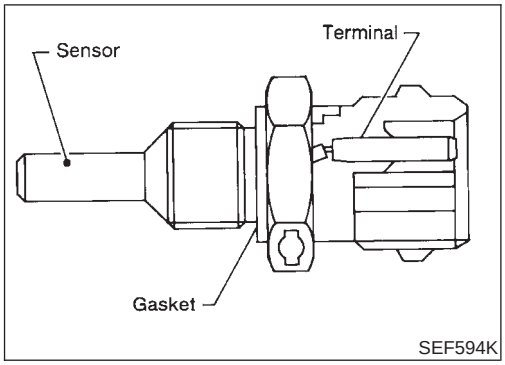
SEF441Z

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

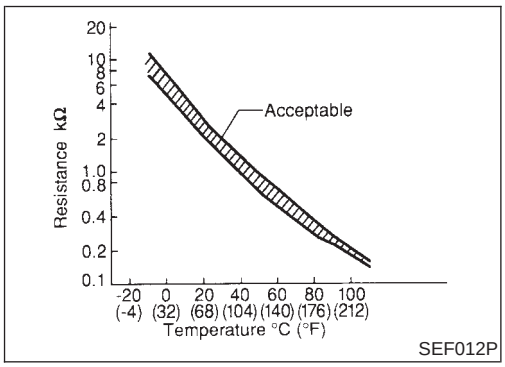
OK or NG

OK	▶	GO TO 7.
NG	▶	Replace mass air flow sensor.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**



SEF594K



SEF012P

Description

NLEC0649

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)	2.3	0.68 - 1.00
90 (194)	1.0	0.236 - 0.260

*: These data are reference values and measured between ECM terminal 347 (Engine coolant temperature sensor) and ground.

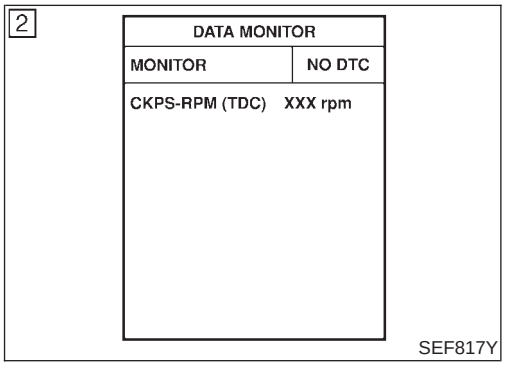
CAUTION:

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

On Board Diagnosis Logic

NLEC0650

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0115 0103	• An excessively high or low voltage from the sensor is entered to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor



SEF817Y

DTC Confirmation Procedure

NLEC0651

WITH CONSULT-II

NLEC0651S01

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If DTC is detected, go to "Diagnostic Procedure", EC-1153.

WITHOUT CONSULT-II

NLEC0651S02

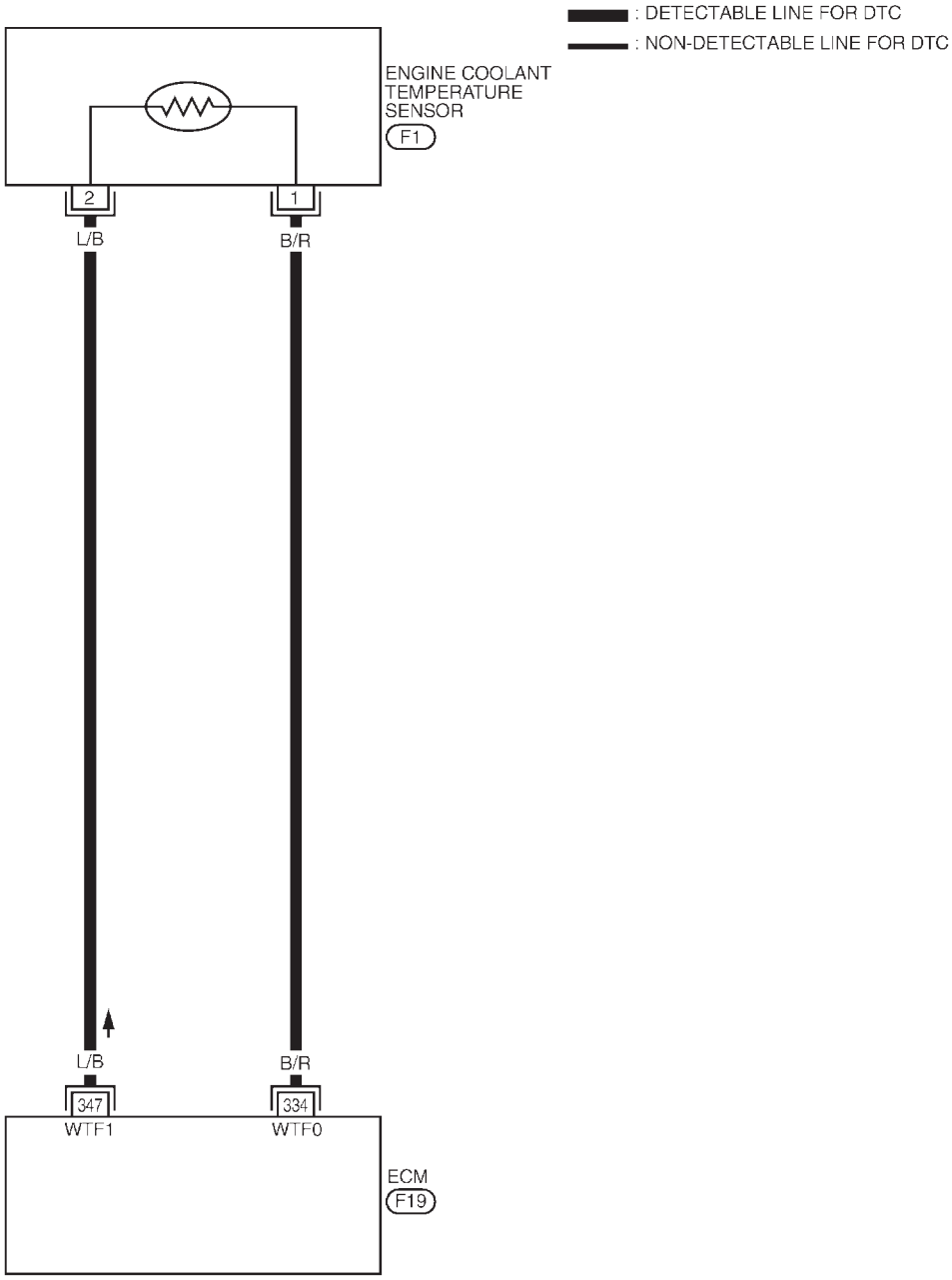
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

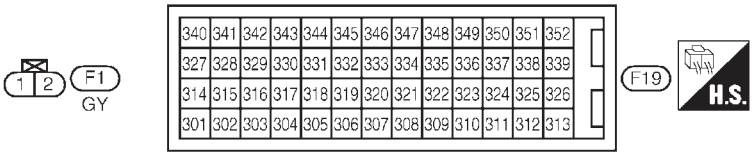
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-1153.

Wiring Diagram

NLEC0652

EC-ECTS-01





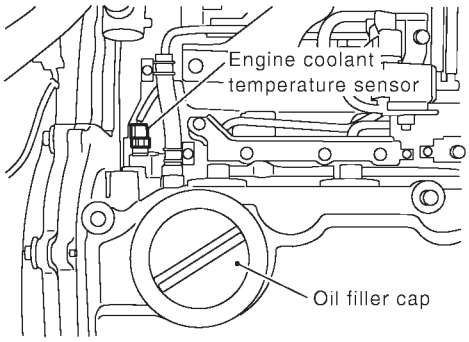
YEC723

Diagnostic Procedure

NLEC0653

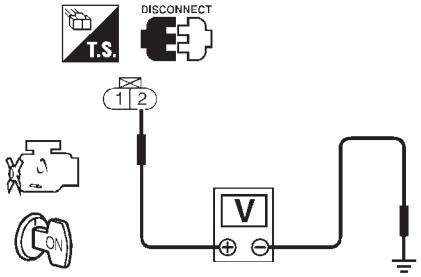
1	CHECK ECTS POWER SUPPLY CIRCUIT

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



SEF750Z

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



Voltage: Approximately 5V

SEF401Y

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 SHORT

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

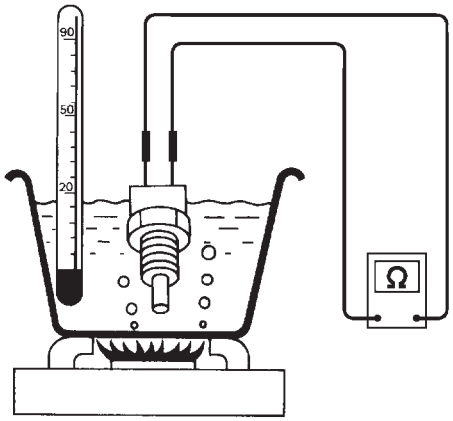
OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following harness for open or short between ECM and engine coolant temperature sensor.	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

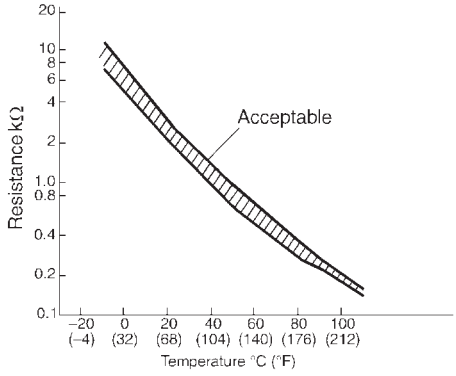
4	CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Remove engine coolant temperature sensor from the engine.
2. Check resistance between ECTS 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.

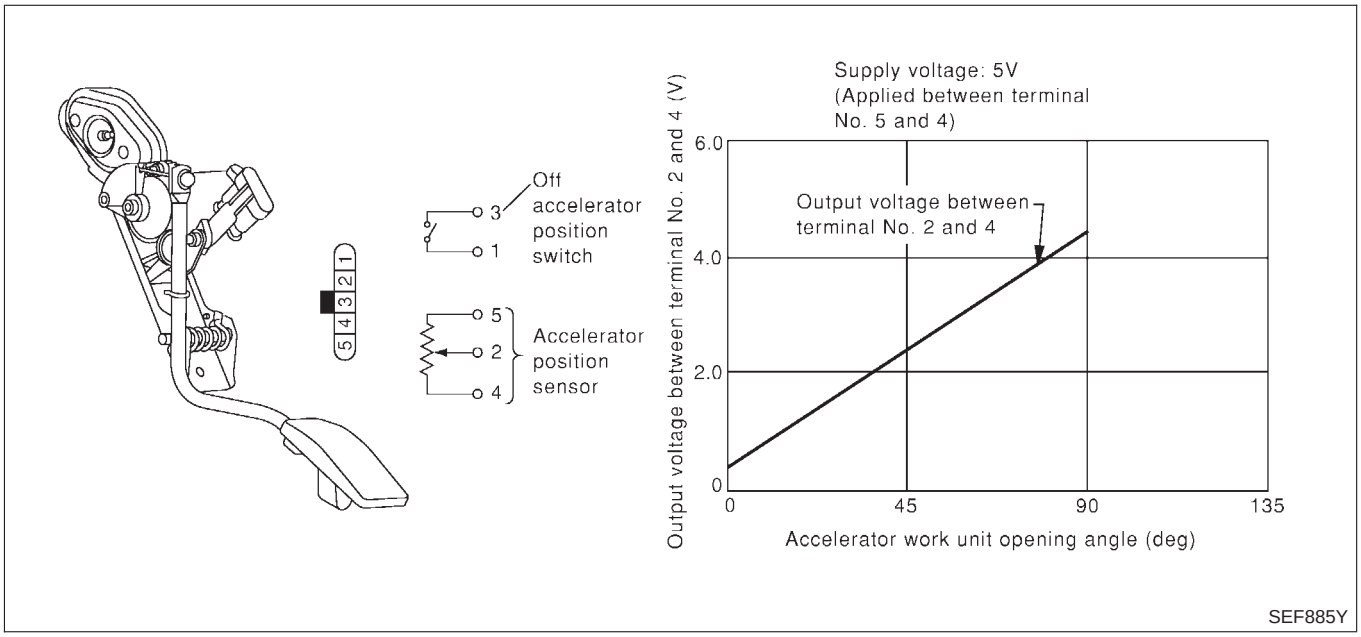
5	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**

Description

NLEC0679

The accelerator work unit is installed on the upper end of the accelerator pedal assembly. The accelerator position sensor and accelerator position switch are built into the accelerator work unit. The sensor detects the accelerator position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.

The accelerator position switch detects Off-accelerator switch signal and send these signals to the ECM. The ECM will then determine engine idle conditions. These signals are also used for diagnosing the accelerator position sensor.



CONSULT-II Reference Value in Data Monitor Mode

NLEC0680

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL POS SEN	● Ignition switch: ON (Engine stopped)	Accelerator pedal: released	0.30 - 0.50V
		Accelerator pedal: depressed	3.0 - 4.3V
OFF ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly open	OFF

ECM Terminals and Reference Value

NLEC0681

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)
425	P/B	Accelerator position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
426	BR/R	Accelerator position switch (Idle) ground	**[Ignition switch "ON"]**	Approximately 0V
433	G/Y	Accelerator position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V

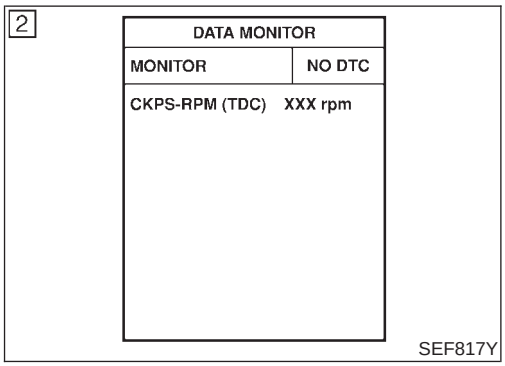
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
434	W	Accelerator position sensor	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.30 - 0.50V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.0 - 4.3V
435	W/G	Accelerator position switch (Idle)	**[Ignition switch "ON"]** ● Accelerator pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Accelerator pedal depressed	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NLEC0682

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	● The relation between sensor and switch signals is not in the nomal range during the specified accelerator positions.	● Harness or connectors (The sensor circuit is open or shorted.) ● Accelerator position sensor ● Accelerator position switch



DTC Confirmation Procedure

NLEC0683

WITH CONSULT-II

NLEC0683S01

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Depress and release fully accelerator pedal slowly.
4) If DTC is detected, go to "Diagnostic Procedure", EC-1159.

WITHOUT CONSULT-II

NLEC0683S02

1) Turn ignition switch "ON".
2) Depress and release fully accelerator pedal slowly.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1159.

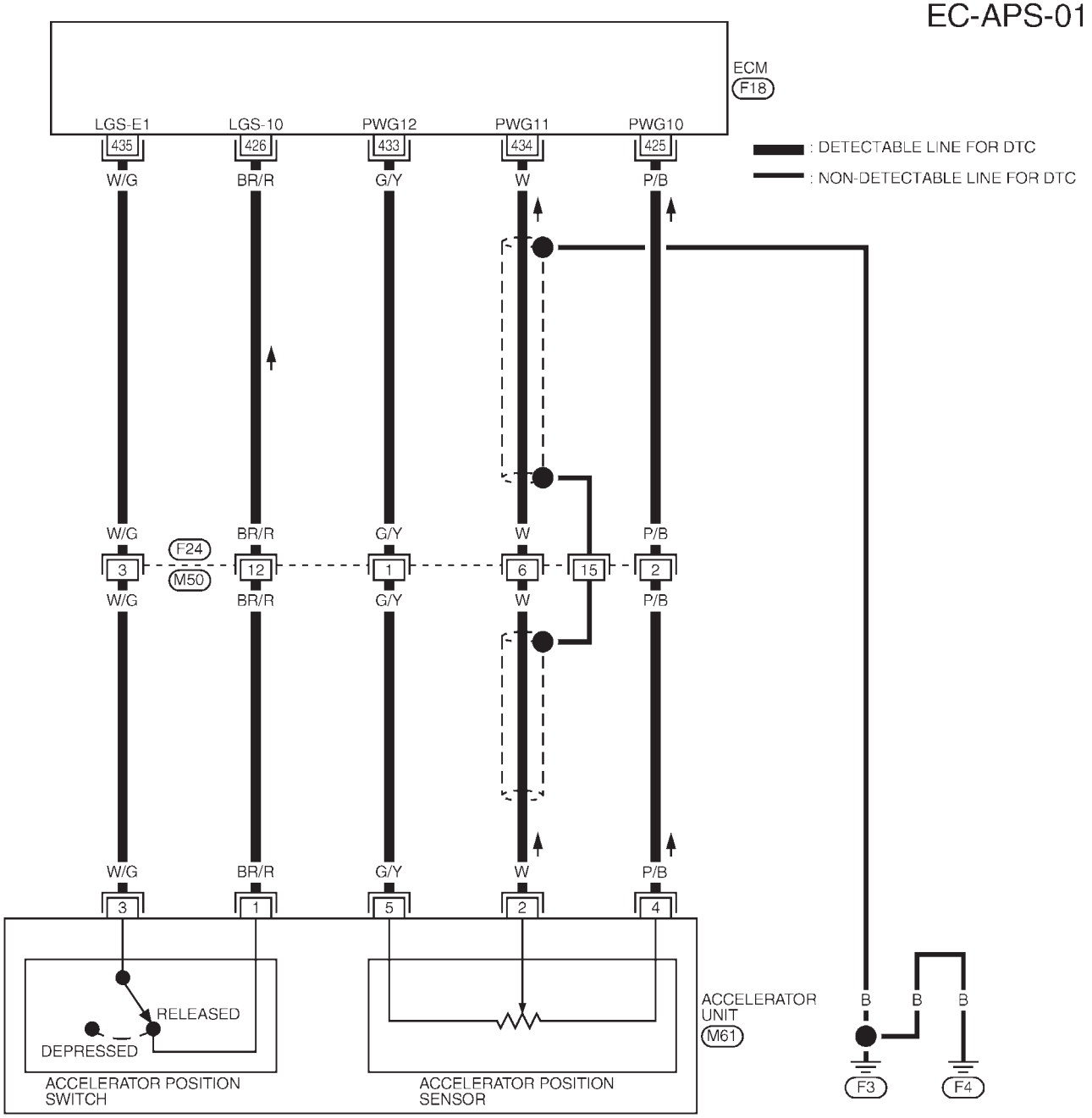
Wiring Diagram

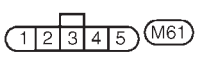
MODELS WITH ECM IN ENGINE COMPARTMENT

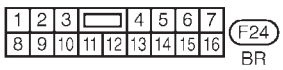
NLEC0684

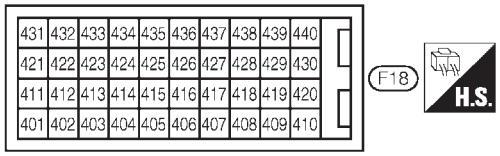
NLEC0684S01

EC-APS-01







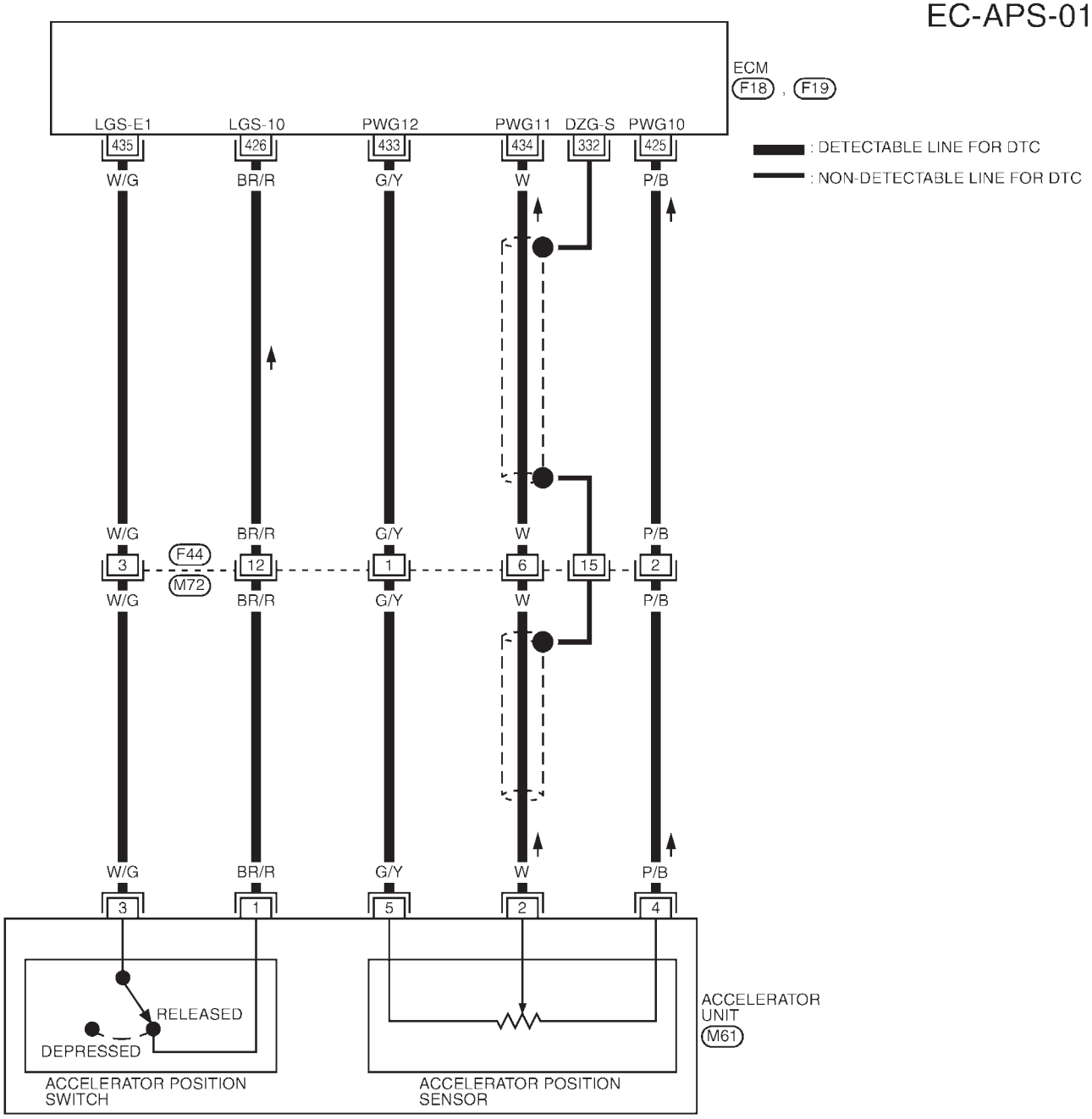


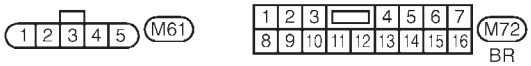
YEC727

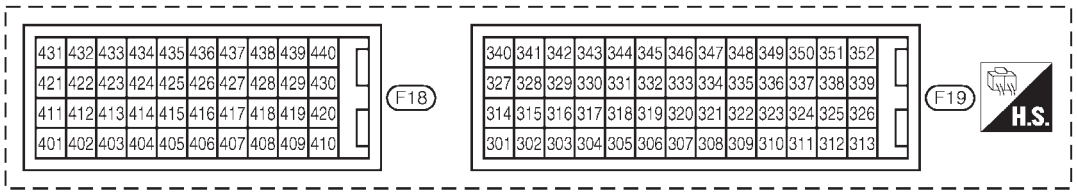
MODELS WITH ECM IN CABIN

NLEC0684S02

EC-APS-01







YEC859

Diagnostic Procedure

NLEC0685

1	CHECK ACCELERATOR POSITION SENSOR FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “ACCEL POS SEN” in “DATA MONITOR” mode with CONSULT-II.
3. Check “ACCEL POS SEN” signal under the following conditions.

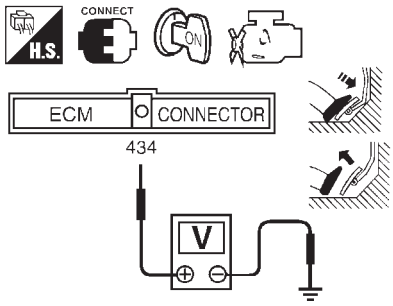
DATA MONITOR	
MONITOR	NO DTC
ACCEL POS SEN	XXX V

Conditions	ACCEL POS SEN
Accelerator pedal fully released	0.30 - 0.50V
Accelerator pedal fully depressed	3.0 - 4.3V

SEF436Z

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 434 and ground under the following conditions.



Conditions	Voltage
Accelerator pedal fully released	0.30 - 0.50V
Accelerator pedal fully depressed	3.0 - 4.3V

SEF437Z

OK or NG

OK	▶	GO TO 2.
NG	▶	GO TO 3.

2	CHECK ACCELERATOR POSITION SWITCH FUNCTION

With CONSULT-II

1. Select "OFF ACCEL SW" in "DATA MONITOR" mode with CONSULT-II.
2. Check "OFF ACCEL SW" signal under the following conditions.

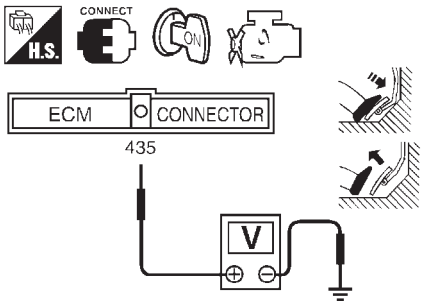
DATA MONITOR	
MONITOR	NO DTC
OFF ACCEL SW	ON

Conditions	OFF ACCEL SW
Accelerator pedal fully released	ON
Accelerator pedal depressed	OFF

SEF910Y

Without CONSULT-II

Check voltage between ECM terminal 435 and ground under the following conditions.



Conditions	Voltage (ECM terminal 435)
Accelerator pedal fully released	Approx. 0V
Accelerator pedal depressed	Battery voltage

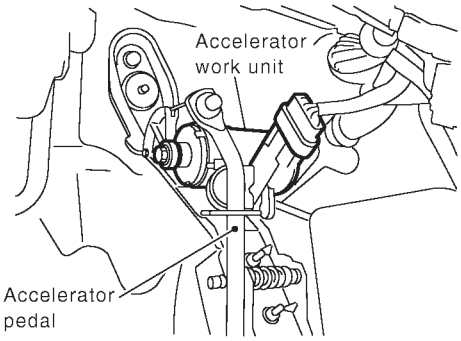
SEF911Y

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 11.

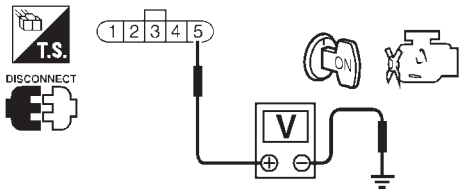
3	CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect accelerator work unit harness connector.



SEF749Z

3. Turn ignition switch "ON".
4. Check voltage between accelerator work unit terminal 5 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF897Y

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

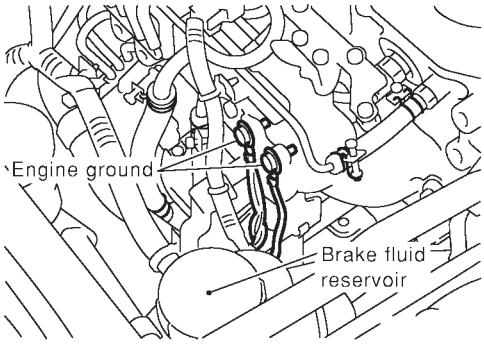
4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F24, M50 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness for open or short between ECM and accelerator work unit

	▶	Repair harness or connectors.

5	CHECK ACCELERATOR POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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



SEF380Y

3. Check harness continuity between accelerator work unit terminal 4 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F24, M50 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness for open or short between ECM and accelerator work unit

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

7	CHECK ACCELERATOR POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 434 and accelerator work unit 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 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F24, M50 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness for open or short between ECM and accelerator work unit

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

9	CHECK ACCELERATOR POSITION SENSOR

With CONSULT-II

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Select "DATA MONITOR" mode with CONSULT-II.
4. Check the indication of "ACCEL POS SEN" under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
ACCEL POS SEN	XXX V

Conditions	ACCEL POS SEN
Accelerator pedal fully released	0.30 - 0.50V
Accelerator pedal fully depressed	3.0 - 4.3V

SEF436Z

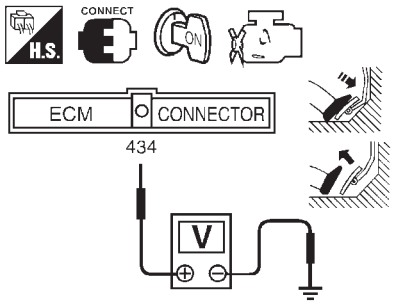
OK or NG

OK	▶	GO TO 16.
NG	▶	Replace accelerator pedal assembly.

10	CHECK ACCELERATOR POSITION SENSOR

Without CONSULT-II

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal 434 and ground under the following conditions.



Conditions	Voltage
Accelerator pedal fully released	0.30 - 0.50V
Accelerator pedal fully depressed	3.0 - 4.3V

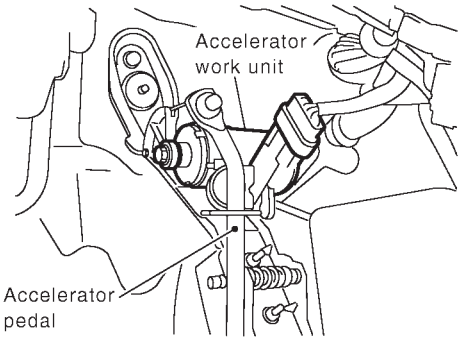
SEF437Z

OK or NG

OK	▶	GO TO 16.
NG	▶	Replace accelerator pedal assembly.

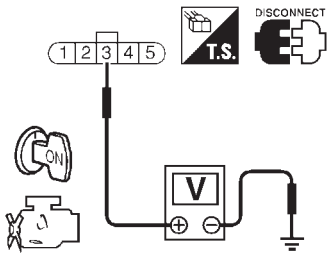
11	CHECK ACCELERATOR POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect accelerator work unit harness connector.



SEF749Z

3. Turn ignition switch "ON".
4. Check voltage between accelerator work unit terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF912Y

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F24, M50 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness for open or short between accelerator work unit and ECM

	▶	Repair harness or connectors.

13	CHECK ACCELERATOR POSITION SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

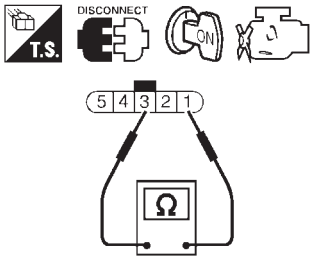
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between accelerator work unit terminal 1 and ECM terminal 426. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 15.
NG	▶	GO TO 14.

14	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F24, M50 (where fitted) ● Harness connectors M72, F44 (where fitted) ● Harness for open or short between ECM and accelerator work unit	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

15	CHECK ACCELERATOR POSITION SWITCH
Check continuity between accelerator position switch terminals 1 and 3 under the following conditions.	



Between terminals 1 and 3

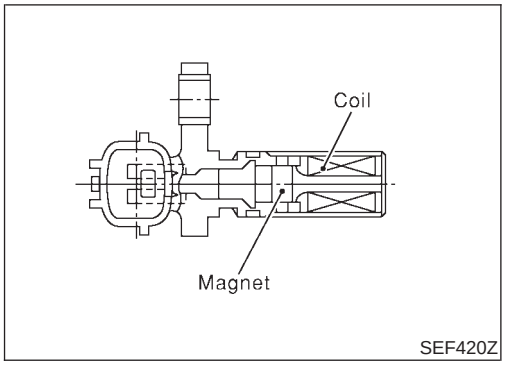
Conditions	Continuity
Accelerator pedal fully released	Should exist.
Accelerator pedal depressed	Should not exist.

SEF913Y

OK or NG

OK	▶	GO TO 16.
NG	▶	Replace accelerator pedal assembly.

16	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**



Description

NLEC0686

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with three protrusions) installed to the crankshaft pulley. The datum signal output is detected at ATDC 10° and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0687

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (TDC)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

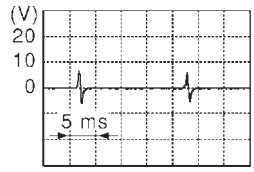
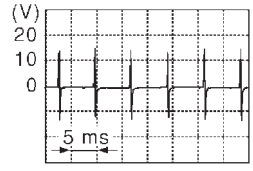
ECM Terminals and Reference Value

NLEC0688

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 and Pulse Signal)
331	OR	Crankshaft position sensor (TDC) ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
344	W	Crankshaft position sensor (TDC)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V  SEF333Y
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 0V  SEF334Y

On Board Diagnosis Logic

NLEC0689

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0335 0407	● An improper signal from the sensor is sent to ECM during engine running and cranking.	● Harness or connectors (The sensor circuit is open.) ● Crankshaft position sensor (TDC)

1

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

DTC Confirmation Procedure

NLEC0690

Before performing the following procedure, confirm that battery voltage is more than 10V.

WITH CONSULT-II

NLEC0690S01

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Crank engine for at least 1 second.
3) Start engine and run it for at least 2 seconds at idle speed.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-1169.

WITHOUT CONSULT-II

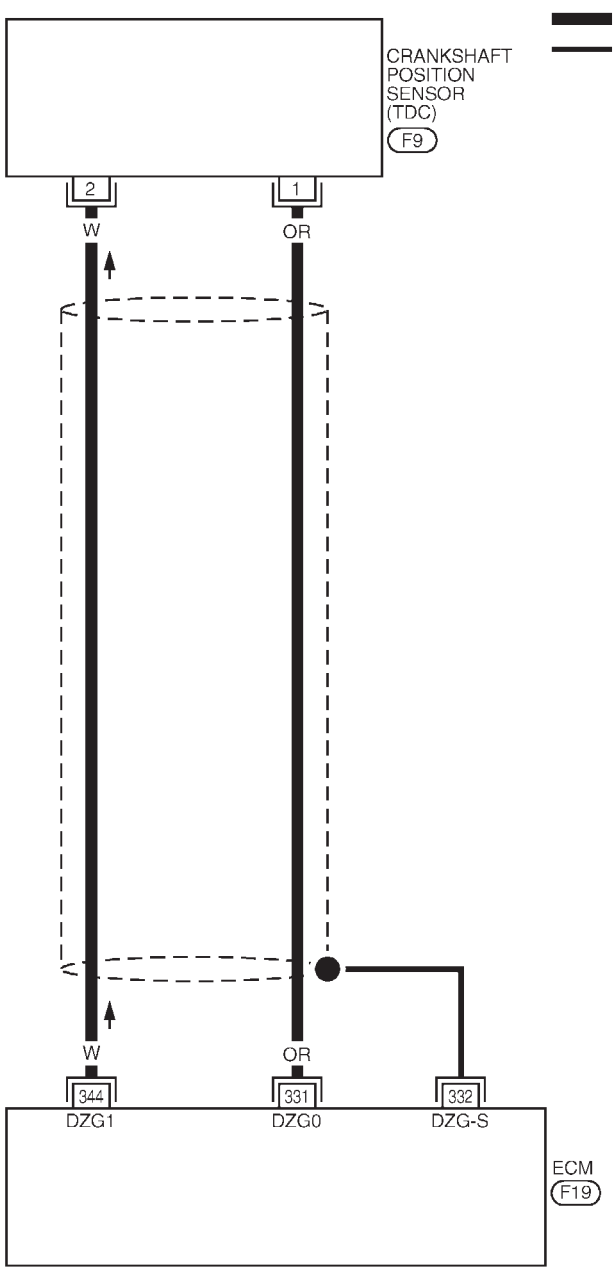
NLEC0690S02

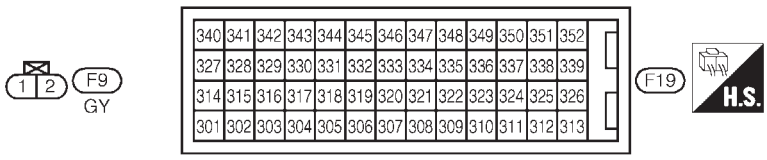
1) Crank engine for at least 1 second.
2) Start engine and run it for at least 2 seconds at idle speed.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-1169.

Wiring Diagram

NLEC0691

EC-CKPS-01





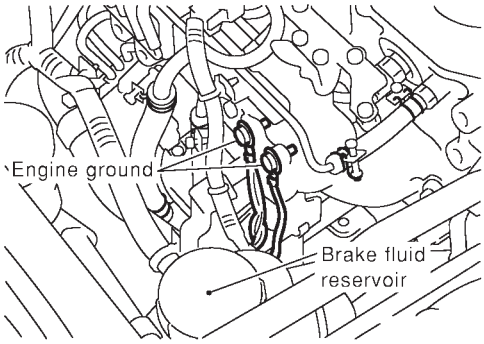
YEC728

Diagnostic Procedure

NLEC0692

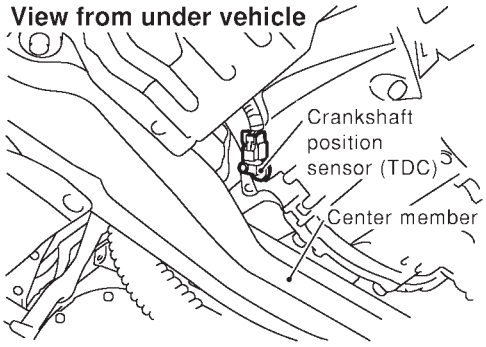
1	CHECK CRANKSHAFT POSITION SENSOR (TDC) GROUND CIRCUIT FOR OPEN AND SHORT

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



SEF380Y

3. Disconnect crankshaft position sensor (TDC) harness connector and ECM harness connector.



SEF387Y

4. Check harness continuity between ECM terminal 331 and crankshaft position sensor (TDC) terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

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

2	CHECK CRANKSHAFT POSITION SENSOR (TDC) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

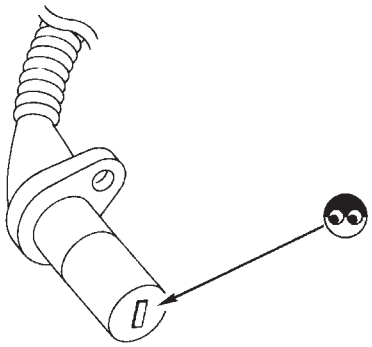
1. Check harness continuity between crankshaft position sensor (TDC) terminal 2 and ECM terminal 344. Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

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

3	CHECK CRANKSHAFT POSITION SENSOR (TDC)-I

1. Loosen the fixing bolt and remove the crankshaft position sensor (TDC).
2. Visually check the sensor for chipping.



SEF620S

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace crankshaft position sensor (TDC).

4	CHECK CRANKSHAFT POSITION SENSOR (TDC)-II

1. Disconnect crankshaft position sensor (TDC) harness connector.
2. Check resistance between crankshaft position sensor (TDC) terminals 1 and 2.

Resistance: 495 - 605Ω [at 20°C (68°F)]

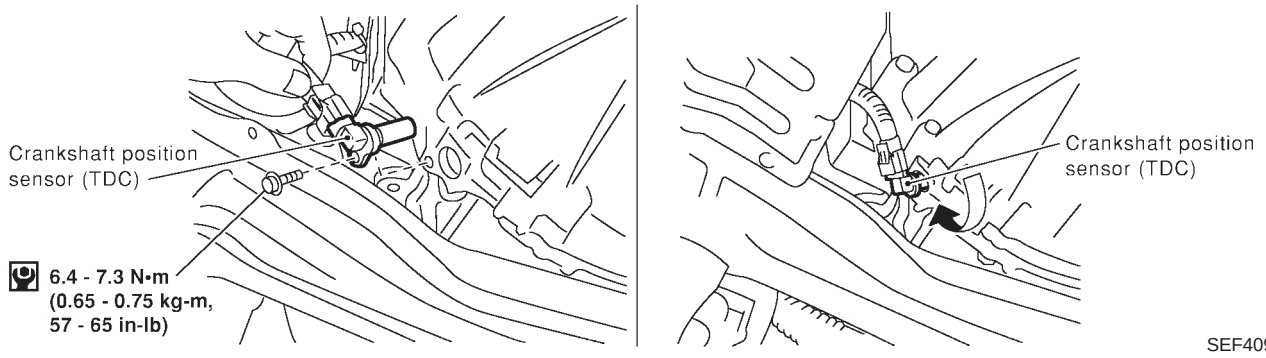
SEF408Y

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace crankshaft position sensor (TDC).

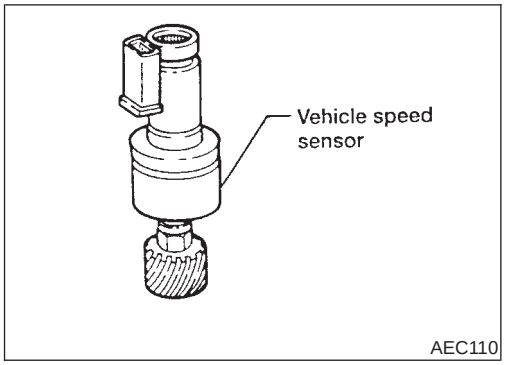
5	INSTALL CRANKSHAFT POSITION SENSOR (TDC)

1. Install crankshaft position sensor (TDC) and temporarily tighten the fixing bolt.
2. Turn crankshaft position sensor (TDC) clockwise until it stops.
3. Tighten the fixing bolt.



▶	GO TO 6.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**



Description

NLEC0654

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.

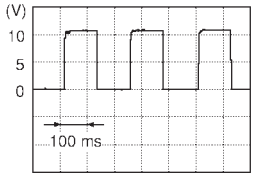
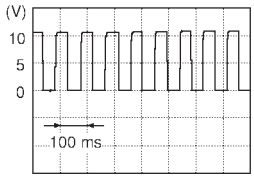
ECM Terminals and Reference Value

NLEC0655

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 and Pulse Signal)
417	PU/R	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle. ● In 1st gear position ● Vehicle speed is 10 km/h (6 MPH)	Approximately 8V  SEF891Y
			[Engine is running] ● Lift up the vehicle. ● In 2nd gear position ● Vehicle speed is 30 km/h (19 MPH)	Approximately 6V  SEF892Y

On Board Diagnosis Logic

NLEC0656

DTC	Malfunction is detected when	Check Items (Possible Cause)
P0500 0104	● The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connector (The vehicle speed sensor circuit is open or shorted.) ● Vehicle speed sensor

2

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm
VHCL SPEED SE	XXX km/h
P/N POSI SW	OFF

SEF864Y

Overall Function Check

NLEC0657

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

WITH CONSULT-II

NLEC0657S01

1) Lift up the vehicle.
2) Start engine.
3) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT-II.
   The vehicle speed on CONSULT-II 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-1176.

WITHOUT CONSULT-II

NLEC0657S02

1) Lift up the vehicle.
2) Start engine.
3) Read the voltage signal for the vehicle speed sensor with an oscilloscope. Refer to "ECM Terminals and Reference Value", EC-1172.
4) Verify that the oscilloscope screen shows the signal wave as shown at "ECM Terminals and Reference Value", EC-1172.
5) If NG, go to "Diagnostic Procedure", EC-1176.

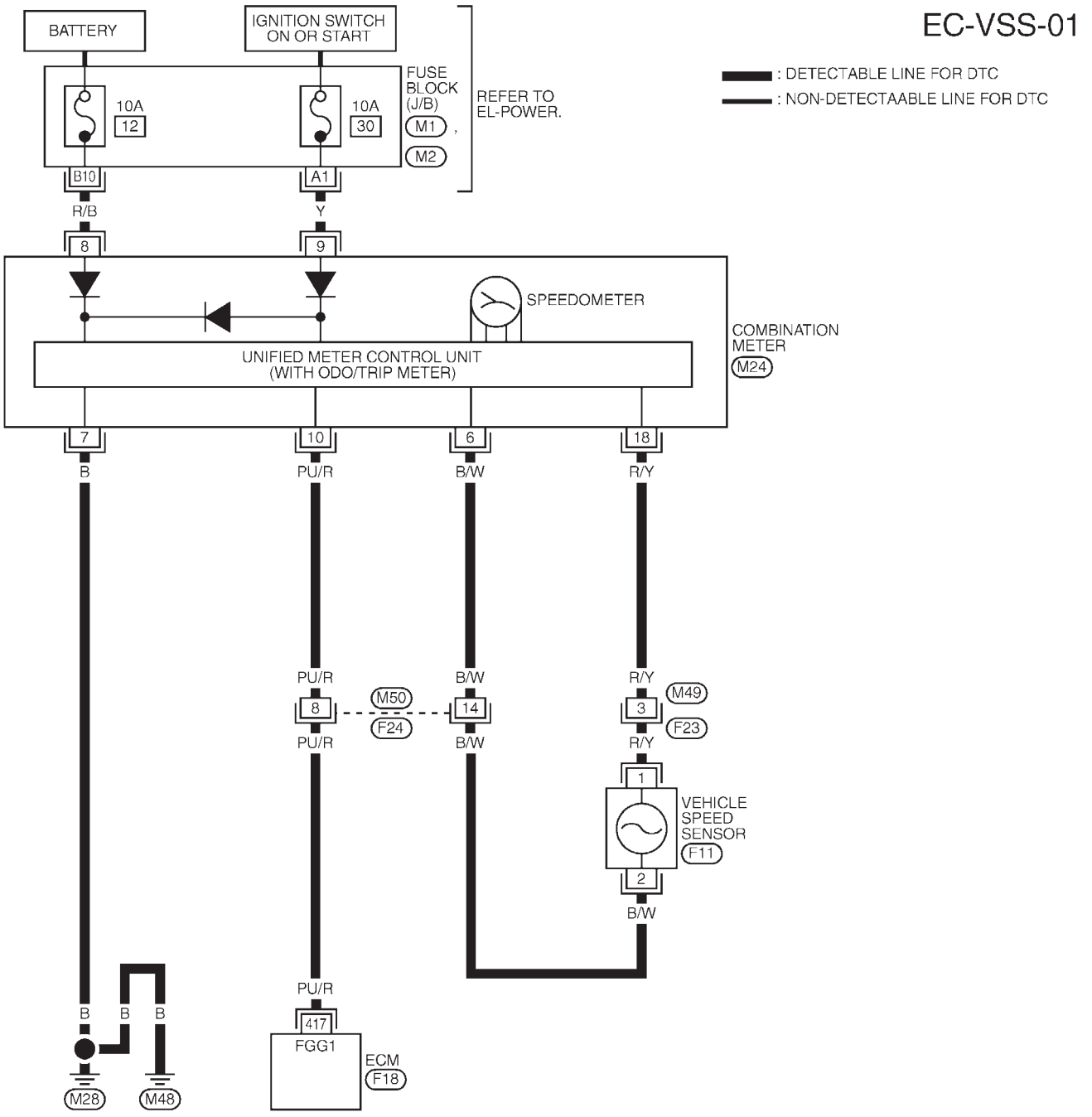
Wiring Diagram

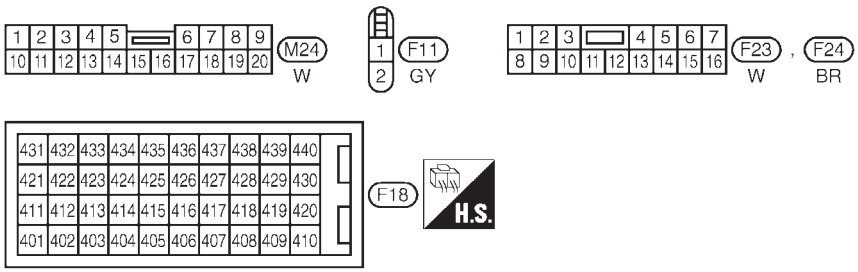
NLEC0658

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0658S01

EC-VSS-01





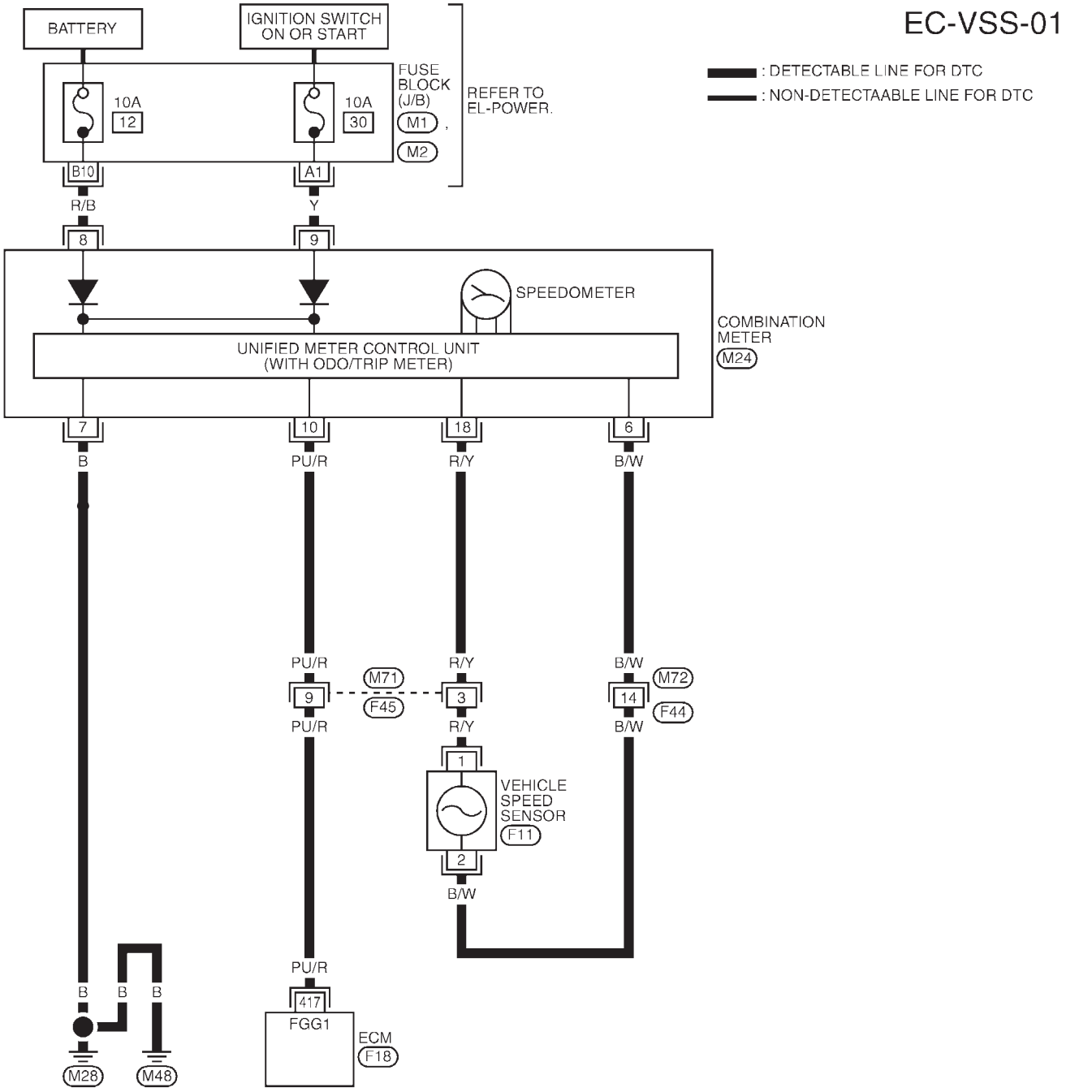
REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK-JUNCTION BOX (J/B)

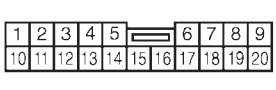
YEC724

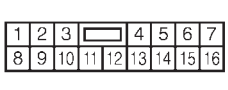
MODELS WITH ECM IN CABIN

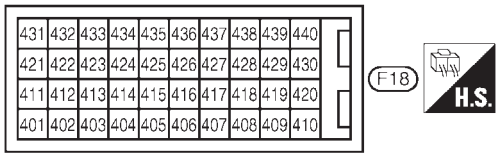
NLEC0658S02

EC-VSS-01









REFER TO THE FOLLOWING.
M1, M2 -FUSE BLOCK-JUNCTION BOX (J/B)

YEC860

Diagnostic Procedure

NLEC0659

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 417 and combination meter terminal 10. 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 M50, F24 (where fitted)
- Harness connectors M71, F45 (where fitted)
- 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 M50, F24 (where fitted)
- Harness connectors M49, F23 (where fitted)
- Harness connectors M71, F45 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness for open or short between combination meter and vehicle speed sensor

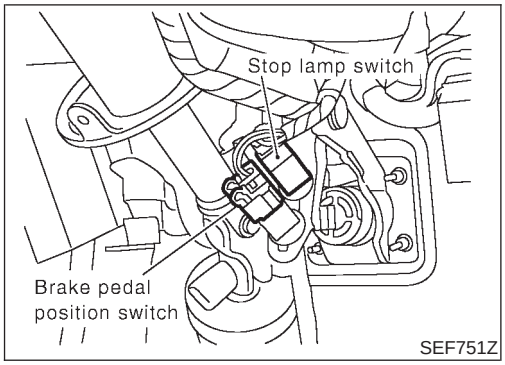
OK or NG

OK	▶	Check vehicle speed sensor and combination meter. Refer to EL 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-1135.

	▶	**INSPECTION END**



Description

NLEC0738

The stop lamp switch is installed to brake pedal bracket. The switch senses brake pedal position and sends an ON-OFF signal to the ECM. The ECM uses the signal to control the fuel injection control system.

ECM Terminals and Reference Value

NLEC0739

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

CAUTION:

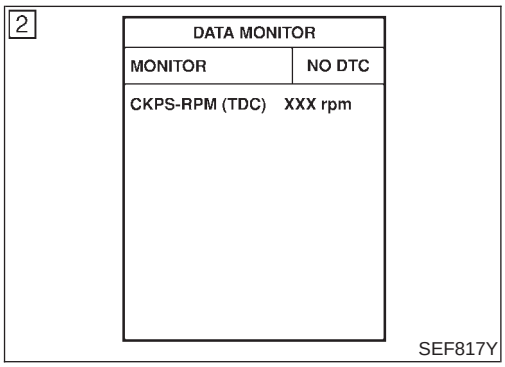
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
405	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
416	Y/B	Brake pedal position switch	**[Ignition switch "ON"]** ● Brake pedal fully released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Brake pedal depressed	Approximately 0V

On Board Diagnosis Logic

NLEC0740

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0571 0807	● An irregular voltage signal from the switch is sent to ECM.	● Harness or connectors (The stop lamp switch circuit is open or shorted.) ● Stop lamp switch



DTC Confirmation Procedure

NLEC0741

WITH CONSULT-II

NLEC0741S01

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Depress and release brake pedal more than 10 times.
4) If DTC is detected, go to "Diagnostic Procedure", EC-1181.

WITHOUT CONSULT-II

NLEC0741S02

1) Turn ignition switch "ON".
2) Depress and release brake pedal more than 10 times.

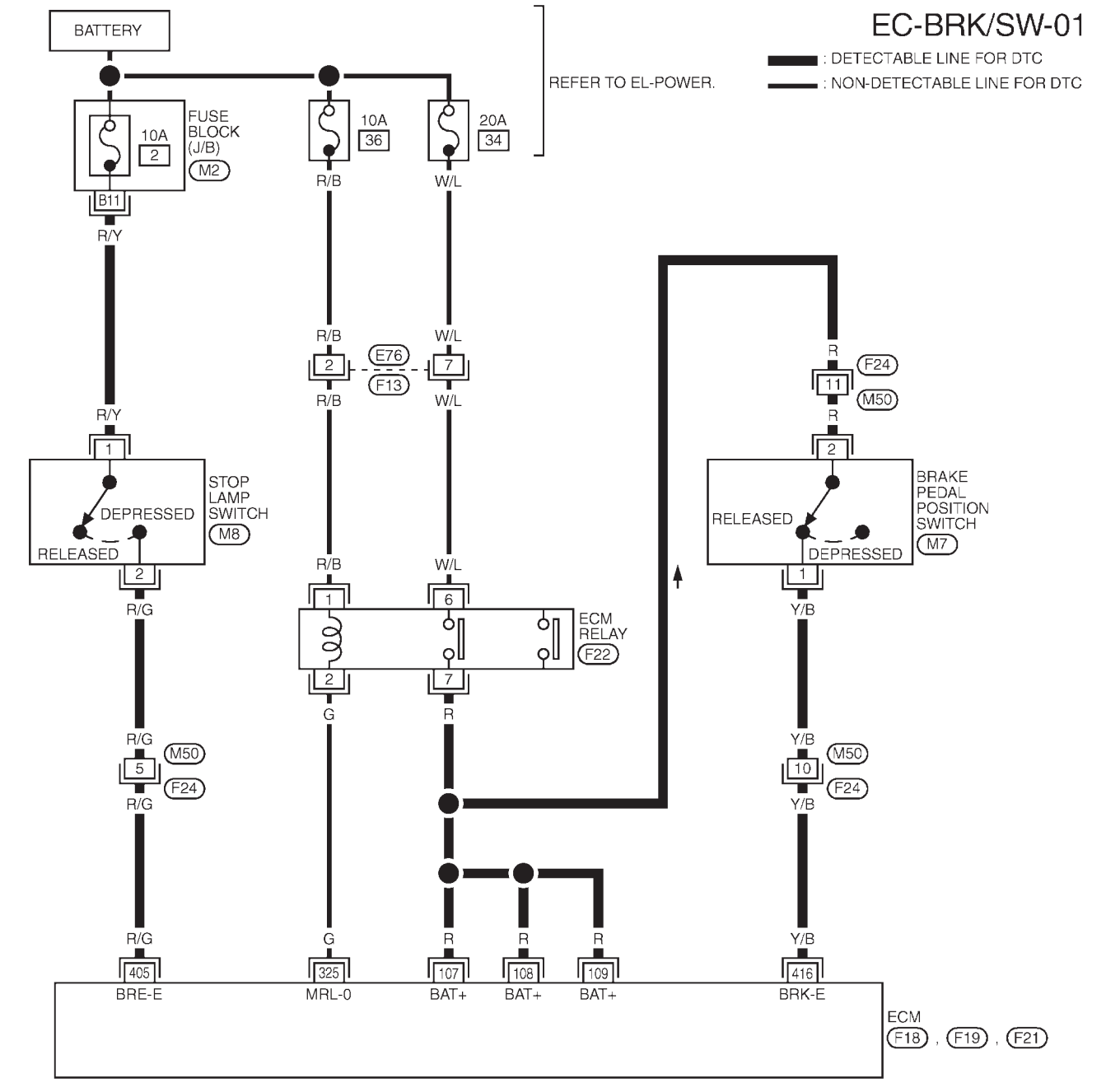
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1181.

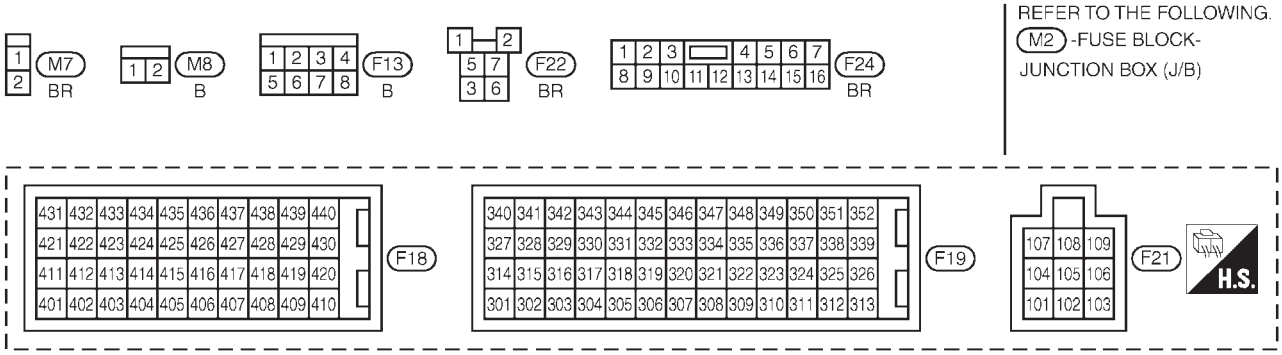
Wiring Diagram

NLEC0742

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0742S01

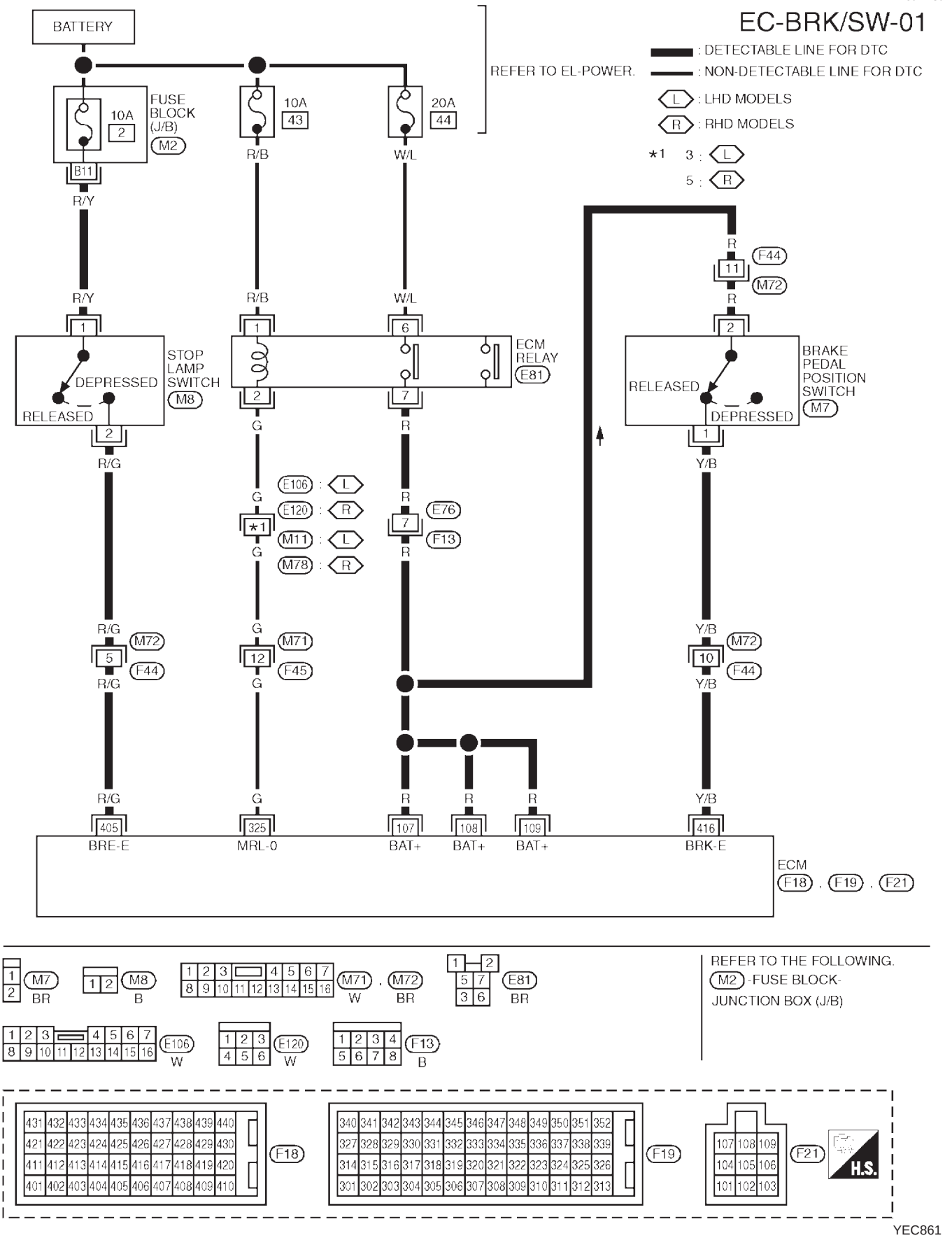




YEC729

MODELS WITH ECM IN CABIN

NLEC0742S02



REFER TO THE FOLLOWING.
M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC861

Diagnostic Procedure

NLEC0743

1	CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the stop lamp switch.

Stop lamp switch	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

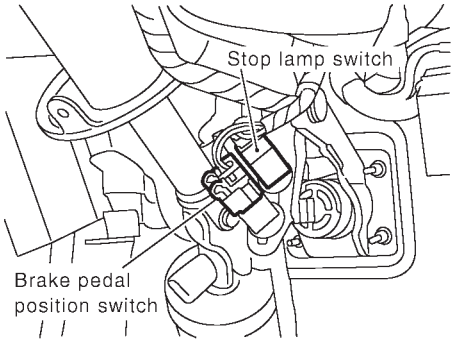
MTBL0443

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 2.

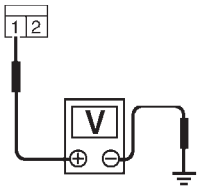
2	CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.



SEF751Z

2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF435Y

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

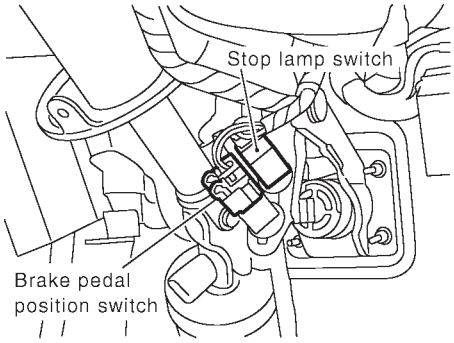
3	DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open and short between stop lamp switch and fuse

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

4	CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.



SEF751Z

4. Check harness continuity between ECM terminal 405 and stop lamp switch terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

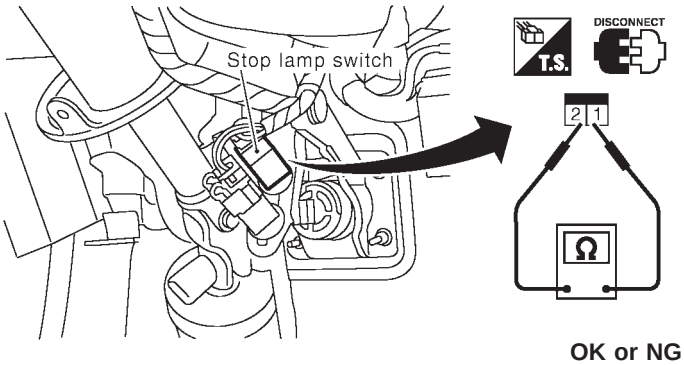
5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M50, F24 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness for open or short between ECM and stop lamp switch

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

6	CHECK STOP LAMP SWITCH

Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.



Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

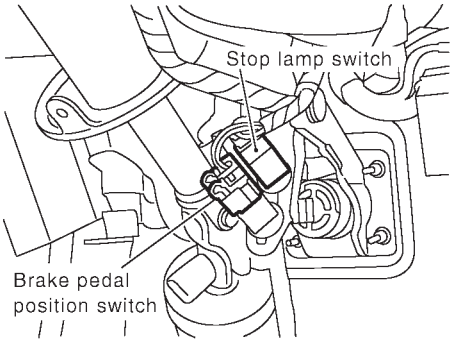
SEF753Z

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace stop lamp switch.

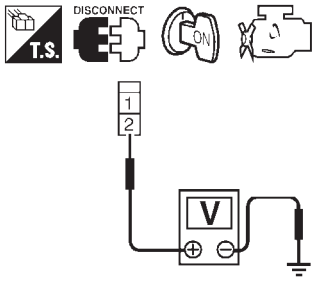
7	CHECK BRAKE PEDAL POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect brake pedal position switch harness connector.



SEF751Z

3. Turn ignition switch "ON".
4. Check voltage between brake pedal position switch terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF905Y

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M50, F24 (where fitted)
- Harness connectors M72, F44 (where fitted)
- Harness connectors M76, F13 (where fitted)
- Harness for open and short between brake pedal position switch and ECM
- Harness for open and short between brake pedal position switch and ECM relay

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

9	CHECK BRAKE PEDAL 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 416 and brake pedal position switch terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

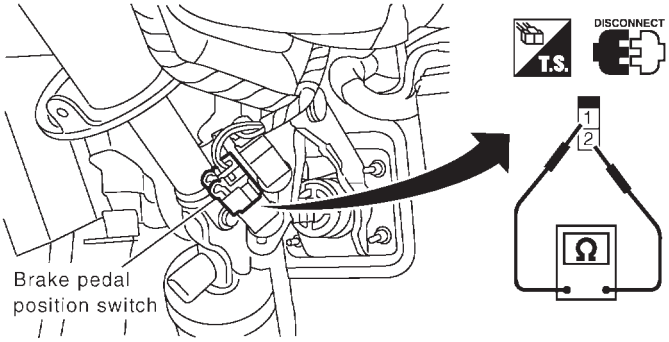
OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M50, F24 (where fitted) ● Harness connectors M72, F44 (where fitted) ● Harness for open or short between ECM and brake pedal position switch	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

11	CHECK BRAKE PEDAL POSITION SWITCH

Check continuity between brake pedal position switch terminals 1 and 2 under the following conditions.



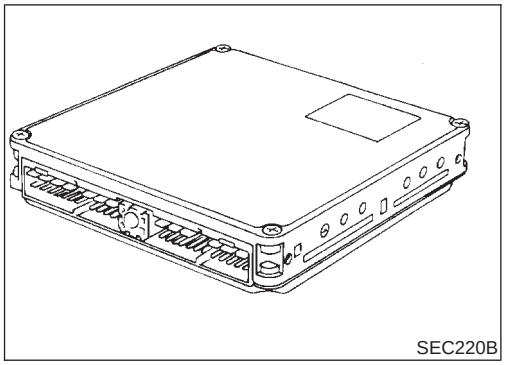
Conditions	Continuity
Brake pedal fully released	Should exist.
Brake pedal depressed	Should not exist.

SEF754Z

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace brake pedal position switch.

12	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**


SEC220B

Description

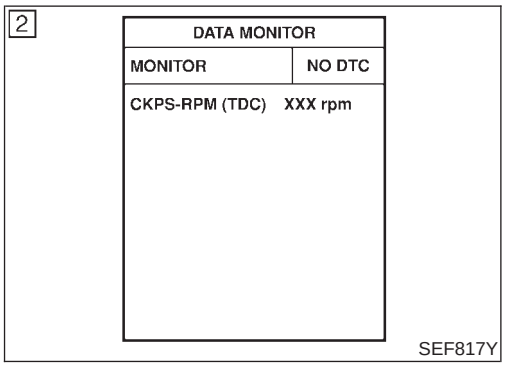
NLEC0734

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

NLEC0735

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1107 0802	● An excessively high or low voltage from the absolute pressure sensor (built-into ECM) is sent to ECM.	● ECM (ECCS-D control module)



SEF817Y

DTC Confirmation Procedure

NLEC0736

WITH CONSULT-II

NLEC0736S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 2 seconds.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-1186.

WITHOUT CONSULT-II

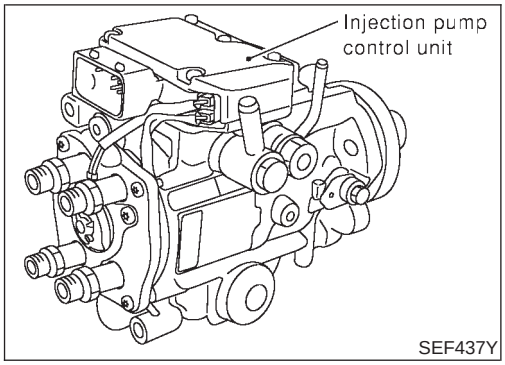
NLEC0736S02

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and wait at least 2 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-1186.

Diagnostic Procedure

NLEC0737

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”, EC-1185, again. 5. Is the DTC P1107 displayed again?		
Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-1185, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0802 displayed again?		
Yes or No		
Yes	▶	Replace ECM.
No	▶	**INSPECTION END**



Description

NLEC0672

SYSTEM DESCRIPTION

NLEC0672S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NLEC0672S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NLEC0672S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NLEC0672S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NLEC0672S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0673

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°CA
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

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

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	● Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

NLEC0674

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

CAUTION:

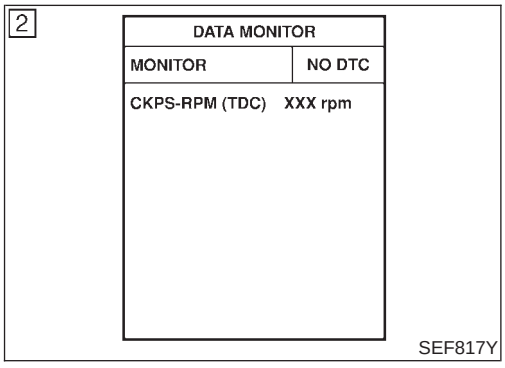
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NLEC0675

DTC	Malfunction is detected when	Check Items (Possible cause)
P1180 0402	● An improper voltage signal from fuel temperature sensor (Built-into electronic control fuel injection pump) is sent to injection pump control unit.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump



DTC Confirmation Procedure

NLEC0676

WITH CONSULT-II

NLEC0676S01

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
4) If DTC is detected, go to "Diagnostic Procedure", EC-1192.

WITHOUT CONSULT-II

NLEC0676S02

1) Turn ignition switch "ON" and wait at least 2 seconds.

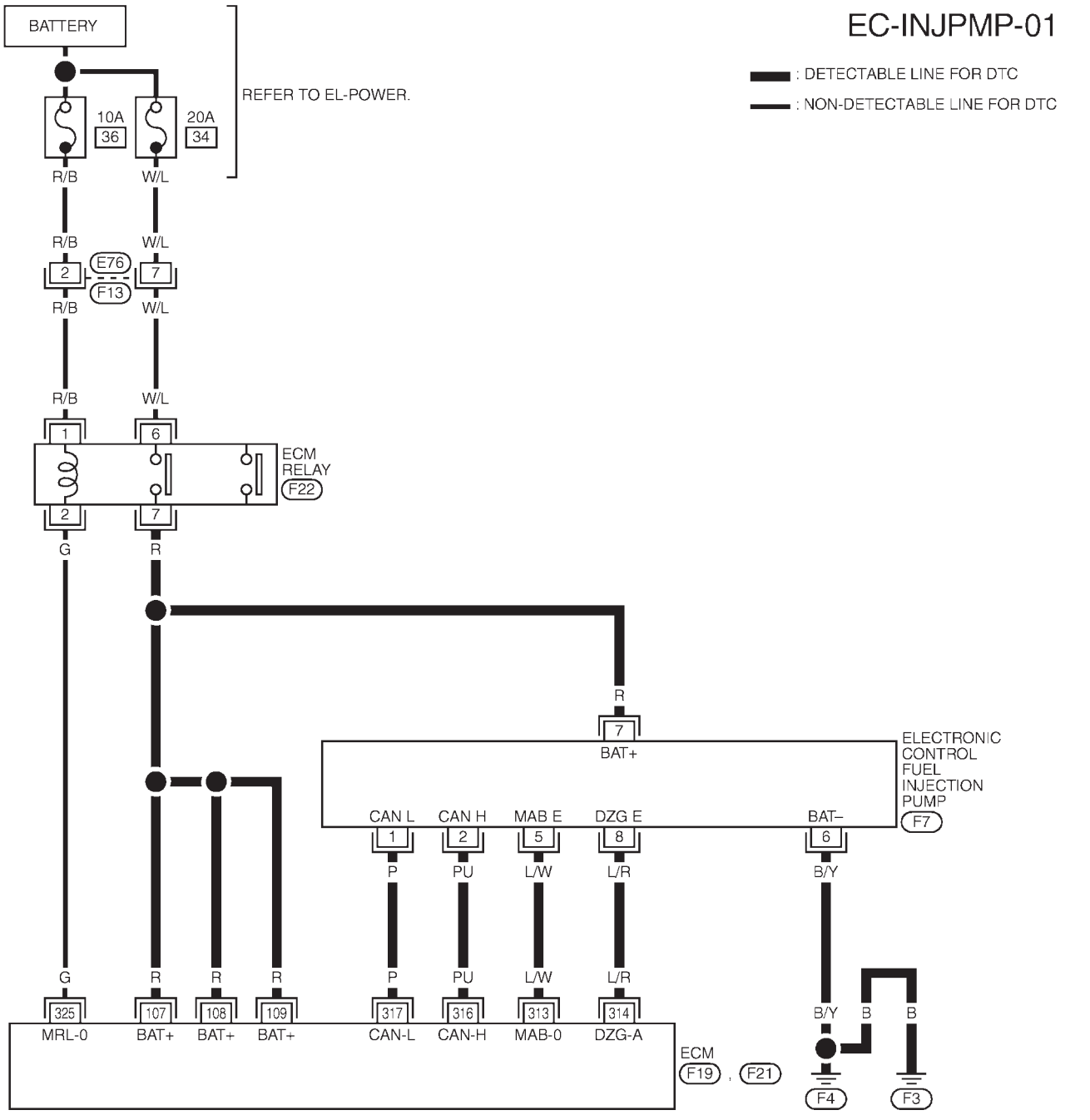
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1192.

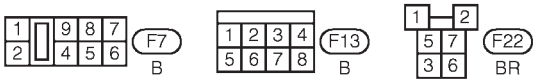
Wiring Diagram

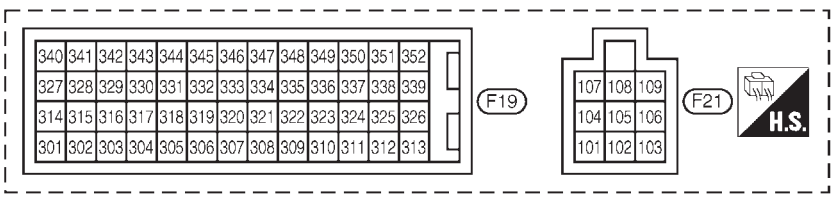
NLEC0677

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0677S01



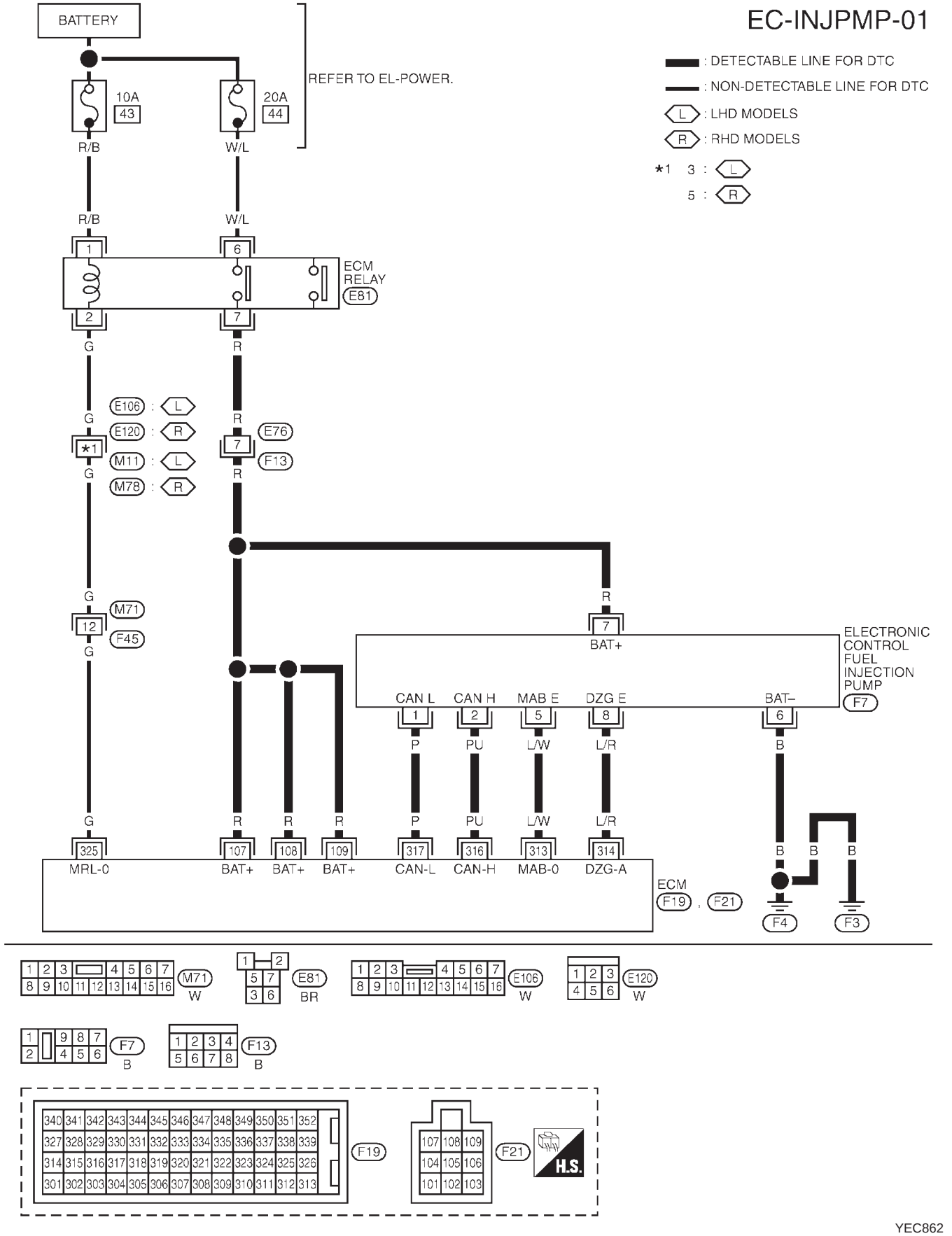




YEC726

MODELS WITH ECM IN CABIN

NLEC0677S02



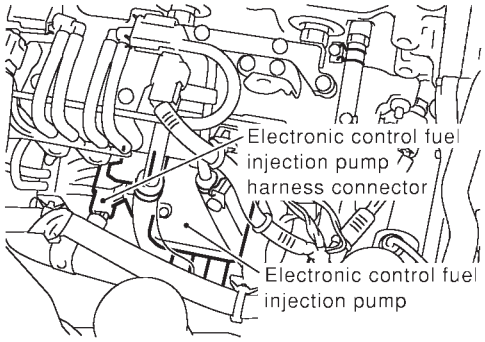
YEC862

Diagnostic Procedure

NLEC0678

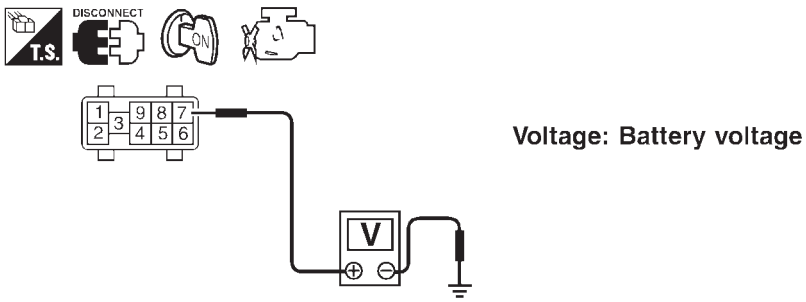
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEF390Y

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



Voltage: Battery voltage

SEF438Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

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

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	317
2	316
5	313
8	314

MTBL0462

Continuity should exist.

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

OK or NG

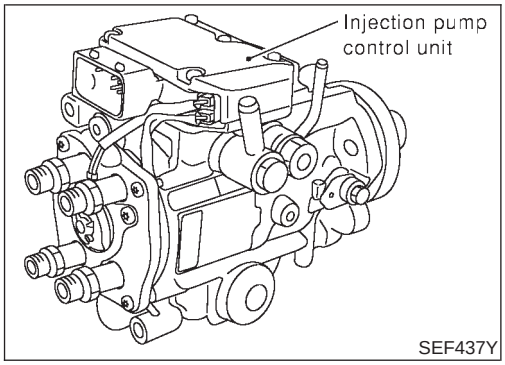
OK	▶	GO TO 5.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

OK or NG

OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

NLEC0753

SYSTEM DESCRIPTION

NLEC0753S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NLEC0753S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NLEC0753S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NLEC0753S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NLEC0753S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0754

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°CA
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	● Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

NLEC0755

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

CAUTION:

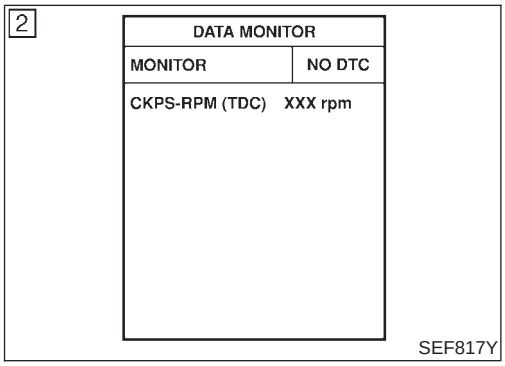
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NLEC0756

DTC	Malfunction is detected when	Check Items (Possible cause)
P1202 1002	● Fuel cut control system does not function properly.	● Harness or connectors (Electronic control fuel circuit is open or shorted.) ● Electronic control fuel



DTC Confirmation Procedure

NLEC0757

WITH CONSULT-II

NLEC0757S01

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
5) If DTC is detected, go to "Diagnostic Procedure", EC-1199.

WITHOUT CONSULT-II

NLEC0757S02

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1199.

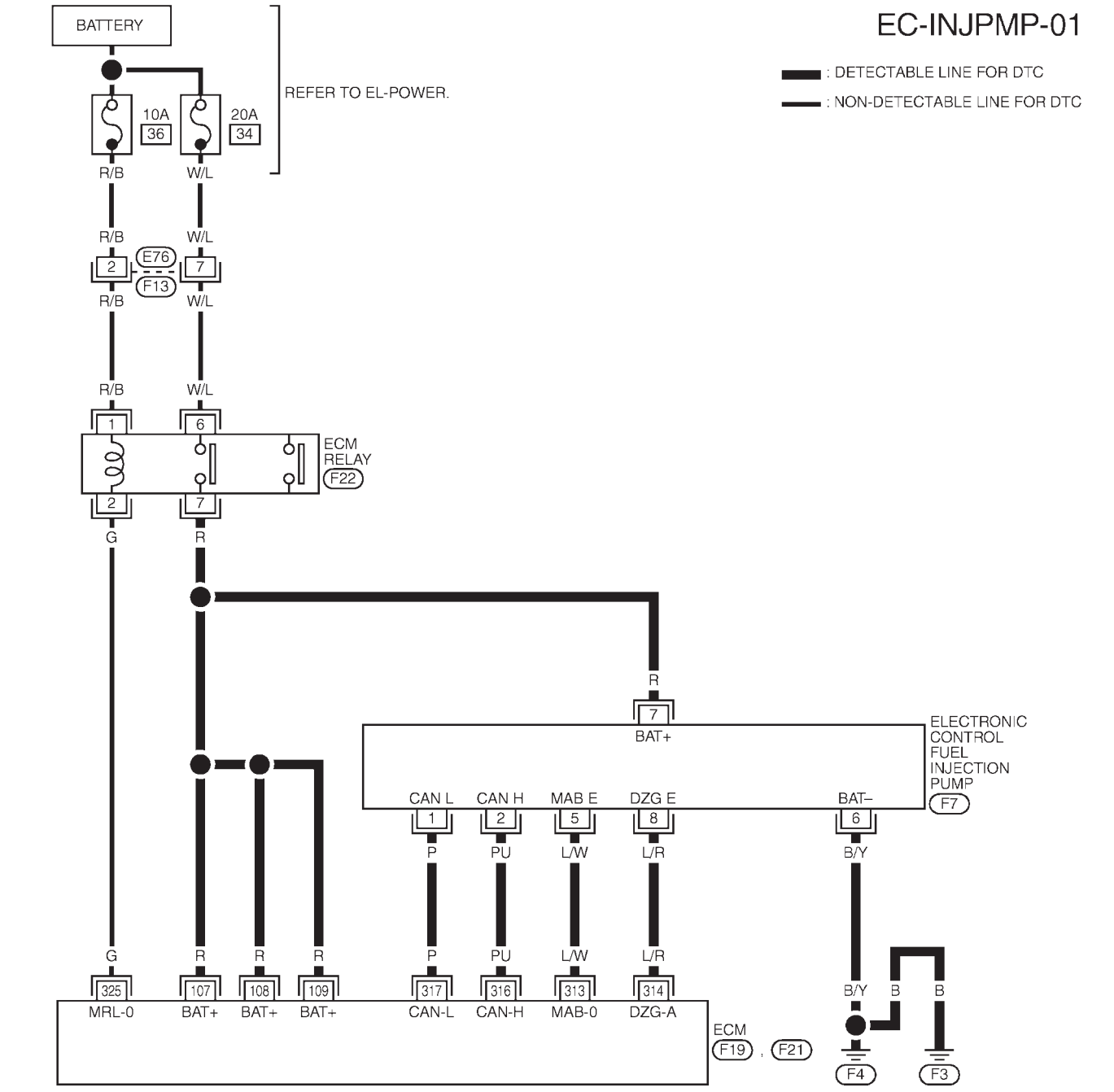
Wiring Diagram

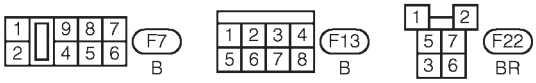
NLEC0758

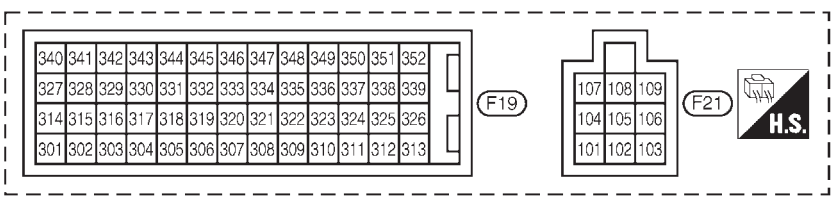
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0758S01

EC-INJPMP-01





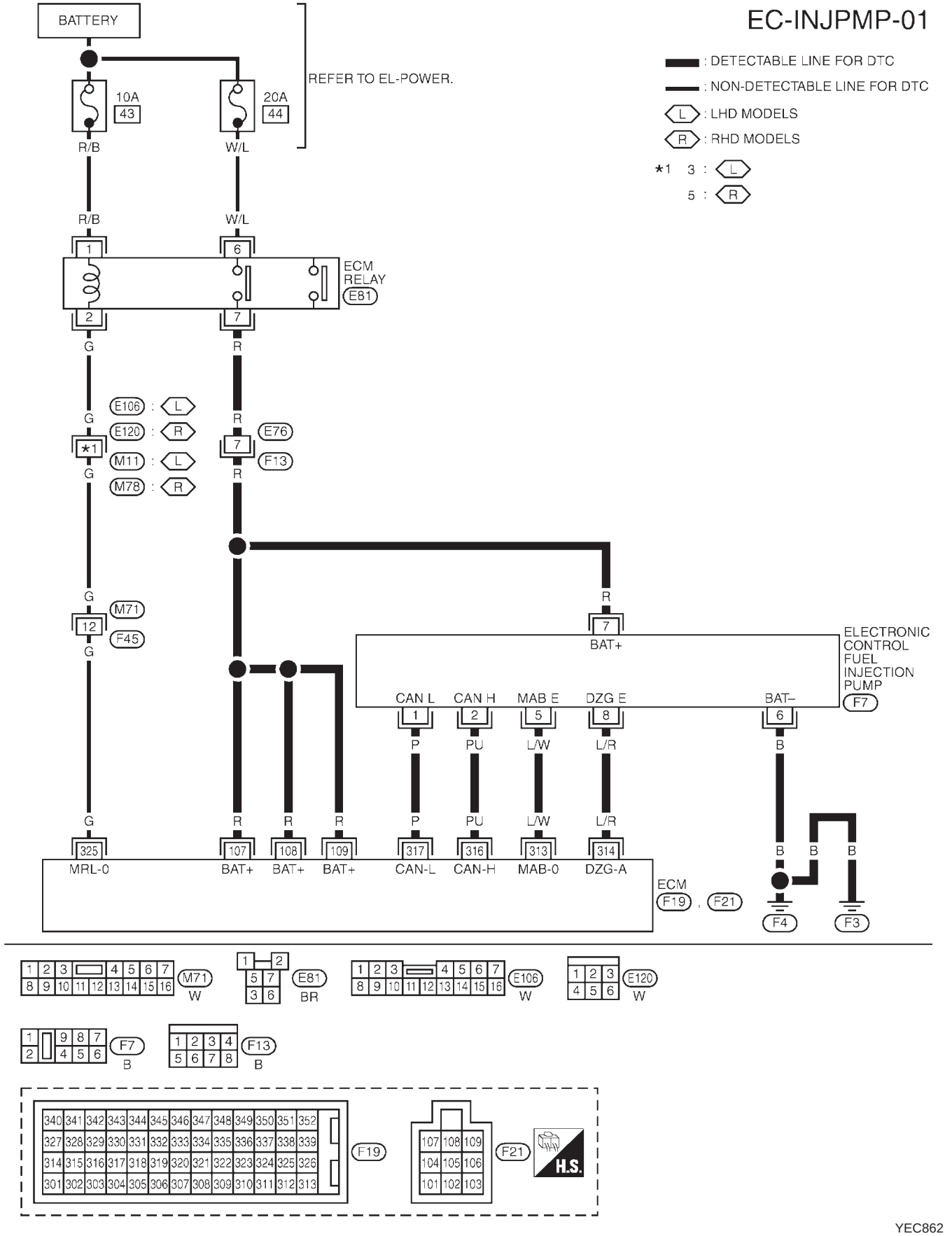


YEC726

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0758S02



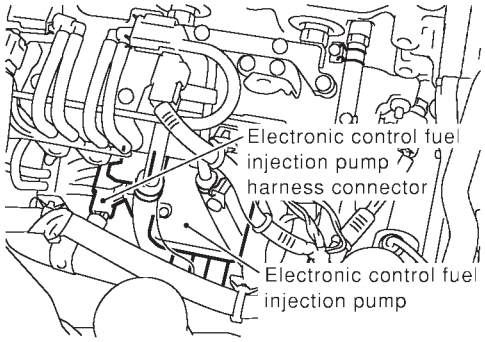
YEC862

Diagnostic Procedure

NLEC0759

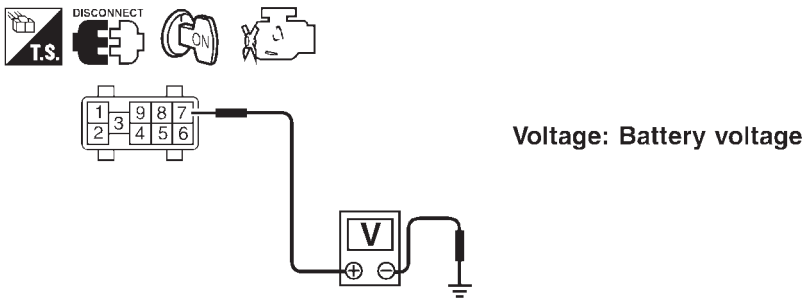
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEF390Y

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



Voltage: Battery voltage

SEF438Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

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

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

Diagnostic Procedure (Cont'd)

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	317
2	316
5	313
8	314

MTBL0462

Continuity should exist.

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

OK or NG

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

5	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

OK or NG

OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Description

NLEC0660

SYSTEM DESCRIPTION

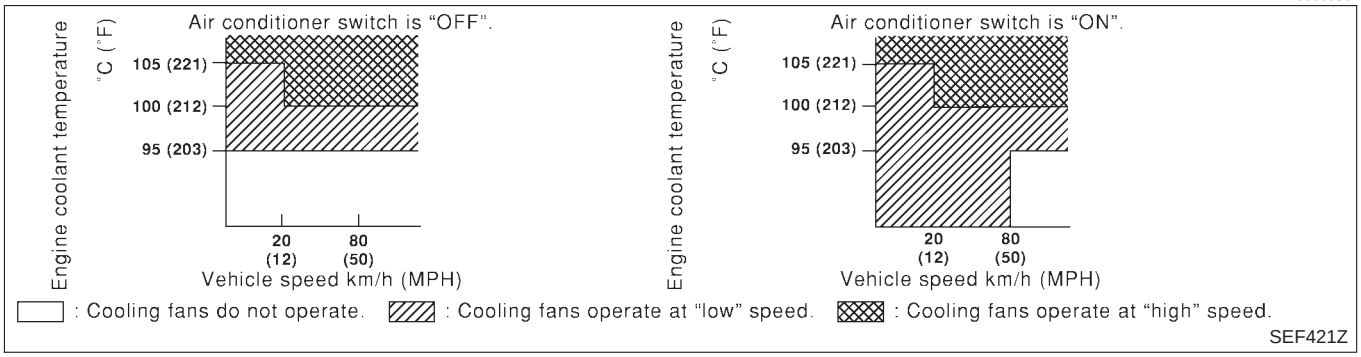
NLEC0660S01

Sensor	Input signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION

NLEC0660S02



CONSULT-II Reference Value in Data Monitor Mode

NLEC0661

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	● When cooling fan is stopped.		OFF
	● When cooling fans operate at low speed.		LOW
	● When cooling fans operate at high speed.		HIGH

ECM Terminals and Reference Value

NLEC0662

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)
219	LG/R	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fans are not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fans are operating	Approximately 0.1V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
221	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fans are not operating ● Cooling fans are operating at low speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fans are operating at high speed	Approximately 0.1V

On Board Diagnosis Logic

NLEC0663

This diagnosis continuously monitors the engine coolant temperature.
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.

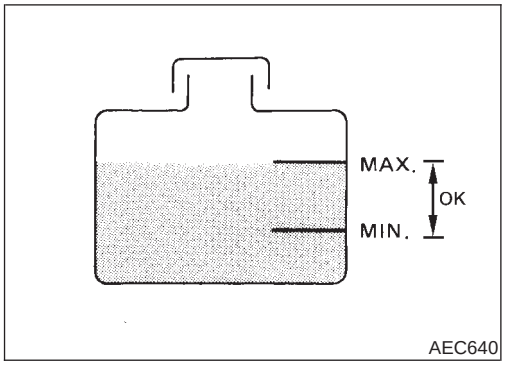
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1217 0208	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat ● Engine coolant temperature sensor For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-1217.

CAUTION:

When a malfunction is indicated, be sure to replace the coolant following the procedure in the LC-59, "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-22, "Engine Coolant Mixture Ratio".

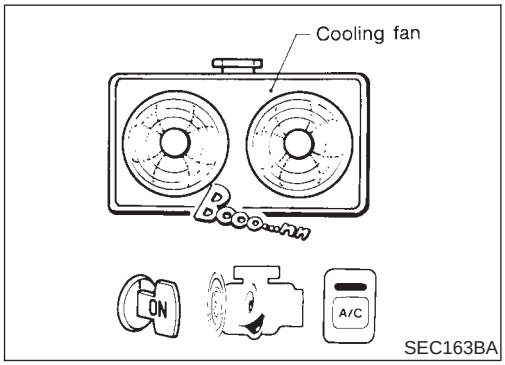
2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.



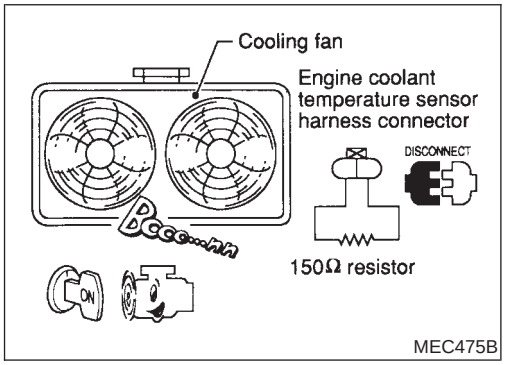
AEC640

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF111X



SEC163BA



MEC475B

Overall Function Check

NLEC0664

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 the cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

NLEC0664S01

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-1206.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-1206.
3) Turn ignition switch "ON".
4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II and make sure that cooling fans operate when touching "HIGH" or "LOW".
   If NG, go to "Diagnostic Procedure", EC-1206.

WITHOUT CONSULT-II

NLEC0664S02

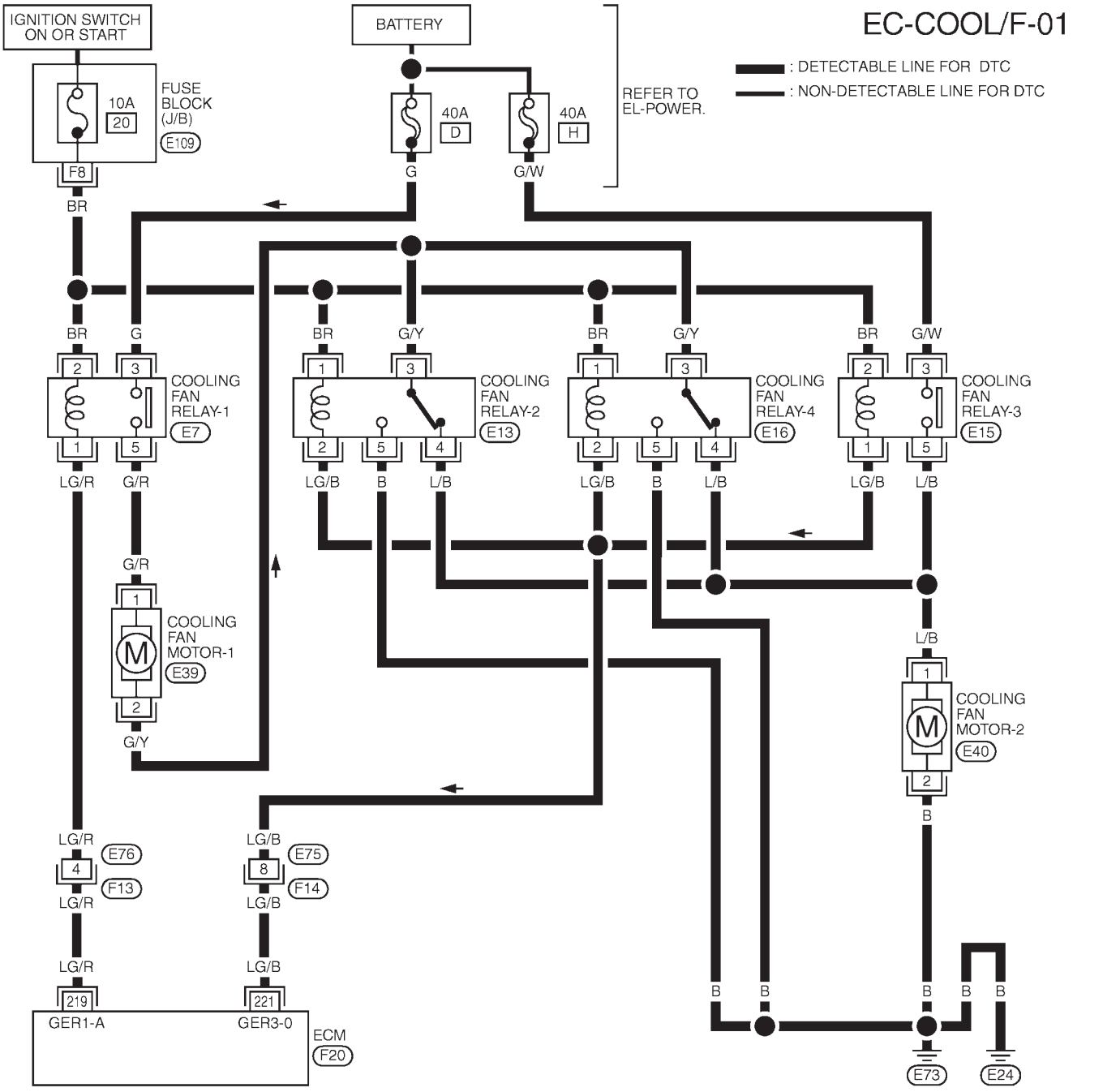
1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "Diagnostic Procedure", EC-1206.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-1206.
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 air conditioner operating.
   Be careful not to overheat engine.
8) Make sure that cooling fans operate at low speed.
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) Start engine and make sure that cooling fans operate at higher speed than low speed.
    Be careful not to overheat engine.
14) If NG, go to "Diagnostic Procedure", EC-1206.

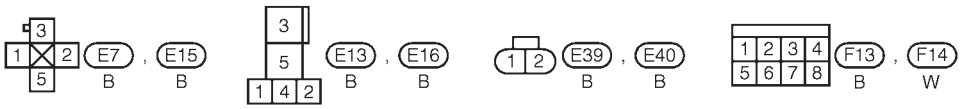
Wiring Diagram

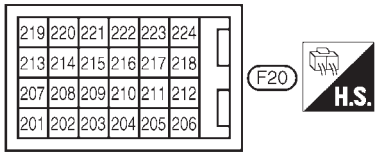
NLEC0665

MODELS WITH FUSE AND FUSIBLE LINK BOX E43

NLEC0665S03





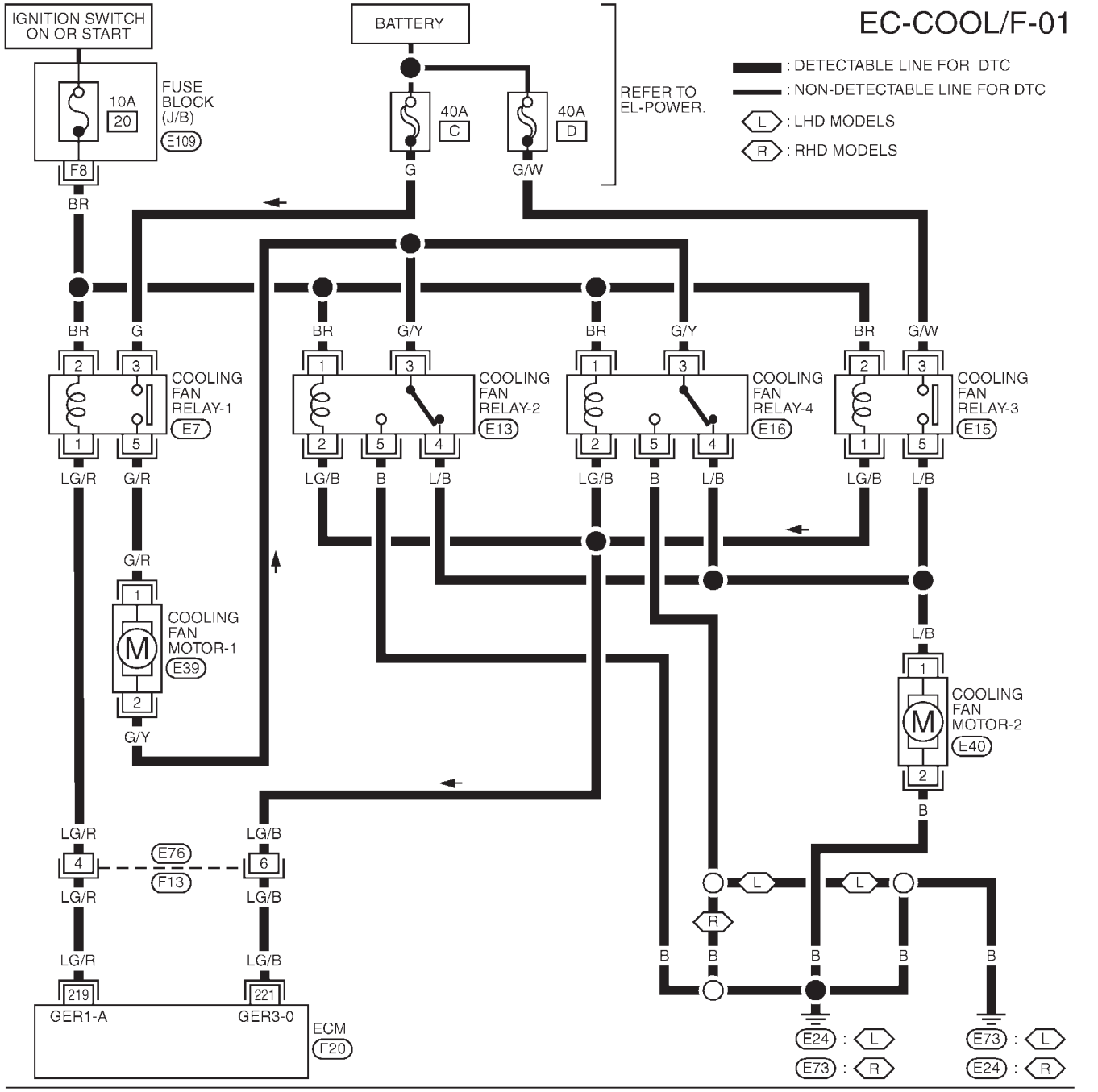


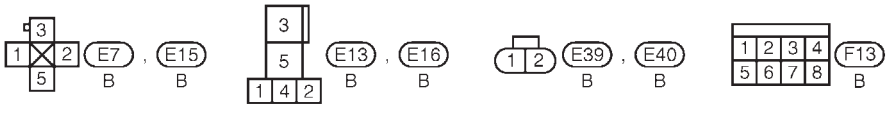
REFER TO THE FOLLOWING.
E109 -FUSE BLOCK-JUNCTION BOX (J/B)

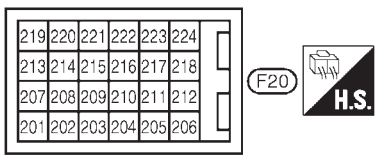
YEC725

MODELS WITH FUSE AND FUSIBLE LINK BOX E90

NLEC0665S04







REFER TO THE FOLLOWING.
E109 -FUSE BLOCK-JUNCTION BOX (J/B)

YEC863

Diagnostic Procedure

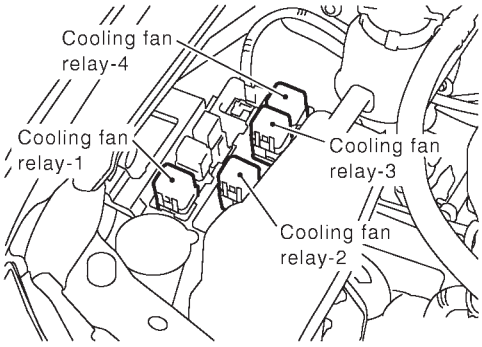
NLEC0666

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 relay-3.



SEF871Z

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, .)

3	CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch "OFF".
2. Reconnect cooling fan relay-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.

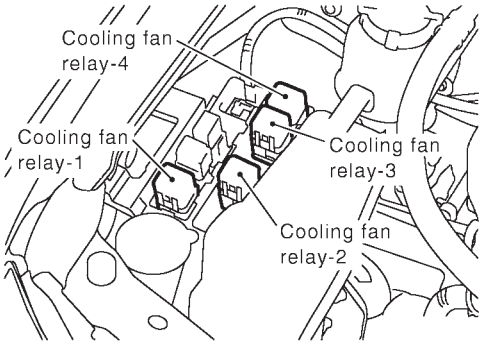
OK or NG

OK	▶	GO TO 6.
NG	▶	Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-1214.)

4	CHECK COOLING FAN LOW SPEED OPERATION

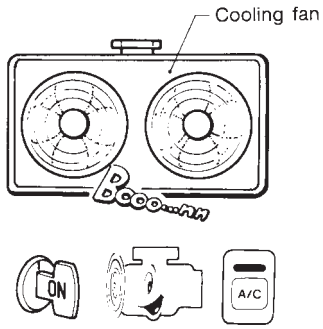
Without CONSULT-II

1. Disconnect cooling fan relay-3.



SEF871Z

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

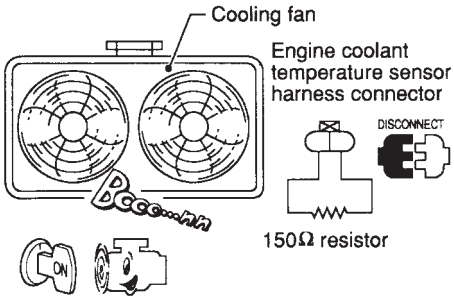
OK or NG

OK	▶	GO TO 5.
NG	▶	Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-1211.)

5	CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch "OFF".
2. Reconnect cooling fan relay-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-1214.)

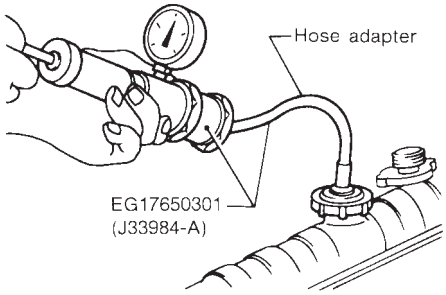
6	CHECK COOLING SYSTEM FOR LEAK

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.

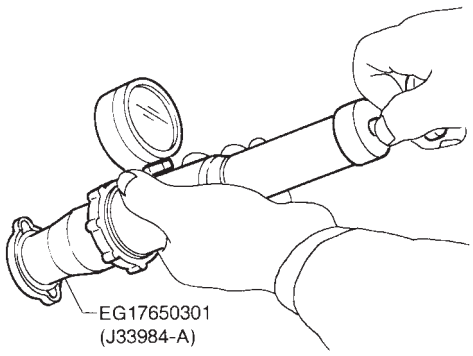
- Hose
- Radiator
- Water pump (Refer to LC-55, "Water Pump".)

	▶	Repair or replace.

Diagnostic Procedure (Cont'd)

8	CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.



SLC755A

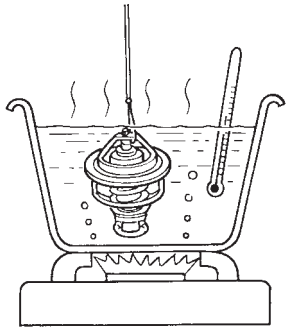
Radiator cap relief pressure:
59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)

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 9.0 mm/95°C (0.354 in/203°F)

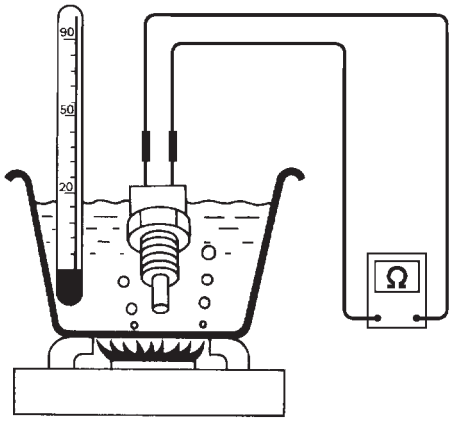
4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC-57, "Thermostat".

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace thermostat.

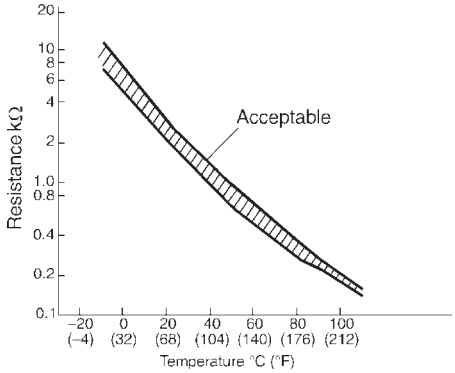
10	CHECK ENGINE COOLANT TEMPERATURE SENSOR

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-1217.

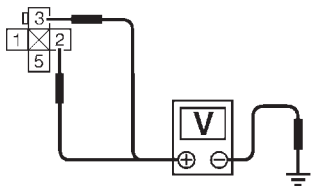
▶	**INSPECTION END**

PROCEDURE A

NLEC0666S05

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 2, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF899Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

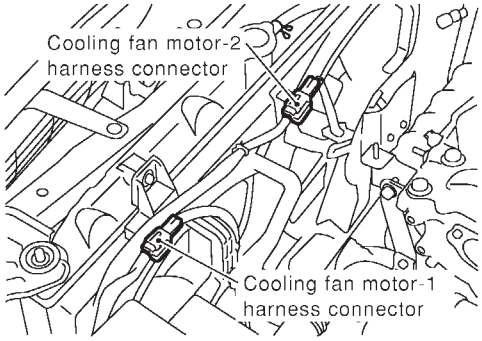
2	DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E109
- 10A fuse
- 40A fusible link
- 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-I

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.



SEF385Y

3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-2 terminal 2 and body ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Check harness continuity between cooling fan motor-1 terminal 2 and cooling fan motor-2 terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 5.

5	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT-III

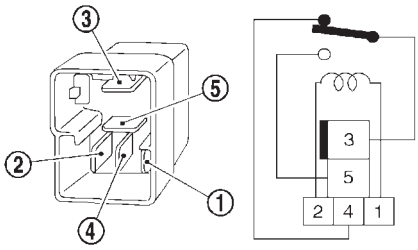
1. Disconnect cooling fan relays-2, 4.
2. Check harness continuity between cooling fan motor-1 terminal 2 and cooling fan relays-2, 4 terminal 3, cooling fan relays-2, 4 terminal 4 and cooling fan motor-2 terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short 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 COOLING FAN RELAY-2, 4

Check continuity between cooling fan relays-2, 4 terminals 3 and 4, 3 and 5 under the following conditions.



Conditions	Continuity	
	terminals 3 and 4	terminals 3 and 5
12V direct current supply between terminals 1 and 2	No	Yes
No current supply	Yes	No

SEF900Y

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace cooling fan relay.

7	CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 219 and cooling fan relay-1 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	▶	GO TO 8.

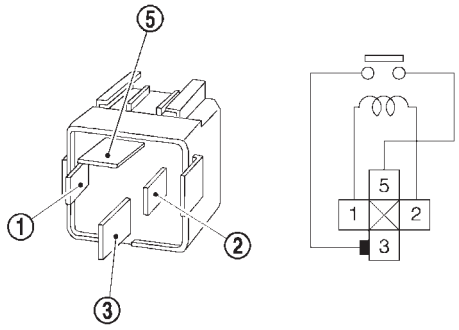
8	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13
- 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.

9	CHECK COOLING FAN RELAY-1

Check continuity between cooling fan relay-1 terminals 3 and 5 under the following conditions.



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

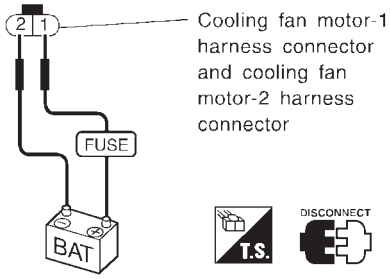
SEF901Y

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace cooling fan relay.

10	CHECK COOLING FAN MOTORS-1 AND -2

Supply battery voltage between the following terminals and check operation.



	Terminals	
	(+)	(−)
Cooling fan motor-1	1	2
Cooling fan motor-2	1	2

SEF902YA

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace cooling fan motors.

11	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

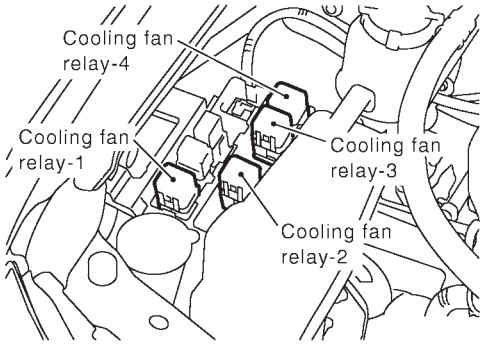
▶ **INSPECTION END**

PROCEDURE B

NLEC0666S06

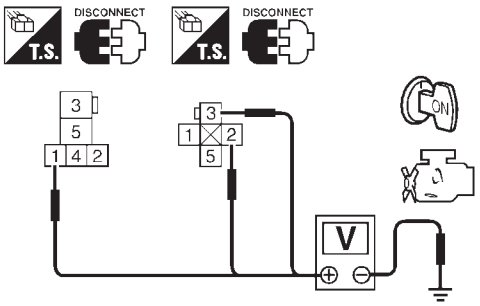
1	CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2, 3 and 4.



SEF871Z

3. Turn ignition switch "ON".
4. Check voltage between cooling fan relays-2, 4 terminals 1 and ground, cooling fan relay-3 terminals 2, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF903Y

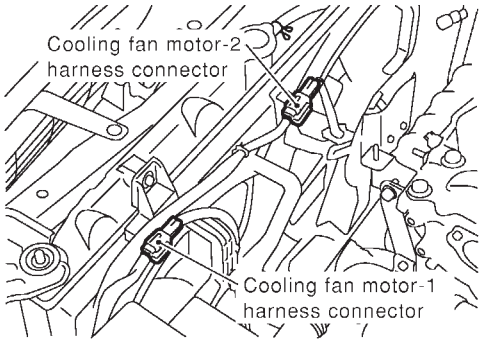
OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART
Check the following. ● 40A fusible link ● Harness for open or short between cooling fan relays-2, 3, 4 and fuse ● Harness for open or short between cooling fan relay-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-2 harness connector.



SEF385Y

3. Check harness continuity between cooling fan relays-2, 4 terminal 5 and body ground, cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 221 and cooling fan relays-2, 4 terminal 2, cooling fan relay-3 terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

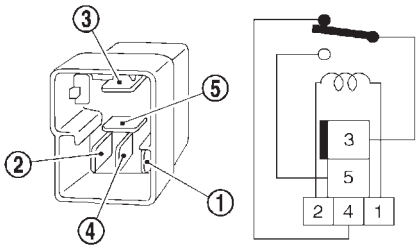
OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E75, F14 (where fitted) ● Harness connectors E76, F13 (where fitted) ● Harness for open or short between cooling fan relays-2, 3, 4 and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK COOLING FAN RELAYS-2 AND -4

Check continuity between cooling fan relay-2, -3 terminals 3 and 4, 3 and 5 under the following conditions.



Conditions	Continuity	
	terminals 3 and 4	terminals 3 and 5
12V direct current supply between terminals 1 and 2	No	Yes
No current supply	Yes	No

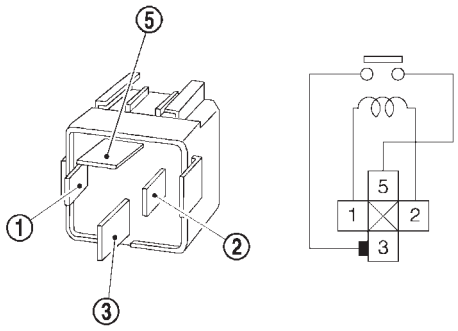
SEF900Y

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace cooling fan relays.

7	CHECK COOLING FAN RELAY-3

Check continuity between cooling fan relay-3 terminals 3 and 5 under the following conditions.



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

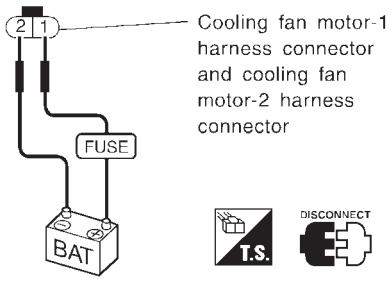
SEF901Y

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace cooling fan relay.

8	CHECK COOLING FAN MOTORS

Supply battery voltage between the following terminals and check operation.



	Terminals	
	(+)	(−)
Cooling fan motor-1	1	2
Cooling fan motor-2	1	2

SEF902YA

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace cooling fan motors.

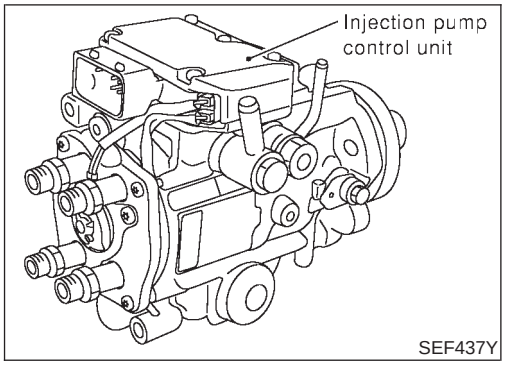
9	CHECK INTERMITTENT INCIDENT
1. Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	INSPECTION END

Main 12 Causes of Overheating

NLEC0667

Engine	Step	Inspection item	Equipment	Condition	Reference page
OFF	1	● Blocked radiator ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	30 - 50% coolant mixture	See MA-20, "RECOMMENDED FLUIDS AND LUBRICANTS".
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See LC-19, "Changing Engine Coolant".
	4	● Radiator cap	● Pressure tester	78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)	See LC-54, "System Check".
ON*2	5	● Coolant leaks	● Visual	No leaks	See LC-54, "System Check".
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-57, "Thermostat" and "Radiator".
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See Trouble Diagnosis for DTC P1217, EC-1201.
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 LC-59, "Changing Engine Coolant".
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See LC-60, "REFILLING ENGINE COOLANT".
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.04mm (0.0016 in) Maximum distortion (warping)	See EM-203, "Inspection".
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-225, "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-62, "OVERHEATING CAUSE ANALYSIS".



Description

NLEC0727

SYSTEM DESCRIPTION

NLEC0727S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NLEC0727S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NLEC0727S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NLEC0727S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NLEC0727S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0728

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°CA
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	● Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

NLEC0729

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

CAUTION:

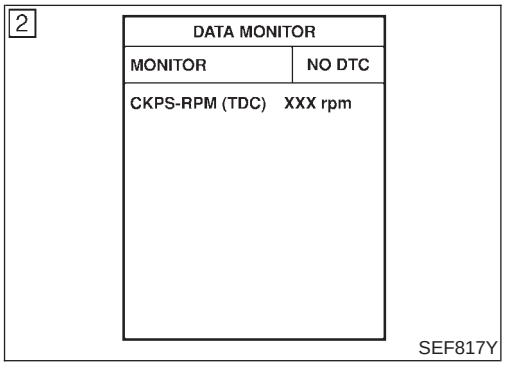
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NLEC0730

DTC	Malfunction is detected when	Check Items (Possible cause)
P1241 0707	● Fuel injection timing control system does not function properly.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump ● Improper fuel quality



DTC Confirmation Procedure

NLEC0731

WITH CONSULT-II

NLEC0731S01

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
4) Keep engine speed at more than 2,000 rpm for at least 10 seconds.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1223.

⊗ WITHOUT CONSULT-II

NLEC0731S02

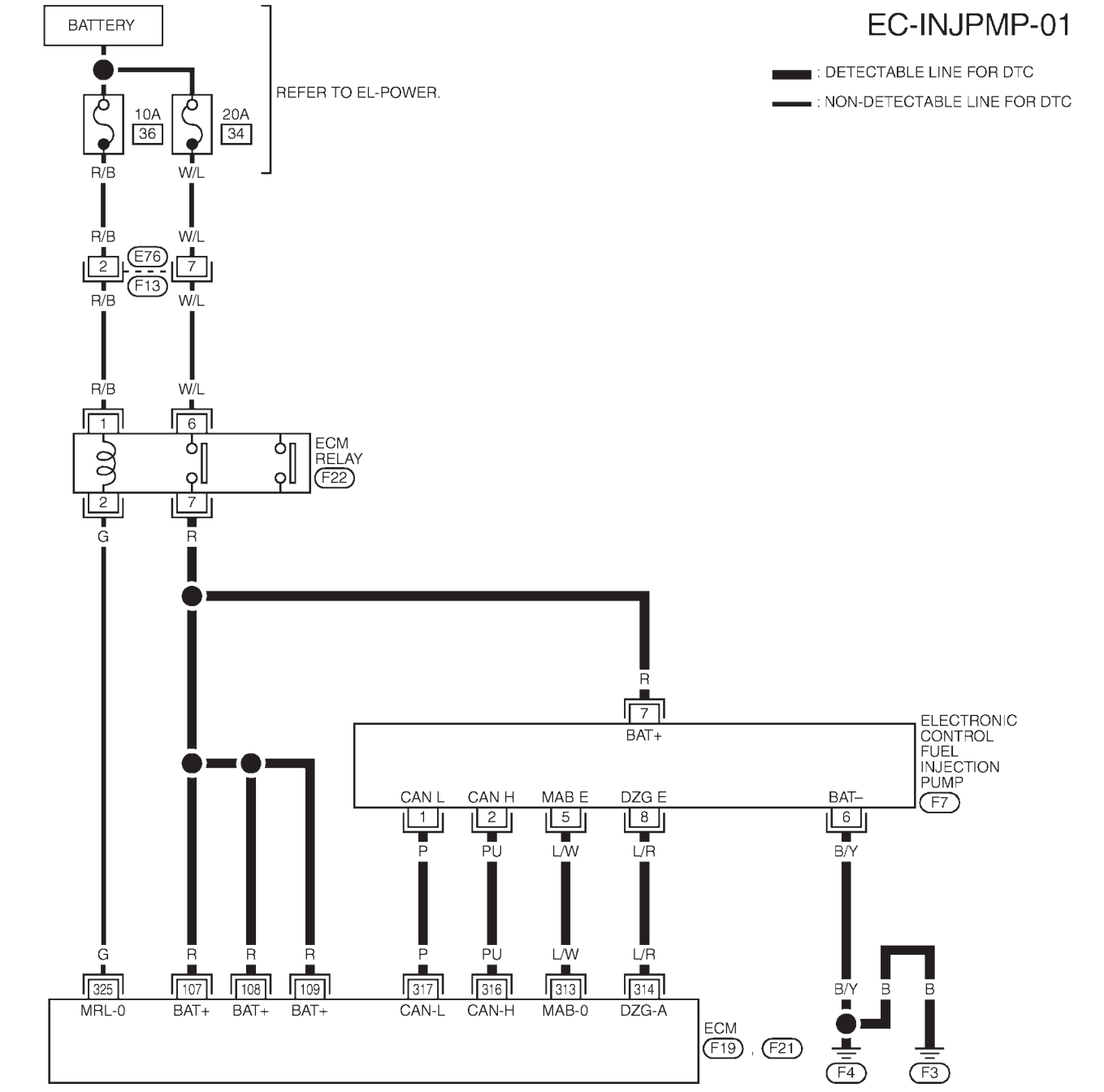
1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) Keep engine speed at more than 2,000 rpm for at least 10 seconds.
4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
6) If DTC is detected, go to "Diagnostic Procedure", EC-1223.

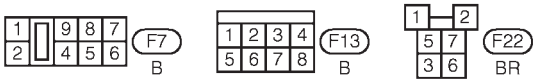
Wiring Diagram

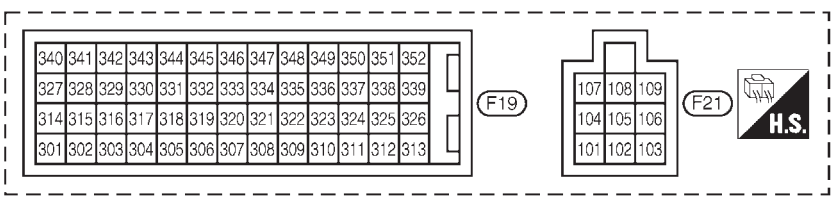
NLEC0732

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0732S01





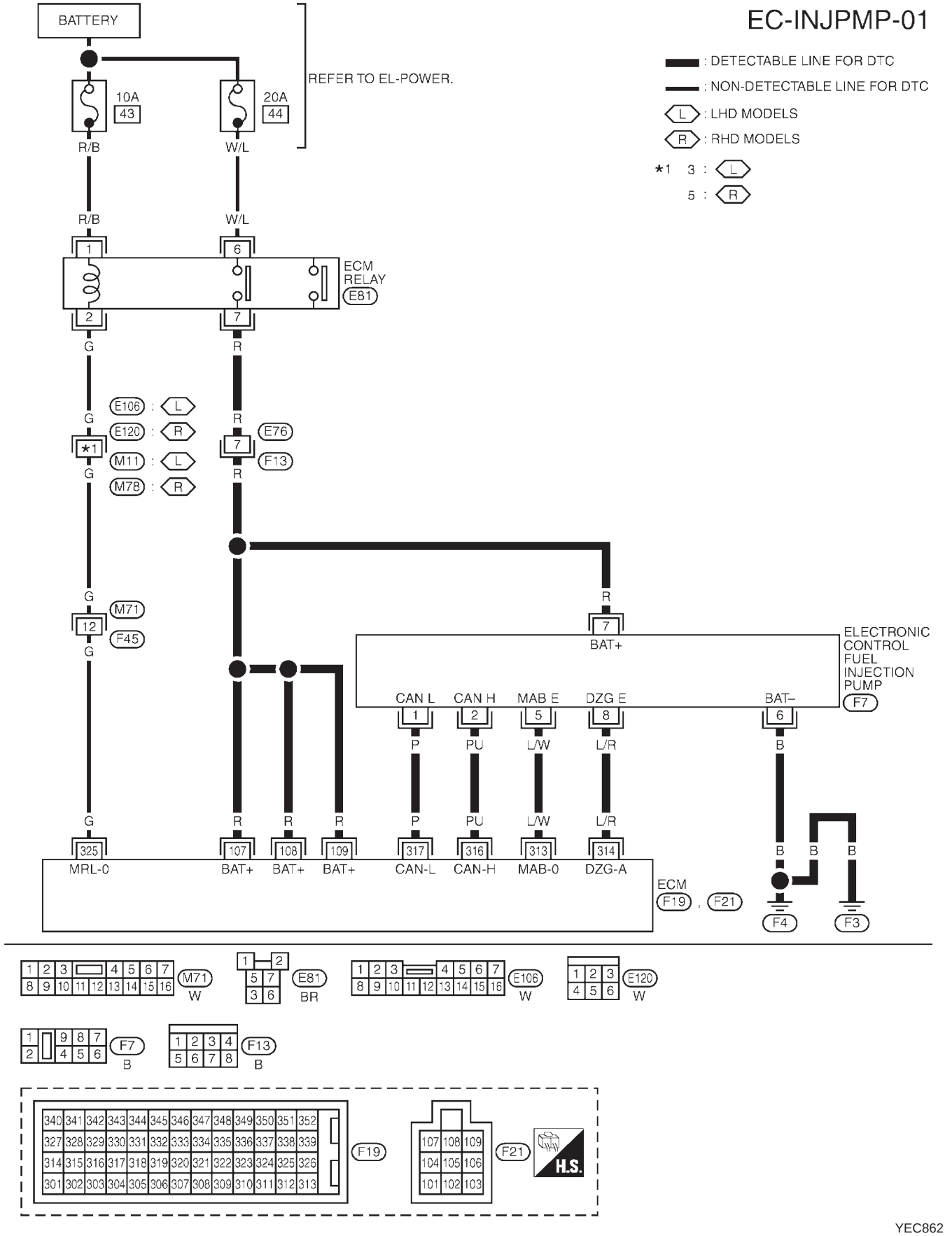


YEC726

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0732S02



YEC862

Diagnostic Procedure

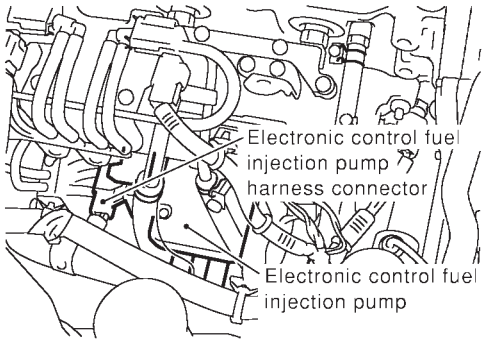
NLEC0733

1	INSPECTION START
1. Turn ignition switch “OFF”. 2. Perform “AIR BREEDING”, EC-1094, and “WATER DRAINING”, EC-1094.	
▶	GO TO 2.

2	PERFORM DTC CONFIRMATION PROCEDURE AGAIN
Perform “DTC Confirmation Procedure”, EC-1219 again.	
OK or NG	
OK ▶	**INSPECTION END**
NG ▶	GO TO 3.

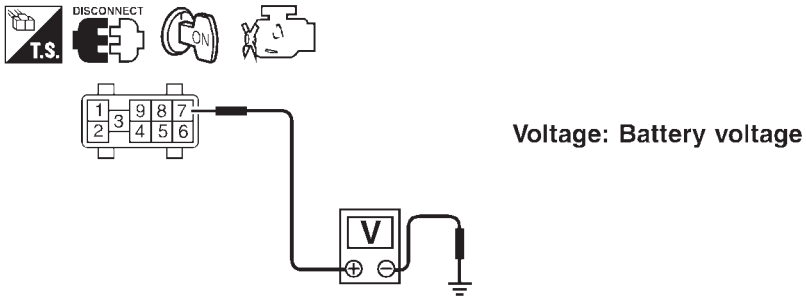
3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEF390Y

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



Voltage: Battery voltage

SEF438Y

OK or NG

OK ▶	GO TO 5.
NG ▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E76, F13 (where fitted) ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	317
2	316
5	313
8	314

MTBL0462

Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

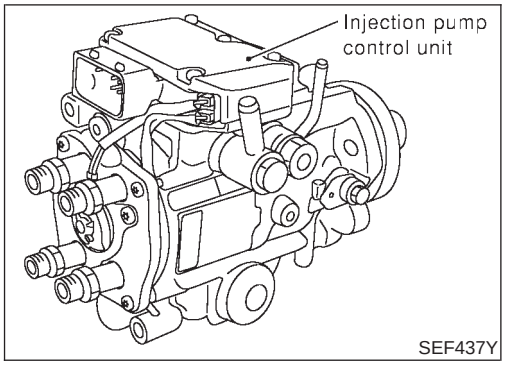
OK	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

OK or NG

OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

NLEC0714

SYSTEM DESCRIPTION

NLEC0714S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NLEC0714S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NLEC0714S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NLEC0714S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NLEC0714S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0715

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°CA
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

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

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	● Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

NLEC0716

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

CAUTION:

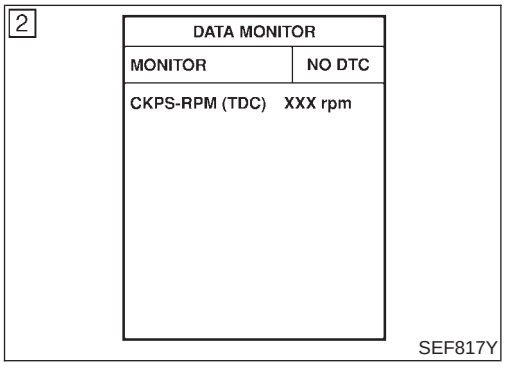
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NLEC0717

DTC	Malfunction is detected when	Check Items (Possible cause)
P1251 0704	● Spill valve (Built-into electronic control fuel injection pump) does not function properly.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump



DTC Confirmation Procedure

NLEC0718

WITH CONSULT-II

NLEC0718S01

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
4) If DTC is detected, go to "Diagnostic Procedure", EC-1230.

WITHOUT CONSULT-II

NLEC0718S02

1) Turn ignition switch "ON" and wait at least 2 seconds.

2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1230.

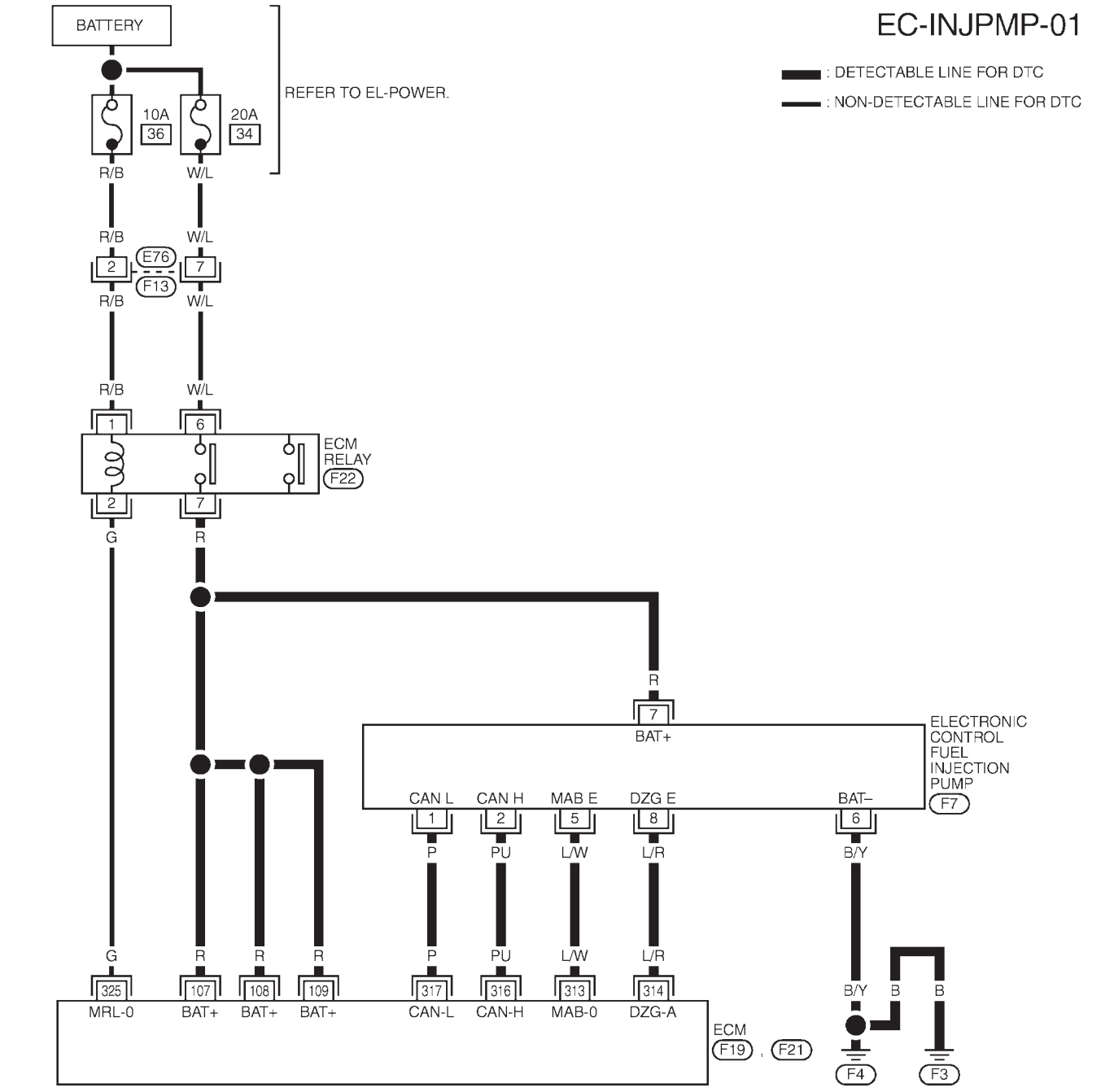
Wiring Diagram

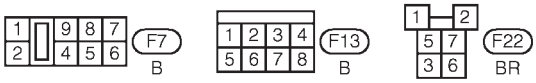
NLEC0719

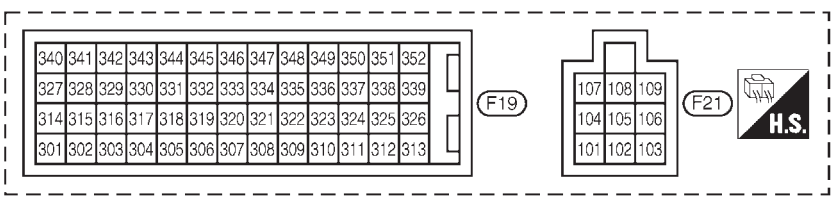
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0719S01

EC-INJPMP-01



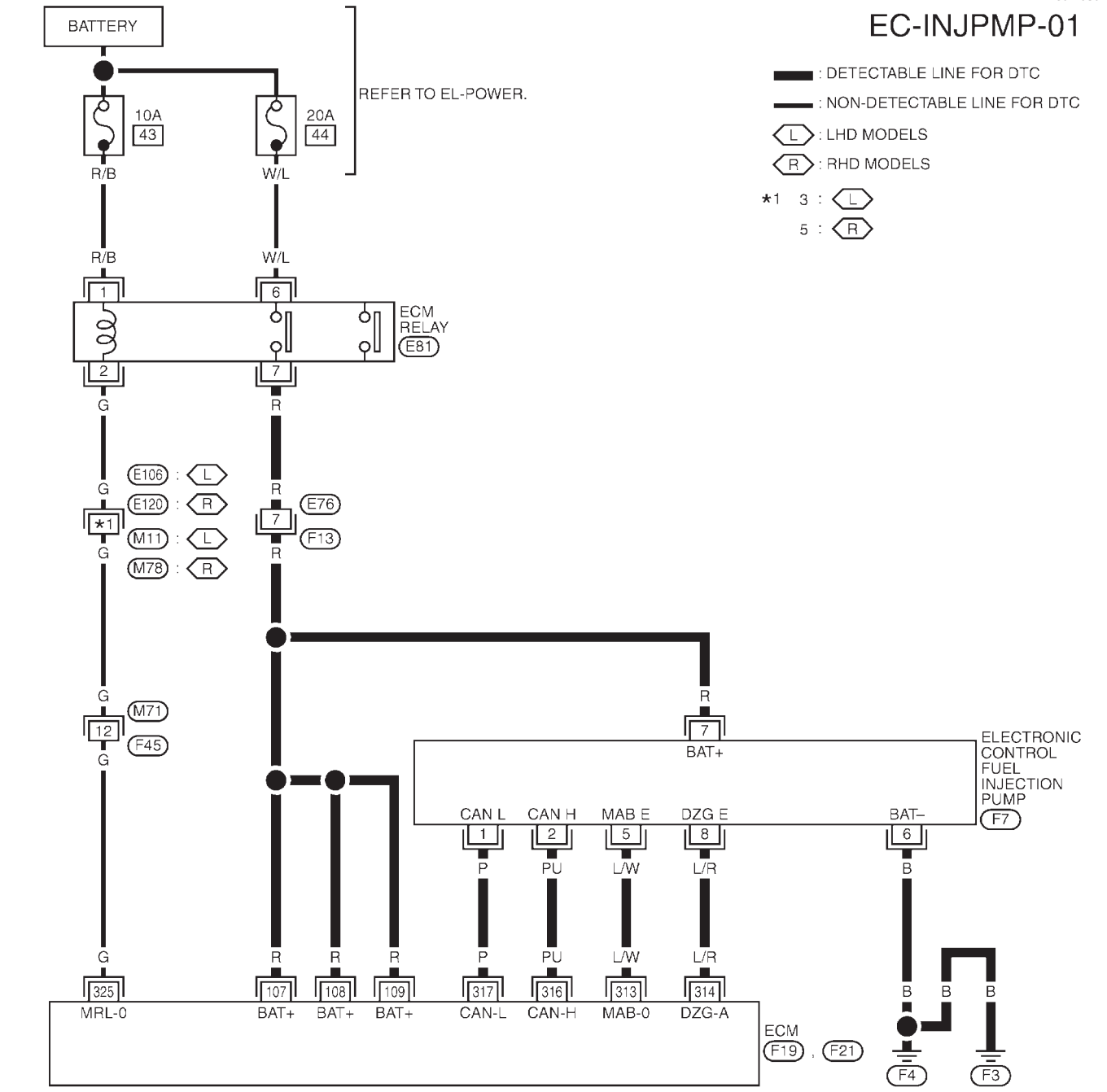


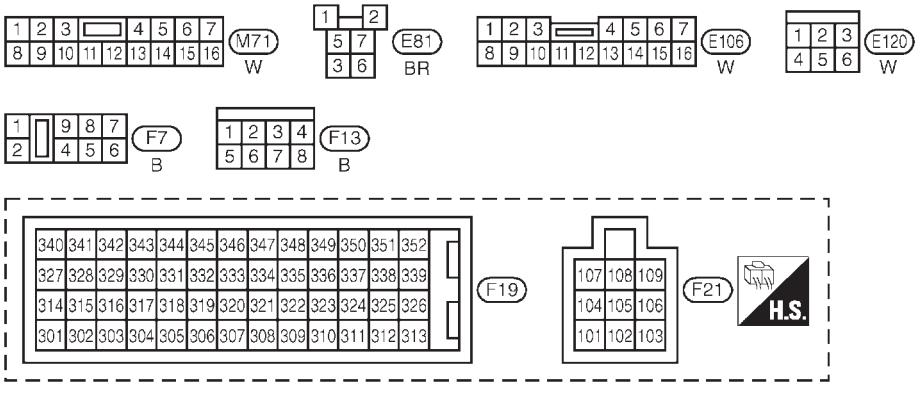


YEC726

MODELS WITH ECM IN CABIN

NLEC0719S02





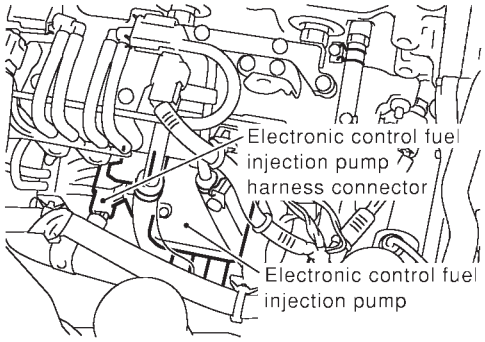
YEC862

Diagnostic Procedure

NLEC0720

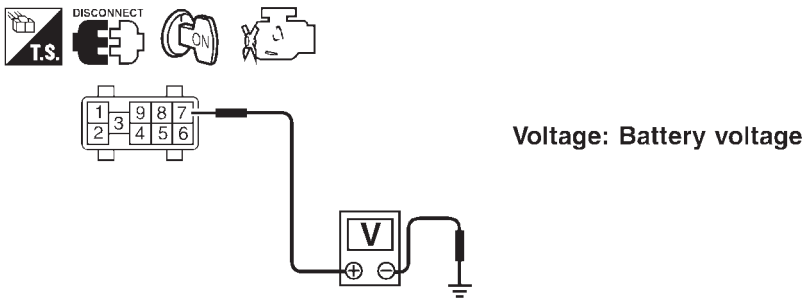
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEF390Y

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



Voltage: Battery voltage

SEF438Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

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

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	317
2	316
5	313
8	314

MTBL0462

Continuity should exist.

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

OK or NG

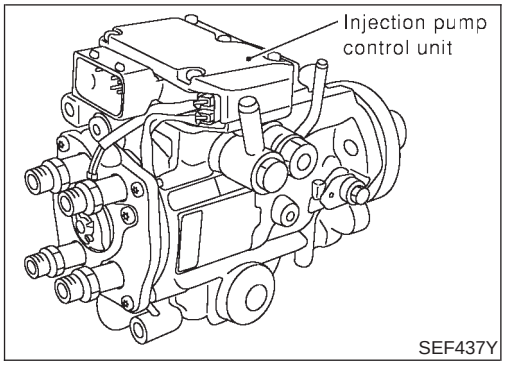
OK	▶	GO TO 5.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

OK or NG

OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

NLEC0700

SYSTEM DESCRIPTION

NLEC0700S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NLEC0700S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NLEC0700S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NLEC0700S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NLEC0700S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0701

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°CA
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	● Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

NLEC0702

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

CAUTION:

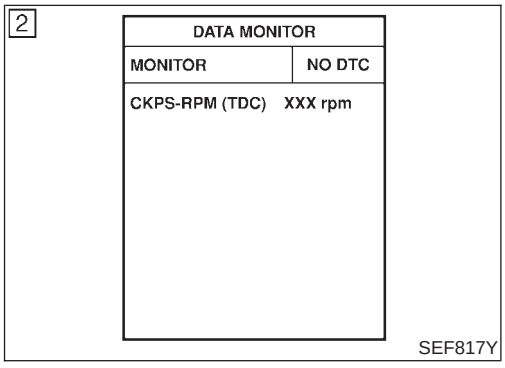
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NLEC0703

DTC	Malfunction is detected when	Check Items (Possible cause)
P1337 0702	● Injection pump control unit input signal [Crankshaft position sensor (TDC) signal] processing function is malfunctioning.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump



DTC Confirmation Procedure

NLEC0704

WITH CONSULT-II

NLEC0704S01

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
4) If DTC P0335 is detected, go to "Diagnostic procedure", EC-1169.
If DTC P1337 is detected, go to "Diagnostic Procedure", EC-1237.

WITHOUT CONSULT-II

NLEC0704S02

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC P0335 is detected, go to "Diagnostic Procedure", EC-1169.
   If DTC P1337 is detected, go to "Diagnostic Procedure", EC-1237.

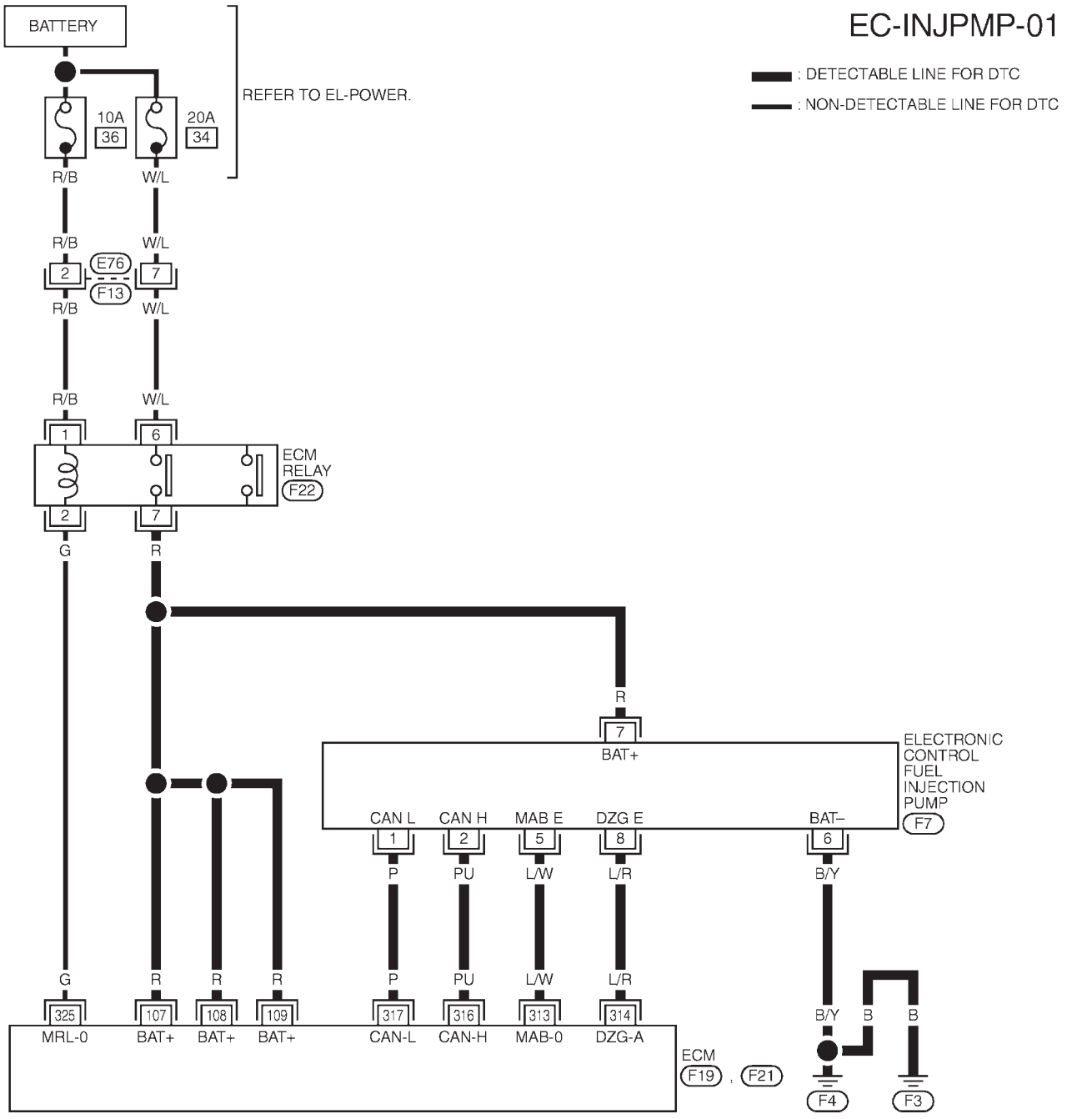
Wiring Diagram

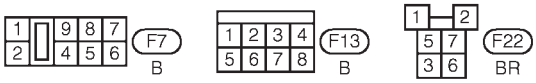
NLEC0705

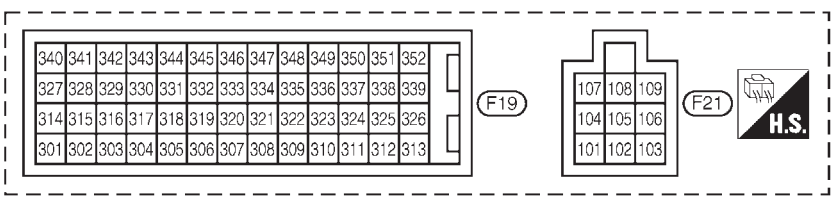
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0705S01

EC-INJPMP-01





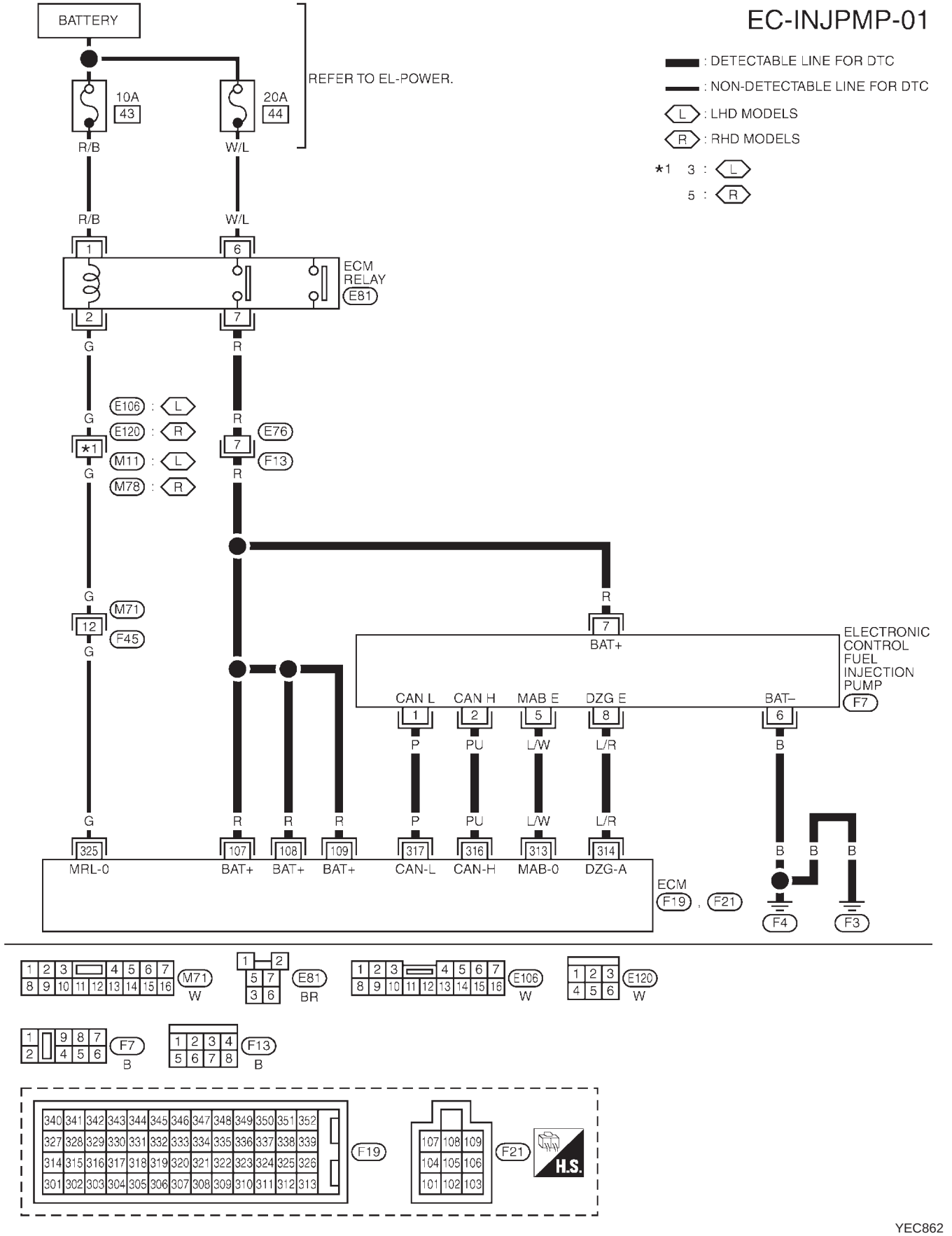


YEC726

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0705S02



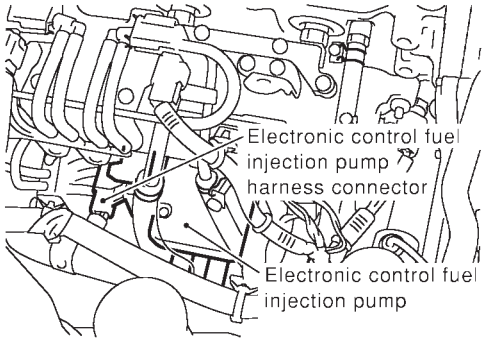
YEC862

Diagnostic Procedure

NLEC0706

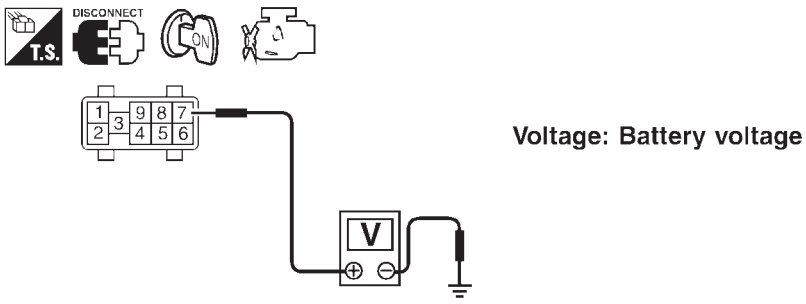
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEF390Y

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



Voltage: Battery voltage

SEF438Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

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

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

Diagnostic Procedure (Cont'd)

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	317
2	316
5	313
8	314

MTBL0462

Continuity should exist.

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

OK or NG

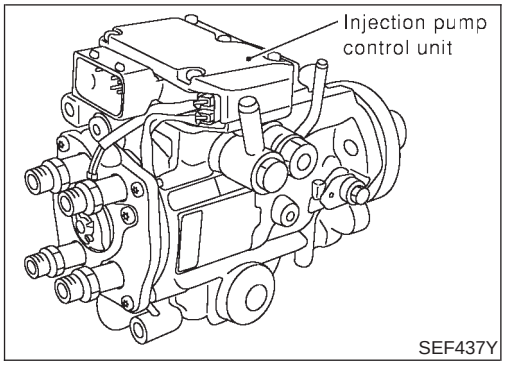
OK	▶	GO TO 5.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

OK or NG

OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

NLEC0693

SYSTEM DESCRIPTION

NLEC0693S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NLEC0693S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NLEC0693S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NLEC0693S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NLEC0693S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0694

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°CA
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

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

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	● Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

NLEC0695

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

CAUTION:

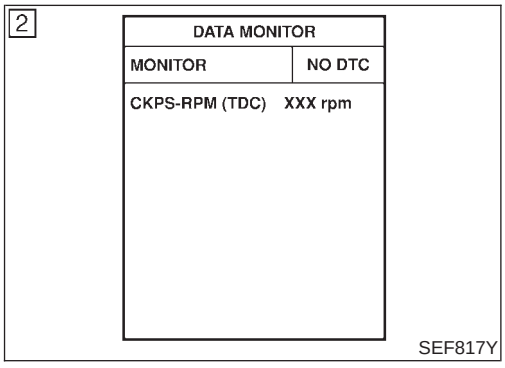
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NLEC0696

DTC	Malfunction is detected when	Check Items (Possible cause)
P1341 0701	● An improper voltage signal from cam position sensor (Built-into electronic control fuel injection pump) is sent to injection pump control unit.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump



DTC Confirmation Procedure

NLEC0697

WITH CONSULT-II

NLEC0697S01

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
4) If DTC is detected, go to "Diagnostic Procedure", EC-1244.

WITHOUT CONSULT-II

NLEC0697S02

1) Turn ignition switch "ON" and wait at least 2 seconds.

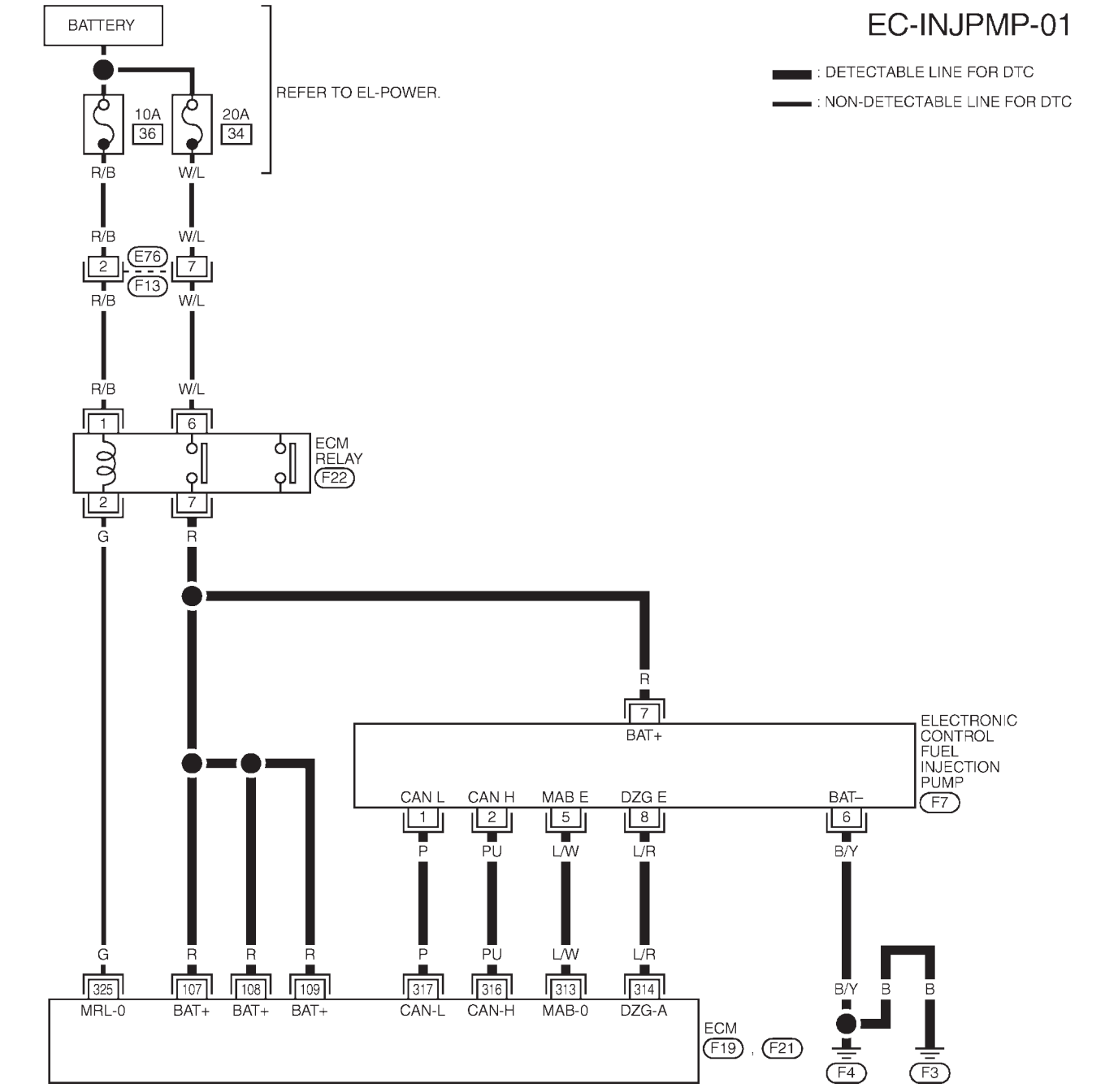
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1244.

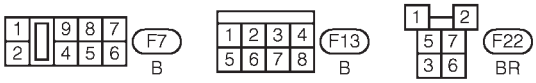
Wiring Diagram

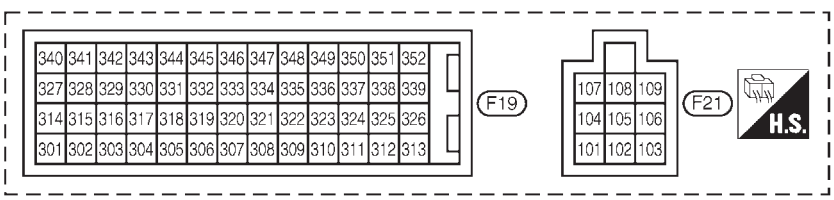
NLEC0698

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0698S01



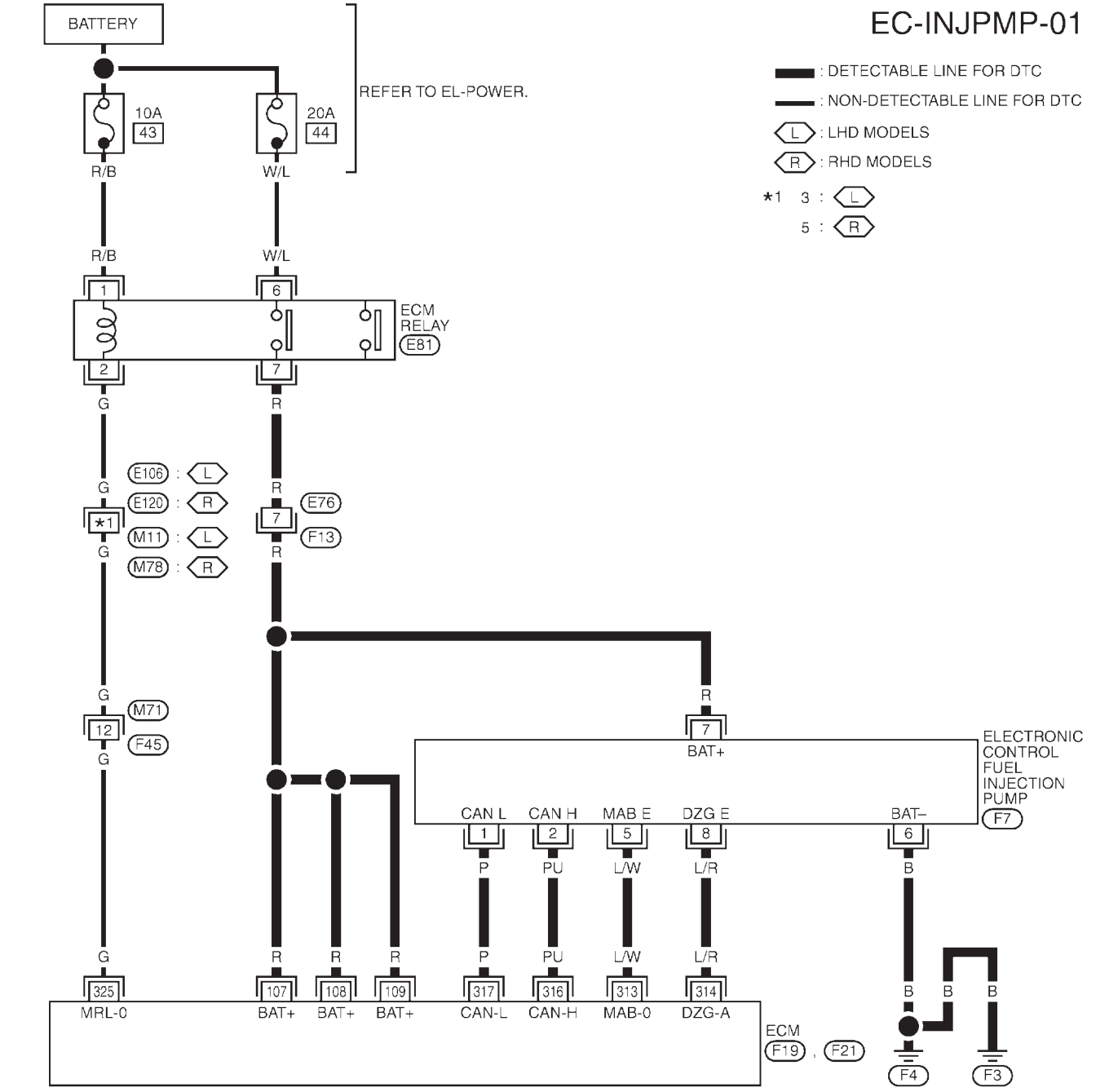


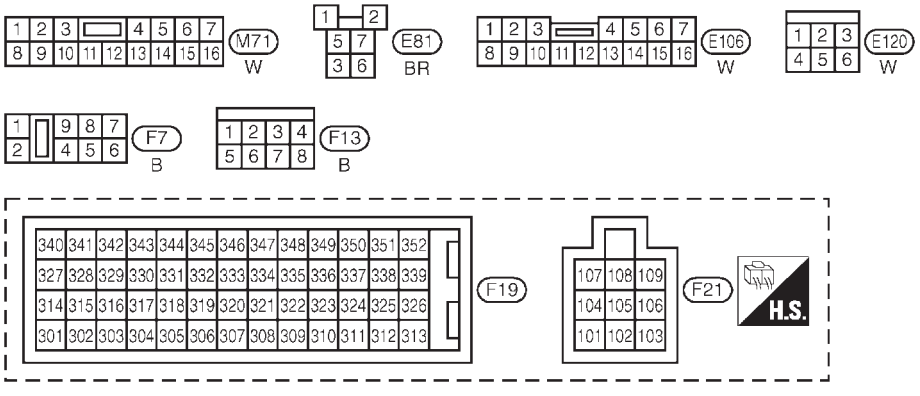


YEC726

MODELS WITH ECM IN CABIN

NLEC0698S02





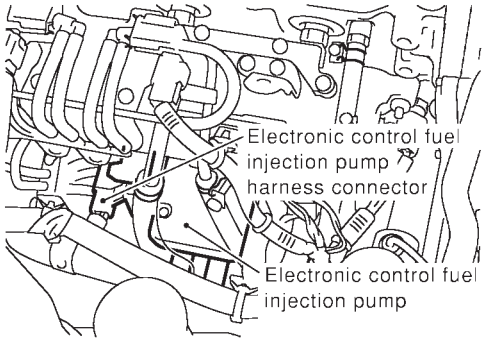
YEC862

Diagnostic Procedure

NLEC0699

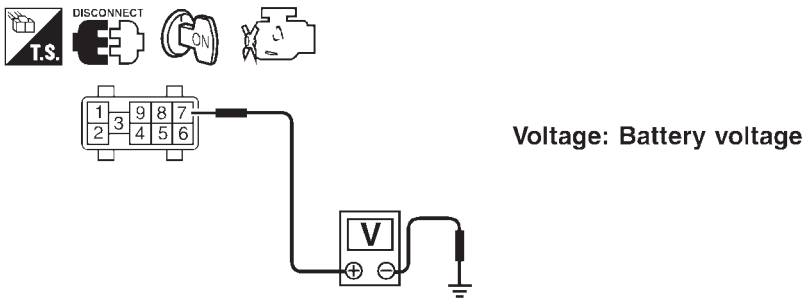
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEF390Y

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



Voltage: Battery voltage

SEF438Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

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

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	317
2	316
5	313
8	314

MTBL0462

Continuity should exist.

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

OK or NG

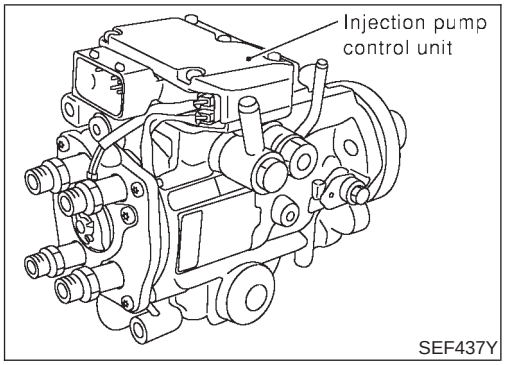
OK	▶	GO TO 5.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

OK or NG

OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

NLEC0707

SYSTEM DESCRIPTION

NLEC0707S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NLEC0707S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NLEC0707S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NLEC0707S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NLEC0707S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0708

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 12 - 13°CA
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	● Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

NLEC0709

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

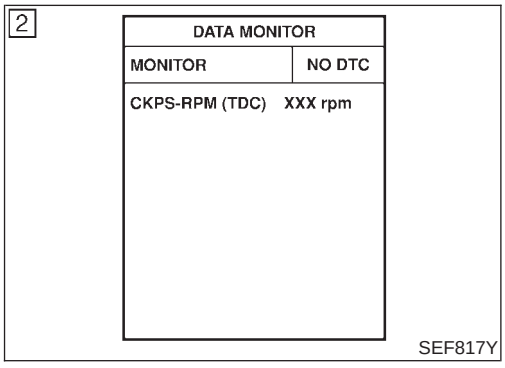
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NLEC0710

DTC	Malfunction is detected when	Check Items (Possible cause)
P1600 0703	● Injection pump control unit receives incorrect voltage signal from ECM continuously.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump



DTC Confirmation Procedure

NLEC0711

WITH CONSULT-II

NLEC0711S01

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
4) If DTC is detected, go to "Diagnostic Procedure", EC-1251.

WITHOUT CONSULT-II

NLEC0711S02

1) Turn ignition switch "ON" and wait at least 2 seconds.

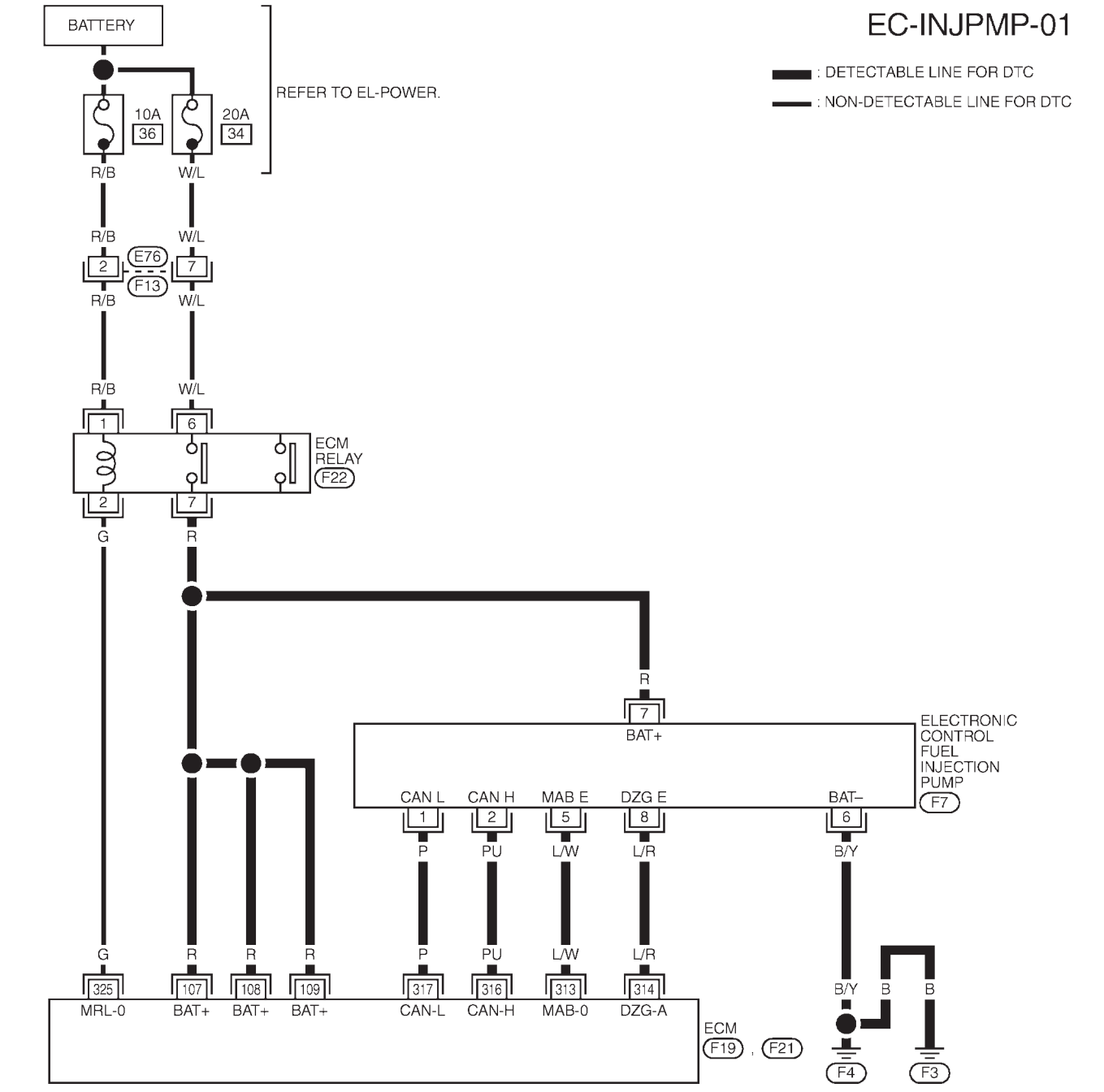
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1251.

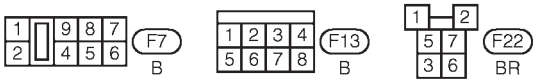
Wiring Diagram

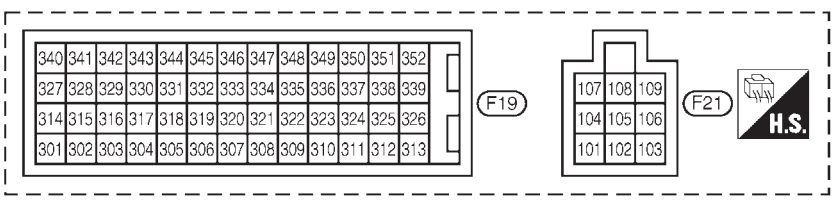
NLEC0712

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0712S01





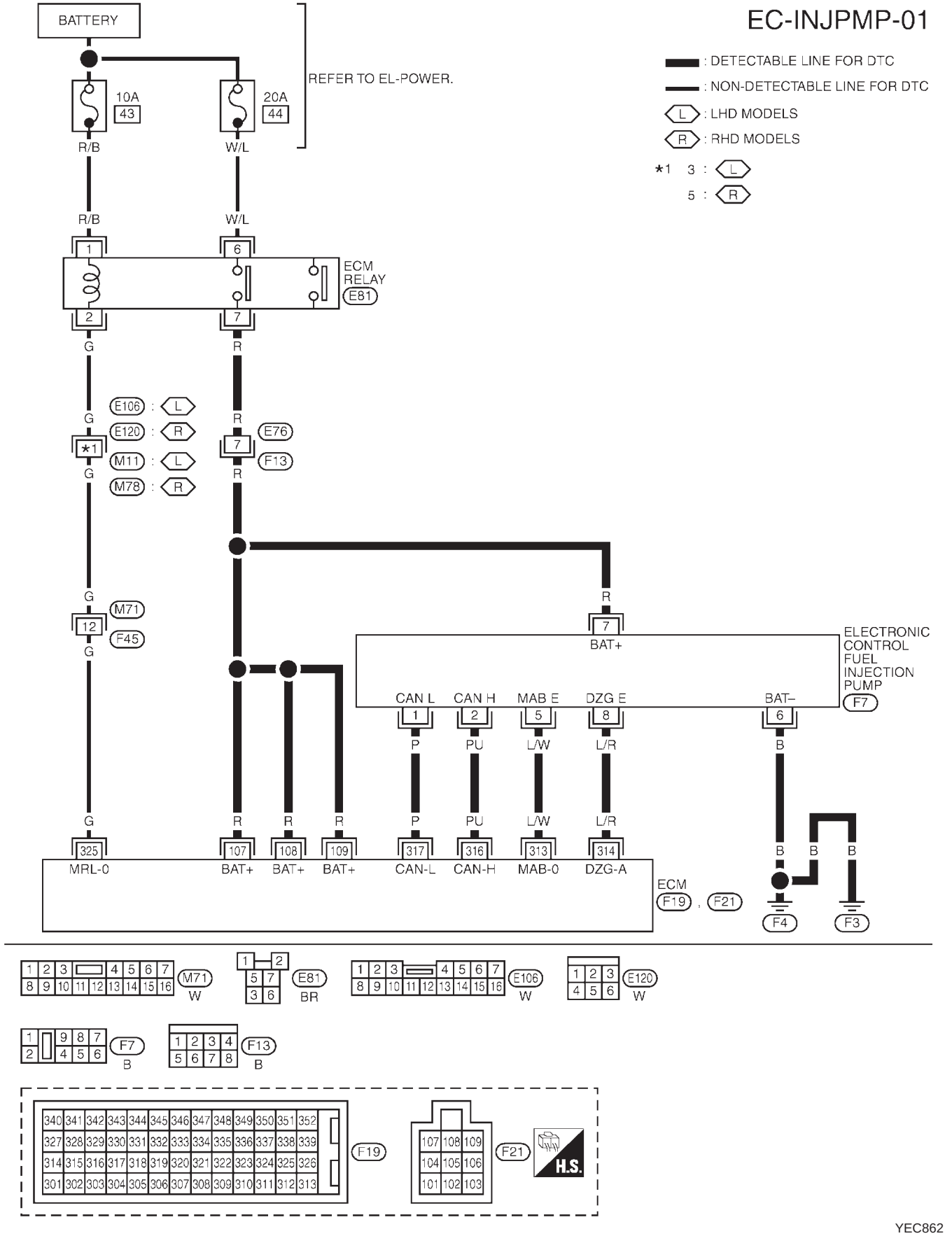


YEC726

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0712S02



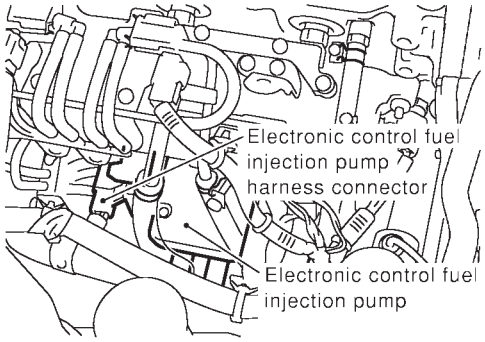
YEC862

Diagnostic Procedure

NLEC0713

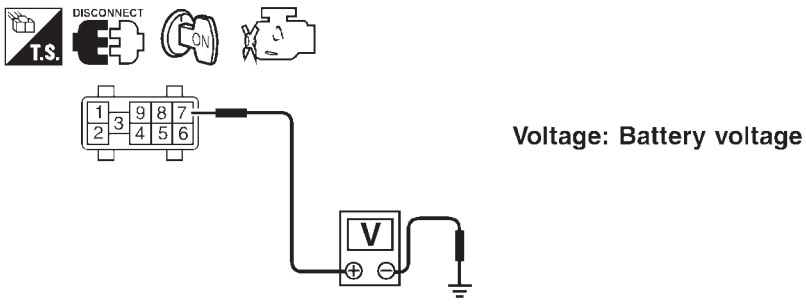
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEF390Y

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



Voltage: Battery voltage

SEF438Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	317
2	316
5	313
8	314

MTBL0462

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

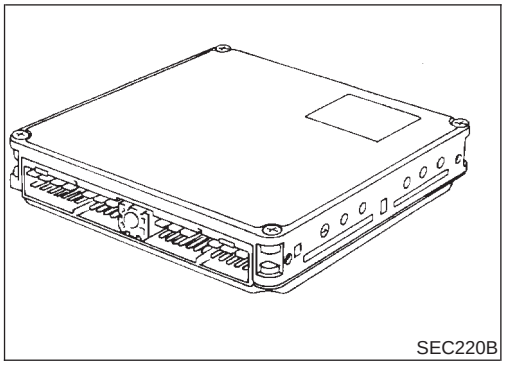
OK	▶	GO TO 5.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

OK or NG

OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.


SEC220B

Description

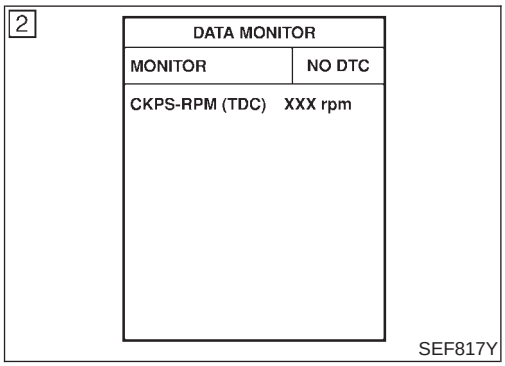
NLEC0668

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

NLEC0669

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1603 0901	● ECM calculation function is malfunctioning.	● ECM (ECCS-D control module)
P1607 0301		



SEF817Y

DTC Confirmation Procedure

NLEC0670

WITH CONSULT-II

NLEC0670S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 2 seconds.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-1254.

WITHOUT CONSULT-II

NLEC0670S02

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and wait at least 2 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-1254.

Diagnostic Procedure

NLEC0671

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”, EC-1253, again. 5. Is the DTC P1603 or P1607 displayed again?	
Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-1253, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0301 or 0901 displayed again?	
Yes or No	
Yes ▶	Replace ECM.
No ▶	**INSPECTION END**

ECM Terminals and Reference Value

NLEC0744

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

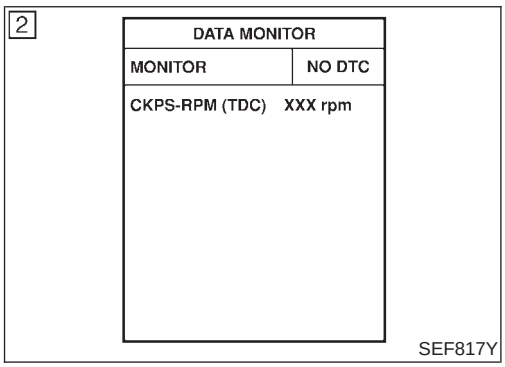
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
107 108 109	R R R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
325	G	ECM relay (Self-shutoff)	**[Ignition switch "ON"]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
507	W/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NLEC0745

DTC	Malfunction is detected when	Check Items (Possible Cause)
P1620 0902	● An irregular voltage signal from the ECM relay is sent to ECM.	● Harness or connectors (ECM relay circuit is open or shorted.) ● ECM relay



DTC Confirmation Procedure

NLEC0746

WITH CONSULT-II

NLEC0746S01

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
4) If DTC is detected, go to "Diagnostic Procedure", EC-1258.

WITHOUT CONSULT-II

NLEC0746S02

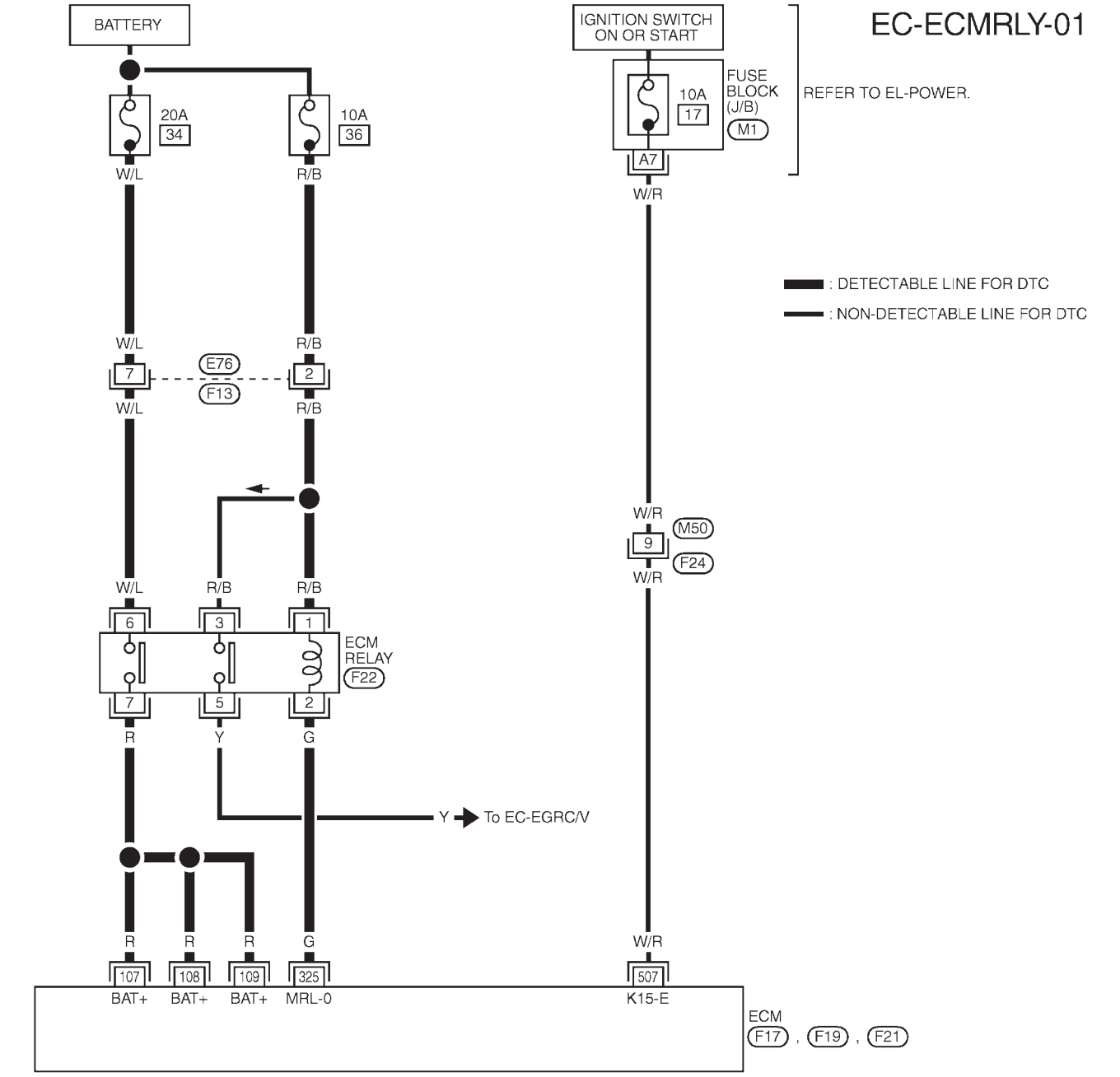
1) Turn ignition switch "ON".
2) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-1258.

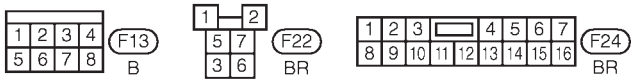
Wiring Diagram

NLEC0747

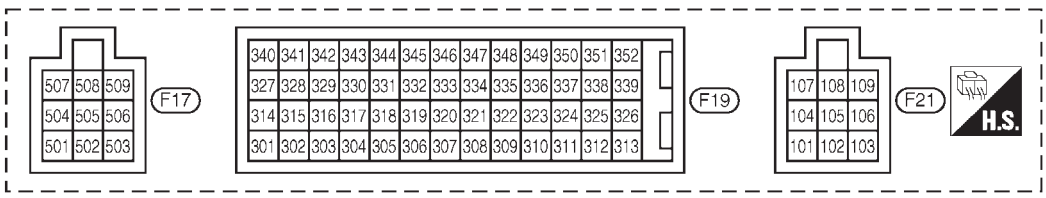
MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0747S01





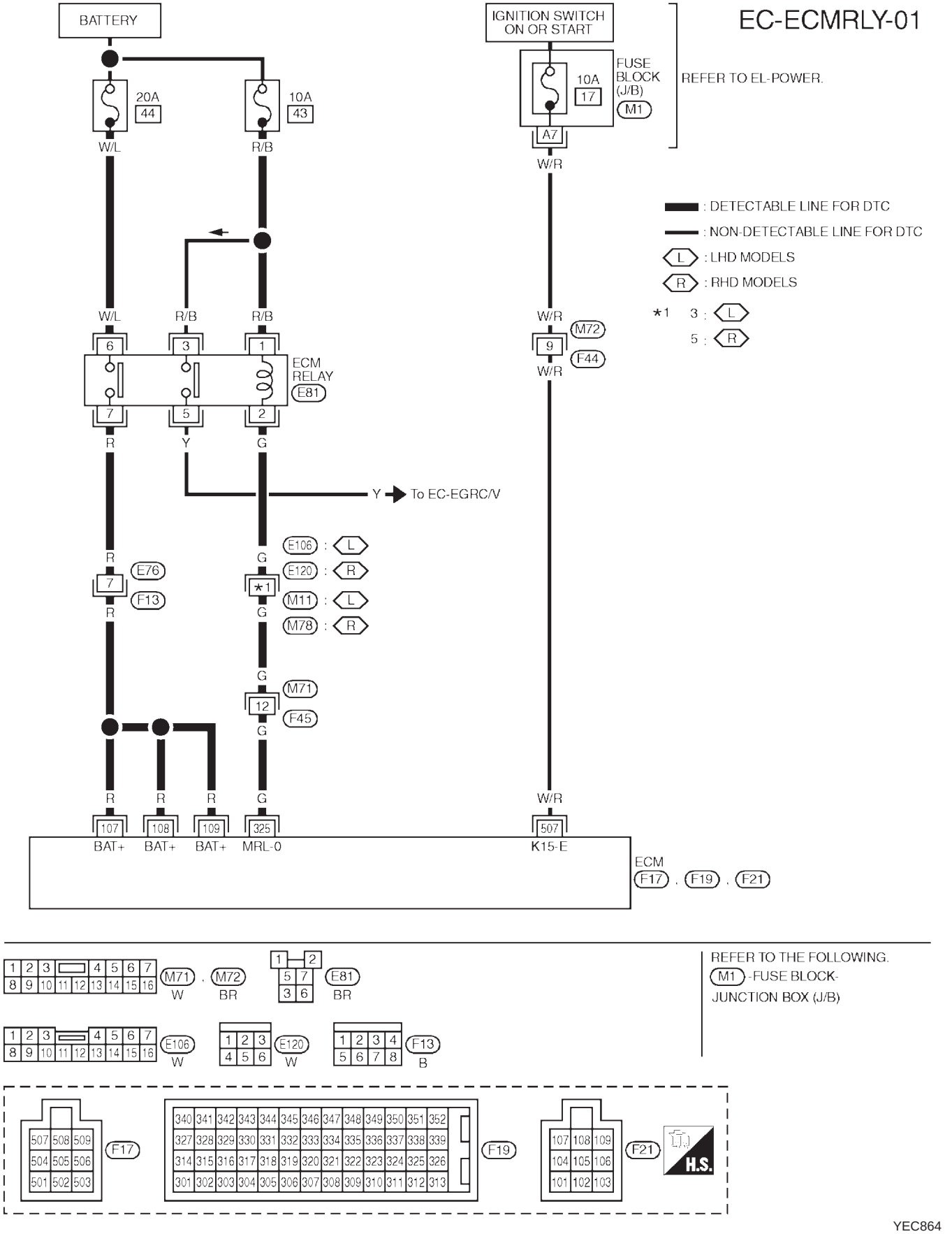
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)



YEC730

MODELS WITH ECM IN CABIN

NLEC0747S02



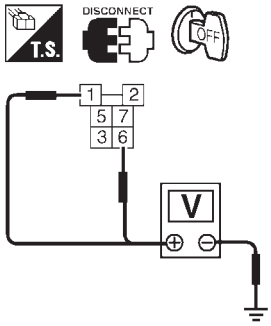
YEC864

Diagnostic Procedure

NLEC0748

1	CHECK ECM POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay. (For ECM relay location, refer to “Engine control component parts location”, EC-1071.)
3. Check voltage between ECM terminals 1, 6 and ground with CONSULT-II or tester.



Voltage: Battery Voltage

SEF399Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- 10A fuse
- 20A fuse
- Harness for open and short between ECM relay and battery

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ECM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 107, 108, 109 and ECM relay terminal 7. 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 ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 325 and ECM relay terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

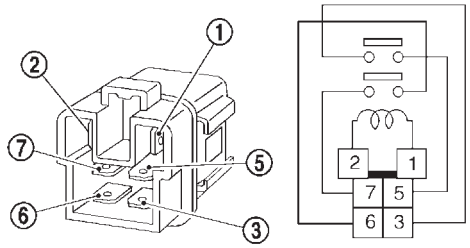
OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M11, E106 (LHD models) (where fitted) ● Harness connectors M78, E120 (RHD models) (where fitted) ● Harness connectors M71, F45 (where fitted) ● Harness for open and short between ECM relay and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	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.



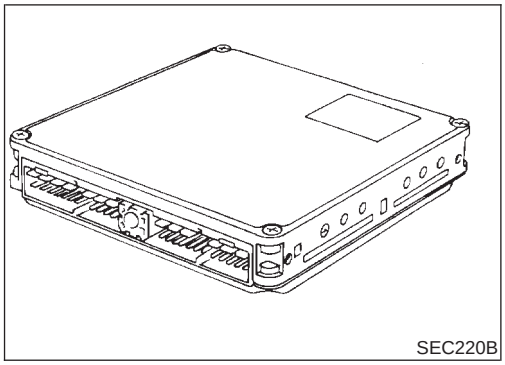
Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

SEF296X

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace ECM relay.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**



SEC220B

Description

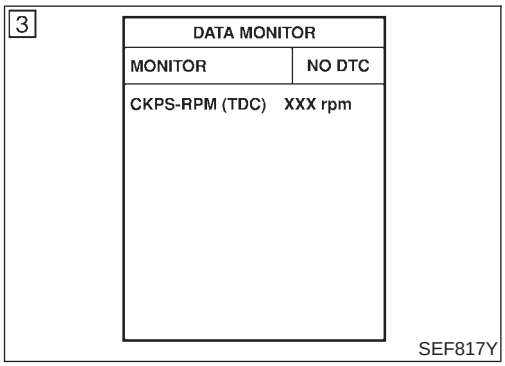
NLEC0749

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

NLEC0750

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1621 0903	● ECM input signal processing function is malfunctioning.	● ECM (ECCS-D control module)



SEF817Y

DTC Confirmation Procedure

NLEC0751

WITH CONSULT-II

NLEC0751S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Turn ignition switch “OFF”, wait at least 20 seconds and then turn “ON”.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-1261.

WITHOUT CONSULT-II

NLEC0751S02

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Turn ignition switch “OFF”, wait at least 20 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-1261.

Diagnostic Procedure

NLEC0752

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”, EC-1260, again. 5. Is the DTC P1621 displayed again?		
Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-1260, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0903 displayed again?		
Yes or No		
Yes	▶	Replace ECM.
No	▶	**INSPECTION END**

On Board Diagnosis Logic

NLEC1258

The ECM checks if battery voltage is within the tolerance range for the engine control system.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1660 0502	● An abnormally high or low voltage from the battery is sent to ECM.	● Incorrect jump starting ● Battery ● Alternator ● ECM

DTC Confirmation Procedure

NLEC1259

With CONSULT-II

1) Check the following.

- Jumper cables are connected for jump starting.
- Battery or alternator has been replaced.

If the result is “Yes” for one item or more, skip the following steps and go to “Diagnostic Procedure”, EC-1262.

2) Check that the positive battery terminal is connected to battery properly. If NG, reconnect it properly.
3) Check that the alternator functions properly. Refer to SC-27, “Trouble Diagnosis”.
4) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
5) Wait one minute.
6) If DTC is detected, go to “Diagnostic Procedure”, EC-1262.
   If DTC is not detected, go to next step.
7) Start engine and wait one minute at idle.
8) If DTC is detected, go to “Diagnostic Procedure”, EC-1262.

Without CONSULT-II

1) Check the following.

- Jumper cables are connected for jump starting.
- Battery or alternator has been replaced.

If the result is “Yes” for one item or more, skip the following steps and go to “Diagnostic Procedure”, EC-1262.

2) Check that the positive battery terminal is connected to battery properly. If NG, reconnect it properly.
3) Check that the alternator functions properly. Refer to SC-27, “Trouble Diagnosis”.
4) Turn ignition switch “ON” and wait one minute.
5) Turn ignition switch “OFF”, wait 5 seconds and then turn “ON”.
6) Perform “Diagnostic Test Mode II (Self-diagnostic result)” with ECM.
7) If DTC is detected, go to “Diagnostic Procedure”, EC-1262.
   If DTC is not detected, go to next step.
8) Start engine and wait one minute at idle.
9) Turn ignition switch “OFF”, wait 5 seconds and then turn “ON”.
10) Perform “Diagnostic Test Mode II (Self-diagnostic result)” with ECM.
11) If DTC is detected, go to “Diagnostic Procedure”, EC-1262.

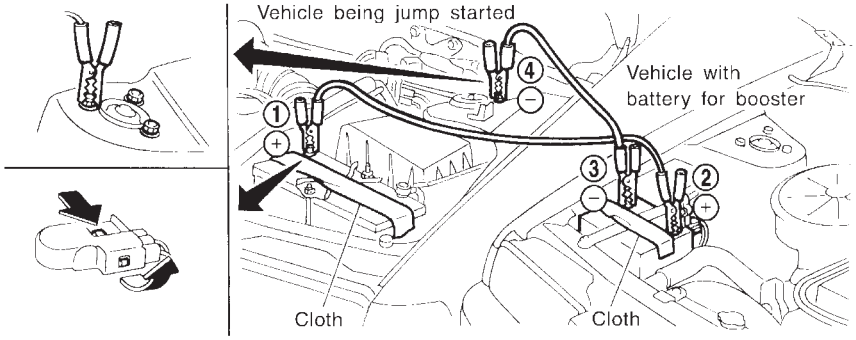
Diagnostic Procedure

NLEC1260

1	INSPECTION START	
Are jumper cables connected for the jump starting? **Yes or No**		
Yes	▶	GO TO 3.
No	▶	GO TO 2.

2	CHECK BATTERY AND ALTERNATOR	
Check that the proper type of battery and alternator is installed. Refer to SC-34, "Battery" and SC-34, "Alternator".		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace with a proper one.

3	CHECK JUMPER CABLES INSTALLATION	
Check that the jumper cables are connected in the correct sequence.		



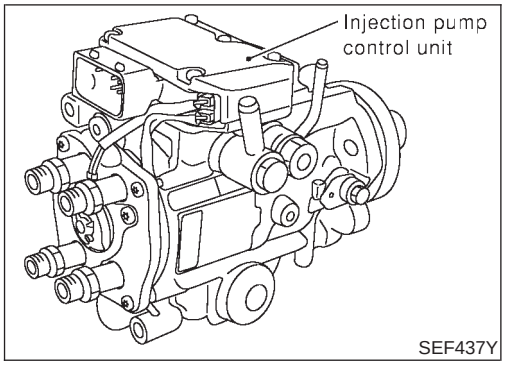
SEF439Z

OK or NG		
OK	▶	GO TO 4.
NG	▶	Reconnect jumper cables properly.

4	CHECK BATTERY FOR BOOSTER	
Check that the battery for the booster is a 12V battery.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Change the vehicle for booster.

5	PERFORM DTC CONFIRMATION PROCEDURE AGAIN	
Perform "DTC Confirmation Procedure", EC-1262, again.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Replace ECM.

6	CHECK ELECTRICAL PARTS DAMAGE	
Check the following for damage. ● Wiring harness and harness connectors for burn ● Fuses for short		
OK or NG		
OK	▶	**INSPECTION END**
NG	▶	Repair or replace malfunctioning part.



Description

NLEC0721

SYSTEM DESCRIPTION

NLEC0721S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NLEC0721S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NLEC0721S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NLEC0721S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NLEC0721S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0722

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°CA
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	● Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

NLEC0723

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

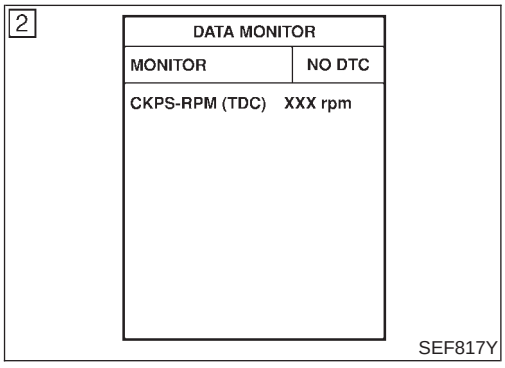
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NLEC0724

DTC	Malfunction is detected when	Check Items (Possible cause)
P1690 0705	● Injection pump control unit does not function properly.	● Electronic control fuel injection pump



DTC Confirmation Procedure

NLEC0725

WITH CONSULT-II

NLEC0725S01

1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
4) If DTC is detected, go to "Diagnostic Procedure", EC-1266.

WITHOUT CONSULT-II

NLEC0725S02

1) Turn ignition switch "ON" and wait at least 2 seconds.

2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-1266.

Diagnostic Procedure

NLEC0726

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", EC-1265, again. 5. Is the DTC P1690 displayed again?		
Without CONSULT-II 1. Turn ignition switch "ON". 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform "DTC Confirmation Procedure", EC-1265, again. 4. Perform "Diagnostic Test Mode II (Self-diagnostic results)". 5. Is the DTC 0705 displayed again?		
Yes or No		
Yes	▶	Replace electronic control fuel injection pump.
No	▶	**INSPECTION END**

Description

SYSTEM DESCRIPTION

NLEC0760

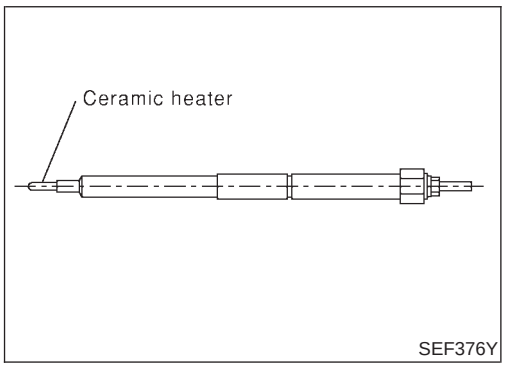
NLEC0760S01

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	Glow control	Glow lamp, Glow relay ↓ Glow plugs
Engine coolant temperature sensor	Engine coolant temperature		

When engine coolant temperature is more than approximately 75°C (167°F), the glow relay turns off.
When coolant temperature is lower than approximately 75°C (167°F):

- Ignition switch ON
  After ignition switch has turned to ON, the glow relay turns ON for a certain period of time in relation to engine coolant temperature, allowing current to flow through glow plug.
- Cranking
  The glow relay turns ON, allowing current to flow through glow plug.
- Starting
  After engine has started, current continues to flow through glow plug (after-glow mode) for a certain period in relation to engine coolant temperature.

The glow indicator lamp turns ON for a certain period of time in relation to engine cooalnt temperature at the time glow relay is turned ON.



COMPONENT DESCRIPTION

NLEC0760S02

Glow Plug

NLEC0760S0201

The glow plug is provided with a ceramic heating element to obtain a high-temperature resistance. It glows in response to a signal sent from the ECM, allowing current to flow through the glow plug via the glow relay.

ECM Terminals and Reference Value

NLEC0761

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.

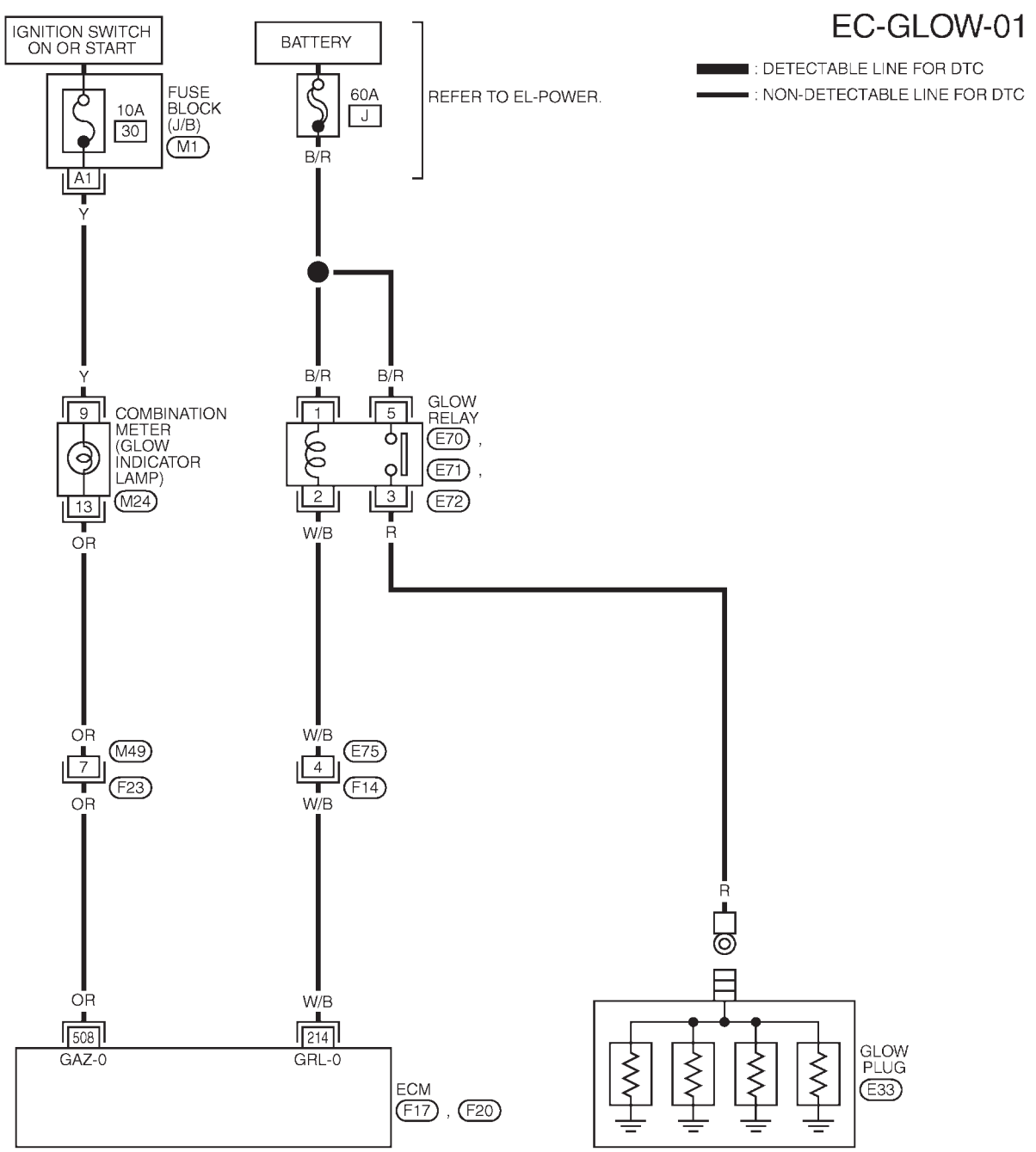
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
214	W/B	Glow relay	Refer to "SYSTEM DESCRIPTION", EC-1267.	
508	OR	Glow indicator lamp	**[Ignition switch "ON"]** ● Glow indicator lamp is "ON"	Approximately 1V
			[Ignition switch "ON"] ● Glow indicator lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)

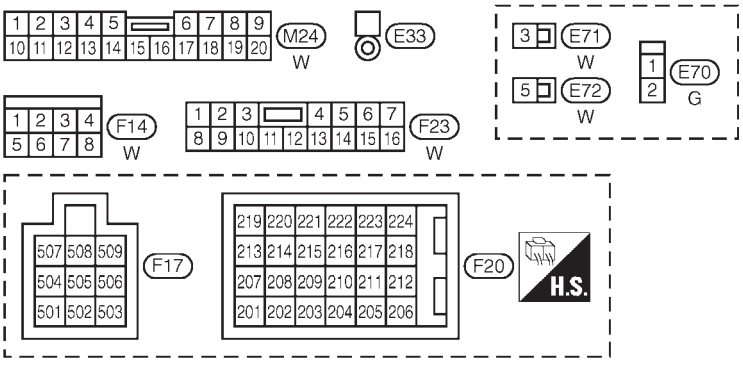
Wiring Diagram

NLEC0762

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0762S01



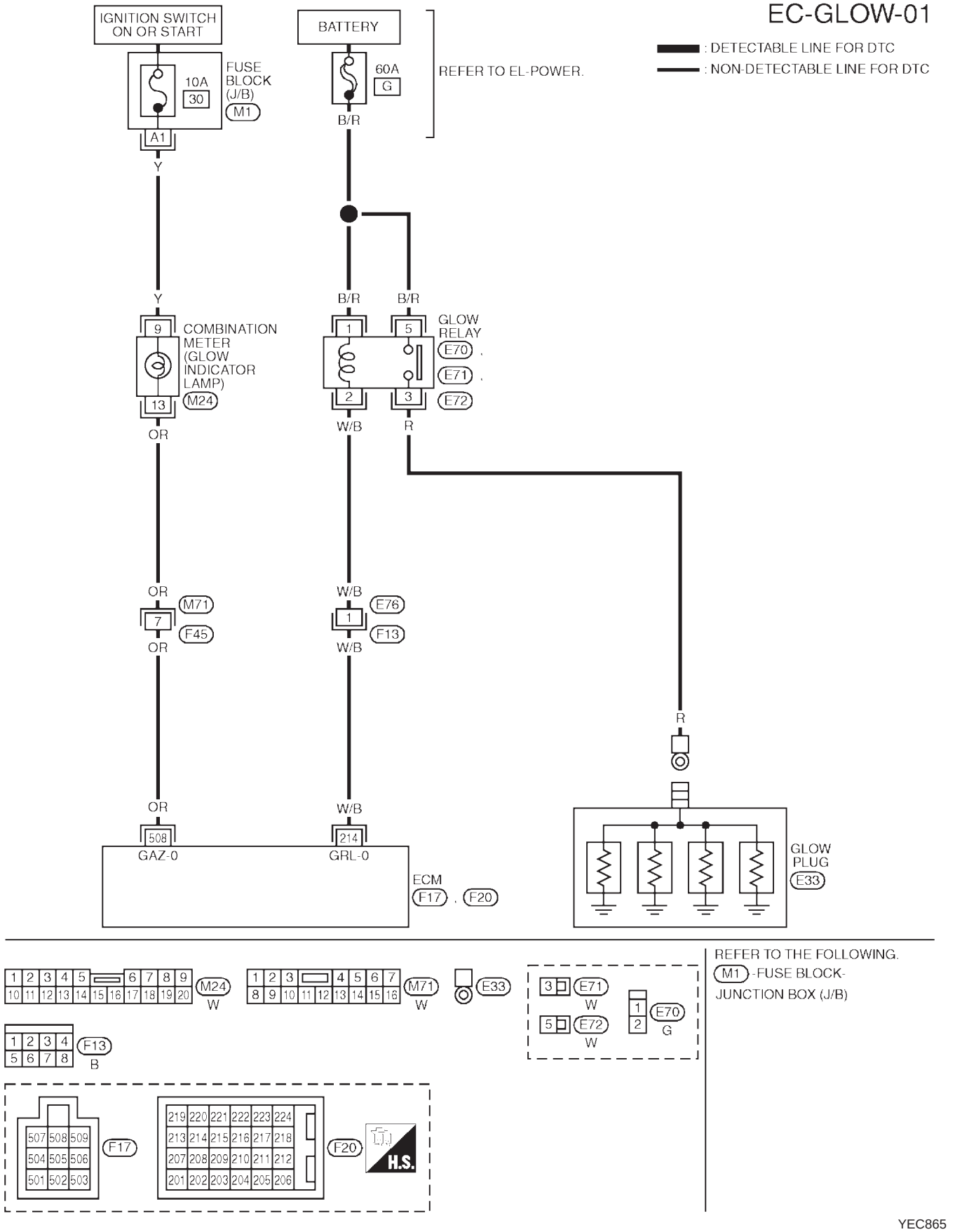


REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC731

MODELS WITH ECM IN CABIN

NLEC0762S02



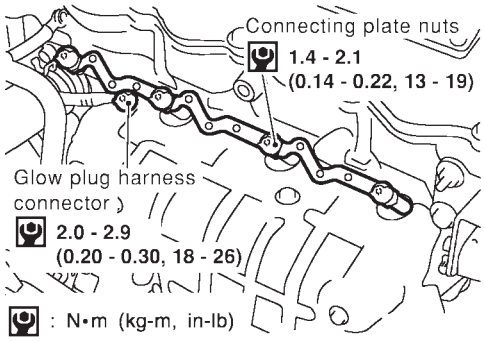
YEC865

Diagnostic Procedure

NLEC0763

1	INSPECTION START
Check fuel level, fuel supplying system, starter motor, etc.	
OK or NG	
OK ▶	GO TO 2.
NG ▶	Correct.

2	CHECK INSTALLATION
Check that glow plug nut and all glow plug connecting plate nuts are installed properly.	



SEF392YA

OK or NG	
OK (With CONSULT-II) ▶	GO TO 3.
OK (Without CONSULT-II) ▶	GO TO 4.
NG ▶	Install properly.

3	CHECK GLOW INDICATOR LAMP OPERATION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
3. Confirm that “COOLAN TEMP/S” indicates below 75°C (167°F). If it indicates above 75°C (167°F), cool down engine.

DATA MONITOR	
MONITOR	NO DTC
COOLAN TEMP/S	XXX °C

SEF013Y

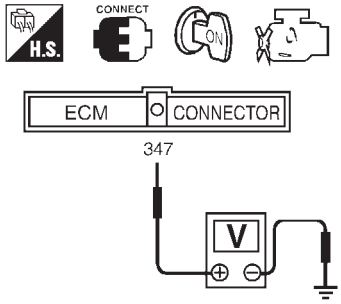
4. Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
5. Make sure that glow indicator lamp is turned “ON” for 1.5 seconds or more after turning ignition switch “ON”, and then turned “OFF”.

OK or NG	
OK ▶	GO TO 5.
NG ▶	GO TO 6.

4	CHECK GLOW INDICATOR LAMP OPERATION

Without CONSULT-II

1. Turn ignition switch "ON".
2. Confirm that the voltage between ECM terminal 347 (Engine coolant temperature sensor signal) and ground is above 1.36V. If it is below 1.36V, cool down engine.



Voltage: More than 1.36V

SEF442Z

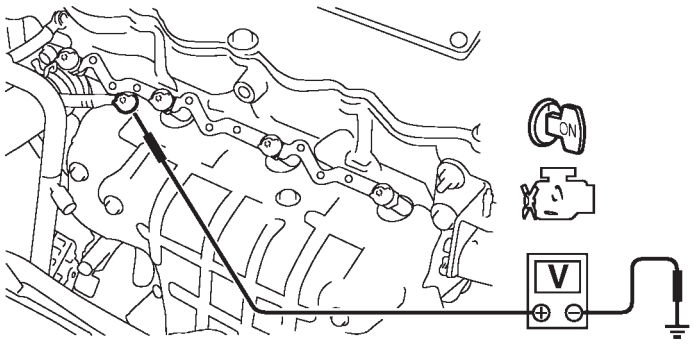
3. Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4. Make sure that glow indicator lamp is turned "ON" for 1.5 seconds or more after turning ignition switch "ON", and then turned "OFF".

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 6.

5	CHECK GLOW CONTROL SYSTEM OVERALL FUNCTION

1. Turn ignition switch "OFF".
2. Set voltmeter probe between glow plug and engine body.
3. Turn ignition switch "ON".
4. Check the voltage between glow plug and engine body under the following conditions.



Conditions	Voltage
For 20 seconds after turning ignition switch "ON"	Battery voltage
More than 20 seconds after turning ignition switch "ON"	Approx. 0V

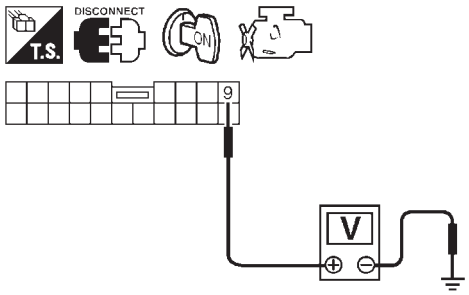
SEF431Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 11.

6	CHECK GLOW INDICATOR LAMP POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector M24.
3. Turn ignition switch "ON".
4. Check voltage between combination meter terminal 9 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF744Z

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between combination meter and fuse

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK GLOW INDICATOR LAMP OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 508 and combination meter terminal 13. 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 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M49, F23 (where fitted)
- Harness connectors M71, F45 (where fitted)
- Harness for open or short between combination meter and ECM

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

10	CHECK COMBINATION METER

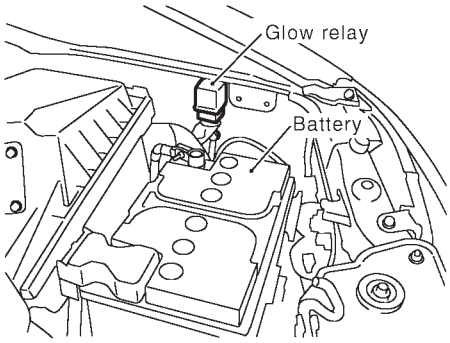
Check combination meter and glow indicator lamp. Refer to EL-130, "Meter and Gauges".

OK or NG

OK	▶	GO TO 18.
NG	▶	Repair or replace combination meter or glow indicator lamp.

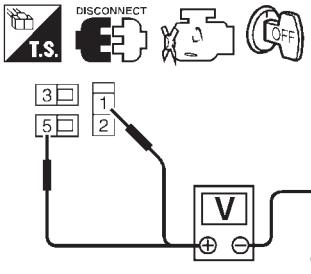
11	CHECK GLOW RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect glow relay.



SEF752Z

3. Check voltage between glow relay terminals 1, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF420Y

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART

Check the following.
- 60A fusible link
- Harness for open or short between glow relay and battery

	▶	Repair harness or connectors.

13	CHECK GLOW RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 214 and glow 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 15.
NG	▶	GO TO 14.

14	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E75, F14 (where fitted)
- Harness connectors M76, F13 (where fitted)
- Harness for open or short between glow relay and ECM

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

15	CHECK HARNESS CONTINUITY BETWEEN GLOW RELAY AND GLOW PLUG FOR OPEN AND SHORT

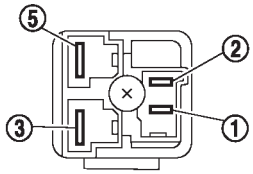
1. Disconnect glow plug harness connector.
2. Check harness continuity between glow relay terminal 3 and glow plug harness connector. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

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 GLOW RELAY

Check continuity between glow relay terminals 3 and 5 under the following conditions.



Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

Operation takes less than 1 second.

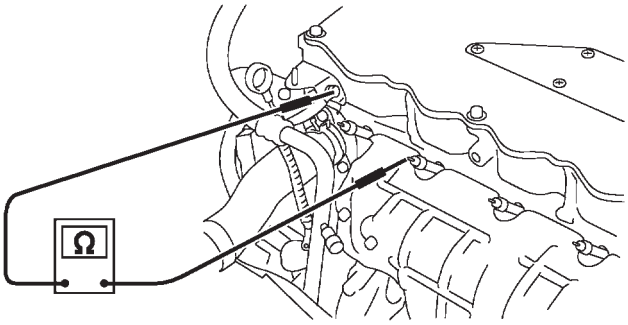
SEF433Y

OK or NG

OK	▶	GO TO 17.
NG	▶	Replace glow relay.

17	CHECK GLOW PLUG

1. Remove glow plug connecting plate.
2. Check glow plug resistance.



Resistance: Approximately 0.8Ω [at 25°C (77°F)]

SEF434Y

NOTE:

- **Do not bump glow plug heating element. If it is bumped, replace glow plug with a new one.**
- **If glow plug is dropped from a height of 10 cm (3.94 in) or higher, replace with a new one.**
- **If glow plug installation hole is contaminated with carbon, remove it with a reamer or suitable tool.**
- **Hand-tighten glow plug by turning it two or three times, then tighten using a tool to specified torque.**
  : 17.7 - 22.5 N·m (1.8 - 2.3 kg-m, 13 - 16 ft-lb)

OK or NG

OK	▶	GO TO 18.
NG	▶	Replace glow plug.

Diagnostic Procedure (Cont'd)

18	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**

Description

SYSTEM DESCRIPTION

NLEC0764

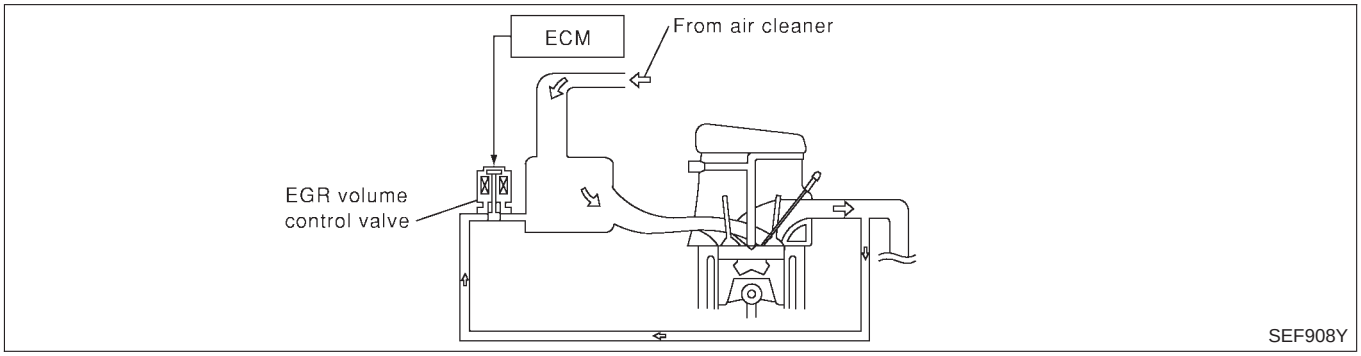
NLEC0764S01

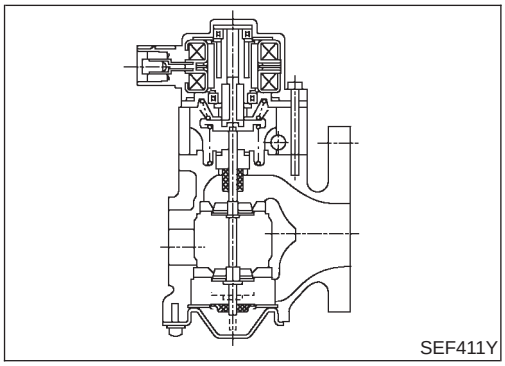
Sensor	Input Signal to ECM	ECM Function	Actuator
Electronic controlled fuel injection pump	Fuel injection signal	EGR volume control	EGR volume control valve
Crankshaft position sensor (TDC)	Engine speed		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Accelerator position sensor	Accelerator position		
Mass air flow sensor	Amount of intake air		
Air conditioner switch	Air conditioner operation		
Electrical load	Electrical load signal		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions.

The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle





COMPONENT DESCRIPTION

NLEC0764S02

EGR Volume Control Valve

NLEC0764S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate 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

NLEC0765

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: Neutral position ● No-load	After one minute at idle	More than 10 step
		Revving engine up to 3,200 rpm	0 step

ECM Terminals and Reference Value

NLEC0766

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.

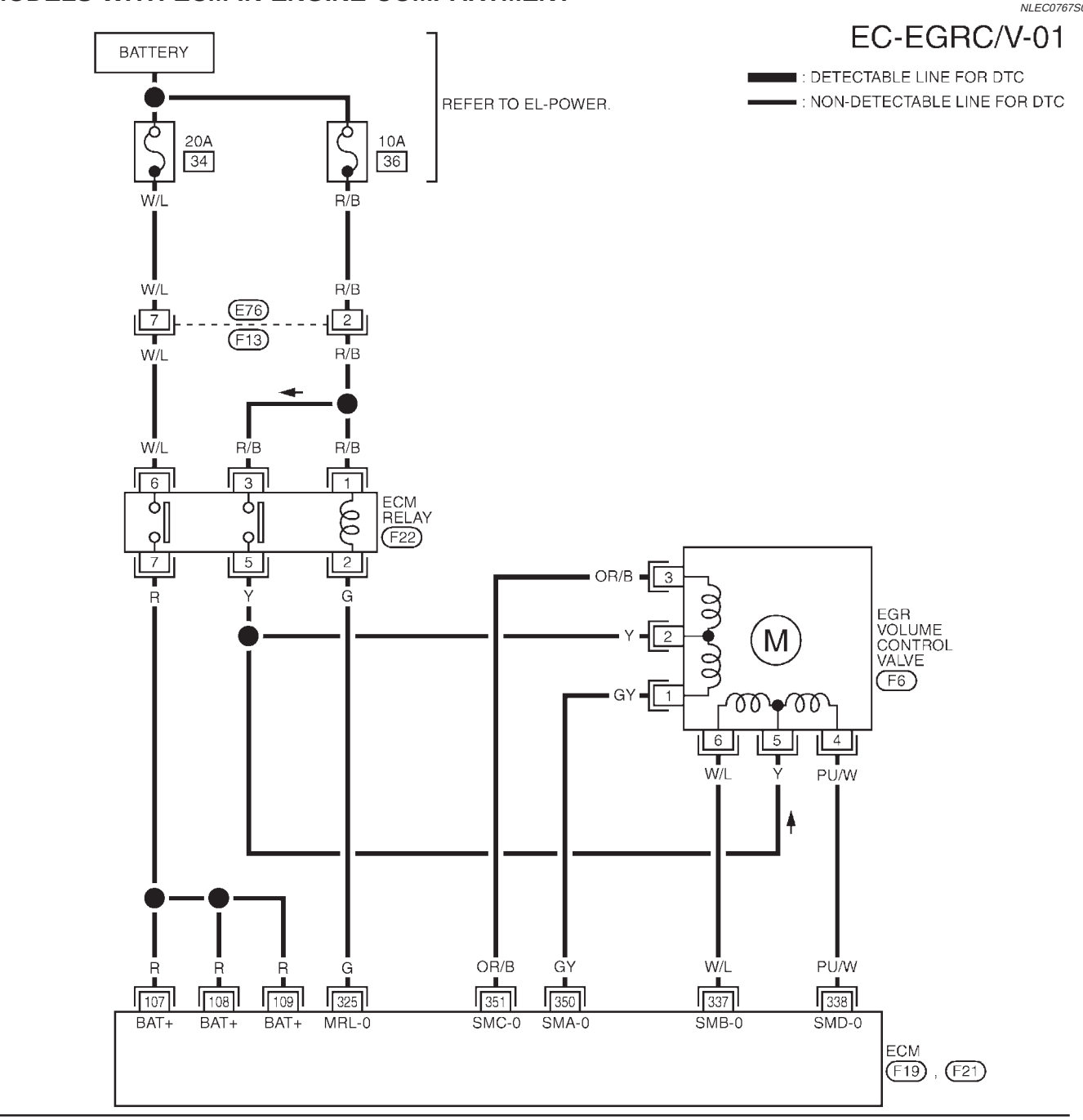
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
337 338 350 351	W/L PU/W GY OR/B	EGR volume control valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V (Voltage signals of each ECM terminals differ according to the control position of EGR volume control valve.)

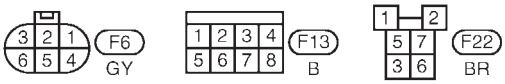
Wiring Diagram

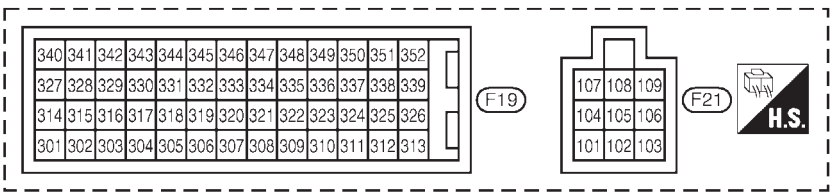
MODELS WITH ECM IN ENGINE COMPARTMENT

=NLEC0767

NLEC0767S01



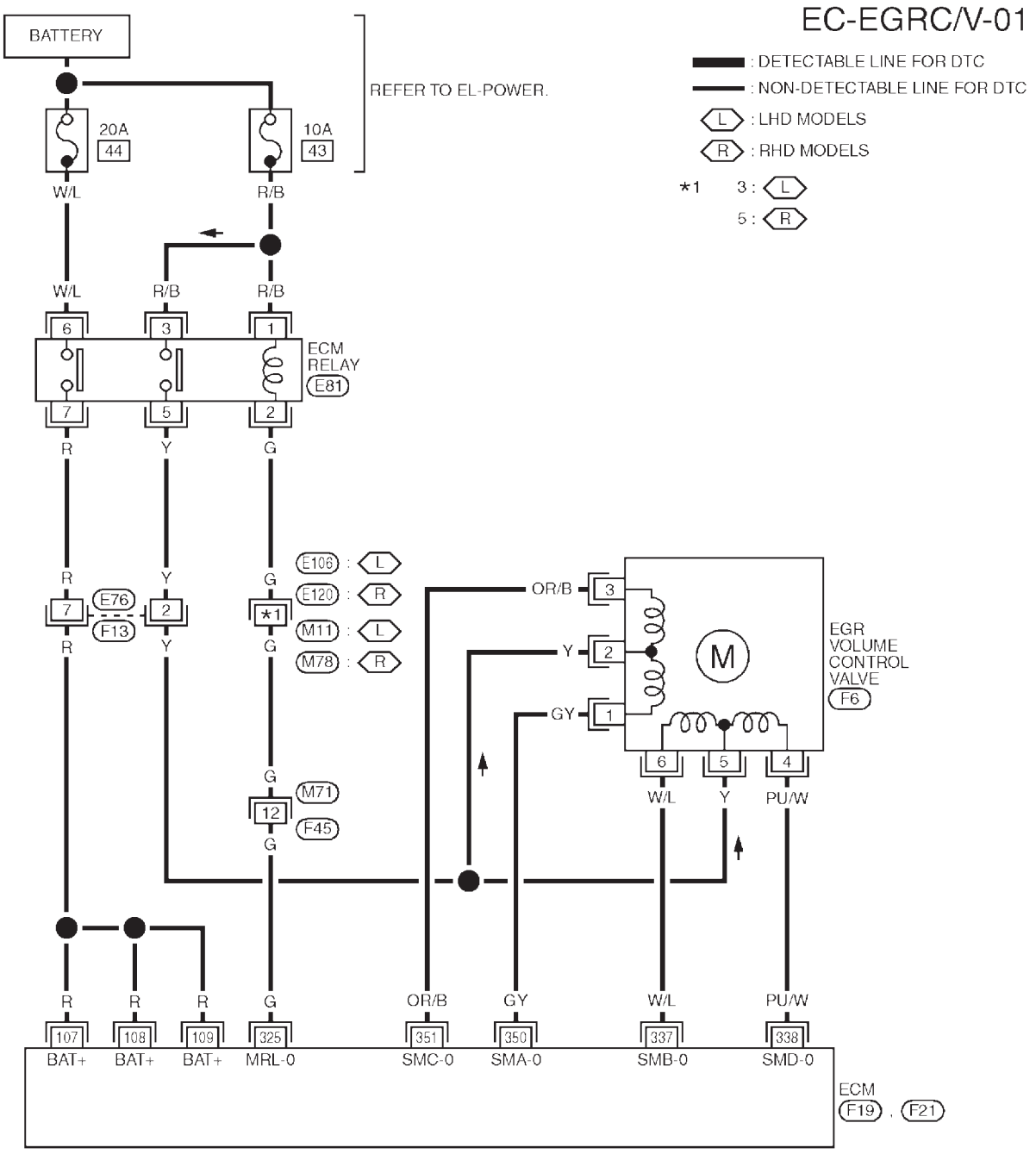


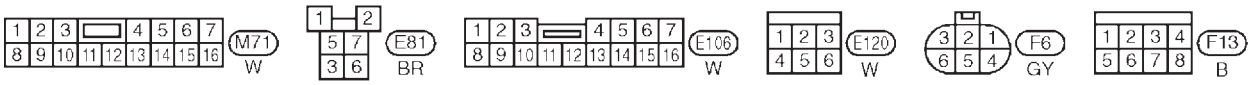


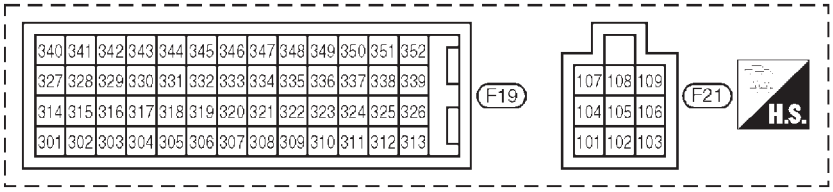
YEC732

MODELS WITH ECM IN CABIN

NLEC0767S02







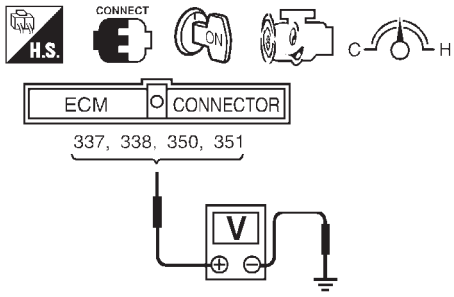
YEC866

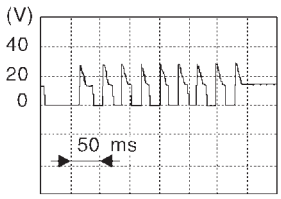
Diagnostic Procedure

NLEC0768

1	CHECK EGR VOLUME CONTROL SYSTEM OVERALL FUNCTION

1. Turn ignition switch “OFF”.
2. Set the oscilloscope probe between ECM terminals 337, 338, 350, 351 and ground.
3. Start engine and let it idle.
4. Check the oscilloscope screen when revving engine up to 3,200 rpm and return to idle.





The pulse signal as shown left should appear.

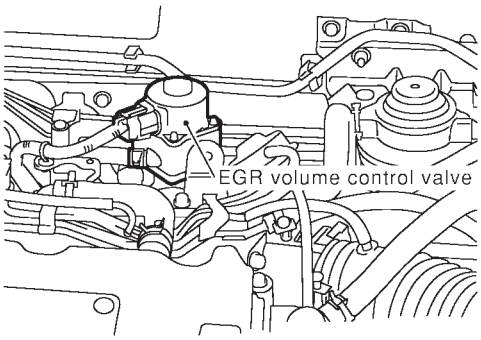
SEF247Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

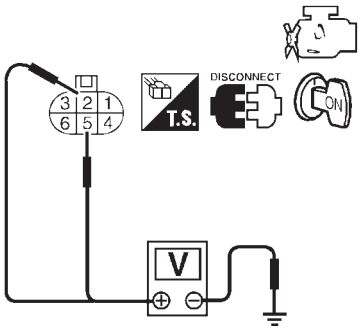
2	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect EGR volume control valve harness connector.



SEF388Y

3. Turn ignition switch “ON”.
4. Check voltage between EGR volume control valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF412Y

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM relay. (For ECM relay location, refer to "Engine control component parts location", EC-1071.)
3. Check harness continuity between ECM relay terminal 5 and EGR volume control valve terminals 2 and 5. Refer to Wiring Diagram.

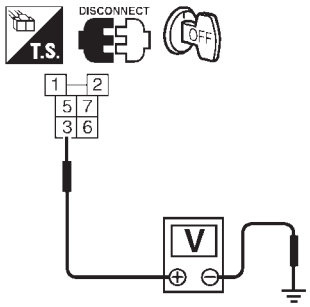
Continuity should exist.

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 EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-III

Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF413Y

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

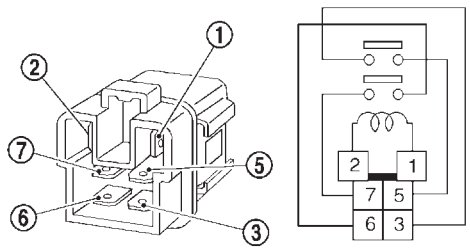
5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13
- 10A fuse
- Harness for open or short between ECM relay and battery

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	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 7.
NG	▶	Replace ECM relay.

7	CHECK EGR VOLUME CONTROL 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 EGR volume control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	EGR volume control valve
337	6
338	4
350	1
351	3

MTBL0463

Continuity should exist.

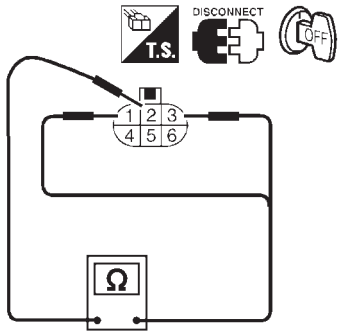
4. Also check harness for short to ground and short to power.

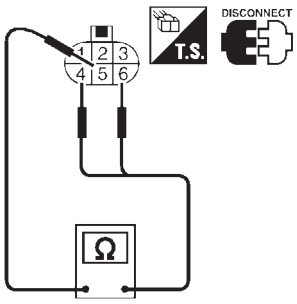
OK or NG

OK	▶	GO TO 8.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK EGR VOLUME CONTROL VALVE-I

Check resistance between EGR volume control valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.





Resistance:
13 - 17Ω [At 20°C (68°F)]

SEF414Y

OK or NG

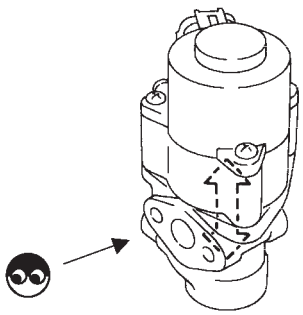
OK (With CONSULT-II)	▶	GO TO 9.
OK (Without CONSULT-II)	▶	GO TO 10.
NG	▶	Replace EGR volume control valve.

9	CHECK EGR VOLUME CONTROL VALVE-II

With CONSULT-II

1. Remove EGR volume control valve.
2. Reconnect ECM harness connector and EGR volume control valve harness connector.
3. Turn ignition switch "ON".
4. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Check that EGR volume control valve shaft moves smoothy forward and backward according to the valve opening steps.

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
CKPS-RPM (TDC)	XXX rpm



SEF819Y

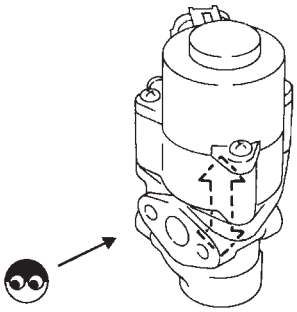
OK or NG

OK	▶	GO TO 11.
NG	▶	Replace EGR volume control valve.

10	CHECK EGR VOLUME CONTROL VALVE-II

Without CONSULT-II

1. Remove EGR volume control valve.
2. Reconnect ECM harness connector and EGR volume control valve harness connector.
3. Turn ignition switch "ON" and "OFF".
4. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.



SEF560W

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace EGR volume control valve.

11	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**

Description

NLEC1266

SYSTEM DESCRIPTION

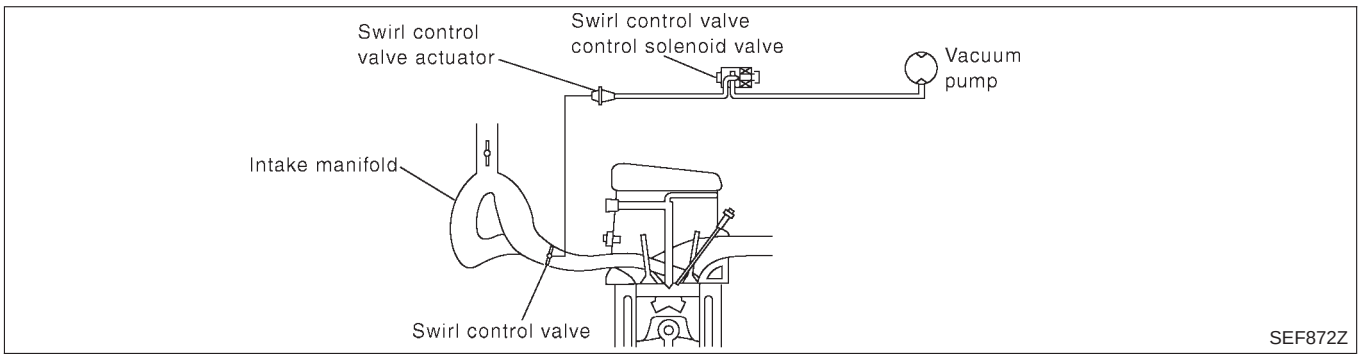
NLEC1266S01

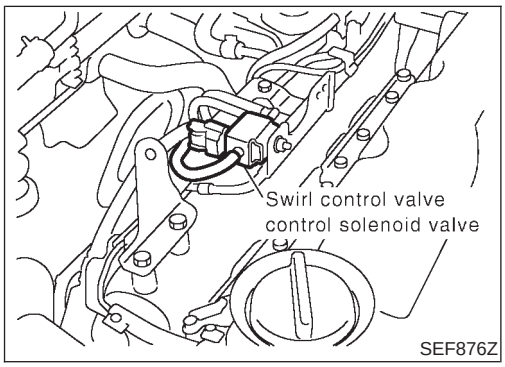
Sensor	Input Signal to ECM	ECM Function	Actuator
Ignition switch	Start signal	Swirl control valve control	Swirl control valve control solenoid valve ↓ Vacuum signal Swirl control valve actuator ↓ Swirl control valve
Crankshaft position sensor (TDC)	Engine speed		
Engine coolant temperature sensor	Engine coolant temperature		

This system has a swirl control valve in the intake manifold.
Under normal driving conditions, the swirl control valve closes, generating a strong swirl in the combustion chamber. This promotes the mixing of fuel and air for stable combustion.
Under high-load conditions, the swirl control valve opens. By obtaining a volume of air for an increase in fuel, combustion that does not easily emit black smoke is achieved.
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

Engine speed	Engine coolant temperature	Swirl control valve control solenoid valve	Swirl control valve
Less than 2,400 rpm*	Less than 20°C (68°F)	OFF	Open
	More than 20°C (68°F)	ON	Closed
More than 2,400 rpm	Less than 20°C (68°F)	OFF	Open
	More than 20°C (68°F)	OFF	Open

*: Except in idle condition and high-load condition





COMPONENT DESCRIPTION

NLEC1266S02

Swirl Control Valve Control Solenoid Valve

NLEC1266S0201

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 vacuum pump 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

NLEC1267

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWRL CONT S/V	● Engine: After warming up ● No-load	Engine speed: 1,500 rpm	ON
		Engine speed: Idle	OFF

ECM Terminals and Reference Value

NLEC1268

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 damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

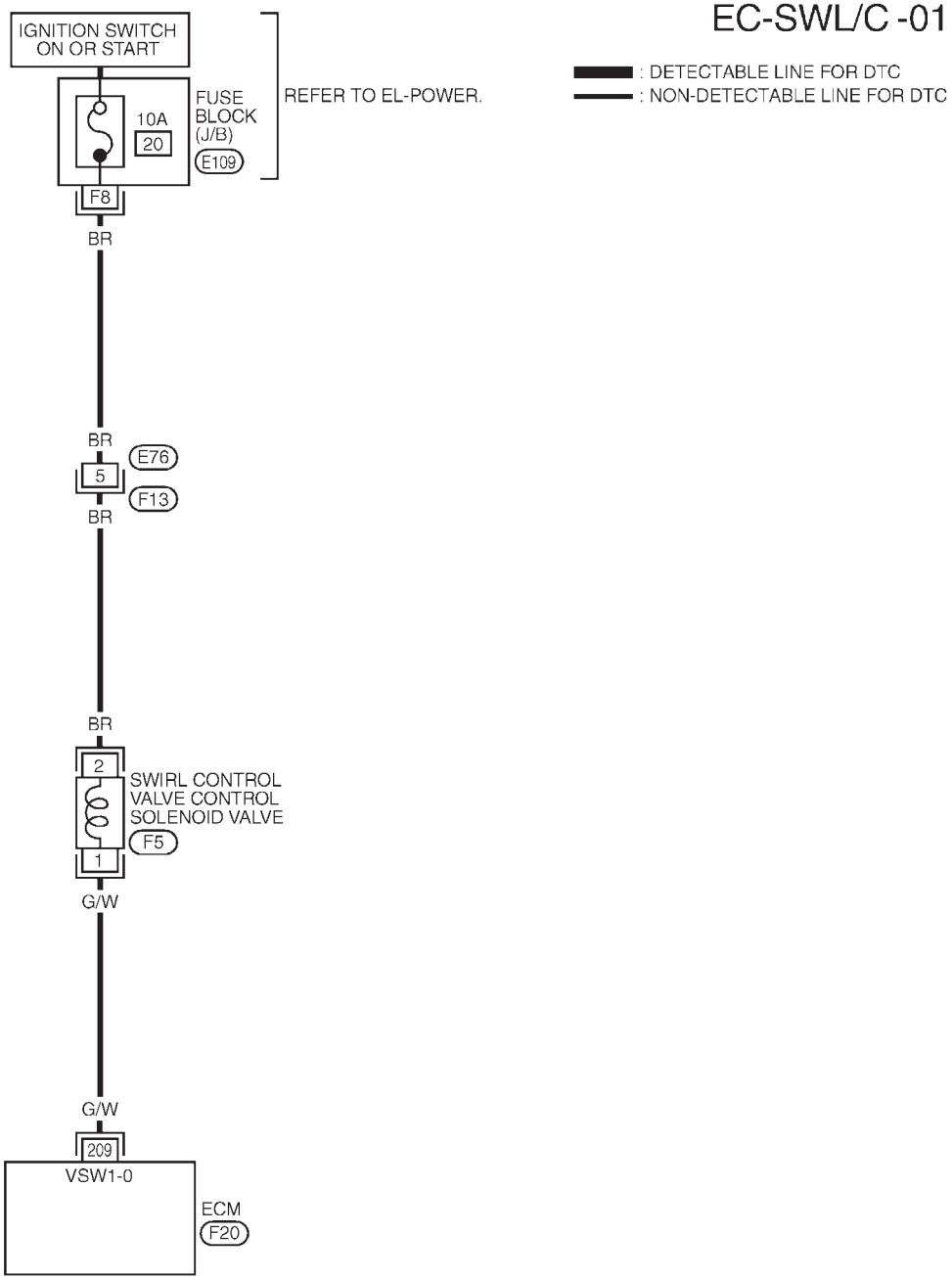
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
209	G/W	Swirl control valve control solenoid valve	**[Engine is running.]** ● **Warm-up condition** ● Engine speed: 1,500 rpm ● No load	Approximately 0.1V
			[Engine is running.] ● Idle speed	BATTERY VOLTAGE (11 - 14V)

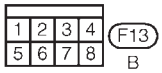
Wiring Diagram

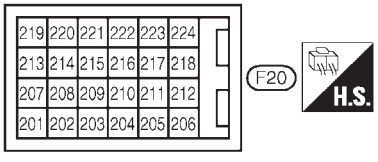
NLEC1269

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC1269S01







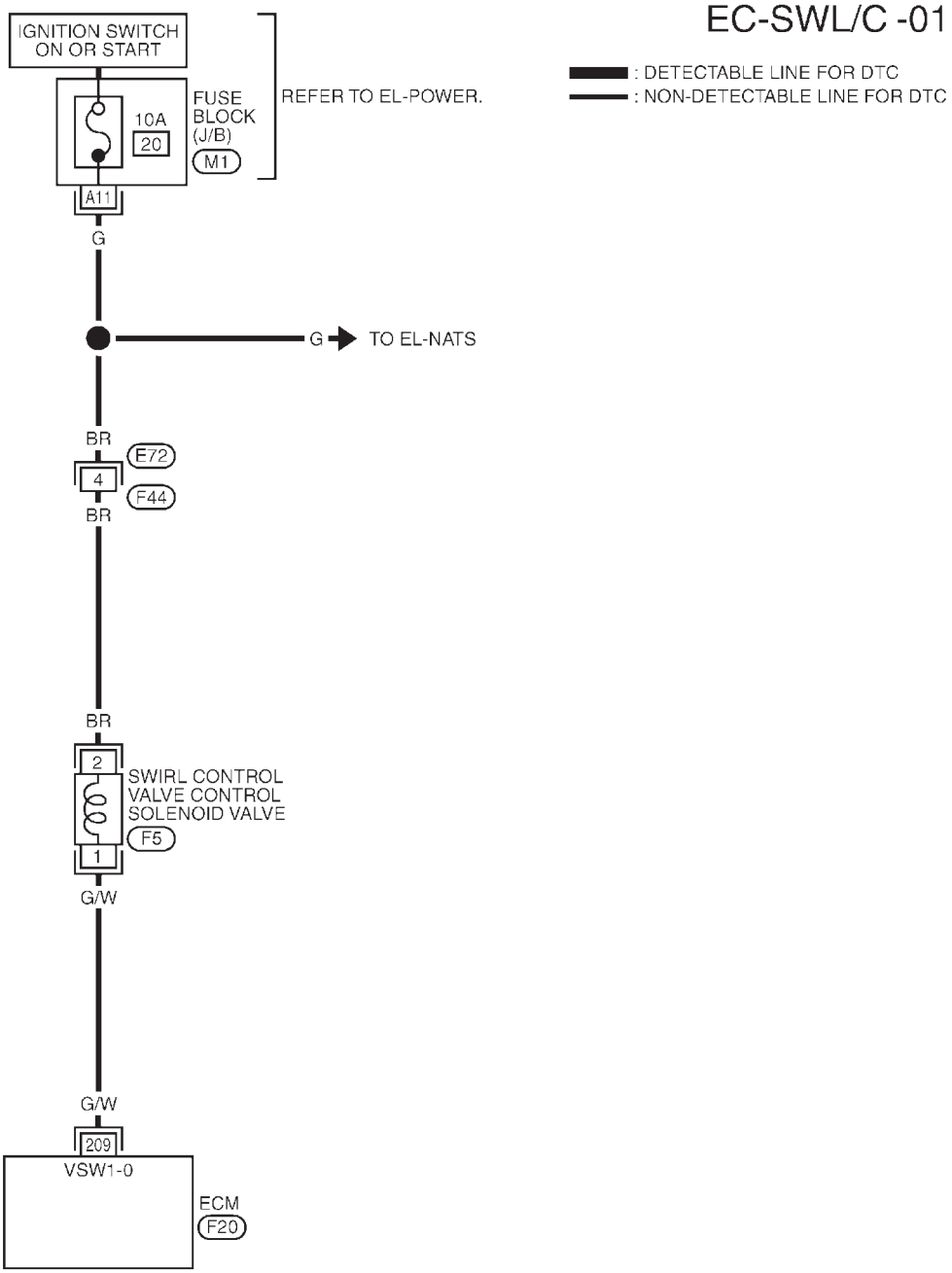
REFER TO THE FOLLOWING.
E109 -FUSE BLOCK-
JUNCTION BOX (J/B)

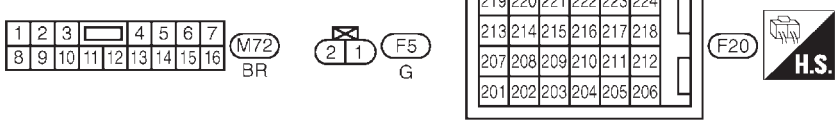
YEC737

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC1269S02





REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-
JUNCTION BOX (J/B)

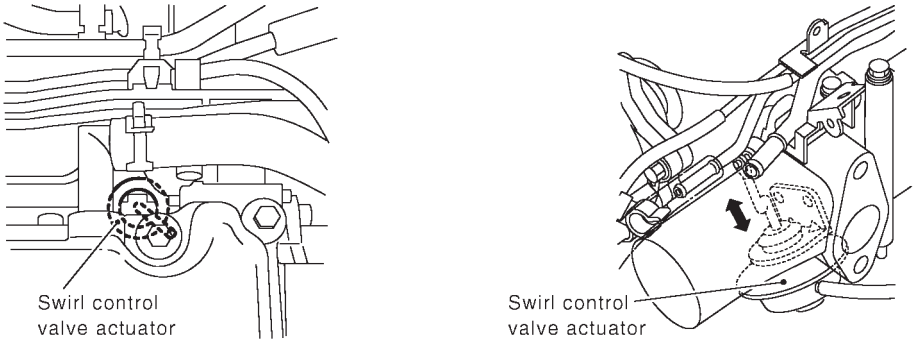
YEC867

Diagnostic Procedure

NLEC1270

1	CHECK OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Run engine at idle speed.
3. Make sure that swirl control valve actuator rod moves by revving engine to 1,500 rpm and returning to idle.



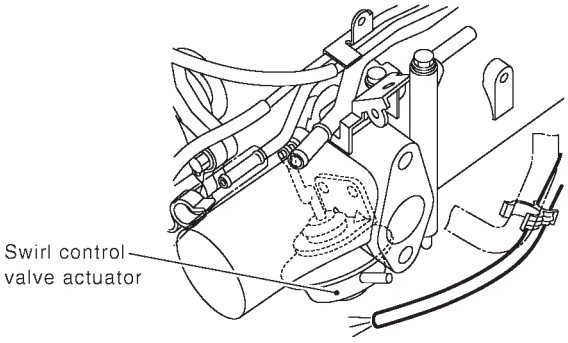
SEF873Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK VACUUM SOURCE

1. Turn ignition switch “OFF”.
2. Disconnect vacuum hose connected to swirl control valve actuator.
3. Start engine and warm it up to normal operating temperature.
4. Check vacuum hose for vacuum existence under the following conditions.



Conditions	Vacuum
Engine speed is at idle.	Should not exist.
Engine speed is about 1,500 rpm.	Should exist.

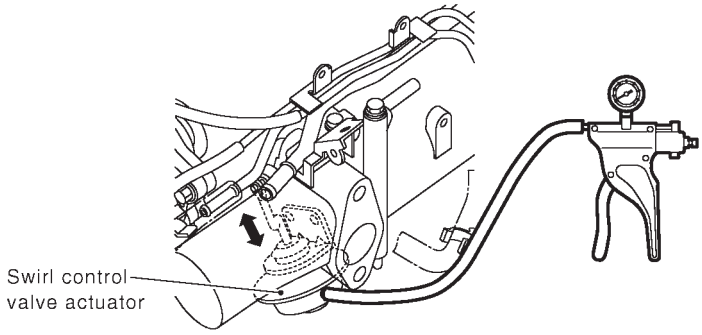
SEF874Z

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 4.

3	CHECK SWIRL CONTROL VALVE ACTUATOR

1. Turn ignition switch "OFF".
2. Install a vacuum pump to swirl control valve actuator.
3. Make sure that the swirl control valve actuator rod moves smoothly when applying vacuum of −26.7 kPa (−267 mbar, −200 mmHg, −7.87 inHg) and releasing it.



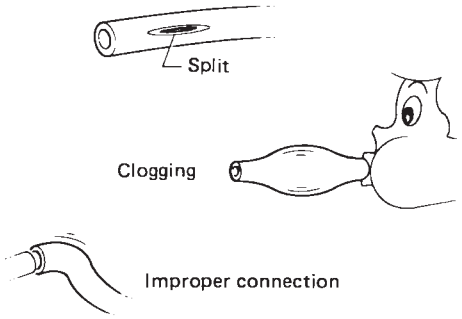
SEF875Z

OK or NG

OK	▶	Repair or replace vacuum hoses and vacuum gallery.
NG	▶	Replace swirl control valve actuator.

4	CHECK VACUUM HOSE

1. Turn ignition switch "OFF".
2. Check vacuum hoses and vacuum gallery for clogging, cracks or improper connection.



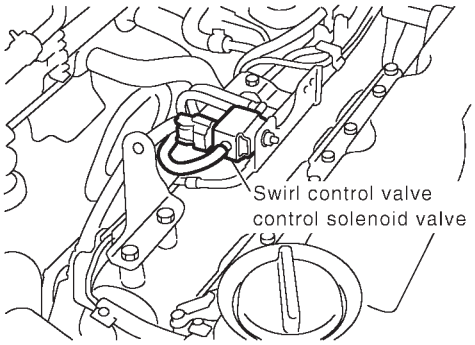
SEF109L

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair or replace vacuum hoses and vacuum gallery.

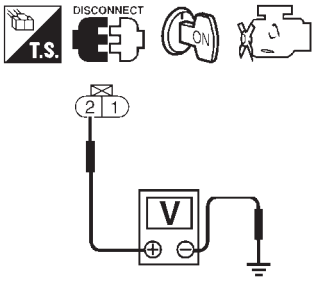
5	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect swirl control valve control solenoid valve harness connector.



SEF876Z

3. Turn ignition switch "ON".
4. Check voltage between swirl control valve control solenoid valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF312Z

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E76, F13 (where fitted)
- Fuse block (J/B) connector E109 (where fitted)
- Harness connectors E72, F44 (where fitted)
- Fuse block (J/B) connector M1 (where fitted)
- 10A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 209 and swirl control valve control solenoid valve terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

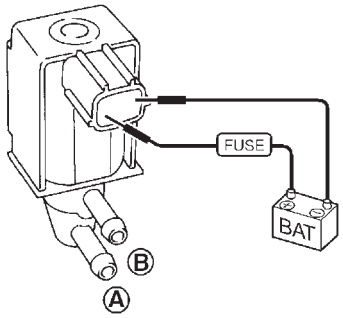
OK or NG

OK	▶	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 SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

1. Apply 12V direct current between swirl control valve control solenoid valve terminals.
2. Check air passage continuity of swirl control valve 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 9.
NG	▶	Replace swirl control valve control solenoid valve.

9	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**

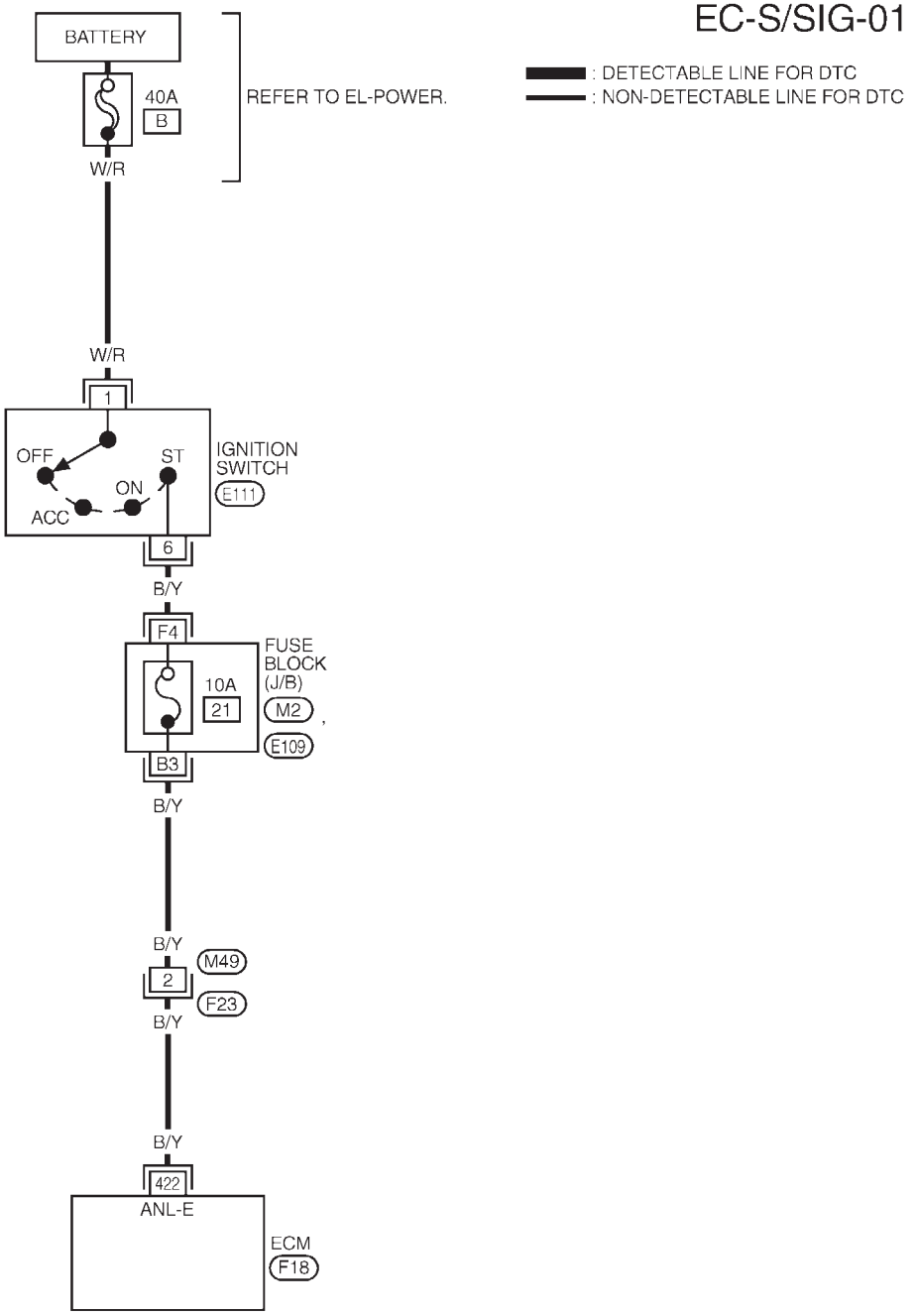
Wiring Diagram

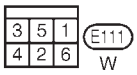
MODELS WITH ECM IN ENGINE COMPARTMENT

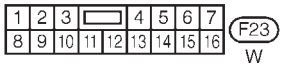
NLEC0769

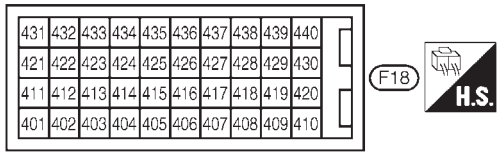
NLEC0769S01

EC-S/SIG-01









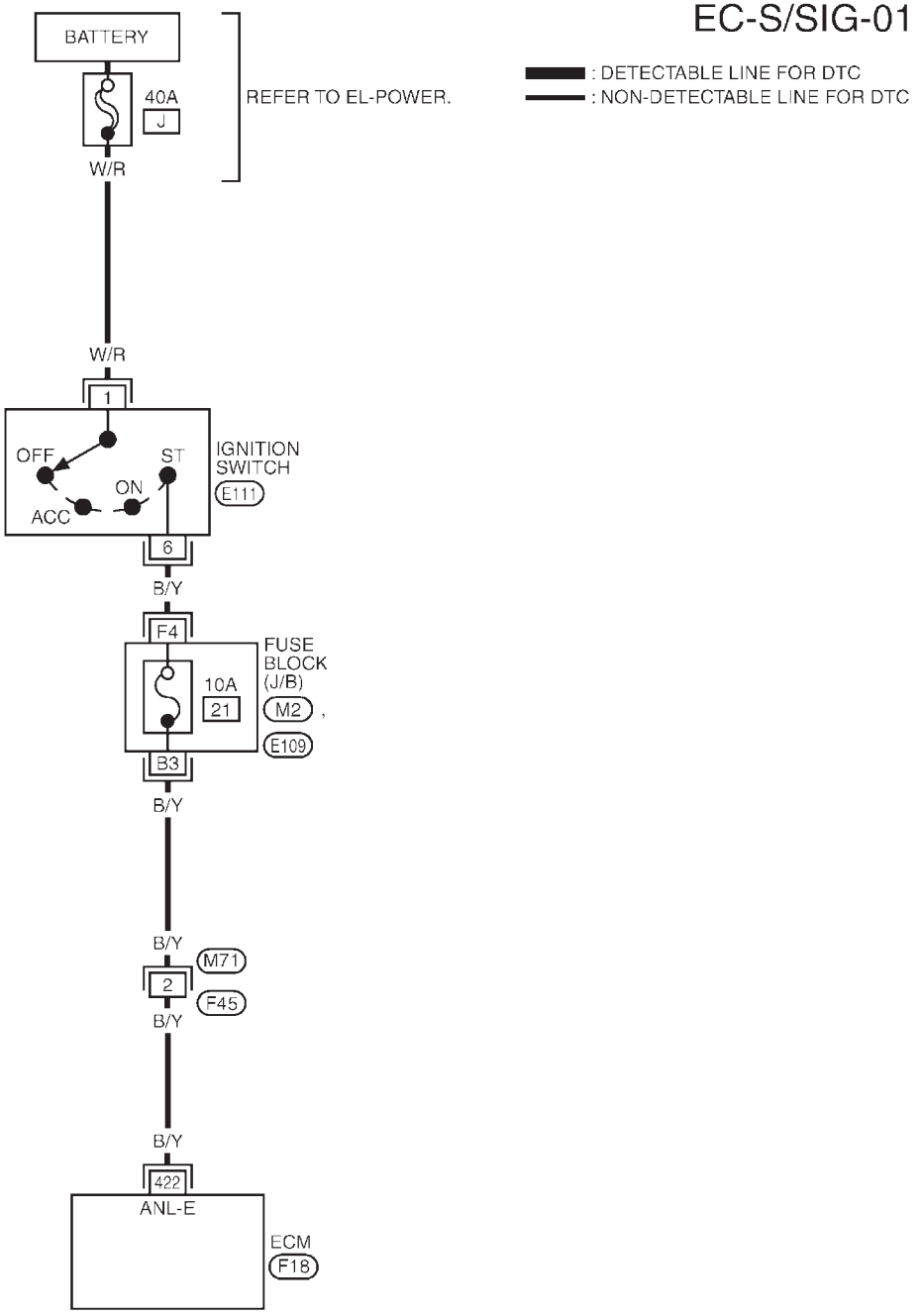
REFER TO THE FOLLOWING.
M2 , E109 -FUSE BLOCK-JUNCTION BOX (J/B)

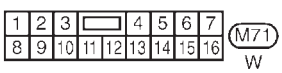
YEC738

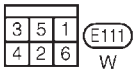
MODELS WITH ECM IN CABIN

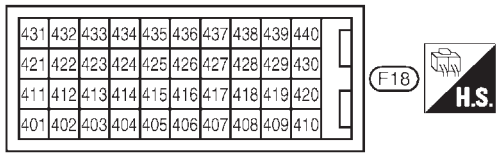
NLEC0769S02

EC-S/SIG-01









REFER TO THE FOLLOWING.
M2 , E109 -FUSE BLOCK-JUNCTION BOX (J/B)

YEC868

Diagnostic Procedure

NLEC0770

1 CHECK START SIGNAL 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.

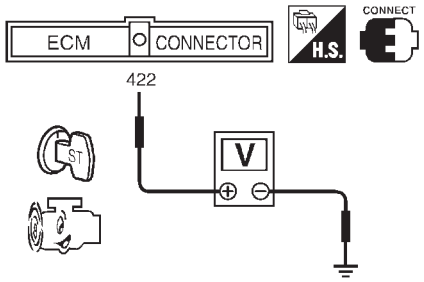
DATA MONITOR	
MONITORING	NO FAIL
START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

Condition	“START SIGNAL”
Ignition switch “ON”	OFF
Ignition switch “START”	ON

SEF604X

Without CONSULT-II

Check voltage between ECM terminal 422 and ground under the following conditions.



Condition	Voltage
Ignition switch “START”	Battery voltage
Other positions	Approximately 0V

SEF909Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2 CHECK START SIGNAL INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and ignition switch harness connector.
3. Check harness continuity between ECM terminal 422 and ignition switch terminal 6. 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 M49, F23 (where fitted)
- Harness connectors M71, F45 (where fitted)
- 10A fuse
- Fuse block (J/B) connectors M2, E109
- Harness for open or short between ECM and ignition switch

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.	
▶	**INSPECTION END**

Description

NLEC0781

When the gear position is in “Neutral”, neutral position is “ON”. ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

NLEC0782

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: Neutral	ON
		Except above	OFF

ECM Terminals and Reference Value

NLEC0783

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

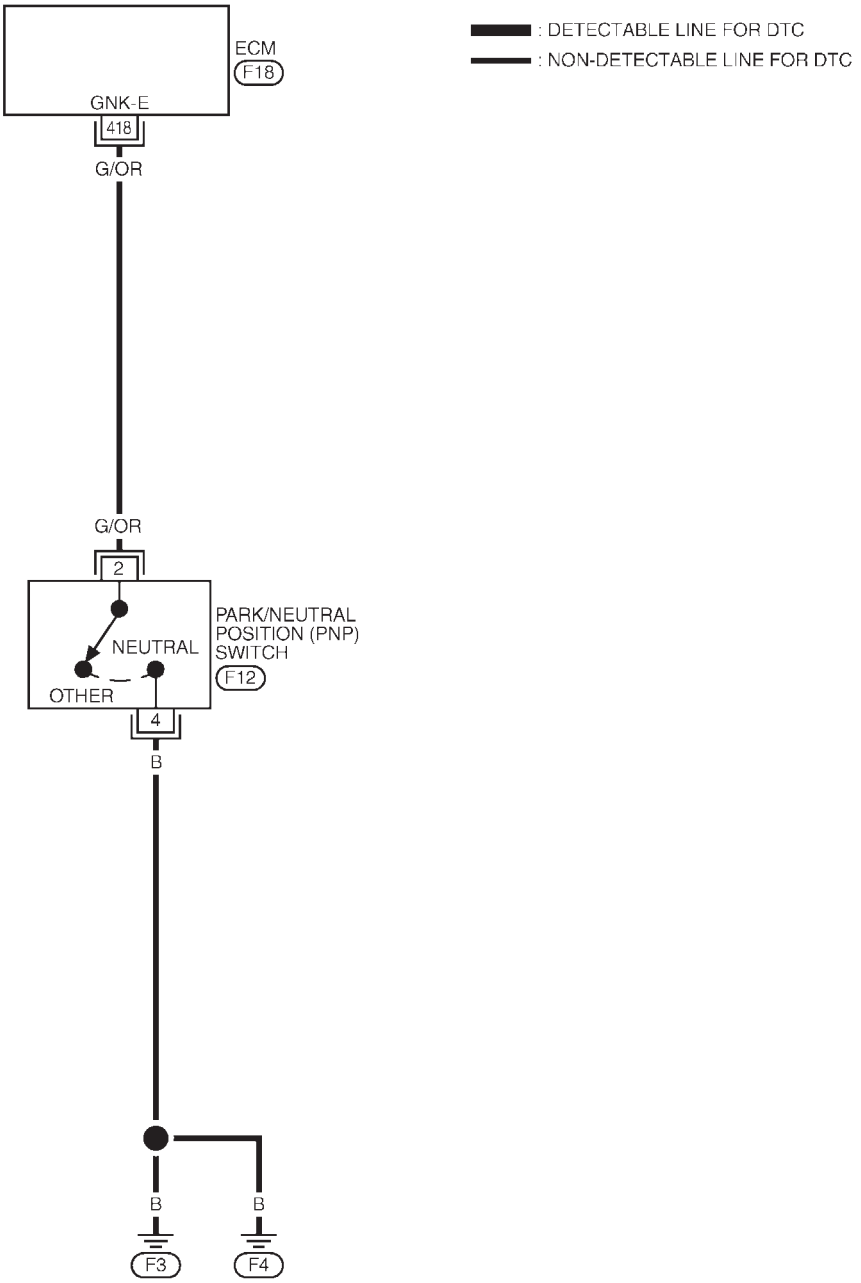
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM’s transistor. Use a ground other than ECM terminals, such as the ground.

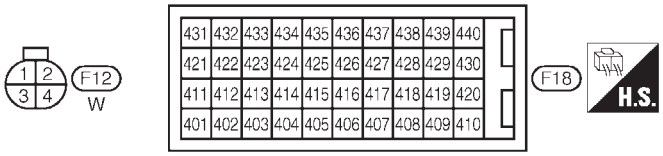
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
418	G/OR	Park/Neutral position switch	**[Ignition switch “ON”]** ● Gear position is “Neutral”	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

NLEC0784

EC-PNP/SW-01





YEC734

Diagnostic Procedure

NLEC0785

1 CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check “P/N POSI SW” signal under the following conditions.

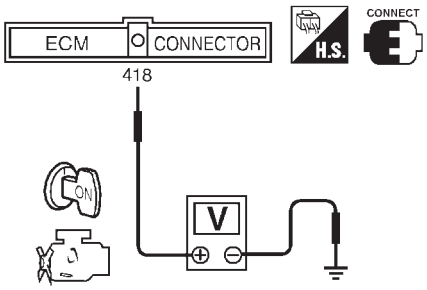
DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

Shift lever position	P/N POSI SW
Neutral position	ON
Except the above position	OFF

SEF049Y

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 418 and ground under the following conditions.



Condition (Gear position)	Voltage V
Neutral position	Approx. 0V
Except the above position	Battery voltage

SEF914Y

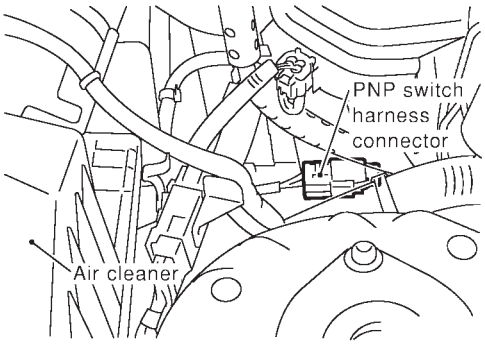
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

Diagnostic Procedure (Cont'd)

2	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.



SEF393Y

3. Check harness continuity between PNP switch terminal 4 and body ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair open circuit or short to ground 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 418 and PNP 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 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK PARK/NEUTRAL POSITION SWITCH

Refer to MT-16, "Position Switch Check".

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace park/neutral position switch.

5	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1135.

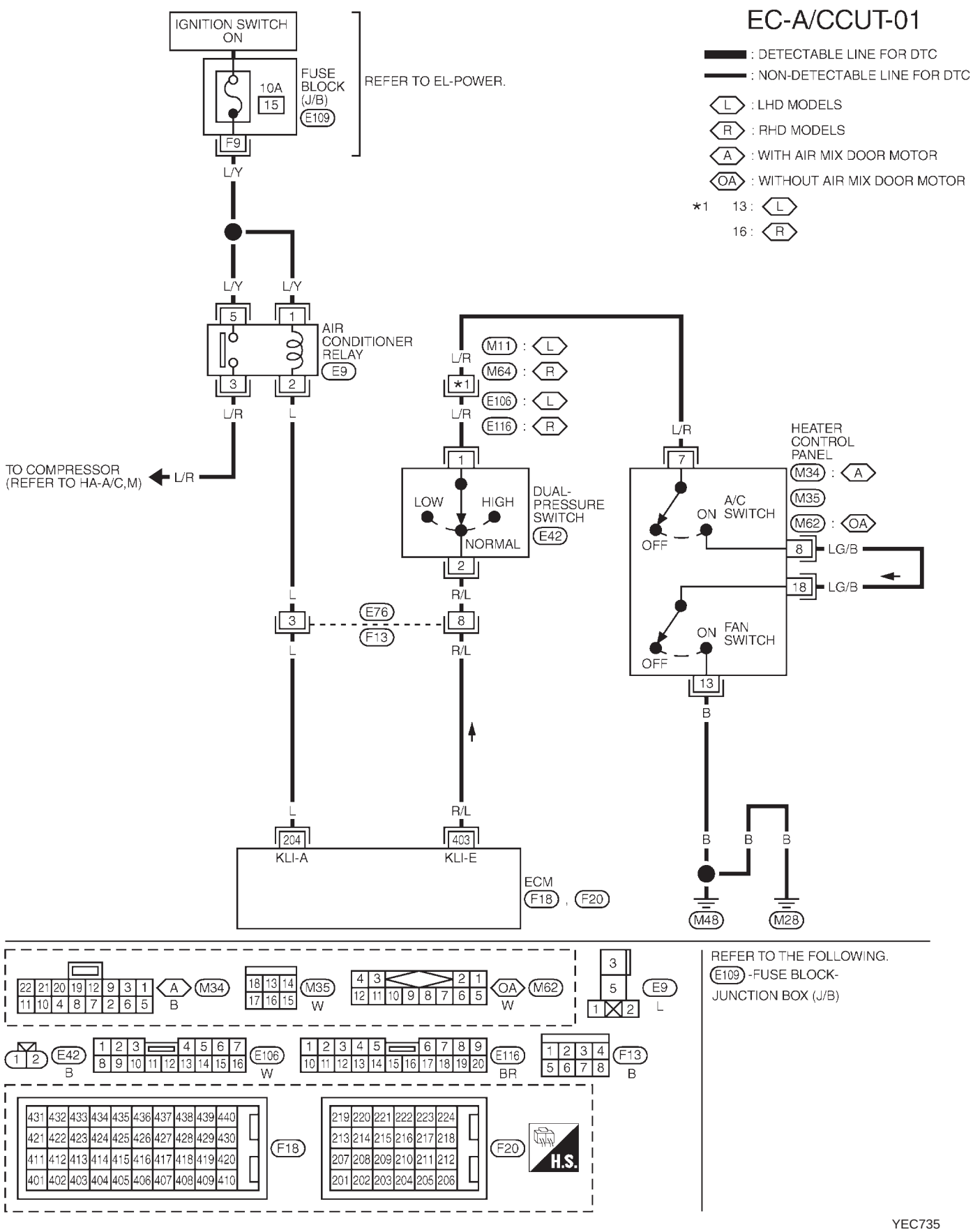
	▶	**INSPECTION END**

Wiring Diagram

NLEC0786

MODELS WITH ECM IN ENGINE COMPARTMENT

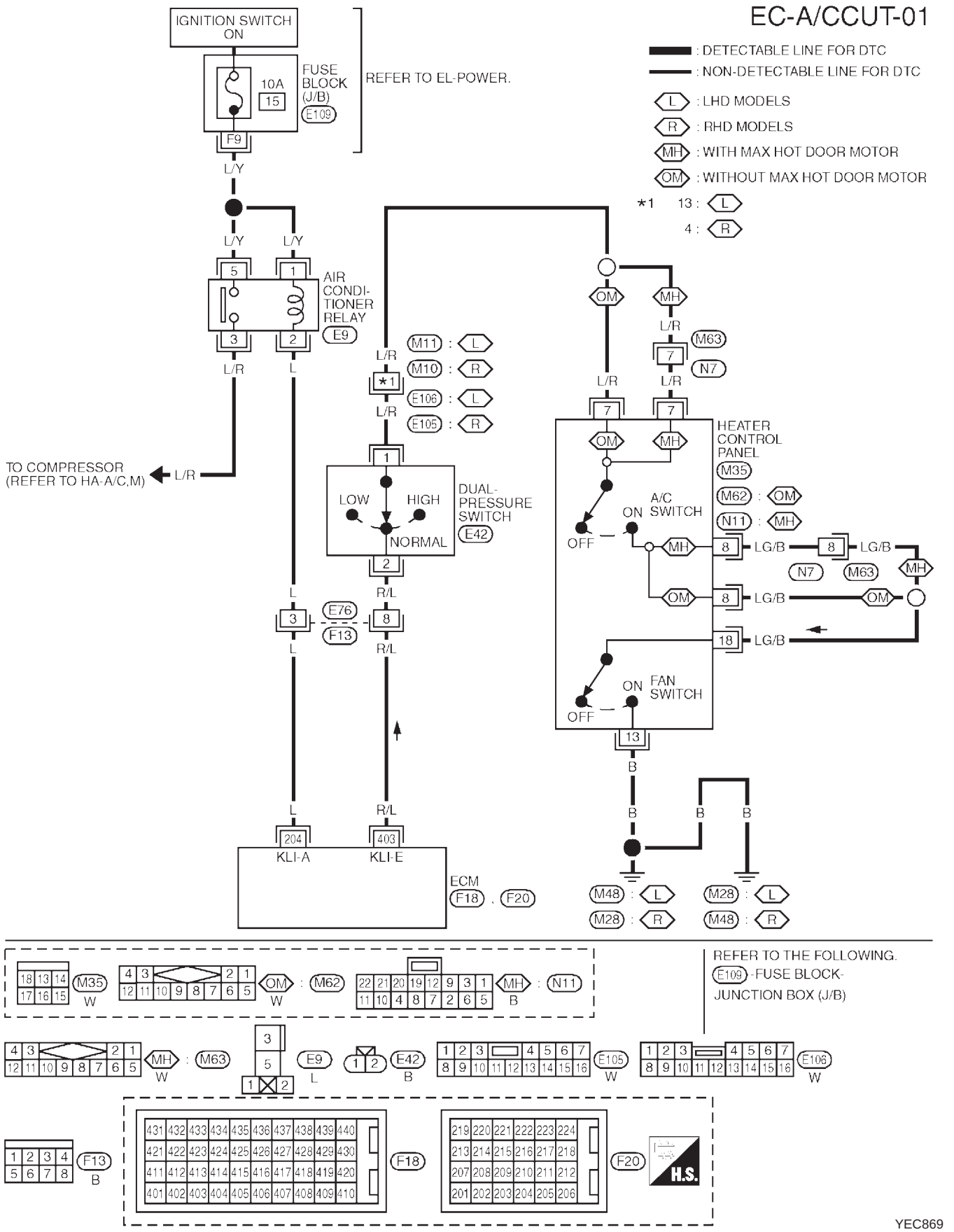
NLEC0786S01



YEC735

MODELS WITH ECM IN CABIN

NLEC0786S02



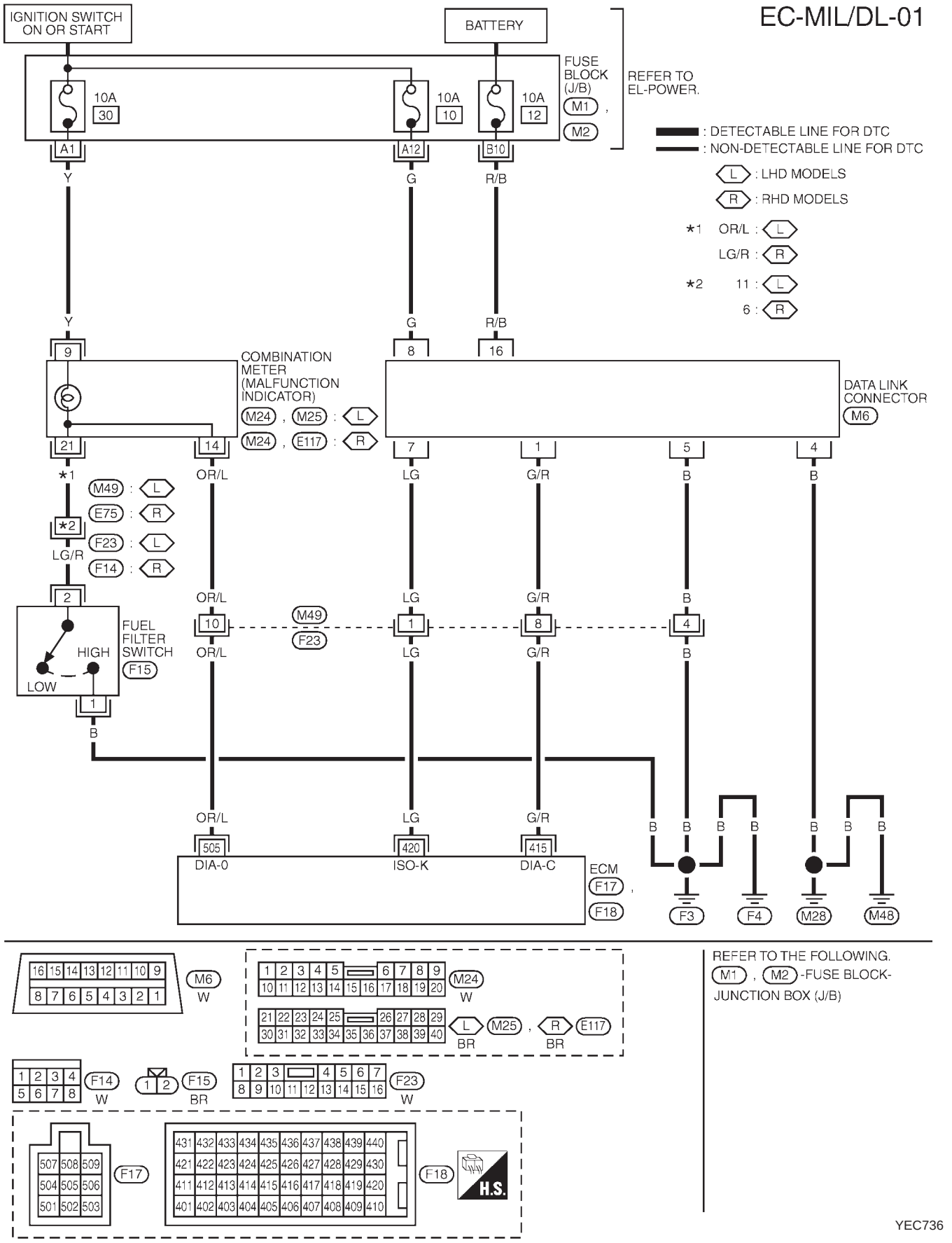
YEC869

Wiring Diagram

NLEC0787

MODELS WITH ECM IN ENGINE COMPARTMENT

NLEC0787S01

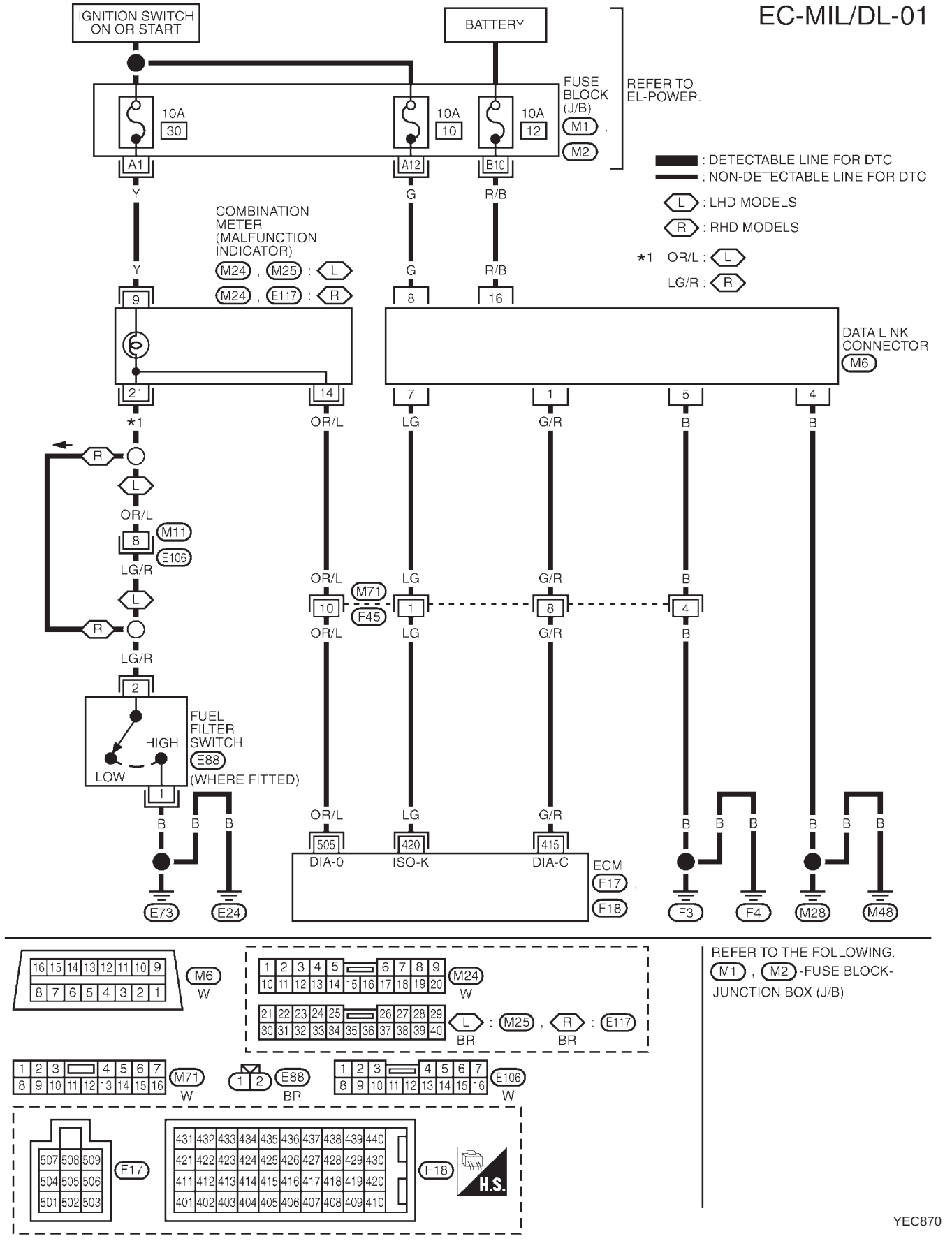


YEC736

Wiring Diagram (Cont'd)

MODELS WITH ECM IN CABIN

NLEC0787S02



General Specifications

NLEC0788

Unit: rpm

Engine	YD22DDT
Idle speed	750±25
Maximum engine speed	4,900

Injection Nozzle

NLEC0790

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	New	21,476 - 22,457 (214.7 - 224.5, 219 - 229, 3,114 - 3,256)
	Limit	18,275 (182.7, 186, 2,650)

Engine Coolant Temperature Sensor

NLEC0791

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Crankshaft Position Sensor (TDC)

NLEC0792

Resistance [at 20°C (68°F)] Ω	495 - 605

Glow Plug

NLEC0793

Resistance [at 25°C (77°F)] Ω	0.8

Accelerator Position Sensor

NLEC0794

Throttle valve conditions	Resistance between terminals 2 and 4 kΩ [at 25°C (77°F)]
Completely closed	0.9 - 1.3
Partially open	0.9 - 2.1
Completely open	1.7 - 2.1

EGR Volume Control Valve

NLEC0795

Resistance [at 25°C (77°F)] Ω	13 - 17