<SUPPLEMENT-III>

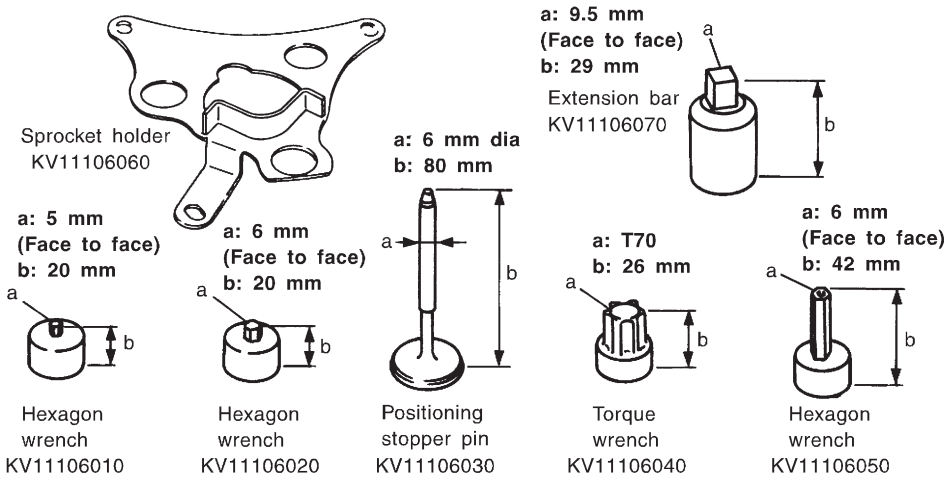
ENGINE CONTROL SYSTEM

SECTION EC

CONTENTS

YD25DDTi

Special Service Tool (YD25DDTi)

Tool number Tool name	Description
KV111060S0 Removal/Installation tool kit for fuel injection pump	 NT814

Supplemental Restraint System (SRS) “AIR BAG”

The Supplemental Restraint System such as “AIR BAG” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL D22 is as follows (The composition varies according to the destination and optional equipment.):
Driver air bag module (located in the center of the steering wheel), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
Information necessary to service the system safely is included in the **RS section** of D22 Service Manual Supplement VI.
WARNING:

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

Alphabetical & P No. Index for DTC

NEEC0001

ALPHABETICAL INDEX FOR DTC

NEEC0001S01

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*4	
Unable to access ECM	—	—	EC-3101
CKP SEN/CIRCUIT	P0335	0335	EC-3264
CKP SENSOR (COG)	P1336	1336	EC-3349
CLOSED TP SW/CIRC	P0510	0510	EC-3301
CMP SEN/CIRCUIT	P0340	0340	EC-3270
CYL1 MISFIRE	P0301	0301	EC-3251
CYL2 MISFIRE	P0302	0302	EC-3251
CYL3 MISFIRE	P0303	0303	EC-3251
CYL4 MISFIRE	P0304	0304	EC-3251
ECM	P0605	0605	EC-3308
ECT SEN/CIRCUIT	P0117*3	0117	EC-3165
ECT SEN/CIRCUIT	P0118*3	0118	EC-3165
ENG OVER TEMP	P1217	1217	EC-3344
FUEL SYS-LEAN-B1	P0171	0171	EC-3237
FUEL SYS-RICH-B1	P0172	0172	EC-3244
HO2S1 (B1)	P0132	0132	EC-3196
HO2S1 (B1)	P0133	0133	EC-3202
HO2S1 (B1)	P0134	0134	EC-3213
HO2S1 (B1)	P1143	1143	EC-3310
HO2S1 (B1)	P1144	1144	EC-3317
HO2S1 HTR (B1)	P0031	0031	EC-3133
HO2S1 HTR (B1)	P0032	0032	EC-3133
HO2S2 HTR (B1)	P0037	0037	EC-3138
HO2S2 HTR (B1)	P0038	0038	EC-3138
HO2S2 (B1)	P0138	0138	EC-3220
HO2S2 (B1)	P0139	0139	EC-3227
HO2S2 (B1)	P1146	1146	EC-3324
HO2S2 (B1)	P1147	1147	EC-3334
IAT SEN/CIRCUIT	P0112*3	0112	EC-3160
IAT SEN/CIRCUIT	P0113*3	0113	EC-3160
IAT SENSOR	P0127	0127	EC-3193
ISC/CIRC	P0505	0505	EC-3295
KNOCK SEN/CIRC-B1	P0327	0327	EC-3260
KNOCK SEN/CIRC-B1	P0328	0328	EC-3260

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*4	
MAF SEN/CIRCUIT	P0101	0101	EC-3143
MAF SEN/CIRCUIT	P0102*3	0102	EC-3151
MAF SEN/CIRCUIT	P0103*3	0103	EC-3151
MULTI CYL MISFIRE	P0300	0300	EC-3251
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EL section
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	**—**
P-N POS SW/CIRCUIT	P1706	1706	EC-3355
PURG VOLUME CONT/V	P0444	0444	EC-3283
PURG VOLUME CONT/V	P0445	0445	EC-3283
TP SEN/CIRCUIT	P0121	0121	EC-3182
TP SEN/CIRCUIT	P0122*3	0122	EC-3182
TP SEN/CIRCUIT	P0123*3	0123	EC-3170
TW CATALYST SYS-B1	P0420	0420	EC-3278
VEH SPEED SEN/CIRC	P0500	0500	EC-3290

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-6.
*3: When the fail-safe operation occurs, the MI illuminates.
*4: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

P NO. INDEX FOR DTC

NEEC0001S02

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*4		
—	—	Unable to access ECM	EC-3101
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	**—**
P0031	0031	HO2S1 HTR (B1)	EC-3133
P0032	0032	HO2S1 HTR (B1)	EC-3133
P0037	0037	HO2S2 HTR (B1)	EC-3138
P0038	0038	HO2S2 HTR (B1)	EC-3138
P0101	0101	MAF SEN/CIRCUIT	EC-3143
P0102*3	0102	MAF SEN/CIRCUIT	EC-3151
P0103*3	0103	MAF SEN/CIRCUIT	EC-3151
P0112*3	0112	IAT SEN/CIRCUIT	EC-3160
P0113*3	0113	IAT SEN/CIRCUIT	EC-3160
P0117*3	0117	ECT SEN/CIRCUIT	EC-3165
P0118*3	0118	ECT SEN/CIRCUIT	EC-3165
P0121	0121	TP SEN/CIRCUIT	EC-3170

Alphabetical & P No. Index for DTC

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*4		
P0122*3	0122	TP SEN/CIRCUIT	EC-3182
P0123*3	0123	TP SEN/CIRCUIT	EC-3182
P0127	0127	IAT SENSOR	EC-3193
P0132	0132	HO2S1 (B1)	EC-3196
P0133	0133	HO2S1 (B1)	EC-3202
P0134	0134	HO2S1 (B1)	EC-3213
P0138	0138	HO2S2 (B1)	EC-3220
P0139	0139	HO2S2 (B1)	EC-3227
P0171	0171	FUEL SYS-LEAN-B1	EC-3237
P0172	0172	FUEL SYS-RICH-B1	EC-3244
P0300	0300	MULTI CYL MISFIRE	EC-3251
P0301	0301	CYL1 MISFIRE	EC-3251
P0302	0302	CYL2 MISFIRE	EC-3251
P0303	0303	CYL3 MISFIRE	EC-3251
P0304	0304	CYL4 MISFIRE	EC-3251
P0327	0327	KNOCK SEN/CIRC-B1	EC-3260
P0328	0328	KNOCK SEN/CIRC-B1	EC-3260
P0335	0335	CKP SEN/CIRCUIT	EC-3264
P0340	0340	CMP SEN/CIRCUIT	EC-3270
P0420	0420	TW CATALYST SYS-B1	EC-3278
P0444	0444	PURG VOLUME CONT/V	EC-3283
P0445	0445	PURG VOLUME CONT/V	EC-3283
P0500	0500	VEH SPEED SEN/CIRC	EC-3290
P0505	0505	ISC/CIRC	EC-3295
P0510	0510	CLOSED TP SW/CIRC	EC-3301
P0605	0605	ECM	EC-3308
P1143	1143	HO2S1 (B1)	EC-3310
P1144	1144	HO2S1 (B1)	EC-3317
P1146	1146	HO2S2 (B1)	EC-3324
P1147	1147	HO2S2 (B1)	EC-3334
P1217	1217	ENG OVER TEMP	EC-3344
P1336	1336	CKP SENSOR (COG)	EC-3349
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	EL section
P1706	1706	P-N POS SW/CIRCUIT	EC-3355

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

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

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

*4: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

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

NEEC0002

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER" used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The SRS system composition which is available to NISSAN MODEL D22 is as follows (The composition varies according to the destination and optional equipment.):
Driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioner, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
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. For removal of Spiral Cable and Air Bag Module, see the RS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow harness connector.**

Precautions for On Board Diagnostic (OBD) System of Engine

NEEC0003

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, "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 the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.**

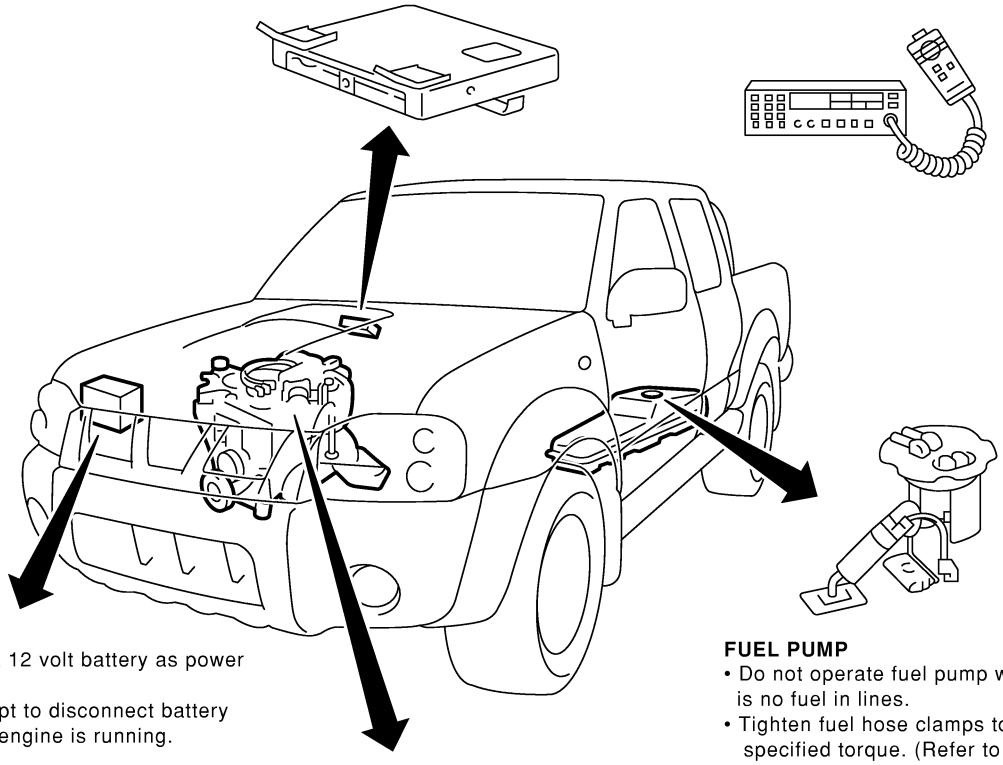
Engine Fuel & Emission Control System

NEEC0004

ECM
- 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.

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

1) Keep the antenna as far away as possible from the electronic control units.
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.



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

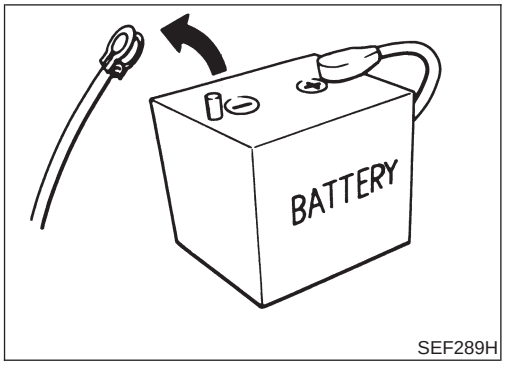
WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

ECM PARTS HANDLING
- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor or crankshaft position sensor (OBD).

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

ECM HARNESS HANDLING
- Securely connect ECM harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (3.9 in.) away from adjacent harnesses to prevent an engine control system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control system parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

SEC304D

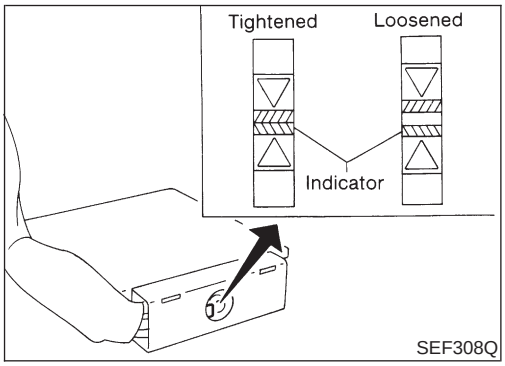


SEF289H

Precautions

NEEC0005

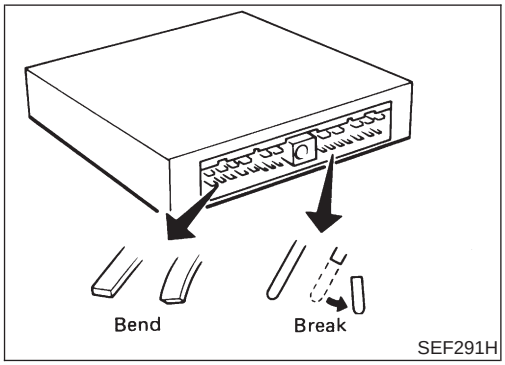
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**



SEF308Q

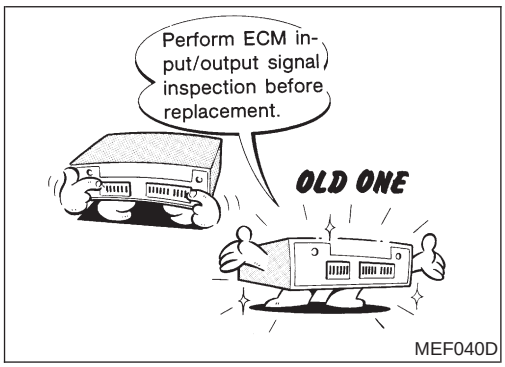
- **When connecting ECM harness connector, tighten securing bolt until the gap between orange indicators disappears.**

  : 3 - 5 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



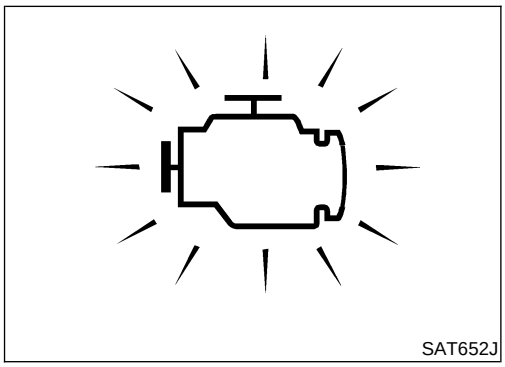
SEF291H

- **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.

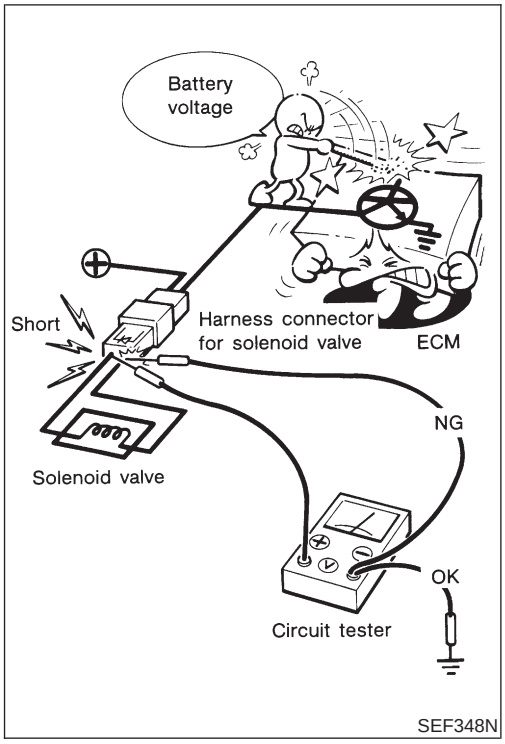


MEF040D

- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-3110.**


SAT652J

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



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

Wiring Diagrams and Trouble Diagnosis

NEEC0006

When you read Wiring diagrams, refer to the following:

- GI section, "HOW TO READ WIRING DIAGRAMS".
- EL section, "POWER SUPPLY ROUTING".

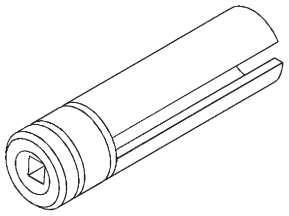
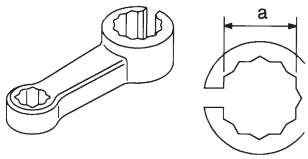
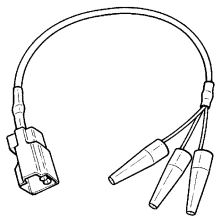
When you perform trouble diagnosis, refer to the following:

- GI section, "How to Follow Test Groups in Trouble Diagnoses".
- GI section, "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"

Special Service Tools

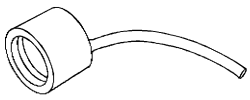
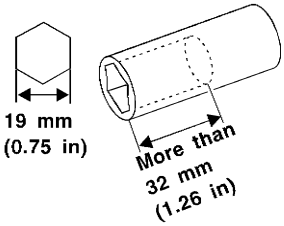
NEEC0007

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

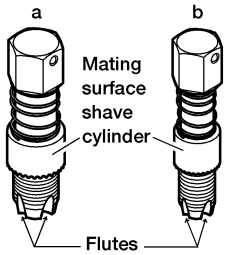
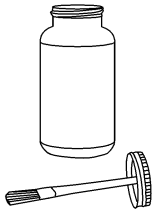
Tool number (Kent-Moore No.) Tool name	Description	
KV10117100 (J36471-A) Heated oxygen sensor wrench	 NT379	Loosening or tightening heated oxygen sensor 1 with 22 mm (0.87 in) hexagon nut
KV10114400 (J-38365) Heated oxygen sensor wrench	 NT636	Loosening or tightening heated oxygen sensor 2 **a: 22 mm (0.87 in)**
(J-45178) TPS test connector	 LEC120A	Used to test the throttle position sensor

Commercial Service Tools

NEEC0008

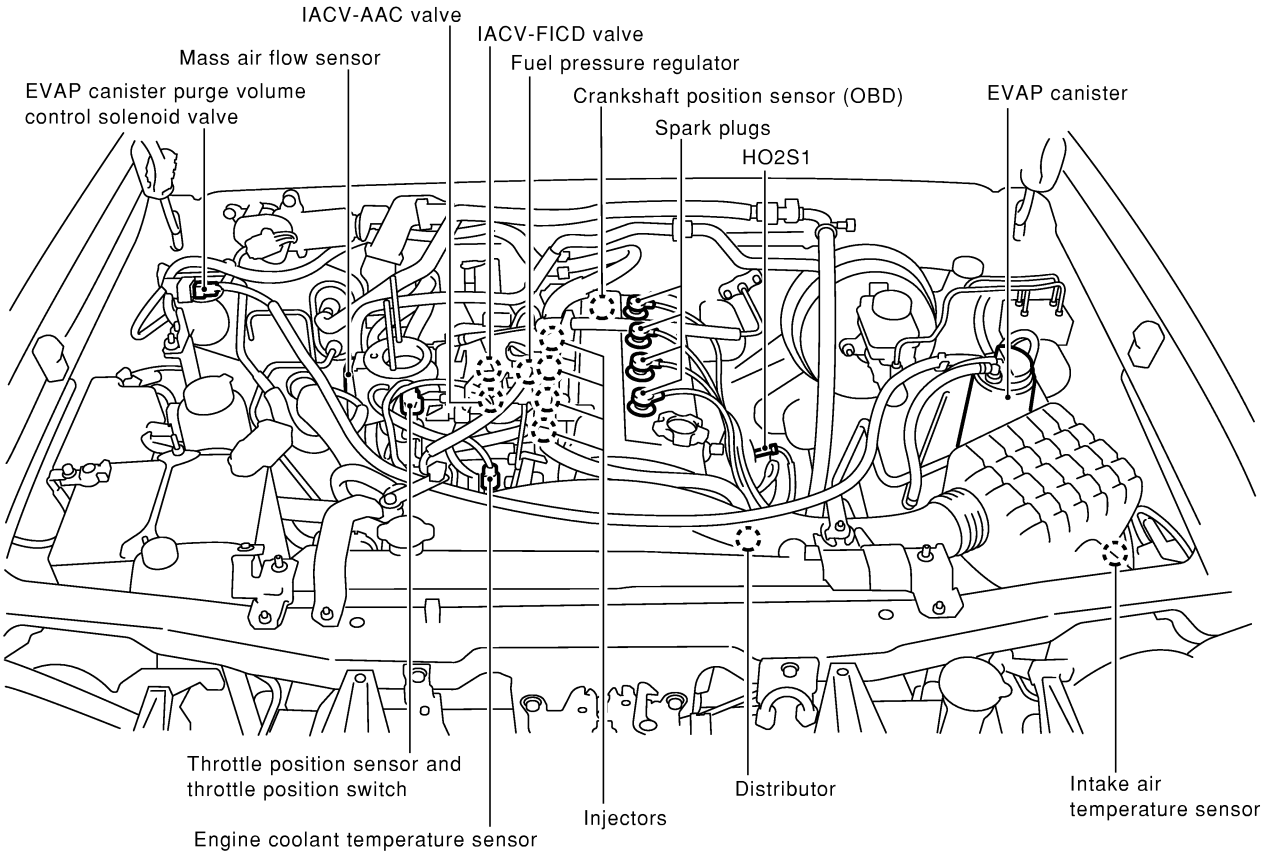
Tool name	Description	
Fuel filler cap adapter	 NT653	Checking fuel tank vacuum relief valve opening pressure
Socket wrench	 NT705	Removing and installing engine coolant temperature sensor

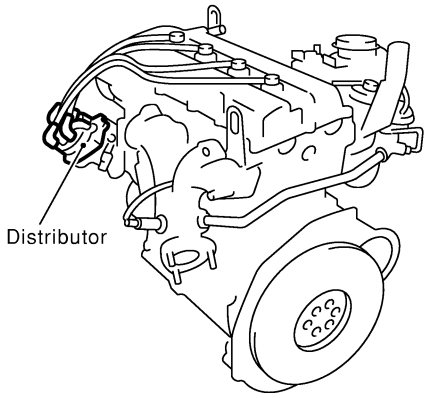
Commercial Service Tools

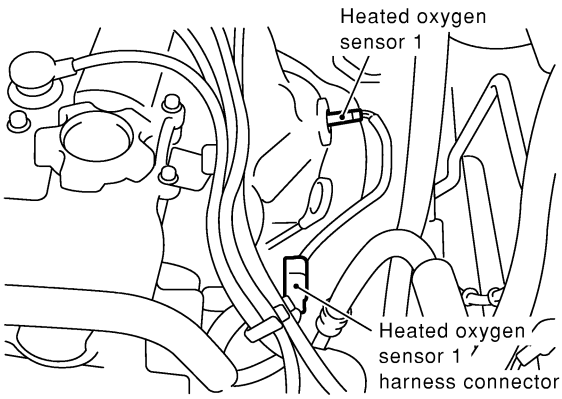
Tool name	Description	
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown in “Commercial Service tools”. a: J-43897-18 18 mm diameter, for Zirconia Oxygen Sensor b: J-43897-12 12 mm diameter, for Titania Oxygen Sensor
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 AEM489	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

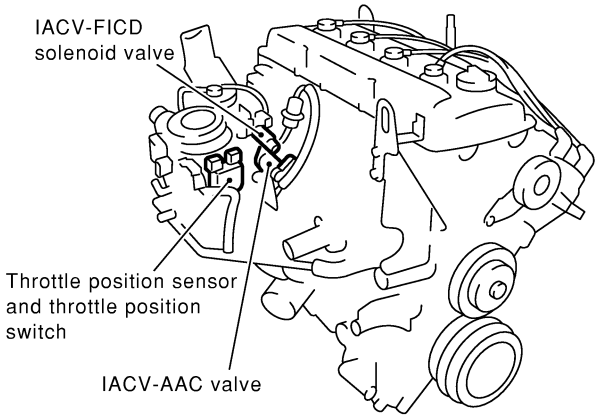
Engine Control Component Parts Location

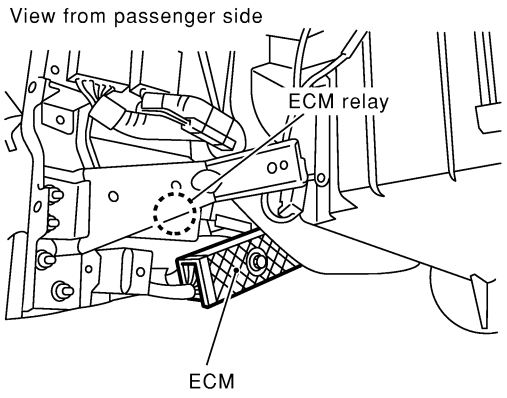
NEEC0009



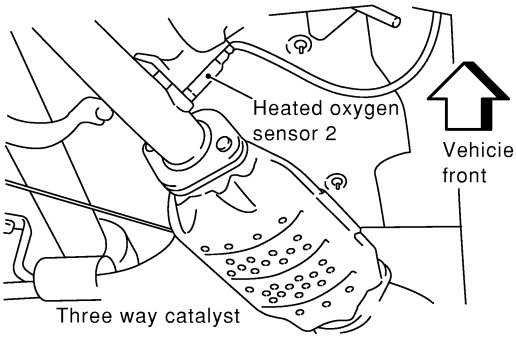


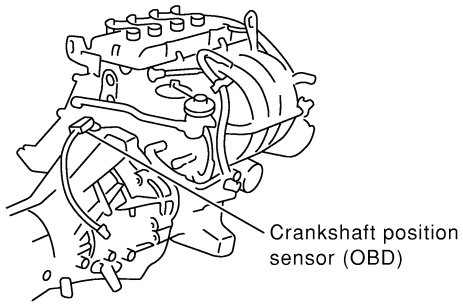






SEC196D

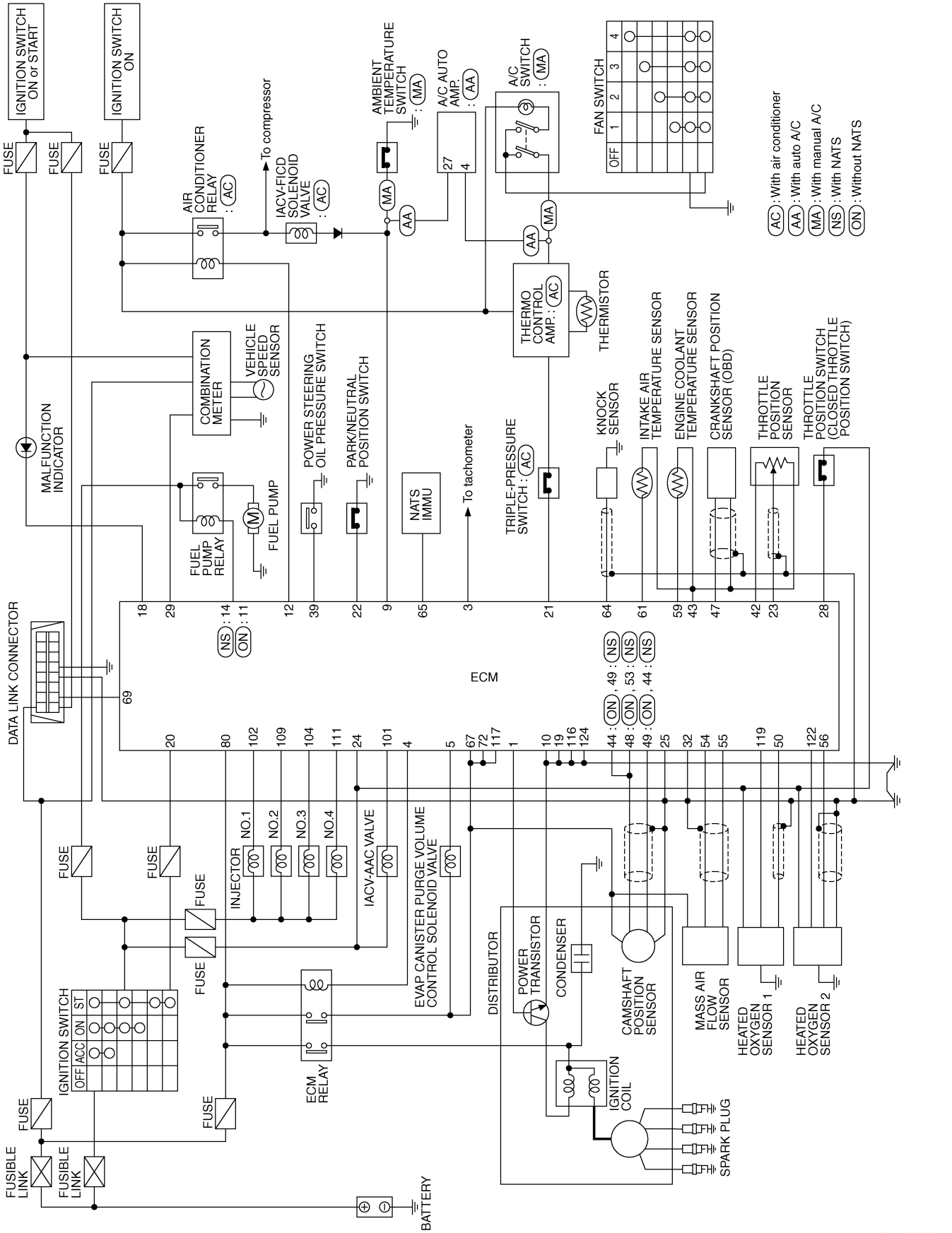

Heated oxygen sensor 2
Vehicle front
Three way catalyst


Crankshaft position sensor (OBD)

SEC302D

Circuit Diagram

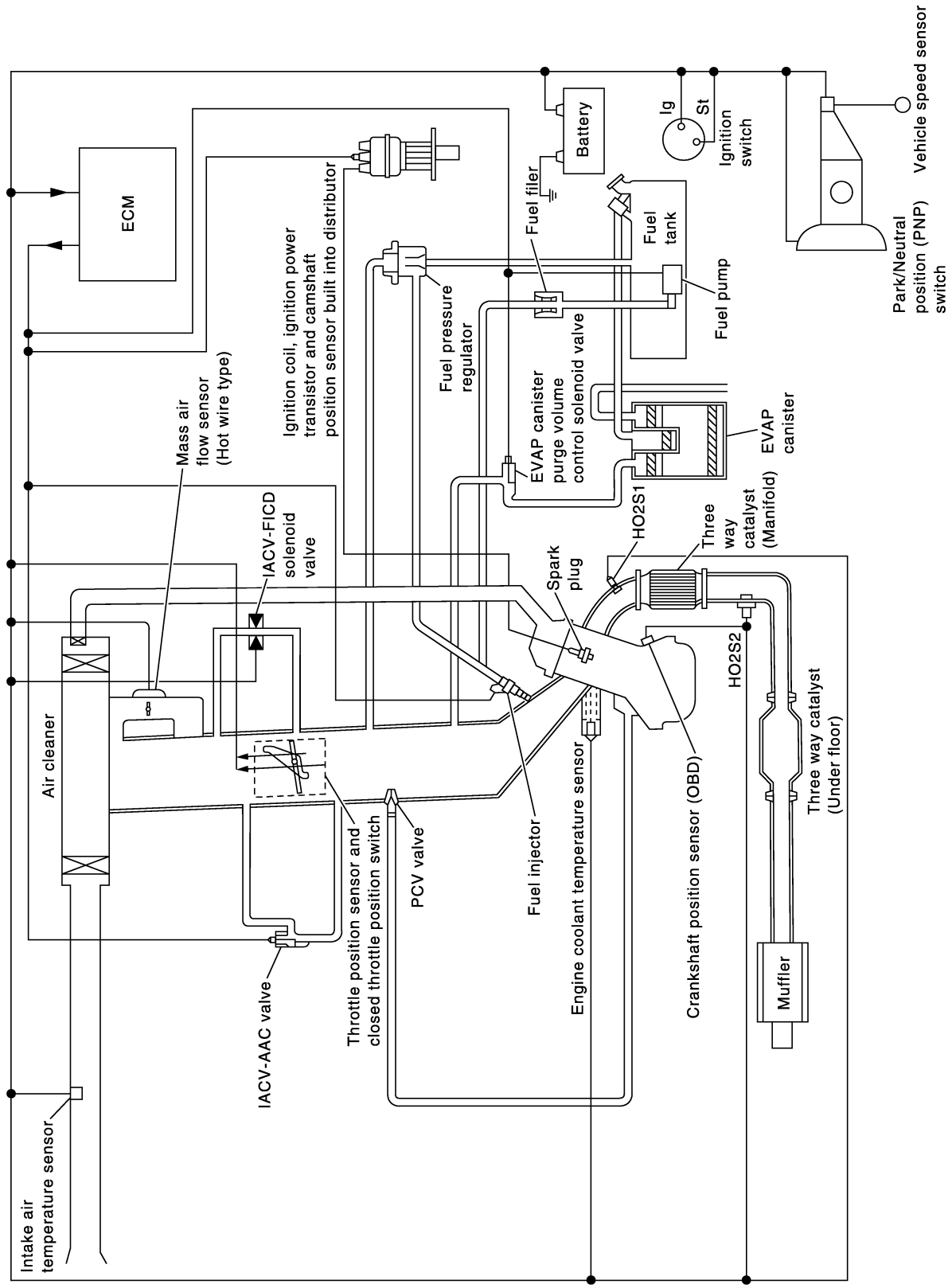
NEEC0010



GEC232A

System Diagram

NEEC0011

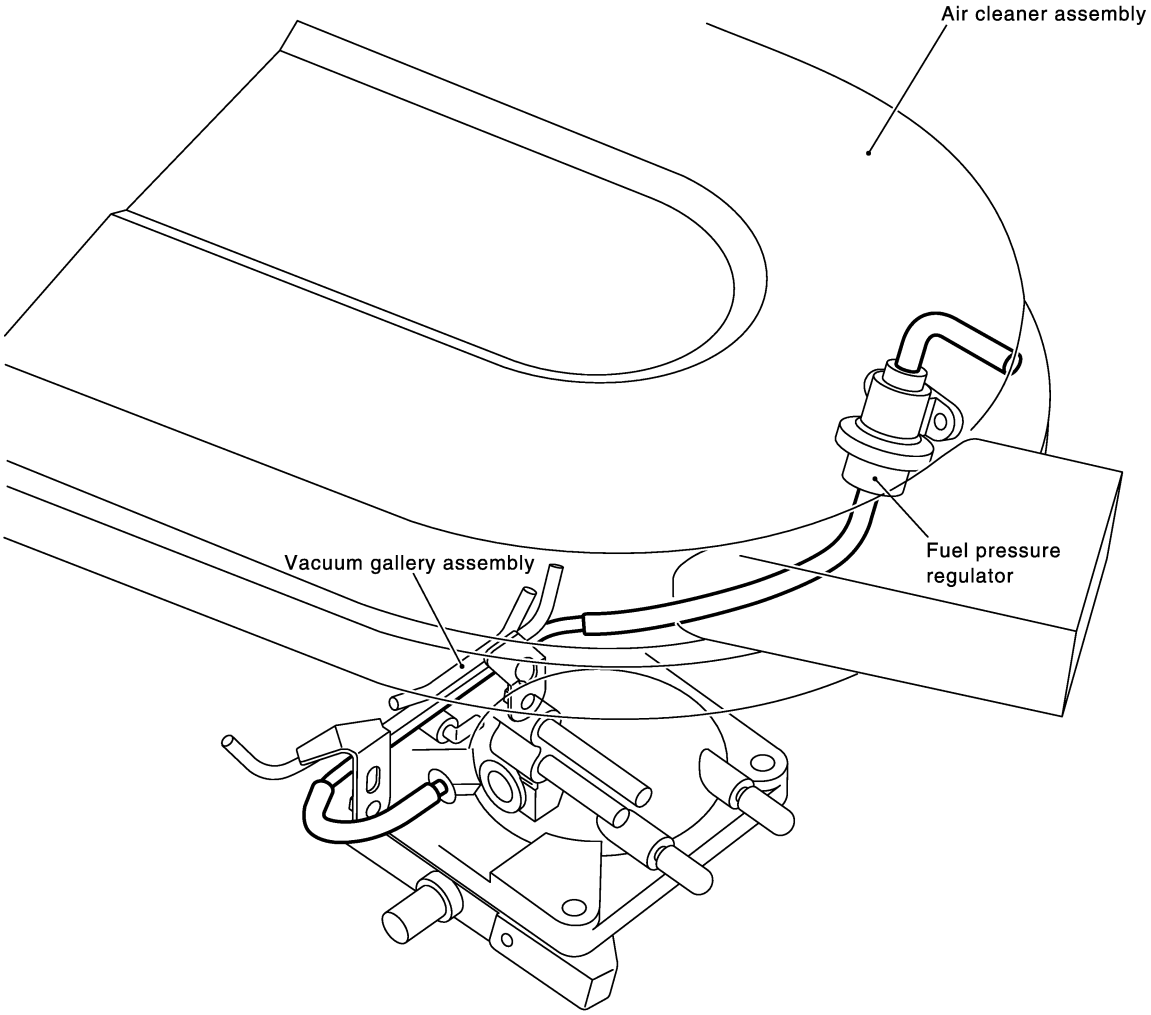


SEC270D

Vacuum Hose Drawing

NEEC0012

Refer to “System Diagram” on EC-3021 for vacuum control system.



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

SEC195D

System Chart

NEEC0013

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Ignition switch ● Throttle position sensor ● PNP switch ● Air conditioner switch ● Knock sensor ● Crankshaft position sensor (OBD) ● Battery voltage ● Power steering oil pressure switch ● Vehicle speed sensor ● Intake air temperature sensor ● Heated oxygen sensor 2*1 ● Closed throttle position switch*2	Fuel injection & mixture ratio control	Injectors
	Distributor ignition system	Power transistor
	Idle air control system	IACV-AAC valve and IACV-FICD solenoid valve
	Fuel pump control	Fuel pump relay
	Heated oxygen sensor 1 monitor & on board diagnostic system	Malfunction indicator (On the instrument panel)
	Heated oxygen sensors 1, 2 heater control	Heated oxygen sensor heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay

*1: Under normal conditions, this sensor is not for engine control operation.
*2: This switch will operate in place of the throttle position sensor to control EVAP parts if the sensor malfunctions.

Multiport Fuel Injection (MFI) System

DESCRIPTION

NEEC0014

Input/Output Signal Chart

NEEC0014S01

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	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		
Battery	Battery voltage		
Power steering oil pressure switch	Power steering operation		
Heated oxygen sensor 2*	Density of oxygen in exhaust gas		

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

Basic Multiport Fuel Injection System

NEEC0014S02

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

NEEC0014S03

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

<Fuel increase>

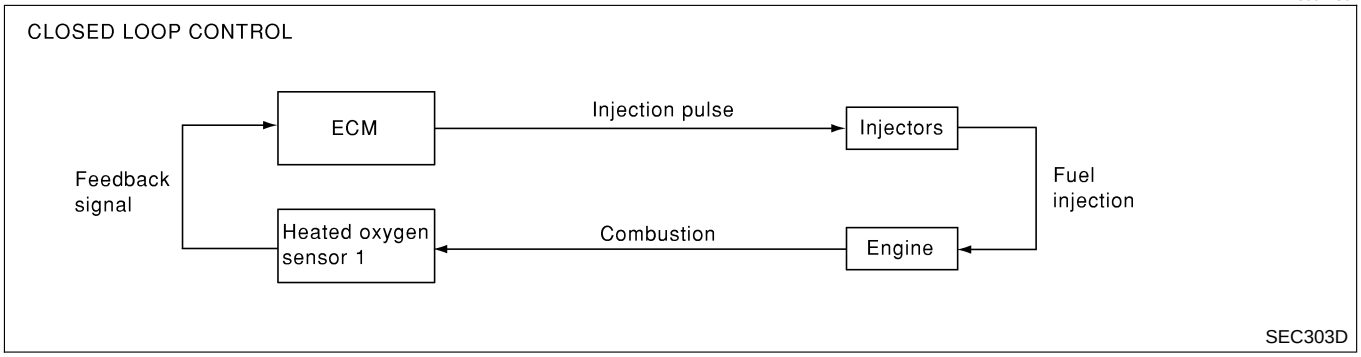
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

Mixture Ratio Feedback Control (Closed loop control)

NEEC0014S04



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 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, refer to EC-3213. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst. Even if the switching characteristics of the heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from the heated oxygen sensor 2.

Open Loop Control

NEEC0014S05

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

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- When starting the engine

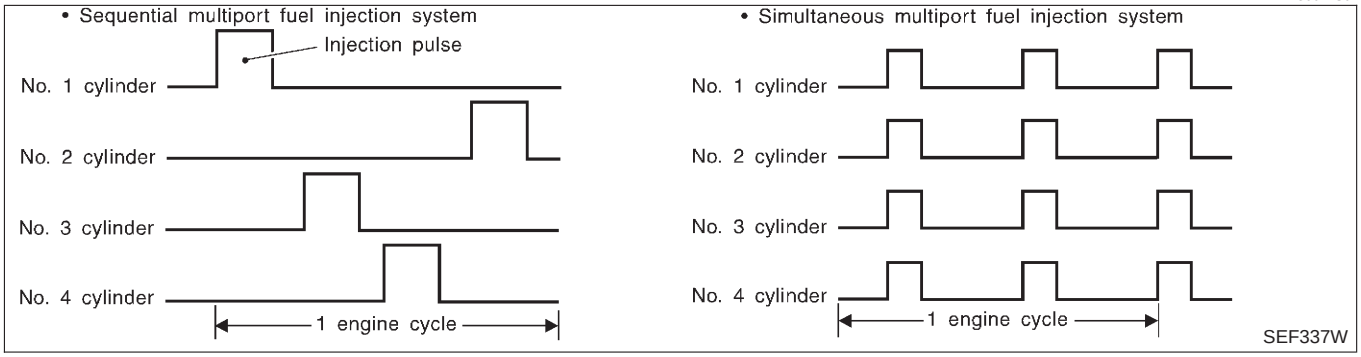
Mixture Ratio Self-learning Control

NEEC0014S06

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

NEEC0014S07



Two types of systems are used.

Sequential Multiport Fuel Injection System

NEEC0014S0701

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

NEEC0014S0702

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

NEEC0014S08

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

Distributor Ignition (DI) System

DESCRIPTION

NEEC0015

Input/Output Signal Chart

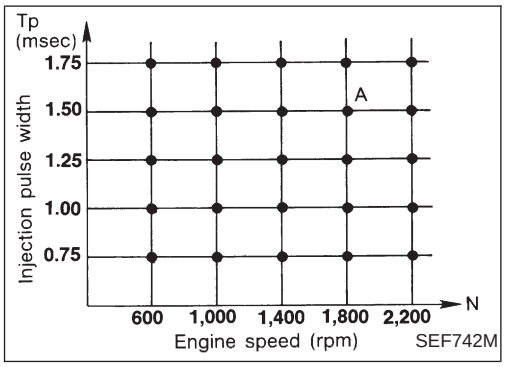
NEEC0015S01

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		

Distributor Ignition (DI) System

System Description

NEEC0015S02



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 and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A°BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

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

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

Air Conditioning Cut Control

DESCRIPTION

=NEEC0016

Input/Output Signal Chart

NEEC0016S01

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

System Description

NEEC0016S02

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.
- When the engine coolant temperature becomes excessively high.
- When operating power steering and air conditioner during low engine speed or when fully releasing accelerator pedal.
- When engine speed is excessively low.

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

DESCRIPTION

NEEC0017

Input/Output Signal Chart

NEEC0017S01

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		
Camshaft position sensor	Engine speed		

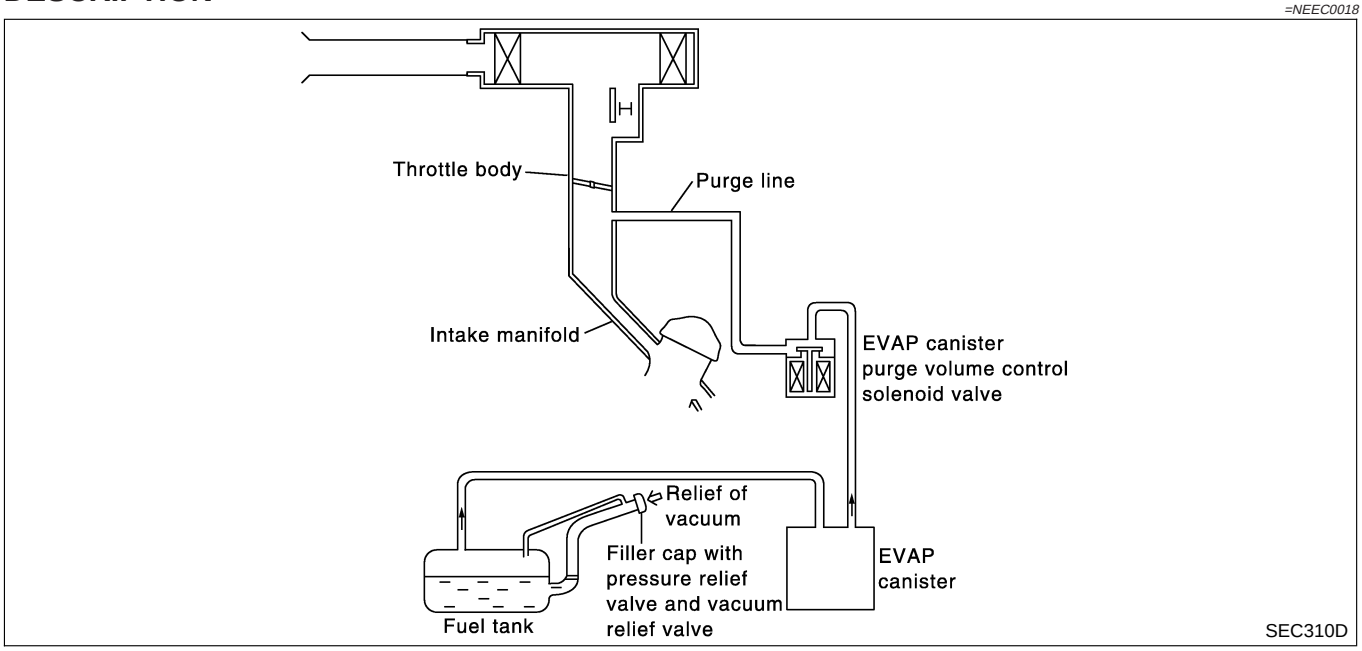
If the engine speed is above 3,000 rpm with no load, (for example, in Neutral and engine speed over 3,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-3024.

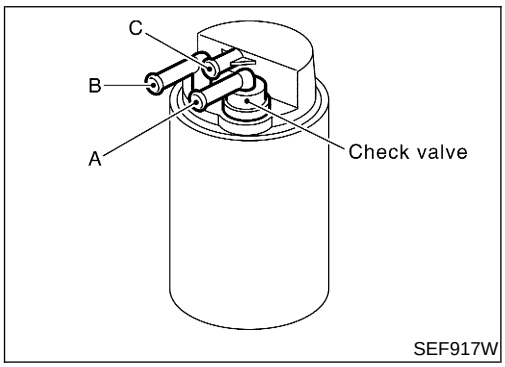
Evaporative Emission System

DESCRIPTION

=NEEC0018



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

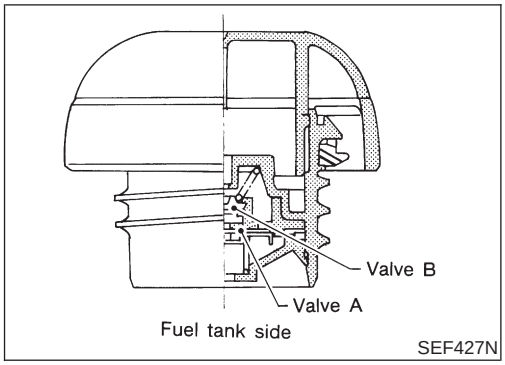
NEEC0019

EVAP Canister

NEEC0019S01

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.



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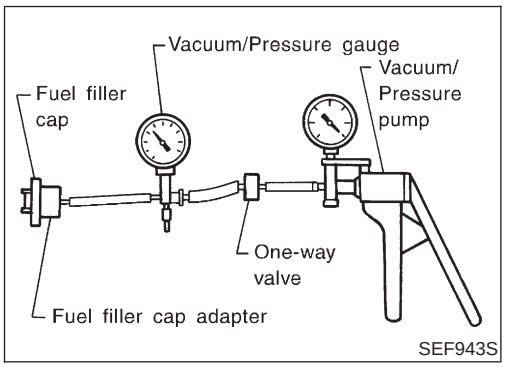


SEF943S

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

NEEC0019S03

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 (−0.06 to −0.35 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.

CAUTION:
Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MI may come on.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve

NEEC0019S06

Refer to EC-3283.

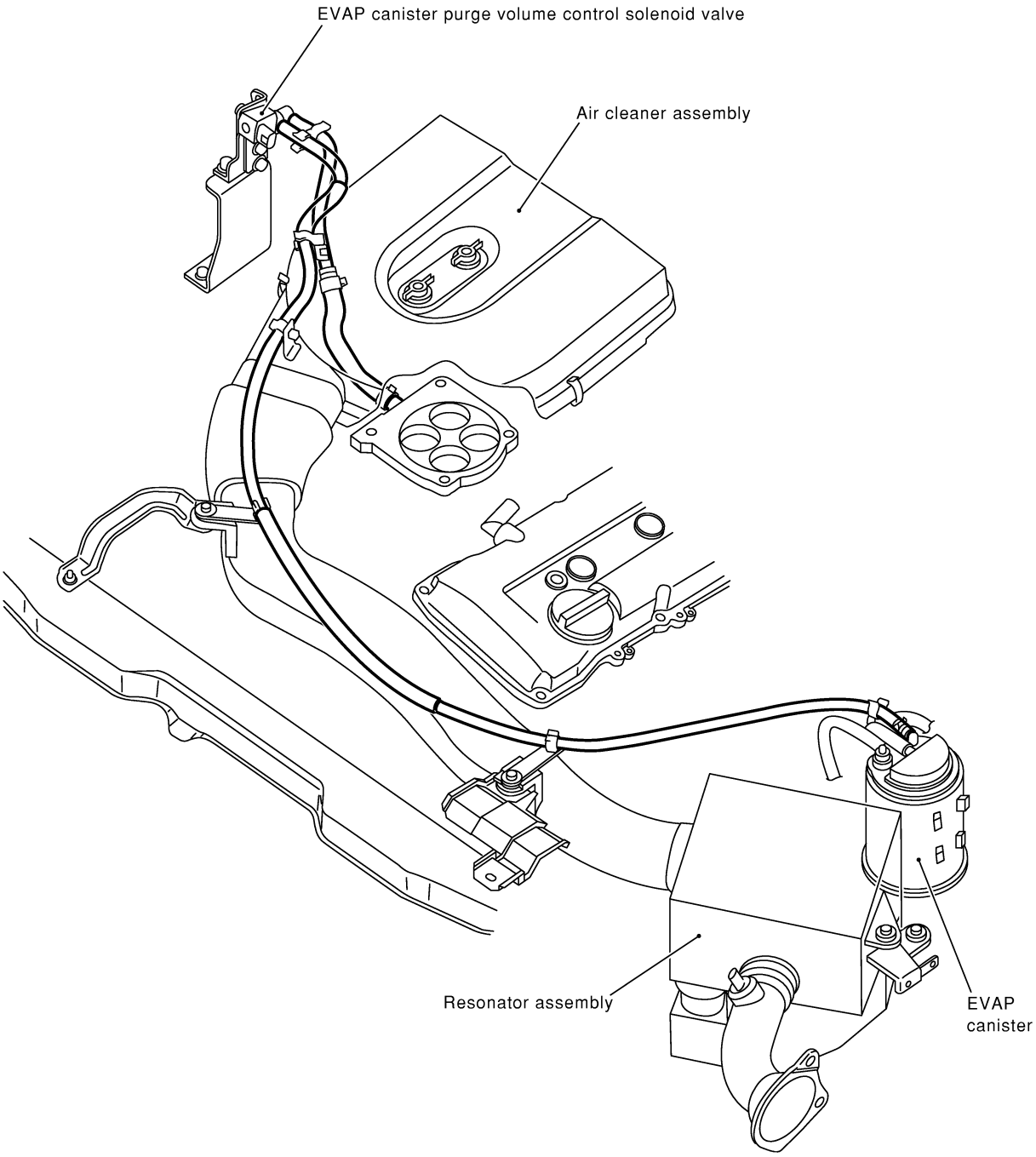
Checking EVAP Vapor Lines

NEEC0019S13

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 EC-3030.

EVAPORATIVE EMISSION LINE DRAWING

=NEEC0020



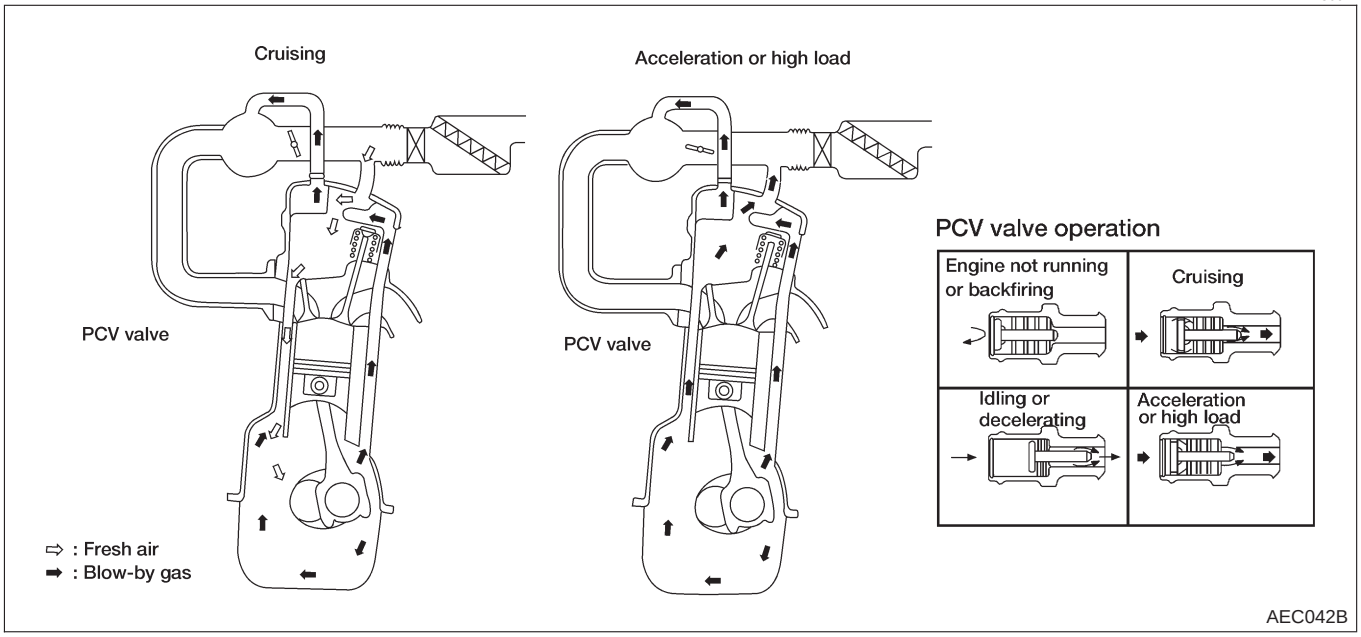
NOTE:
Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

SEC266D

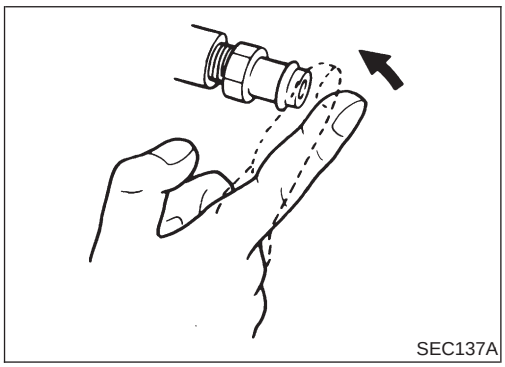
Positive Crankcase Ventilation

DESCRIPTION

NEEC0022



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.


SEC137A

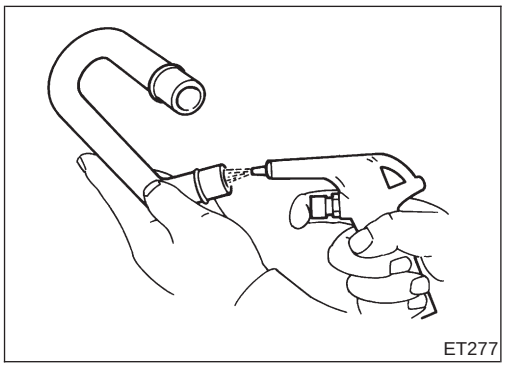
INSPECTION

NEEC0023

PCV (Positive Crankcase Ventilation) Valve

NEEC0023S01

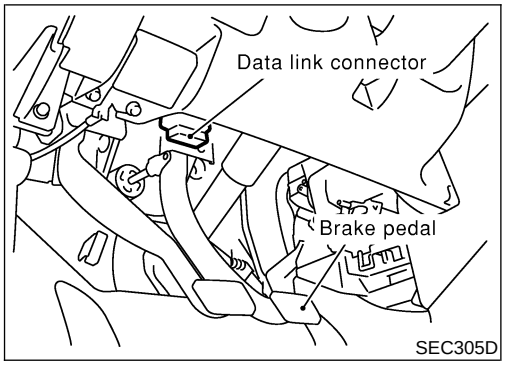
With engine running at idle, remove PCV valve from breather separator. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.


ET277

Ventilation Hose

NEEC0023S02

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



Fuel Pressure Release

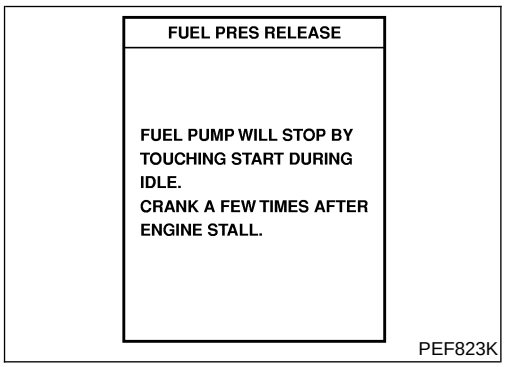
NEEC0024

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

WITH CONSULT-II

NEEC0024S01

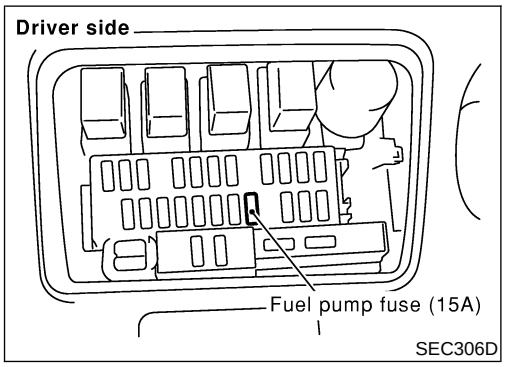
1. Start engine.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-II.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.



WITHOUT CONSULT-II

NEEC0024S02

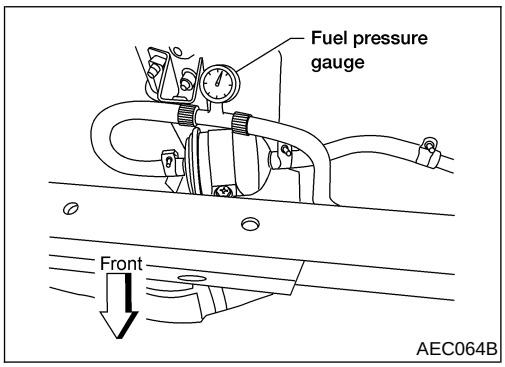
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF and reconnect fuel pump fuse.



Fuel Pressure Check

NEEC0025

- **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.

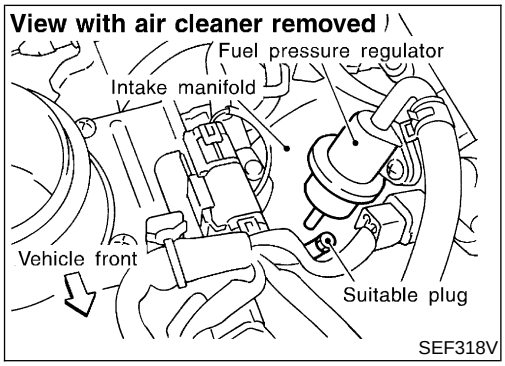
At idle speed:

With vacuum hose connected

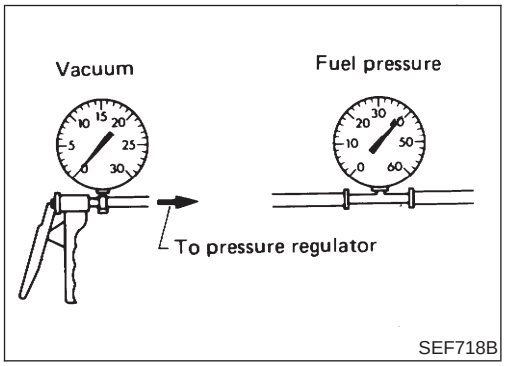
Approximately 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)

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-3034.

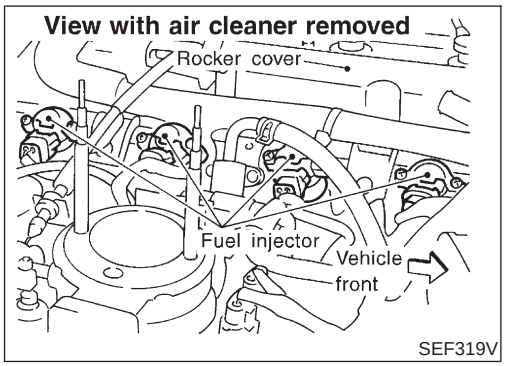


Fuel Pressure Regulator Check

NEEC0026

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

NEEC0027

1. Release fuel pressure to zero.
2. Remove injector tube assembly with injectors from intake manifold.
3. Remove injectors from injector tube assembly.

- Push injector tail piece.
- Do not pull on the connector.

4. Install injector to fuel tube assembly.

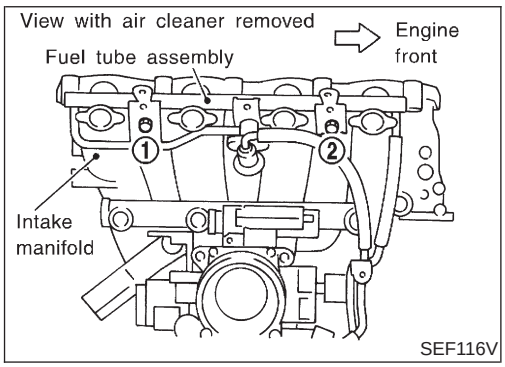
a. Clean exterior of injector tail piece.
b. Use new O-rings.

Always replace O-rings with new ones.
Lubricate O-rings with a smear of engine oil.

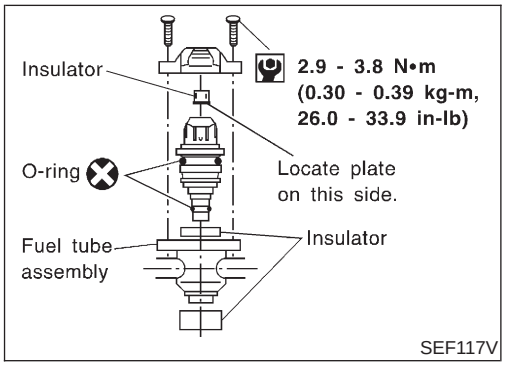
5. Install injectors with fuel tube assembly to intake manifold. **Tighten in numerical order shown in the figure.**

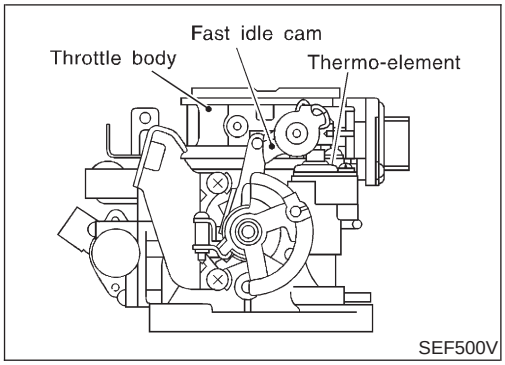
a. First, tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).
b. Then, tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).

6. Install fuel hoses to fuel tube assembly.
7. Reinstall any parts removed in reverse order of removal.



CAUTION:
After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.





Fast Idle Cam (FIC)

COMPONENT DESCRIPTION

NEEC0502

The FIC is installed on the throttle body to maintain adequate engine speed while the engine is cold. It is operated by a volumetric change in wax located inside the thermo-element. The thermo-element is operated by engine coolant temperature.
For inspection refer to “TROUBLE DIAGNOSIS-BASIC INSPECTION”, “Basic Inspection”, EC-3086.

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

NEEC0028

PREPARATION

NEEC0028S05

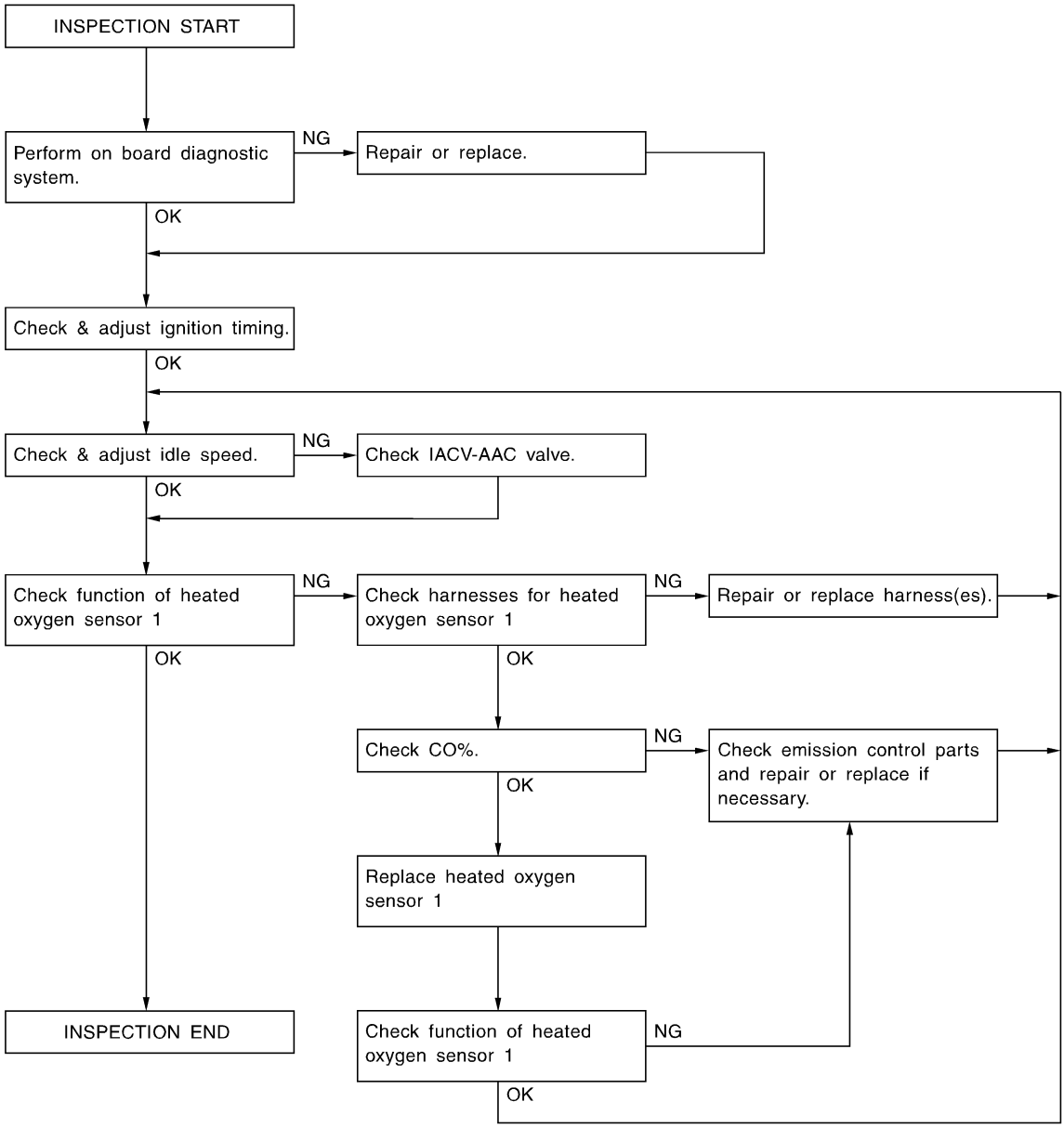
- **Make sure that the following parts are in good order.**

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) **Throttle valve**
k) **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.**
- **Keep front wheels pointed straight ahead.**

Overall Inspection Sequence

NEEC0028S0501



SEF554YB

NOTE:
If a vehicle contains a part which is operating outside of design specifications with no MI illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system cannot reasonably be expected to detect the resulting malfunction.

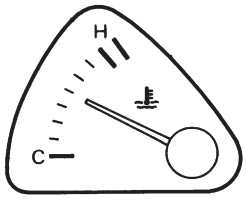
INSPECTION PROCEDURE

=NEEC0028S02

1	INSPECTION START

1. Visually check the following:
- Air cleaner clogging
- Hoses and duct for leaks
- Electrical connectors
- Gasket (intake manifold, cylinder head, exhaust system)
- 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 speed stays below 1,000 rpm.



SEF810K

3. Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.
4. Make sure that no DTC is displayed with CONSULT-II or GST.

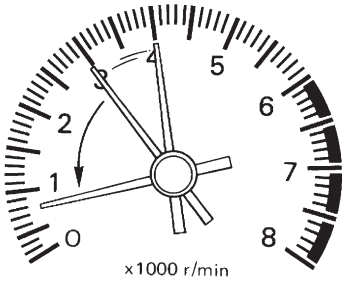
OK or NG

OK	▶	• GO TO 2. (With CONSULT-II) • GO TO 3. (Without CONSULT-II)
NG	▶	1. Repair or replace components as necessary. 2. GO TO 2. (With CONSULT-II) 3. GO TO 3. (Without CONSULT-II)

2	CHECK IGNITION TIMING

With CONSULT-II

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



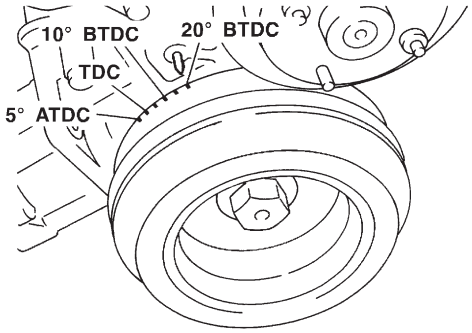
SEF978U

3. Select “IGNITION TIMING ADJ” in WORK SUPPORT mode.
4. Touch “START”.

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.

PEF546N

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



SEF320V

M/T: 15°±2° BTDC

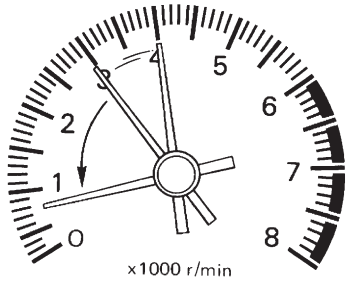
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

3	CHECK IGNITION TIMING

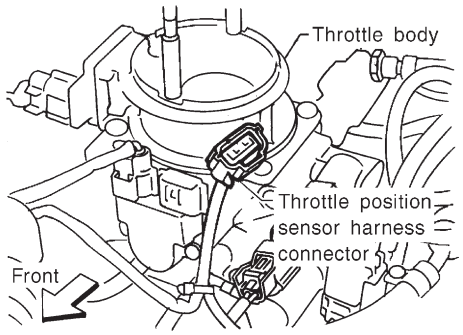
Without CONSULT-II

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



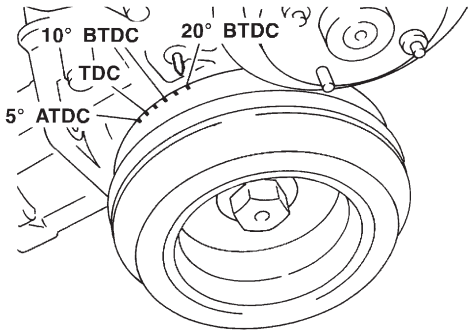
SEF978U

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



SEF265S

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



SEF320V

M/T: 15°±2° BTDC

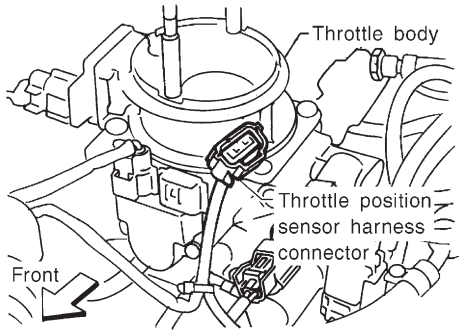
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	ADJUST IGNITION TIMING

With CONSULT-II
1. Adjust ignition timing to the specified value by turning distributor after loosening bolts which secure distributor.

Without CONSULT-II
1. Adjust ignition timing to the specified value by turning distributor after loosening bolts which secure distributor.
2. Turn off engine and connect throttle position sensor harness connector to throttle position sensor.



SEF265S

Models with CONSULT-II	▶	GO TO 2.
Models without CONSULT-II	▶	GO TO 3.

5	CHECK BASE IDLE SPEED

With CONSULT-II
1. Read idle speed in “IGNITION TIMING ADJ” in “WORK SUPPORT” mode.

IGNITION TIMING ADJ	
CONDITION SETTING	
IGN/T FEEDBACK	HOLD
MONITOR	
ENG SPEED	XXX rpm
IGN TIMING	XXX BTDC
CLSD THL POS	ON

SEF713Z

M/T: 650±50 rpm

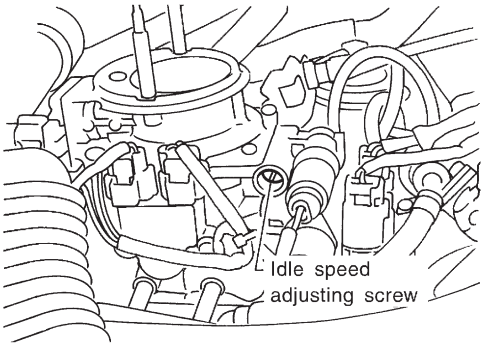
Without CONSULT-II
1. Check idle speed.
M/T: 650±50 rpm

OK or NG

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

6	ADJUST BASE IDLE SPEED

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



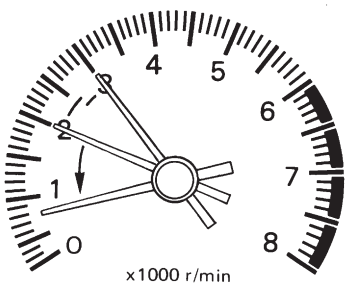
SEF240SA

M/T: 650±50 rpm

Models with CONSULT-II ▶	GO TO 7.
Models without CONSULT-II ▶	GO TO 8.

7	CHECK TARGET IDLE SPEED

With CONSULT-II
1. Touch “BACK” on CONSULT-II.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.



SEF602K

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

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

M/T: 700±50 rpm

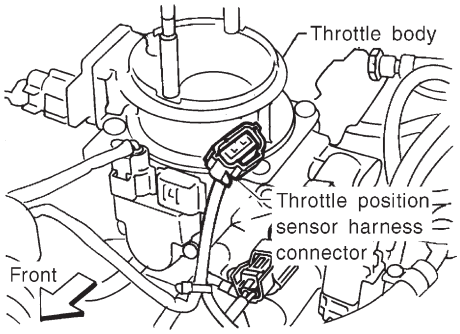
OK or NG

OK ▶	GO TO 10.
NG ▶	GO TO 9.

8	CHECK TARGET IDLE SPEED

Without CONSULT-II

1. Turn off engine and connect throttle position sensor harness connector.



SEF265S

2. Start engine.
3. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
4. Check target idle speed.
   M/T: 700±50 rpm

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.

1. Check IACV-AAC valve and replace if necessary. Refer to EC-3295.
2. Check IACV-AAC valve harness and repair if necessary. Refer to EC-3295.
3. Check ECM function by substituting another known-good ECM.
   (ECM may be the cause of a problem, but this is rarely the case.)

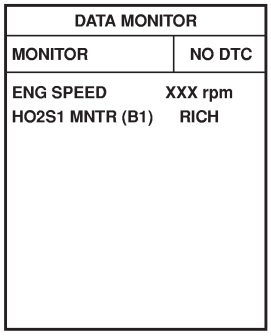
	▶	GO TO 10.

10	CHECK HEATED OXYGEN SENSOR 1 SIGNAL

With CONSULT-II

1. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
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 (engine is warmed up to normal operating temperature) and check that the monitor fluctuates between “LEAN” and “RICH” more than five times during 10 seconds.

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



SEF820Y

1 cycle: RICH → LEAN → RICH
2 cycles: RICH → LEAN → RICH → LEAN → RICH

Without CONSULT-II

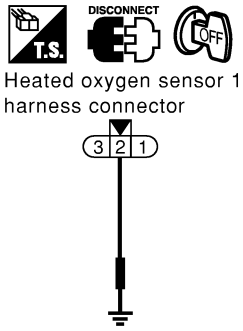
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Set voltmeter probe between ECM terminal 50 and ground.
3. Make sure that the voltage fluctuates between 0 - 0.3V and 0.6 - 1.0V more than 5 times during 10 seconds at 2,000 rpm.
   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

OK or NG

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

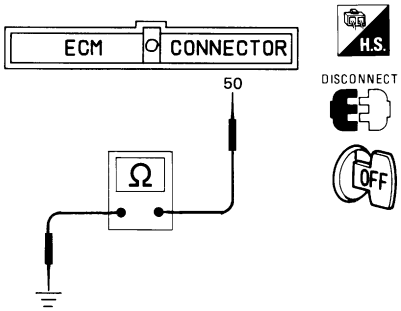
11	CHECK HEATED OXYGEN SENSOR 1 HARNESS

1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect heated oxygen sensor 1 harness connector.
4. Then connect harness connector terminal for heated oxygen sensor 1 to ground with a jumper wire.



SEC299D

5. Check for continuity between terminal 50 of ECM harness connector and body ground.



SEF250P

Continuity exists...OK
Continuity does not exist...NG

OK or NG

OK	▶	1. Connect ECM harness connector to ECM. 2. Connect battery ground cable. 3. GO TO 13.
NG	▶	1. Repair or replace harness. 2. GO TO 12.

12	PREPARATION FOR IDLE SPEED ADJUSTING

With CONSULT-II

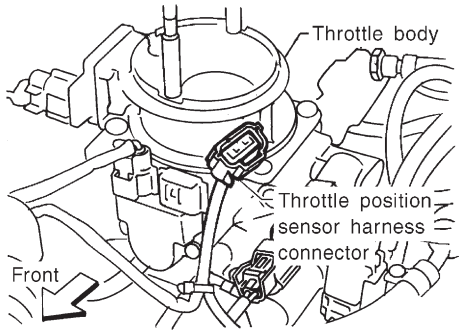
1. Select “IGNITION TIMING ADJ” in “WORK SUPPORT” mode.
2. Touch “START”.

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.

PEF546N

Without CONSULT-II

1. Stop engine and disconnect throttle position sensor harness connector.



SEF265S

2. Start engine.

▶	GO TO 6.

13	PREPARATION FOR “CO” % CHECK

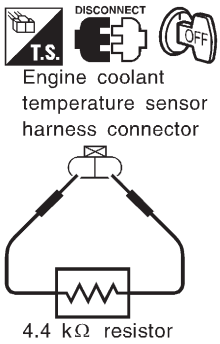
With CONSULT-II

1. Select “ENGINE COOLANT TEMP” in “ACTIVE TEST” mode.
2. Set “COOLANT TEMP” to 5°C (41°F) by touching “Qu” and “Qd” and “UP”, “DOWN”.

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

SEF172Y

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



SEF053RA

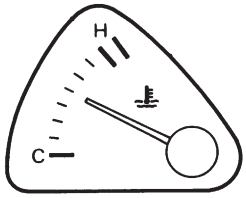
4. Connect battery ground cable.

▶	GO TO 14.

14	CHECK “CO” %

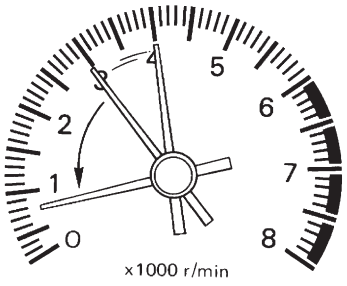
Without CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points to middle of gauge.
   (Be sure to start engine after setting “COOLANT TEMP” or installing a 4.4 kΩ resistor.)



SEF810K

2. Rev engine two or three times under no-load, then run engine at idle speed.



SEF978U

3. Check “CO” %.
   Idle CO: 2.9 - 10.8% and engine runs smoothly.
4. **With CONSULT-II**
   After checking CO%, touch “BACK”.
5. **Without CONSULT-II**
   After checking CO%,

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

OK or NG

OK	▶	GO TO 15.
NG	▶	GO TO 16.

15	CHECK HEATED OXYGEN SENSOR 1 SIGNAL

With CONSULT-II

1. Replace heated oxygen sensor 1.
2. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
3. Maintain 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 five times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

Without CONSULT-II

1. Stop engine.
2. Replace heated oxygen sensor 1.
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 50 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 12.
NG	▶	GO TO 16.

16	DETECT MALFUNCTIONING PART

1. Connect heated oxygen sensor 1 harness connector to heated oxygen sensor 1.
2. Check fuel pressure regulator. Refer to EC-3034.
3. Check mass air flow sensor and its circuit.
   Refer to EC-3143, EC-3151.
4. Check injector and its circuit.
   Refer to EC-3369.
   Clean or replace if necessary.
5. Check engine coolant temperature sensor and its circuit. Refer to EC-3165.
6. 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 12.

- **If a vehicle contains a part which is operating outside of design specifications with no MI illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system cannot reasonably be expected to detect the resulting malfunction.**

Introduction

NEEC0029

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 15031-6

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

X: Applicable —: Not applicable

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

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

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-3101.)

Two Trip Detection Logic

NEEC0030

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

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-3101.)	—	X	—	—	X*1	—	X*1	—
Except above	—	—	—	X	—	X	X	—

*1: Except “ECM”

Emission-related Diagnostic Information

NEEC0031

DTC AND 1ST TRIP DTC

NEEC0031S01

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-3060.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-3058. 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-3084. 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

NEEC0031S0101

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

With CONSULT-II

With GST

CONSULT-II or GST (Generic Scan Tool) Examples: P0340 etc.
These DTCs are prescribed by ISO 15031-5.
(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, GST does not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal.**
  CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.

A sample of CONSULT-II display for DTC 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
MAF SEN/CIRCUIT [P0101]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
MAF SEN/CIRCUIT [P0101]	1t

LEC028A

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

NEEC0031S02

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 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-3073.
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the

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

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items
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-3060.

SYSTEM READINESS TEST (SRT) CODE

NEEC0031S03

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15051-5.
As part of enhanced emissions test for Inspection and Maintenance (I/M), certain states require that 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 “incomplete”, use the information in this service manual to set the SRT to “complete”.
In most cases, the ECM will automatically complete its self-diagnosis cycle during normal usage and the SRT status will indicate “complete” for each application system. Once set as “complete”, the SRT status remains “complete” 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 and the SRT will indicate “incomplete” for these items.

NOTE:
The SRT will also indicate “incomplete” 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 “complete” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “incomplete” 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 “complete” for all test items. Therefore, it is important to check SRT (“complete”) and DTC (No DTCs) before the inspection.

This service manual contains the service procedure and support information to perform a comprehensive road test that enables the ECM to complete the SRT.

SRT Item

NEEC0031S0308

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

SRT item (CONSULT-II indication)	Performance Priority *	Required self-diagnostic items to set the SRT to ″CMPLT″	Corresponding DTC No.
CATALYST	3	Three way catalyst function	P0420
HO2S	2	Heated oxygen sensor 1	P0132
		Heated oxygen sensor 1	P0133
		Heated oxygen sensor 1	P0134
		Heated oxygen sensor 1	P1143
		Heated oxygen sensor 1	P1144
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139
		Heated oxygen sensor 2	P1146
		Heated oxygen sensor 2	P1147
HO2S HTR	1	Heated oxygen sensor 1 heater	P0031, P0032
		Heated oxygen sensor 2 heater	P0037, P0038

*: 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

NEEC0031S0310

SRT is set as “complete” after self-diagnosis has been performed one or more times. Completion of SRT will occur if the result is OK or NG. The set timing is different between them and is shown in the following table.

Self-diagnosis result		Example				
		Diagnosis	Ignition OFF – ON – OFF	Ignition OFF – ON – OFF	Ignition OFF – ON – OFF	Ignition OFF – ON – OFF
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	“complete”	“complete”	“complete”	“complete”
	Case 2	P0400	OK (1)	– (1)	– (1)	– (1)
		P0402	– (0)	– (0)	OK (1)	– (1)
		P1402	OK (1)	OK (2)	– (2)	– (2)
		SRT of EGR	“incomplete”	“incomplete”	“complete”	“complete”
NG exists	Case 3	P0400	OK	OK	–	–
		P0402	–	–	–	–
		P1402	NG	–	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	–	1st trip DTC	DTC (=MI “ON”)
		SRT of EGR	“incomplete”	“incomplete”	“incomplete”	“complete”

OK: Self-diagnosis is carried out and the result is OK.

NG: Self-diagnosis is carried out and the result is OK.

– : Self-diagnosis is not carried out.

When all SRT related self-diagnoses showed OK results in a same cycle (Ignition OFF – ON – OFF), the SRT will indicate “complete”.

→ Case 1 above

When all SRT related self-diagnoses show OK results through several different cycles, the SRT will indicate “complete” 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 “complete”.

→ Case 3 above

The previous table shows that the minimum number of cycles for setting SRT as “incomplete” is one (1) for each self-diagnosis (Case 1 and 2) or two (2) for one self-diagnosis (Case 3). However, in preparation for the State emissions inspection, it is unnecessary of each self-diagnosis to be executed twice (Case 3) because of the following reasons;

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

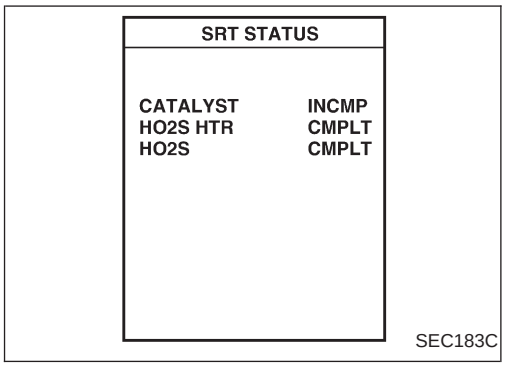
NOTE:
SRT can be set as “complete” together with the DTC(s). Therefore, DTC check must always be carried out prior to the State emission inspection even though the SRT indicates “complete”.

How to Display SRT Code

NEEC0031S0301

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

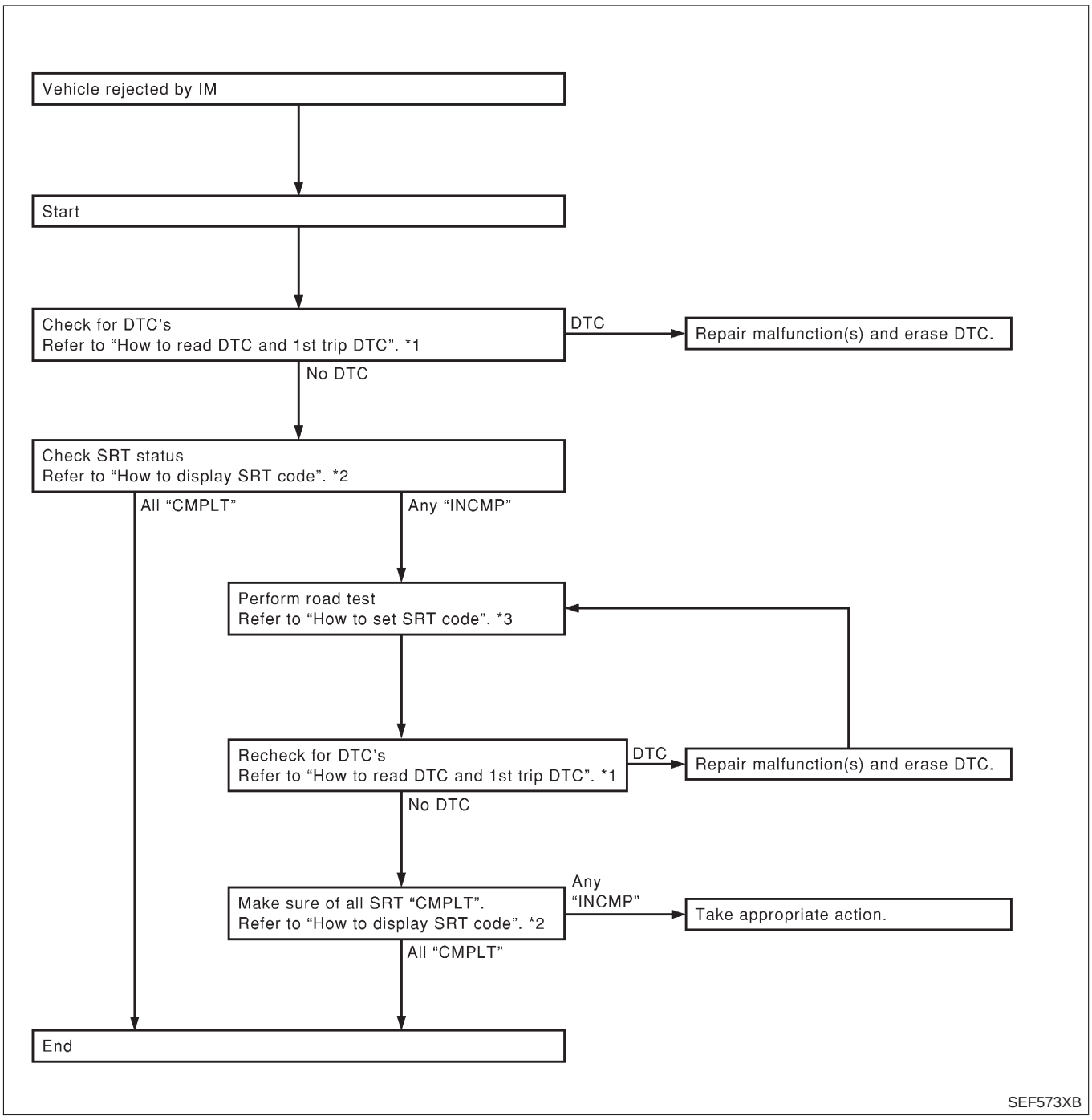
A sample of CONSULT-II display for SRT code is shown below.
“INCMP” means the self-diagnosis is incomplete and SRT is not set. “CMPLT” means the self-diagnosis is complete and SRT is set.



SRT Service Procedure

=NEEC0031S0311

If a vehicle has been rejected for the State emissions inspection due to one or more SRT items indicating “incomplete”, review the following flowchart diagnostic sequence.



*1 EC-3050 *2 EC-3053 *3 EC-3055

How to Set SRT Code

=NEEC0031S0302

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-3051.

Without CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on EC-3056. The driving pattern should be performed one or more times to set all SRT codes.

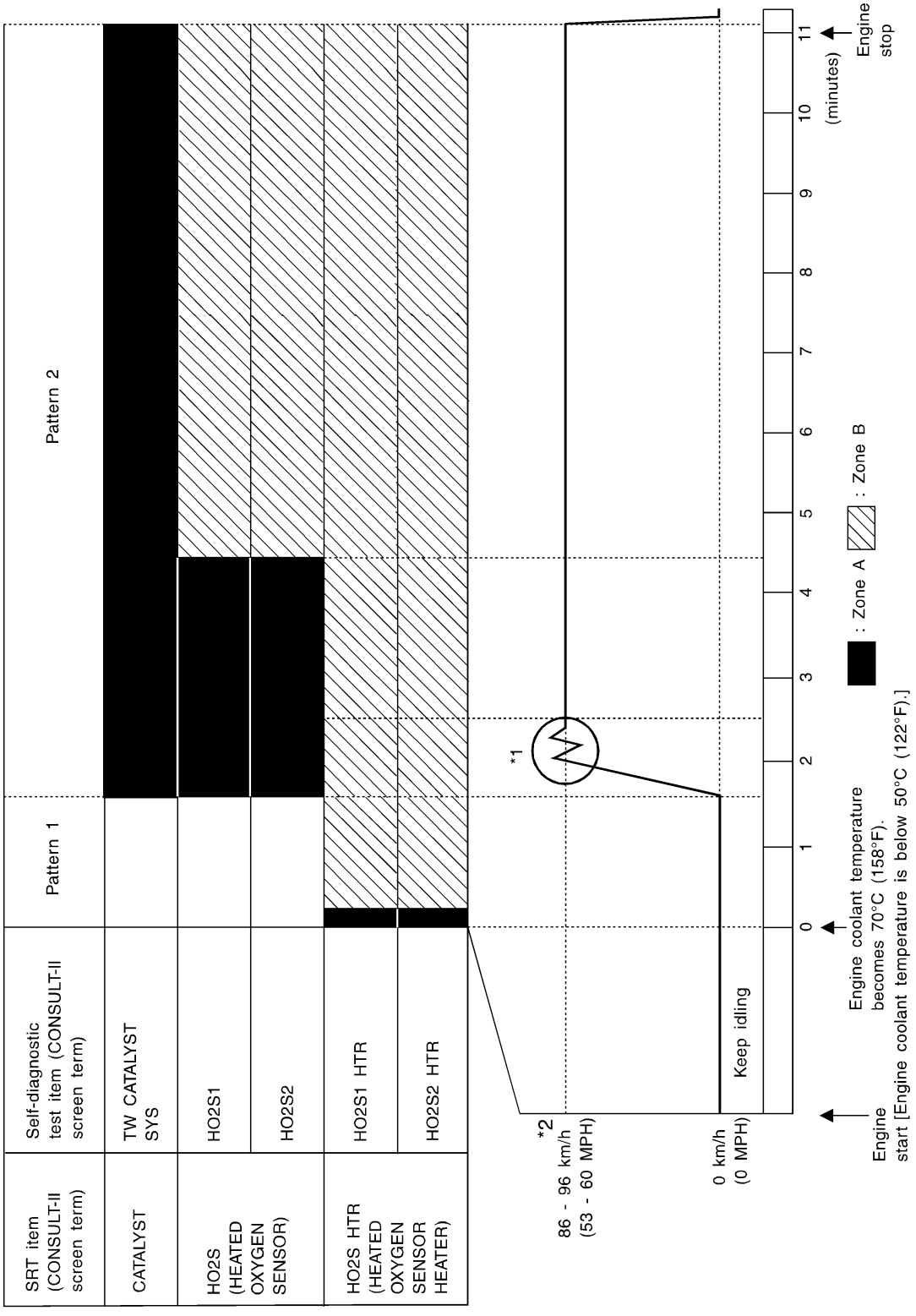
Driving Pattern

NEEC0031S0303

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.

Driving pattern



SEC300D

- 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 59 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 59 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 CONSULT-II or GST is advised.

Suggested upshift speeds for M/T models

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

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:		For quick acceleration in low altitude areas and high altitude areas [over 1,219 m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)	km/h (MPH)
1st to 2nd	24 (15)	24 (15)	24 (15)
2nd to 3rd	40 (25)	29 (18)	40 (25)
3rd to 4th	58 (36)	48 (30)	64 (40)
4th to 5th	64 (40)	63 (39)	72 (45)

Suggested Maximum Speed in Each Gear

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

Gear	km/h (MPH) 2WD (AUTO mode)
1st	50 (30)
2nd	95 (60)

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

NEEC0031S04

The following is the information specified in Mode 6 of ISO 15031-5.
The test value is a parameter used to determine whether a system/circuit diagnostic test is “OK” or “NG” while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the

maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items.
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

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
H02S	Heated oxygen sensor 1	09H	04H	Max.	X
		0AH	84H	Min.	X
		0BH	04H	Max.	X
		0CH	04H	Max.	X
		0DH	04H	Max.	X
	Heated oxygen sensor 2	19H	86H	Min.	X
		1AH	86H	Min.	X
		1BH	06H	Max.	X
		1CH	06H	Max.	X
HO2S HTR	Heated oxygen sensor 1 heater	29H	08H	Max.	X
		2AH	88H	Min.	X
	Heated oxygen sensor 2 heater	2DH	0AH	Max.	X
		2EH	8AH	Min.	X

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

NEEC0031S05

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*3	ECM				
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	—	—
HO2S1 HTR (B1)	P0031	0031	X	X	X*3	EC-3133
HO2S1 HTR (B1)	P0032	0032	X	X	X*3	EC-3133
HO2S2 HTR (B1)	P0037	0037	X	X	X*3	EC-3138
HO2S2 HTR (B1)	P0038	0038	X	X	X*3	EC-3138
MAF SEN/CIRCUIT	P0101	0101	—	—	X	EC-3143
MAF SEN/CIRCUIT	P0102*2	0102	—	—	—	EC-3151
MAF SEN/CIRCUIT	P0103*2	0103	—	—	—	EC-3151
IAT SEN/CIRCUIT	P0112*2	0112	—	—	—	EC-3160
IAT SEN/CIRCUIT	P0113*2	0113	—	—	—	EC-3160
ECT SEN/CIRCUIT	P0117*2	0117	—	—	—	EC-3165
ECT SEN/CIRCUIT	P0118*2	0118	—	—	—	EC-3165
TP SEN/CIRCUIT	P0121	0121	—	—	X	EC-3170

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*3	ECM				
TP SEN/CIRCUIT	P0122*2	0122	—	—	—	EC-3182
TP SEN/CIRCUIT	P0123*2	0123	—	—	—	EC-3182
IAT SENSOR	P0127	0127	—	—	X	EC-3193
HO2S1 (B1)	P0132	0132	X	X	X*3	EC-3196
HO2S1 (B1)	P0133	0133	X	X	X*3	EC-3202
HO2S1 (B1)	P0134	0134	X	X	X*3	EC-3213
HO2S2 (B1)	P0138	0138	X	X	X*3	EC-3220
HO2S2 (B1)	P0139	0139	X	X	X*3	EC-3227
FUEL SYS-LEAN-B1	P0171	0171	—	—	X	EC-3237
FUEL SYS-RICH-B1	P0172	0172	—	—	X	EC-3244
MULTI CYL MISFIRE	P0300	0300	—	—	X	EC-3251
CYL1 MISFIRE	P0301	0301	—	—	X	EC-3251
CYL2 MISFIRE	P0302	0302	—	—	X	EC-3251
CYL3 MISFIRE	P0303	0303	—	—	X	EC-3251
CYL4 MISFIRE	P0304	0304	—	—	X	EC-3251
KNOCK SEN/CIRC-B1	P0327	0327	—	—	—	EC-3260
KNOCK SEN/CIRC-B1	P0328	0328	—	—	—	EC-3260
CKP SEN/CIRCUIT	P0335	0335	—	—	X	EC-3264
CMP SEN/CIRCUIT	P0340	0340	—	—	X	EC-3270
TW CATALYST SYS-B1	P0420	0420	X	X	X*3	EC-3278
PURG VOLUME CONT/V	P0444	0444	—	—	X	EC-3283
PURG VOLUME CONT/V	P0445	0445	—	—	X	EC-3283
VEH SPEED SEN/CIRC	P0500	0500	—	—	X	EC-3290
ISC/CIRC	P0505	0505	—	—	X	EC-3295
CLOSED TP SW/CIRC	P0510	0510	—	—	X	EC-3301
ECM	P0605	0605	—	—	X	EC-3308
HO2S1 (B1)	P1143	1143	X	X	X*4	EC-3310
HO2S1 (B1)	P1144	1144	X	X	X*4	EC-3317
HO2S2 (B1)	P1146	1146	X	X	X*4	EC-3324
HO2S2 (B1)	P1147	1147	X	X	X*4	EC-3334
ENG OVER TEMP	P1217	1217	—	—	X	EC-3344
CKP SENSOR (COG)	P1336	1336	—	—	X	EC-3349
P-N POS SW/CIRCUIT	P1706	1706	—	—	X	EC-3355

*1: 1st trip DTC No. is the same as DTC No.
*2: When the fail-safe operation occurs, the MI illuminates.
*3: These numbers are prescribed by ISO 15031-6.
*4: These are not displayed with GST.

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

NEEC0031S06

How to Erase DTC (With CONSULT-II)

NEEC0031S0601

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. Turn CONSULT-II “ON” and 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” (engine stopped) again.

SELECT SYSTEM
ENGINE

2. Turn **CONSULT-II** “ON” and touch “ENGINE”.

SELECT DIAG MODE
WORK SUPPORT
SELF-DIAG RESULTS
DATA MONITOR
DATA MONITOR (SPEC)
ACTIVE TEST
SRT CONFIRMATION
ECM PART NUMBER

3. Touch “SELF-DIAG RESULTS”.

SELF DIAG RESULTS	
DTC RESULTS	TIME
MAF SEN/CIRCUIT [P0101]	0

4. Touch “ERASE”. (The DTC in the ECM will be erased.)

SEC312D

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

How to Erase DTC (With GST)

NEEC0031S0602

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. Select Mode 4 with GST (Generic Scan Tool).

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

NOTE:

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

1) Diagnostic trouble codes
2) 1st trip diagnostic trouble codes
3) Freeze frame data
4) 1st trip freeze frame data
5) System readiness test (SRT) codes
6) Test values
7) Others

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

NVIS (Nissan Vehicle Immobilizer System — NATS)

NEEC1601

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

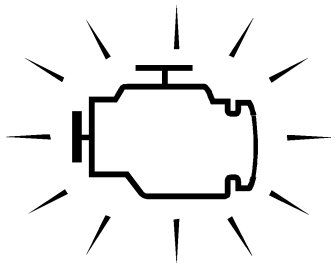
SEF515Y

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

Malfunction Indicator (MI)

DESCRIPTION

NEEC0032



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 section, "WARNING LAMPS" or see EC-3396.
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

NEEC0032S07

The on board diagnostic system has the following four functions.

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

MI Flashing without DTC

NEEC0032S0701

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

How to switch the diagnostic test (function) modes, and details of the above functions are described later. How to Switch Diagnostic Test Mode.

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

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

How to Switch Diagnostic Test Mode

NEEC0032S08

NOTE:

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

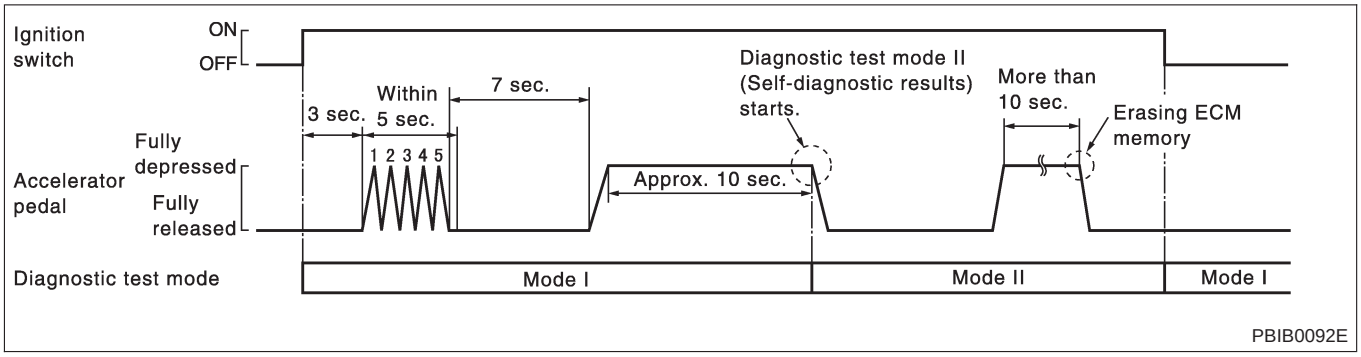
How to Set Diagnostic Test Mode II (Self-diagnostic Results)

NEEC0032S0801

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

1) Fully depress the accelerator pedal.
2) Fully release the accelerator pedal.

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



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

NEEC0032S0802

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to How to Set Diagnostic Test Mode II (Self-diagnostic Results).
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).
   ECM will start heated oxygen sensor 1 monitoring from the bank 1 sensor.

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

NEEC0032S0804

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

Diagnostic Test Mode I — Bulb Check

NEEC0032S09

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to WARNING LAMPS, EC-3396.

Diagnostic Test Mode I — Malfunction Warning

NEEC0032S10

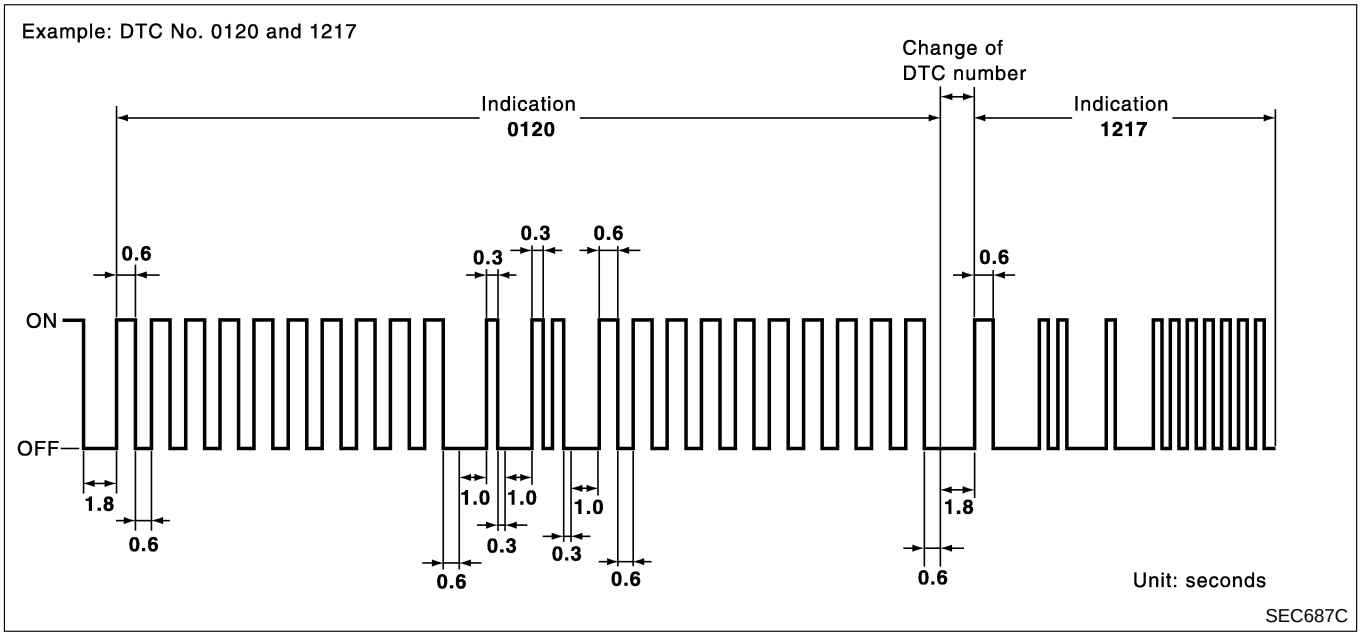
MI	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

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

Diagnostic Test Mode II — Self-Diagnostic Results

NEEC0032S11

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



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See “TROUBLE DIAGNOSIS — INDEX”, EC-3009.)

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

NEEC0032S1101

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to How to Switch Diagnostic Test Mode.

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

Diagnostic Test Mode II — Heated Oxygen Sensor 1 Monitor

NEEC0032S12

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

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

*: Maintains conditions just before switching to open loop.

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

OBD System Operation Chart

NEEC0033

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

NEEC0033S01

- 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-3049.

OBD System Operation Chart

- 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

NEEC0033S02

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-3067.

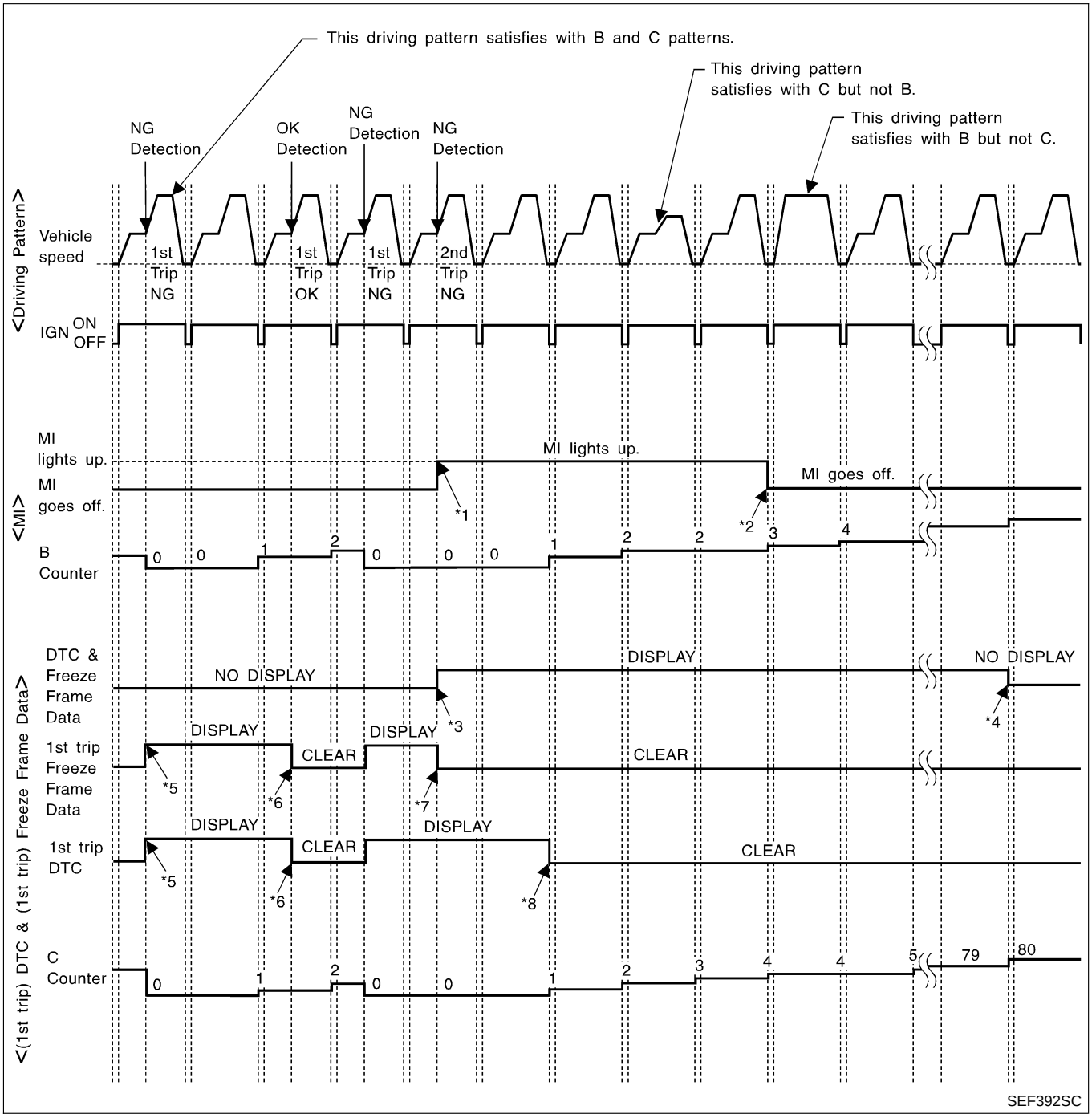
For details about patterns “A” and “B” under “Other”, see EC-3069.

*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"

=NEEC0033S03



*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”

NEEC0033S04

Driving Pattern B

NEEC0033S0401

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

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

Driving Pattern C

NEEC0033S0402

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:

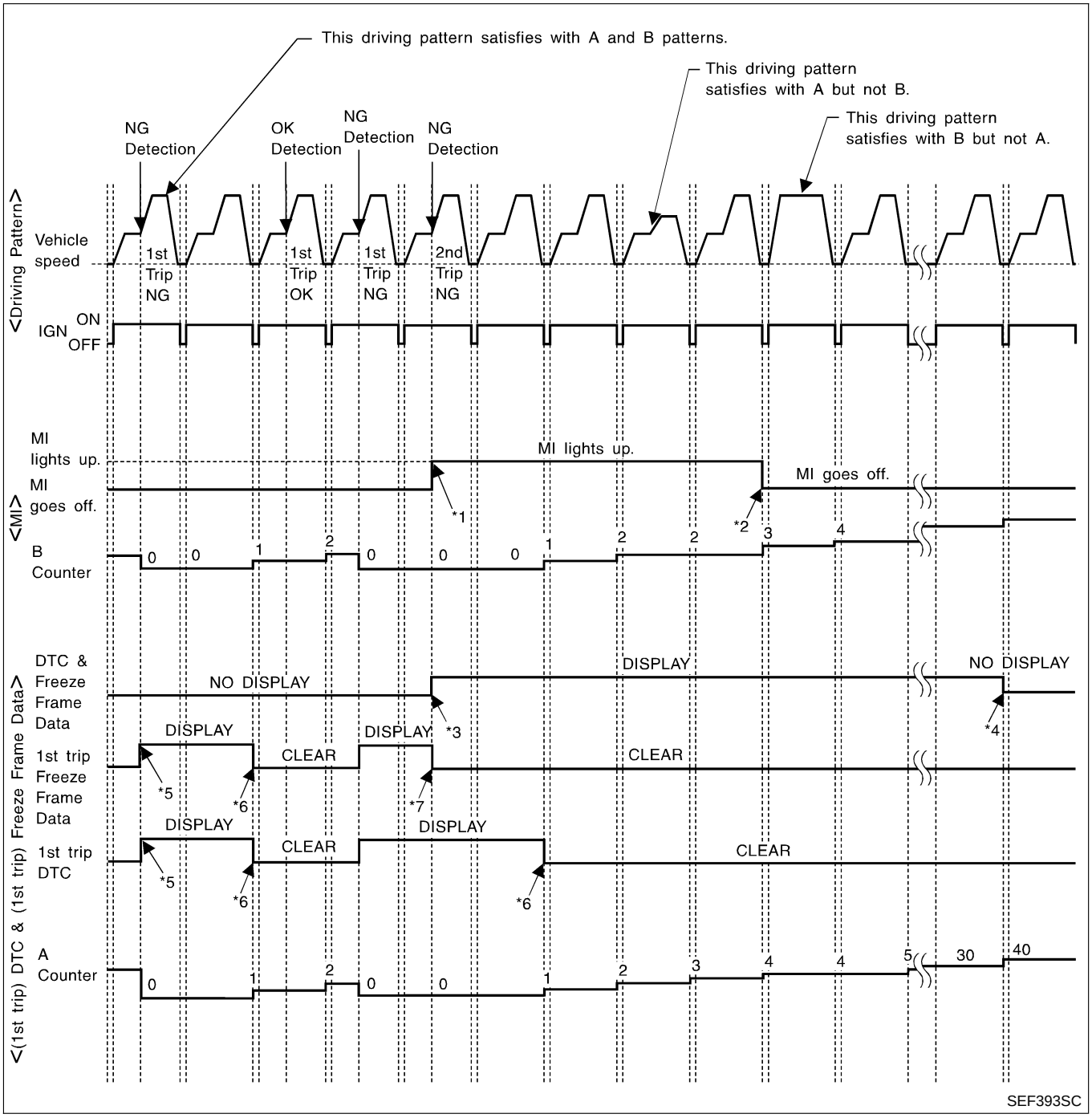
- When the freeze frame data shows lower than 70°C (158°F), “T” should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), “T” should be higher than or equal to 70°C (158°F).

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

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

NEEC0033S05



*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.

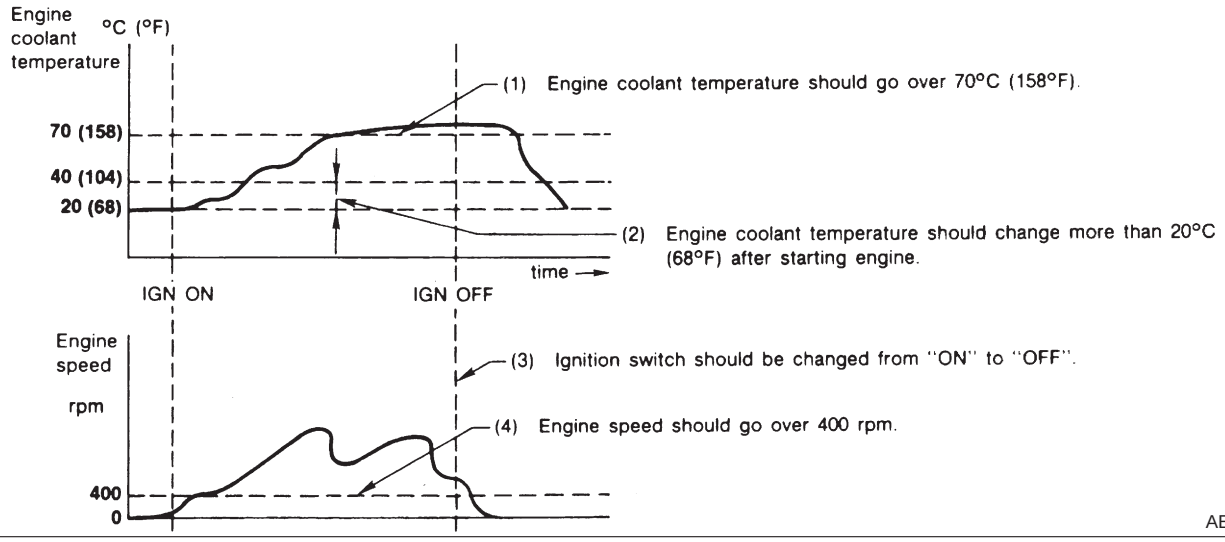
*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

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

NEEC0033S06

Driving Pattern A

NEEC0033S0601



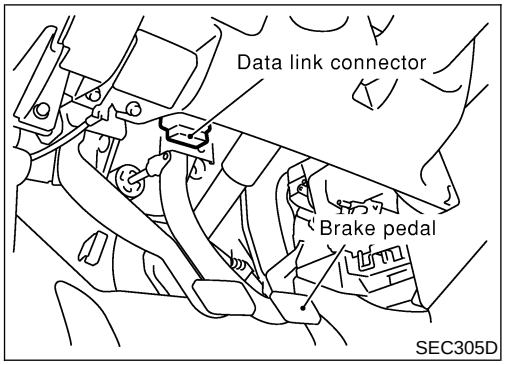
- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

Driving Pattern B

NEEC0033S0602

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

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



SEC305D

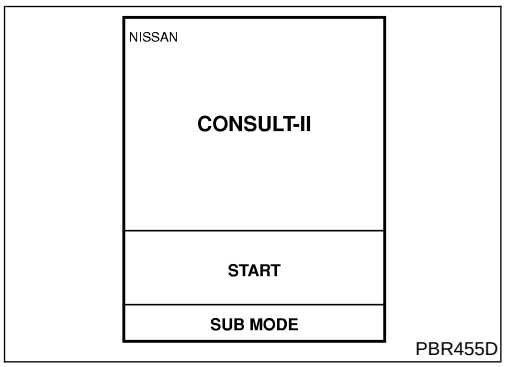
CONSULT-II

=NEEC0034

CONSULT-II INSPECTION PROCEDURE

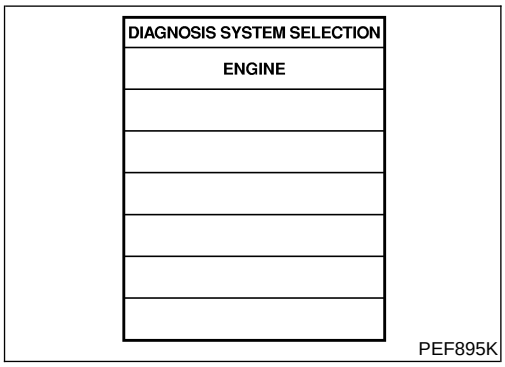
NEEC0034S01

1. Turn ignition switch OFF.
2. Connect “CONSULT-II” to data link connector which is located behind the fuse box cover.



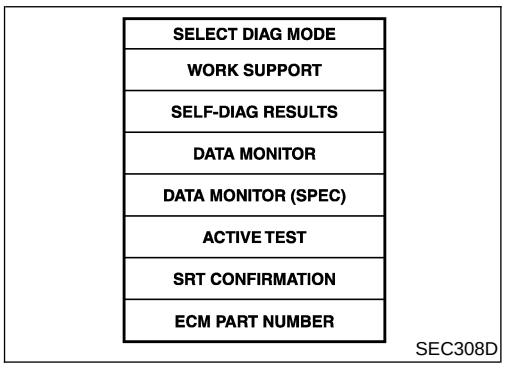
PBR455D

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



PEF895K

5. Touch “ENGINE”.



SEC308D

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

NEEC0034S02

Item			DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STA-TUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Camshaft position sensor		X	X	X	X			
		Mass air flow sensor		X		X	X			
		Engine coolant temperature sensor		X	X	X	X	X		
		Heated oxygen sensor 1		X		X	X		X	X
		Heated oxygen sensor 2		X		X	X		X	X
		Vehicle speed sensor		X	X	X	X			
		Throttle position sensor	X	X		X	X			
		Intake air temperature sensor		X		X	X			
		Crankshaft position sensor (OBD)		X						
		Knock sensor		X						
		Ignition switch (start signal)				X	X			
		Closed throttle position switch		X		X	X			
		Closed throttle position switch (throttle position sensor signal)				X	X			
		Air conditioner switch				X	X			
		Park/Neutral position (PNP) switch		X		X	X			
		Power steering oil pressure switch				X	X			
		Air conditioner pressure switch				X	X			
		Battery voltage				X	X			
		Ambient air temperature switch				X	X			

Item			DIAGNOSTIC TEST MODE							
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST	SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				X	X	X		
		Power transistor (Ignition timing)	X	X (Ignition signal)		X	X	X		
		IACV-AAC valve	X	X		X	X	X		
		EVAP canister purge volume control solenoid valve		X		X	X	X		
		Air conditioner relay				X	X			
		Fuel pump relay	X			X	X	X		
		Heated oxygen sensor 1 heater		X		X	X		X	
		Heated oxygen sensor 2 heater		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-3050.

FUNCTION

NEEC0034S03

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly. *1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for the basic fuel schedule, AFM, A/F, feedback control valve 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.
SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
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) Others

WORK SUPPORT MODE

NEEC0034S04

WORK ITEM	CONDITION	USAGE
TP SW/TP SEN IDLE POSI ADJ	● FOLLOW THE BASIC INSPECTION 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 CRANKSHAFT 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
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When releasing fuel pressure from fuel line
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed

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

SELF DIAGNOSTIC MODE

NEEC0034S05

DTC and 1st Trip DTC

NEEC0034S0501

Regarding items of “DTC and 1st trip DTC”, refer to “TROUBLE DIAGNOSIS — INDEX”, EC-3009.

Freeze Frame Data and 1st Trip Freeze Frame Data

NEEC0034S0502

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-3009).]
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.
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.
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.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VEHICLE 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.

Freeze frame data item*	Description
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

NEEC0034S06

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.	● 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 is displayed.	
HO2S2 (B1) [V]	○		● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	○	○	● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	○		● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	○	○	● The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	○	○	● The power supply voltage of ECM is displayed.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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.	
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]	○		● 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.	
AMB TEMP SW [ON/OFF]	○		● Indicates [ON/OFF] condition from the ambient air temperature switch signal.	
IGNITION SW [ON/OFF]	○		● Indicates [ON/OFF] condition from ignition switch.	
INJ PULSE-B1 [msec]		○	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
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 [g·m/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	
IACV-AAC/V [%]		○	● 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 value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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.	
HO2S1 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
VOLTAGE [V]			● Voltage measured by the voltage probe.	
TRVL AFTER MIL [km] or [Mile]			● Distance traveled while MI is activated.	
Frequency [msec] or [Hz] or [%]			● Pulse width, frequency or duty cycle measured by the pulse probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

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

DATA MONITOR (SPEC) MODE

NEEC0034S12

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 specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]		○	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.
A/F ALPHA-B1 [%]		○	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

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

ACTIVE TEST MODE

NEEC0034S07

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

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
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 percent using CONSULT-II.	Engine speed changes according to the opening percent.	● 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
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
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connector ● EVAP canister purge volume control solenoid valve

DTC & SRT CONFIRMATION MODE

=NEEC0034S08

SRT STATUS Mode

NEEC0034S0801

For details, refer to “SYSTEM READINESS TEST (SRT) CODE”, EC-3051.

SRT Work Support Mode

NEEC0034S0803

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

DTC Work Support Mode

NEEC0034S0802

TEST MODE	TEST ITEM	CONDITION	REFERENCE PAGE
HO2S1	HO2S1 (B1) P0133	Refer to corresponding trouble diagnosis for DTC.	EC-3202
	HO2S1 (B1) P0134		EC-3213
	HO2S1 (B1) P1143		EC-3310
	HO2S1 (B1) P1144		EC-3317
HO2S2	HO2S2 (B1) P0139		EC-3227
	HO2S2 (B1) P1146		EC-3324
	HO2S2 (B1) P1147		EC-3334

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

NEEC0034S10

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 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:

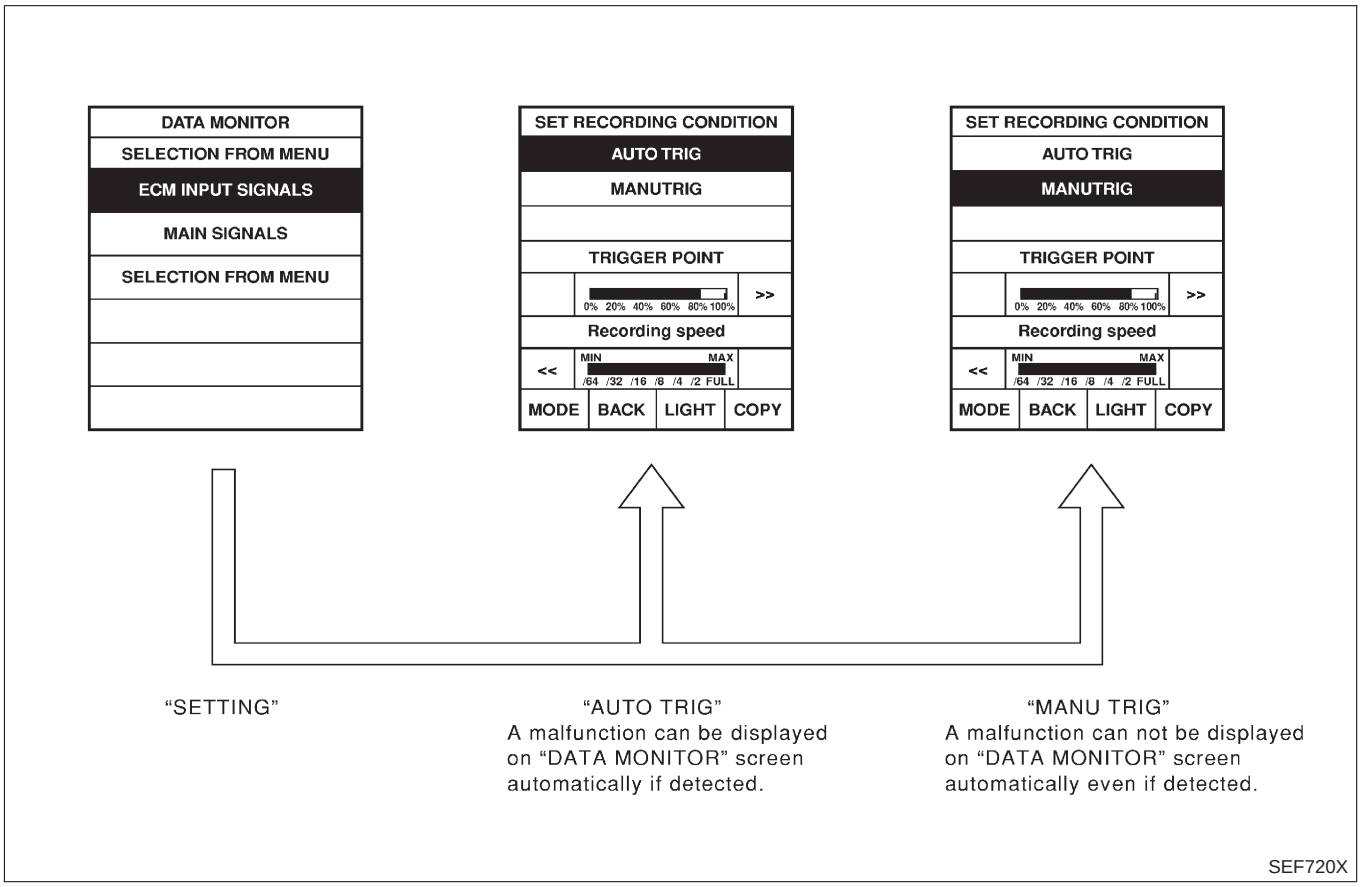
1) “AUTO TRIG”

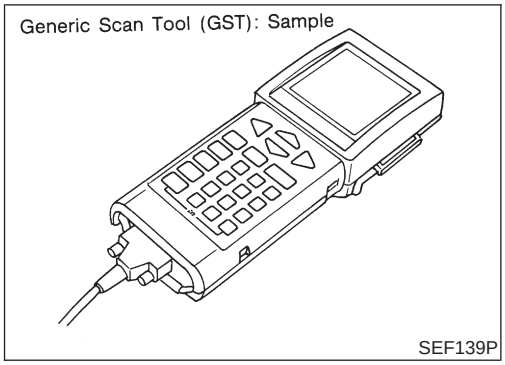
- While trying to detect the DTC/1st trip DTC by performing the “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in “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 “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”, GI section.

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.





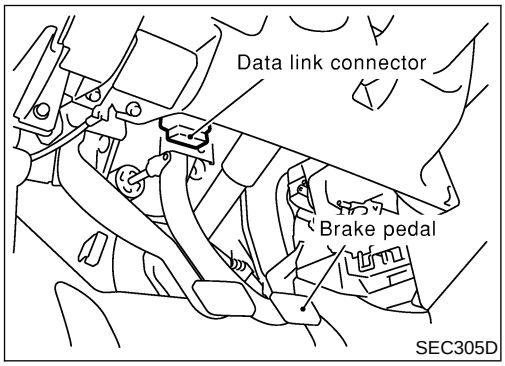
Generic Scan Tool (GST)

=NEEC0035

DESCRIPTION

NEEC0035S01

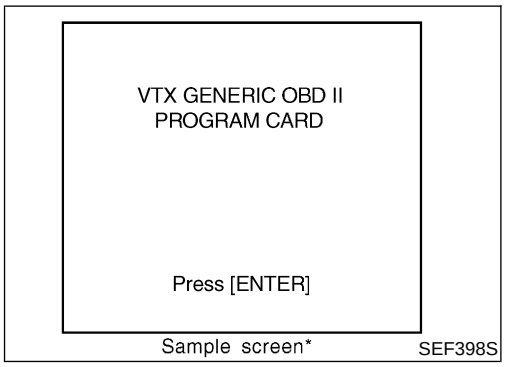
Generic Scan Tool (OBDII scan tool) complying with ISO 15031-4 has 8 different functions explained on the next page.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



GST INSPECTION PROCEDURE

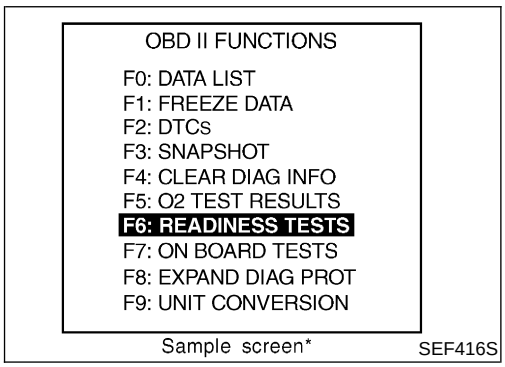
NEEC0035S02

1. Turn ignition switch OFF.
2. Connect “GST” to data link connector for GST which is located under LH 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.

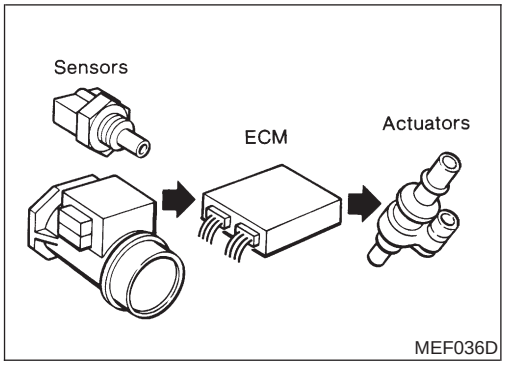
For further information, see the GST Operation Manual of the tool maker.

Generic Scan Tool (GST)

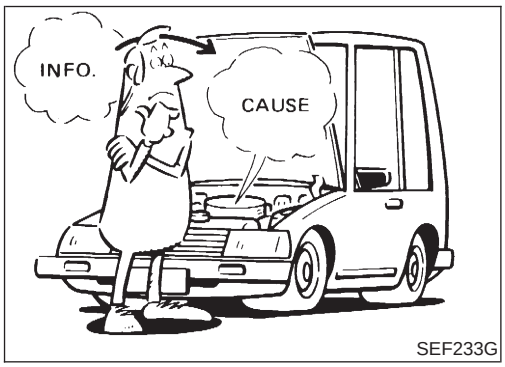
FUNCTION

NEEC0035S03

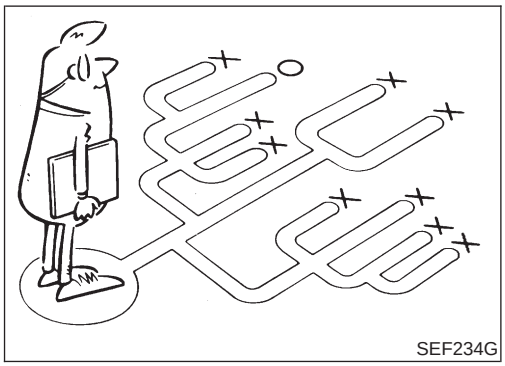
Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to “Freeze Frame Data” (EC-3073).]
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	—	—
MODE 9	(CALIBRATION ID)	This mode is to enable the off-board to request vehicle specific information such as Vehicle Identification Number (VIN) and Calibration ID.



MEF036D



SEF233G


SEF234G

KEY POINTS

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

SEF907L

Introduction

NEEC0036

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-3084.

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

NEEC0036S01

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. Examples:

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

Worksheet Sample

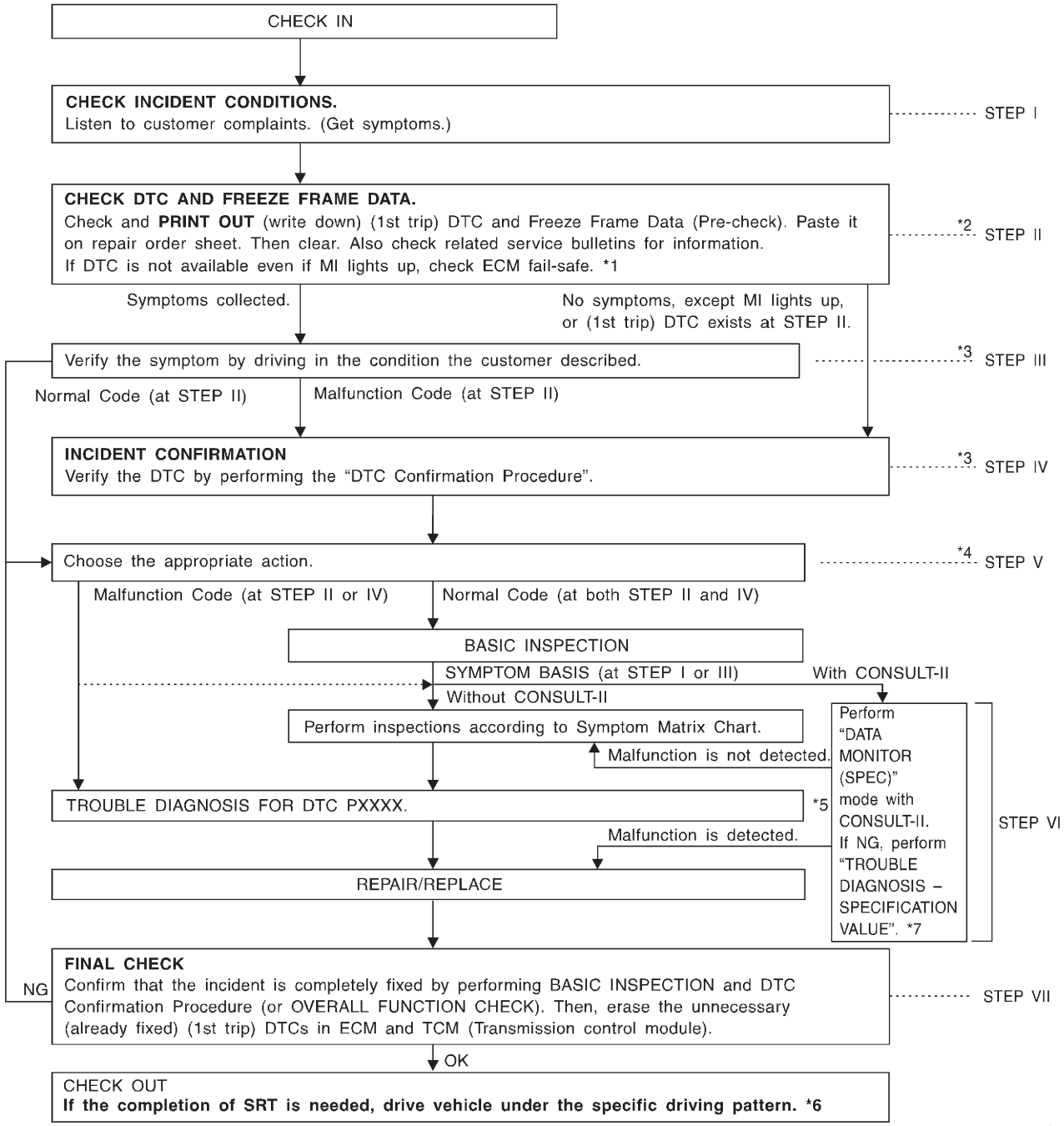
NEEC0036S0101

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

LEC031A

Work Flow

NEEC0037



SEF510ZD

*1: EC-3101

*2: If time data of "SELF-DIAG RESULTS" is other than "0" or "1t" refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT", EC-3123.

*3: If the incident cannot be duplicated, refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3123.

*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-3124.

*5: If the malfunctioning part cannot be found, refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3123.

*6: EC-3056

*7: EC-3119

DESCRIPTION FOR WORK FLOW

NEEC0037S01

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-3083.
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or Generic Scan Tool) the (1st trip) Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-3060.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. 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-3102.) 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 ″Incident Simulation Tests″, refer to GI section. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) Diagnostic Trouble Code by driving in (or performing) the “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or Generic Scan Tool. 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 “Incident Simulation Tests”, refer to GI section. In case the “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” is not available, perform the “OVERALL FUNCTION CHECK” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “OVERALL FUNCTION CHECK” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-3086.) If CONSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TROUBLE DIAGNOSIS — SPECIFICATION VALUE”, EC-3119. (If malfunction is detected, proceed to “REPAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-3102.)
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-3110. 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 “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”, “Circuit Inspection”, GI section. Repair or replace the malfunction parts.
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 “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” and confirm the normal code [Diagnostic trouble code No. 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) (1st trip) DTC in ECM. (Refer to EC-3060.)

Basic Inspection

NEEC0038

Precaution:

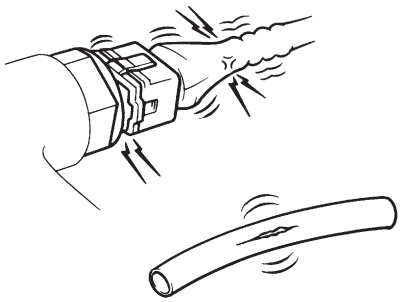
Perform Basic Inspection without electrical or mechanical loads applied;

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

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

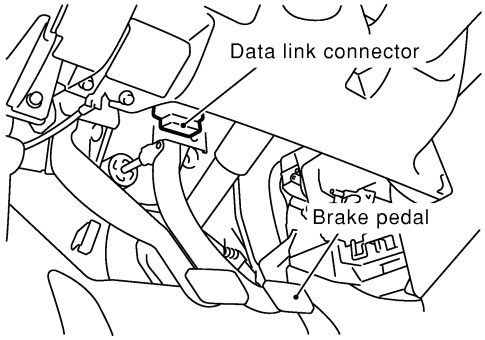


SEF142I

With CONSULT-II	▶	GO TO 2.
With GST	▶	GO TO 4.
No tools	▶	GO TO 5.

2	CONNECT CONSULT-II TO THE VEHICLE

Connect “CONSULT-II” to the data link connector and select “ENGINE” from the menu. Refer to EC-3070.



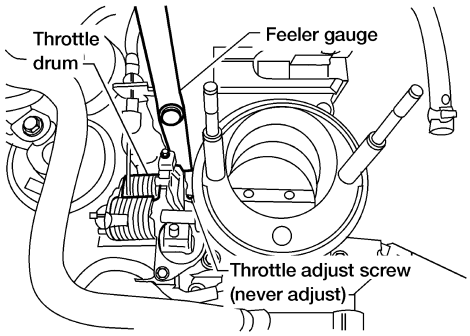
SEC305D

	▶	GO TO 3.

3	CHECK FI CAM FUNCTION

With CONSULT-II

1. Adjust accelerator wire. Refer to “Adjust Accelerator Wire”, FE section.
2. Warm up engine to 75°C (167°F).
3. Stop engine and wait at least 5 seconds, then turn ignition switch ON.
4. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
5. When the engine coolant temp is 75 to 85°C (167 to 185°F), confirm the clearance is less than 0.05 mm (0.0020 in), between stopper and throttle drum as shown in the figure.



AEC871A

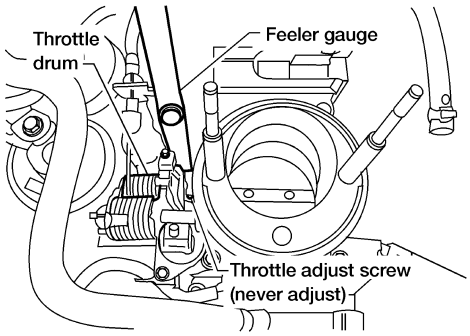
OK or NG

OK	▶	GO TO 6.
NG	▶	1. Replace throttle body assembly. Refer to “OUTER COMPONENT PARTS”, EM section. 2. GO TO 6.

4	CHECK FI CAM FUNCTION

With GST

1. Adjust accelerator wire. Refer to “Adjust Accelerator Wire”, FE section.
2. Warm up engine to 75°C (167°F).
3. Stop engine and wait at least 10 seconds, then turn ignition switch ON.
4. Select “MODE 1” with GST.
5. When the engine coolant temp is 75 to 85°C (167 to 185°F), confirm the clearance is less than 0.05 mm (0.0020 in), between stopper and throttle drum as shown in the figure.



AEC871A

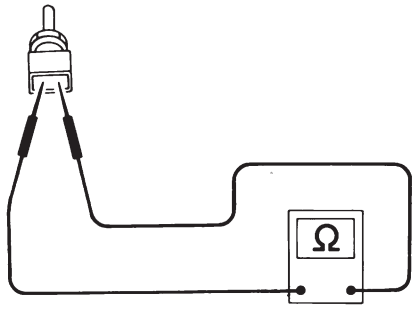
OK or NG

OK (With CONSULT-II)	▶	GO TO 6.
OK (Without CONSULT-II)	▶	GO TO 14.
NG	▶	1. Replace throttle body assembly. Refer to “OUTER COMPONENT PARTS”, EM section. 2. With CONSULT-II: GO TO 6. Without CONSULT-II: GO TO 14.

5	CHECK FI CAM FUNCTION

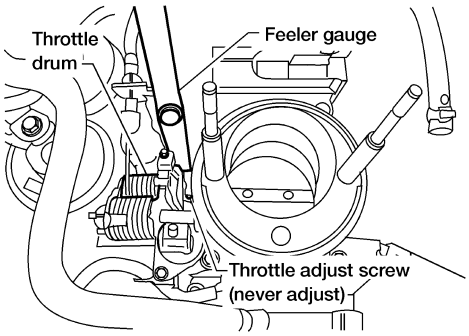
No Tools

1. Adjust accelerator wire. Refer to “Adjust Accelerator Wire”, FE section.
2. Disconnect engine coolant temperature sensor harness connector and check resistance as shown in the figure.



SEF536H

3. Warm up engine until the resistance of coolant temperature sensor is 0.26 to 0.39 kΩ.
4. Turn ignition switch OFF.
5. When engine coolant temperature is 75 to 85°C (167 to 185°F), with the voltage between 1.10 to 1.36V, make sure that the clearance is less than 0.05 mm (0.0020 in), between stopper and throttle adjusting screw as shown in figure.



AEC871A

OK or NG

OK	▶	GO TO 14.
NG	▶	1. Replace throttle body assembly. Refer to “OUTER COMPONENT PARTS”, EM section. 2. GO TO 14.

6	CHECK IGNITION TIMING

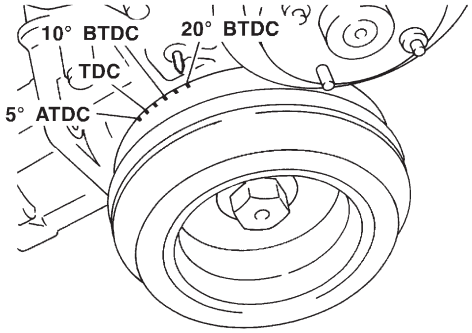
With CONSULT-II

1. Warm up engine to normal operating temperature.
2. Select “IGNITION TIMING ADJ” in “WORK SUPPORT” mode.
3. Touch “START”.

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.

PEF546N

4. Check ignition timing at idle using timing light.



SEF320V

Ignition timing:
15°±2° BTDC

OK or NG

OK	▶	GO TO 7.
NG	▶	1. Adjust ignition timing by turning distributor. Refer to “Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment”, EC-3035. 2. GO TO 7.

7	CHECK BASE IDLE SPEED

With CONSULT-II

1. Select “IGNITION TIMING ADJ” in “WORK SUPPORT” mode and touch “START”.

IACV-AAC/V ADJ	
ADJ MONITOR	
ENG SPEED	700 rpm
CONDITION SETTING	
IACV-ACC/V	FIXED
MONITOR	
COOLAN TEMP/S	XXX°C
CLSD THL POS	XXX N

SEF714Z

2. Check idle speed.
   650±50 rpm

OK or NG

OK	▶	GO TO 8.
NG	▶	1. Adjust base idle speed by turning idle speed adjusting screw. Refer to “Idle Speed/ Ignition Timing/Idle Mixture Ratio Adjustment”, EC-3035. 2. GO TO 8.

8	CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION (CHECK THROTTLE POSITION SENSOR IDLE POSITION)

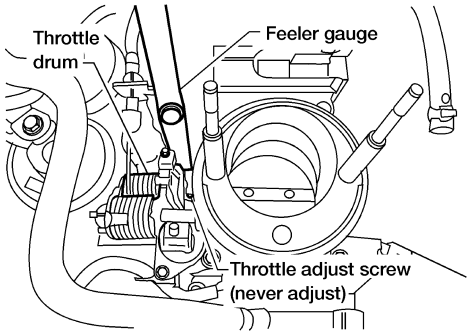
With CONSULT-II

NOTE:

Always check ignition timing and base idle speed before performing the following.

1. Warm up engine to normal operating temperature.
2. Check FI cam. Refer to procedure 3.
3. Stop engine.
4. Turn ignition switch ON.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Select “CLSD THL/P SW” from the menu.
7. Read “CLSD THL/P SW” signal under the following conditions.

- Insert a 0.1 mm (0.004 in) and 0.3 mm (0.012 in) feeler gauge alternately between the throttle adjust screw (TAS) and throttle drum as shown in the figure and check the signal.



AEC871A

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
CLSD THL/P SW	ON

SEF197Y

“CLSD THL/P SW” signal should remain “ON” while inserting 0.1 mm (0.004 in) feeler gauge.
“CLSD THL/P SW” signal should remain “OFF” while inserting 0.3 mm (0.012 in) feeler gauge.

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 9.

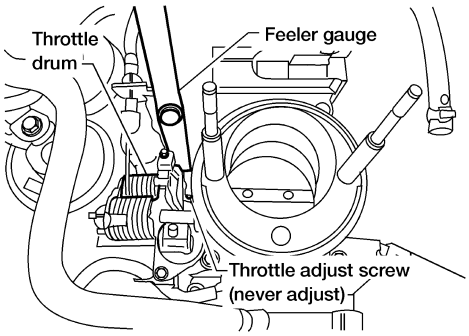
9	ADJUSTMENT THROTTLE POSITION SENSOR IDLE POSITION-1

With CONSULT-II

NOTE:

- **Never adjust throttle adjust screw (TAS).**
- **Do not touch throttle drum when checking "CLSD THL/P SW" signal. Doing so may cause an incorrect adjustment.**

1. Warm engine up to normal operating temperature.
2. Check FI cam. Refer to procedure 3.
3. Stop engine.
4. Loosen throttle position sensor fixing bolts.
5. Turn ignition switch ON.
6. Select "CLSD THL/P SW" in "DATA MONITOR" mode.
7. Insert a 0.1 mm (0.004 in) feeler gauge between throttle adjust screw and throttle drum as shown in the figure.



AEC871A

8. Open throttle valve and then close.
9. Check "CLSD THL/P SW" signal.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
CLSD THL/P SW	ON

SEF197Y

"CLSD THL/P SW" signal should remain "OFF" when the throttle valve is closed.
If it is impossible to adjust closed throttle position switch, replace throttle position sensor.

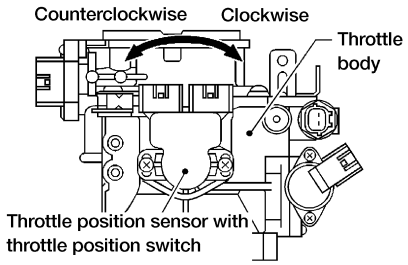
OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

10	ADJUSTMENT THROTTLE POSITION SENSOR IDLE POSITION-2

With CONSULT-II

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



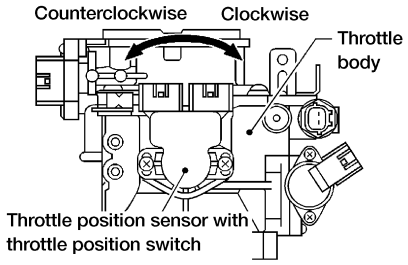
AEC872A

▶	GO TO 11.

11	ADJUSTMENT THROTTLE POSITION SENSOR IDLE POSITION-3

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” when tightening sensor body fixing bolts.**



AEC872A

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 0.1 mm (0.004 in) feeler gauge then insert 0.3 mm (0.012 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 “CLSD THL/P SW” signal again.
   The signal remains “OFF” while closing throttle valve.

OK or NG

OK	▶	1. Remove 0.3 mm (0.012 in) feeler gauge. 2. GO TO 12.
NG	▶	GO TO 9.

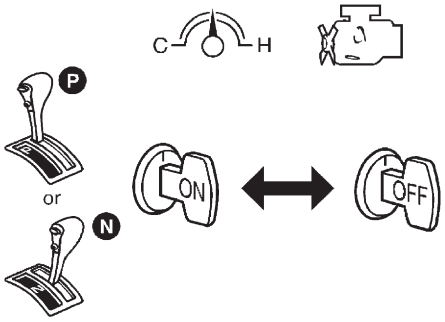
12	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

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.
2. Warm up engine to normal operating temperature.
3. Select “CLSD THL POS” in “DATA MONITOR” mode manual trigger.
4. Stop engine. (Turn ignition switch OFF.)
5. Turn ignition switch ON and wait at least 5 seconds.



SEF864V

6. Turn ignition switch OFF and wait at least 5 seconds.
7. Repeat steps 5 and 6 until “CLSD THL POS” in “DATA MONITOR” mode with CONSULT-II changes to “ON”.

DATA MONITOR	
MONITORING	NO DTC
CLSD THL/P SW	ON

SEF715Z

	▶	GO TO 13.

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.
3. Check idle speed.

700±50 rpm

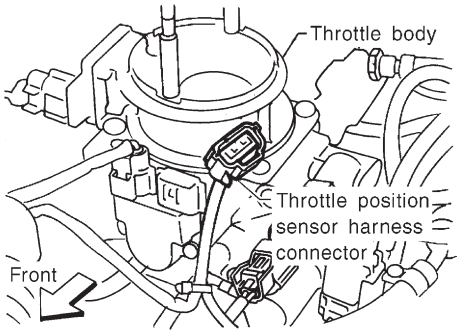
OK or NG

OK	▶	**INSPECTION END**
NG	▶	Adjust idle speed. Refer to “Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment”, EC-3035. Inspection end after adjust idle speed.

14	CHECK IGNITION TIMING

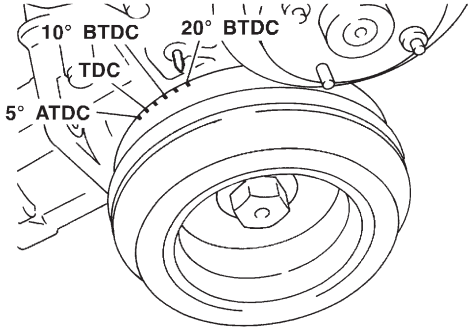
Without CONSULT-II

1. Warm up engine to normal operating temperature.
2. Stop engine and disconnect throttle position sensor harness connector.



SEF265S

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



SEF320V

Ignition timing:
15°±2° BTDC

OK or NG

OK	▶	GO TO 15.
NG	▶	1. Adjust ignition timing by turning distributor. Refer to “Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment”, EC-3035. 2. GO TO 15.

15	CHECK BASE IDLE SPEED

Without CONSULT-II

Make sure that engine speed falls to the following speed.
650±50 rpm

OK or NG

OK	▶	GO TO 16.
NG	▶	1. Adjust base idle speed by turning idle speed adjusting screw. Refer to “Idle Speed/ Ignition Timing/Idle Mixture Ratio Adjustment”, EC-3035. 2. GO TO 16.

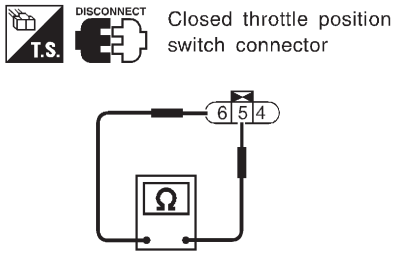
16	CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION (CHECK THROTTLE POSITION SENSOR IDLE POSITION)

Without CONSULT-II

NOTE:

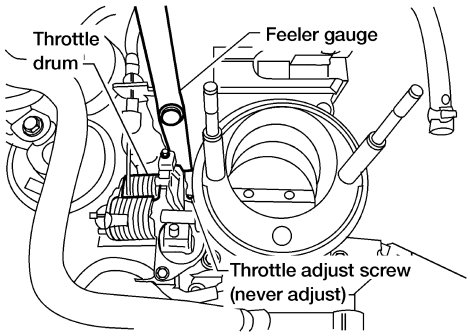
Always check ignition timing and base idle speed before performing the following.

1. Warm up engine to normal operating temperature.
2. Check FI cam. Refer to procedure 5.
3. Stop engine.
4. Disconnect closed throttle position switch harness connector .
5. Connect the tester probe to closed throttle position switch terminals 5 and 6.
6. Check harness continuity under the following conditions.



SEF862V

- Insert the 0.1 mm (0.004 in) and 0.3 mm (0.012 in) feeler gauge alternately between the throttle adjust screw (TAS) and throttle drum as shown in the figure.



AEC871A

“Continuity should exist” while inserting 0.1 mm (0.004 in) feeler gauge.
“Continuity should not exist” while inserting 0.3 mm (0.012 in) feeler gauge.

OK or NG

OK	▶	GO TO 20.
NG	▶	GO TO 17.

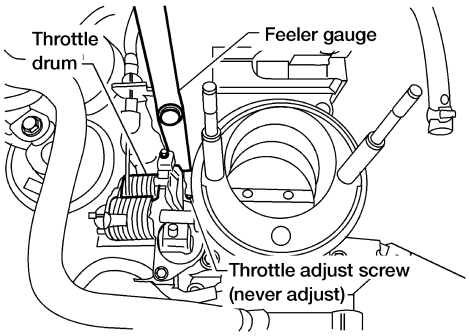
17	ADJUSTMENT THROTTLE POSITION SENSOR IDLE POSITION-1

Without CONSULT-II

NOTE:

- **Never adjust throttle adjust screw (TAS).**
- **Do not touch throttle drum when checking "continuity".**
  Doing so may cause an incorrect adjustment.

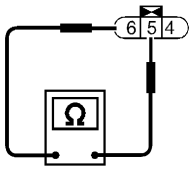
1. Warm engine up to normal operating temperature.
2. Check FI cam. Refer to procedure 5.
3. Stop engine.
4. Loosen throttle position sensor fixing bolts.
5. Disconnect closed throttle position sensor harness connector.
6. Insert 0.1 mm (0.004 in) feeler gauge between the throttle adjust screw and throttle drum as shown in the figure.



AEC871A

7. Open throttle valve then close.
8. Check continuity between closed throttle position switch terminals 5 and 6.

Closed throttle position switch connector



SEF862V

The continuity should not exist while closing the throttle position sensor body.
If it is impossible to adjust closed throttle position switch, replace throttle position sensor.

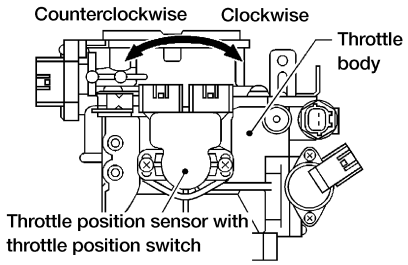
OK or NG

OK	▶	GO TO 19.
NG	▶	GO TO 18.

18	ADJUSTMENT THROTTLE POSITION SENSOR IDLE POSITION-2

Without CONSULT-II

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



AEC872A

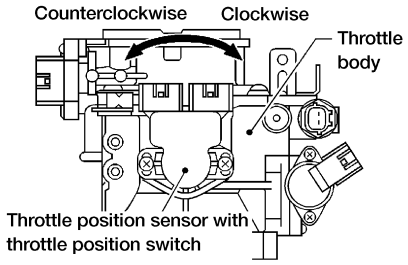
	▶	GO TO 19.

19	ADJUSTMENT THROTTLE POSITION SENSOR IDLE POSITION-3

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 tighten sensor body fixing bolts.**



AEC872A

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 0.1 mm (0.004 in) feeler gauge then insert 0.3 mm (0.012 in) feeler gauge.
4. Make sure two or three times that 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 20.
NG	▶	GO TO 17.

20	REINSTALLATION

Without CONSULT-II

1. Remove 0.3 mm (0.012 in) feeler gauge.
2. Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.
3. Rev engine (2,000 to 3,000 rpm) two or three times under no-load and then run engine at idle speed.

	▶	GO TO 21.

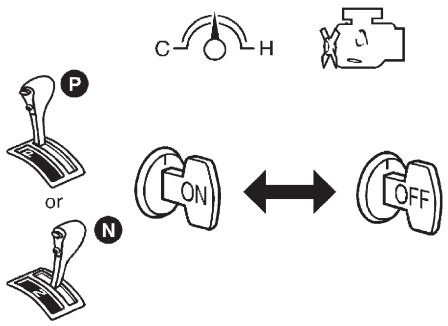
21	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

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.
2. Warm up engine to normal operating temperature.
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 5, 20 times.

▶	GO TO 22.

22	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 23.
NG	▶	1. Adjust target idle speed. Refer to “Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment”, EC-3035. 2. GO TO 23.

23	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-3060) .

▶	**INSPECTION END**

DTC Inspection Priority Chart

NEEC0039

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	● P0101, P0102, P0103 MAF sensor ● P0112, P0113, P0127 IAT sensor ● P0117, P0118 ECT sensor ● P0121, P0122, P0123 TP sensor ● P0327, P0328 KS ● P0340 CMP sensor ● P0500 VSS ● P0605 ECM ● P1706 PNP switch
2	● P0031, P0032 HO2S1 heater ● P0037, P0038 HO2S2 heater ● P0132, P0133, P0134, P1143, P1144 HO2S1 ● P0138, P0139, P1146, P1147 HO2S2 P0335, P1336 CKP sensor ● P0444, P0445 EVAP canister purge volume control solenoid valve ● P0510 CTP switch
3	● P0171, P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0505 ISC system ● P0420 Three way catalyst function

Fail-safe Chart

=NEEC0040

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>DTC No.
CONSULT-II
GST</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0102
P0103</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>P0112
P0113</td><td>Intake air temperature sensor</td><td colspan="2">The ECM functions on the assumption that the intake air temperature is 25°C (77°F).</td></tr>
<tr><td rowspan="5">P0117
P0118</td><td rowspan="5">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 to ON or START.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned to ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td rowspan="4">P0122
P0123</td><td rowspan="4">Throttle position sensor circuit</td><td colspan="2">Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor.</td></tr>
<tr><td>Condition</td><td>Driving condition</td></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
<tr><td rowspan="9">Unable to access ECM</td><td rowspan="9">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>ECM fail-safe operation</td></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is “ON” when engine is running and “OFF” when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td colspan="2">Replace ECM, if ECM fail-safe condition is confirmed.</td></tr>
</table>

Symptom Matrix Chart

SYSTEM — ENGINE CONTROL SYSTEM

NEEC0041

NEEC0041S01

		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-3378
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-3034
	Injector circuit	1	1	2	3	2		2	2			2			EC-3370
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-3029
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-3032
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-3035
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-3295
	IACV-FICD solenoid valve circuit	2	2	3	3	3	3	3	3	3		3			EC-3390
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-3035
	Ignition circuit	1	1	2	2	2		2	2			2			EC-3361
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3		2	EC-3124
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 Matrix Chart

	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	
Camshaft position sensor circuit	2	2	3	3	3		3	3			3			EC-3270
Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-3143, EC-3151
Heated oxygen sensor 1 circuit		1	2	3	2		2	2			2			EC-3213, 3310
Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-3165
Throttle position sensor circuit		1	2		2	2	2	2	2		2			EC-3170
Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-3086
Vehicle speed sensor circuit		2	3		3						3			EC-3290
Knock sensor circuit			2								3			EC-3260
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-3308, 3101
Start signal circuit	2													EC-3375
PNP switch circuit			3		3		3	3			3			EC-3355
Power steering oil pressure switch circuit		2					3	3						EC-3386

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

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

NEEC0041S03

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FE section
	Fuel piping			5	5	5		5	5			5			
	Vapor lock		5												
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														
Air	Air duct														
	Air cleaner														
	Air leakage from air duct (Mass air flow sensor — throttle body)	5	5	5	5	5	5	5	5	5		5			
	Throttle body, Throttle wire														FE section
	Air leakage from intake manifold/Collector/Gasket														—
Crank-ing	Battery	1	1	1		1		1	1			1		1	SC section
	Alternator circuit														
	Starter circuit	3													
	Flywheel	6													EM section
	PNP switch	4													—

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

(continued on next page)

Symptom Matrix Chart

		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 section, LC section
	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														
	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

NEEC0042

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 camshaft position sensor and other ignition timing related sensors.)

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	0.9 - 1.8V
		2,500 rpm	1.9 - 2.3V
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
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 ←→ Approx. 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: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.2 - 0.8V
		Throttle valve fully opened	3.5 - 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/P SW	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
CLSD THL POS	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		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: “N”	ON
		Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	2.5 - 3.3 msec
		2,000 rpm	2.4 - 3.2 msec

CONSULT-II Reference Value in Data Monitor Mode

MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	0.8 - 1.2 msec
		2,000 rpm	0.8 - 1.2 msec
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	Approx. 15° BTDC
		2,000 rpm	More than 30° BTDC
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	Approx. 30%
		2,000 rpm	—
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm (More than 200 seconds after starting engine)	—
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	50 - 159%
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking		ON
	● Except as shown above		OFF
HO2S1 HTR (B1)	● Engine speed: Below 3,600 rpm		ON
	● Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1)	● Engine speed: Idle after driving for 2 minutes at 70 km/h (43 MPH) or more		ON
	● Ignition switch: ON (Engine stopped)		OFF
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	9.5 - 34.0%
		2,500 rpm	13.9 - 24.9%
ABSOL TH·P/S	● Engine: After warming up, engine stopped ● Ignition switch: ON	Throttle valve: fully closed	0.0%
		Throttle valve: fully opened	Approx. 80%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	0.9 - 5.8 g·m/s
		2,500 rpm	7.5 - 13.2 g·m/s
ABSOL PRES/SE	● Engine: More than 5 seconds after starting engine (After warming up)		Approx. 1.2V

Major Sensor Reference Graph in Data Monitor Mode

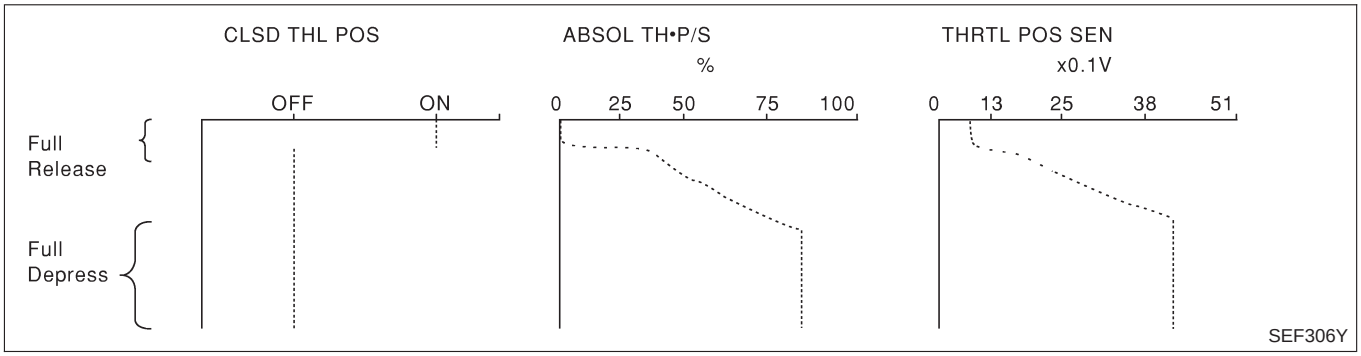
NEEC0043

The following are the major sensor reference graphs in “DATA MONITOR” mode.
(Select “MANU TRIG” in “DATA MONITOR” with CONSULT-II. “Trigger Point” is set to 100%, “Recording Speed” is set to MAX.)

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

NEEC0043S01

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”.

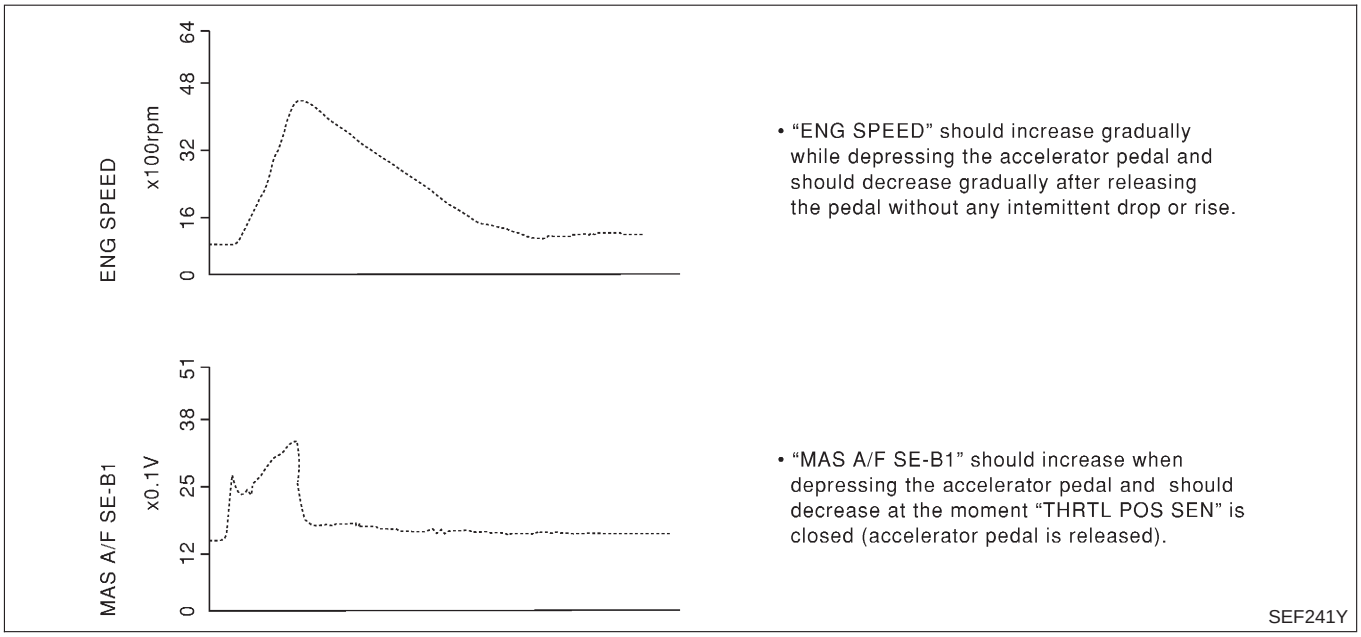


ENG SPEED, MAS A/F SE-B1, THRTL POS SEN, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

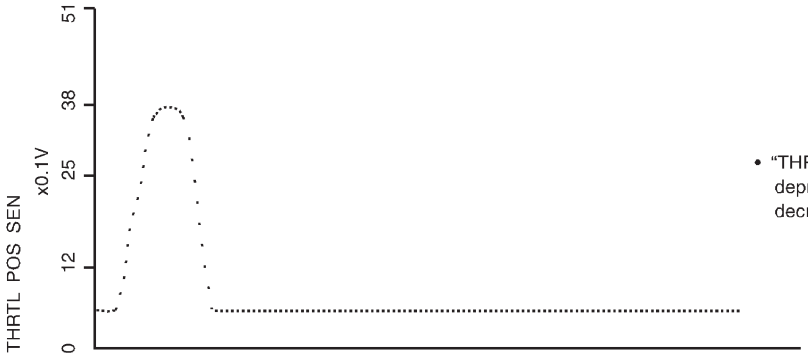
NEEC0043S02

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.

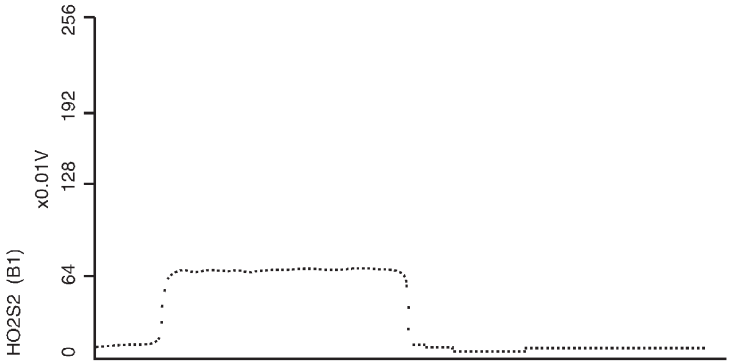
Each value is for reference, the exact value may vary.



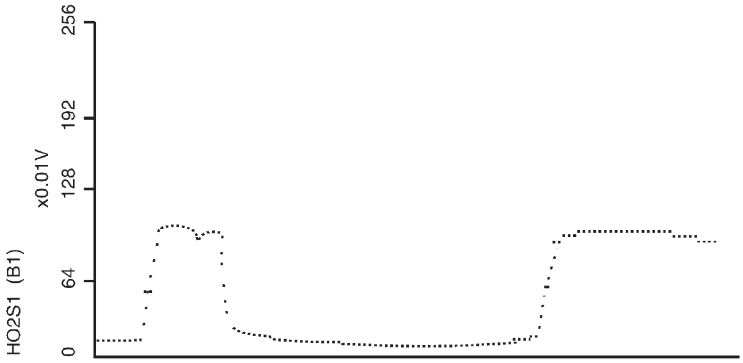
Major Sensor Reference Graph in Data Monitor Mode



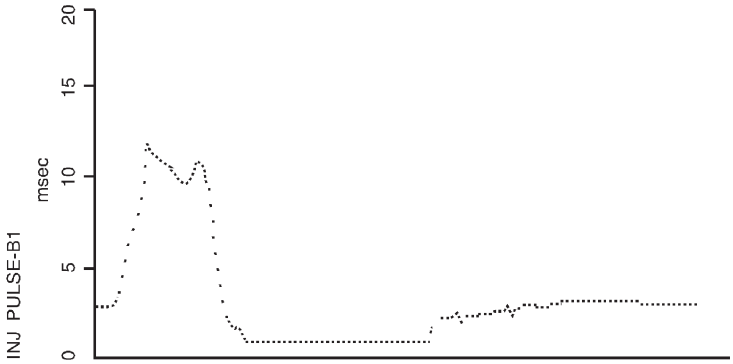
• "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



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

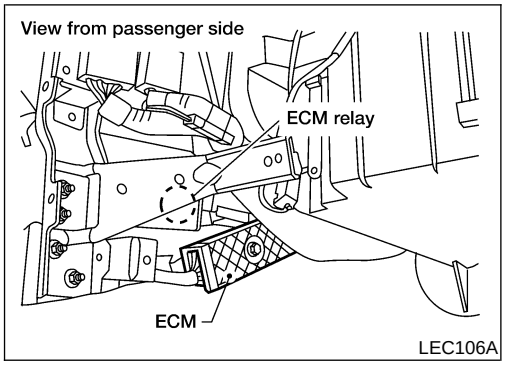


• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.

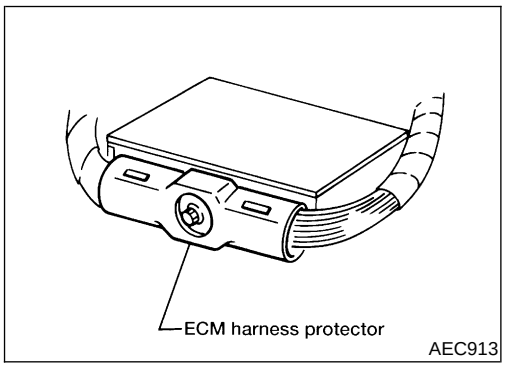


• "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

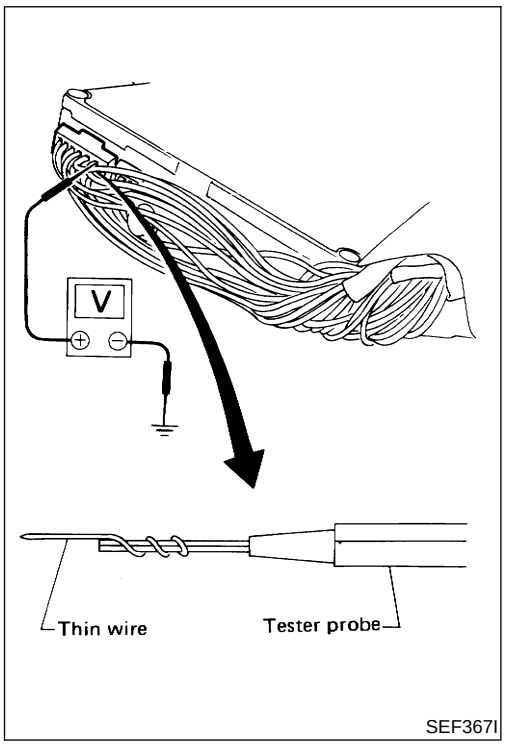
SEF242YA



LEC106A



AEC913



SEF367I

ECM Terminals and Reference Value

NEEC0044

PREPARATION

NEEC0044S01

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

- Remove instrument lower cover.

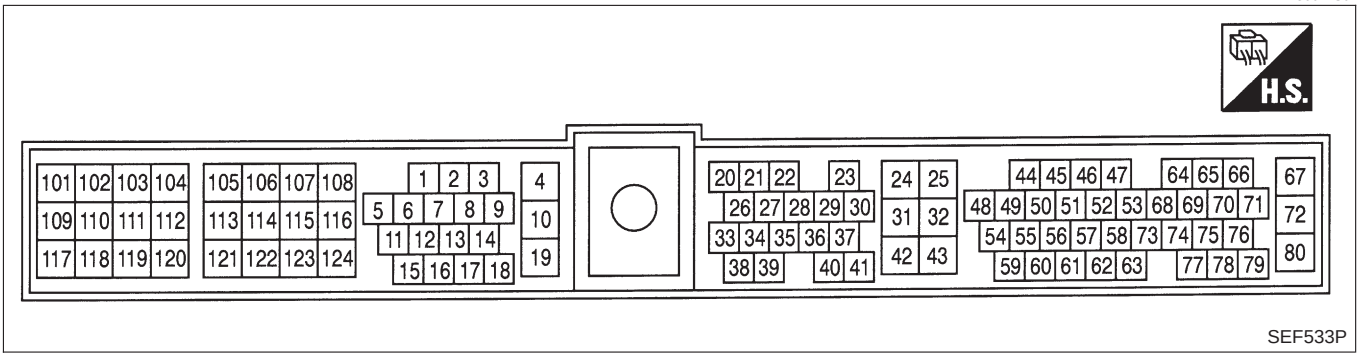
2. Remove ECM harness protector.

3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.

- Open harness securing clip to make testing easier.
- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.

ECM HARNESS CONNECTOR TERMINAL LAYOUT

NEEC0044S02



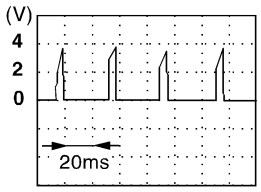
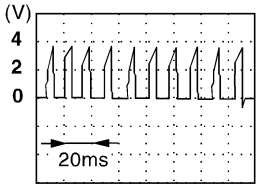
ECM INSPECTION TABLE

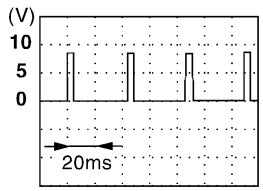
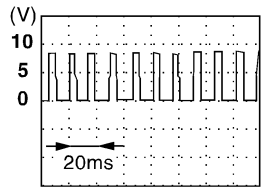
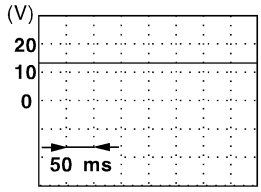
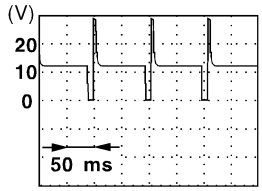
NEEC0044S03

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

CAUTION:

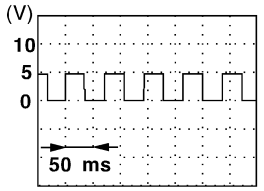
Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	W/PU	Ignition signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.5V  SEF186T
			[Engine is running] ● Engine speed is 2,000 rpm	0.2 - 1.0V  SEF187T

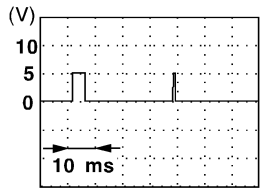
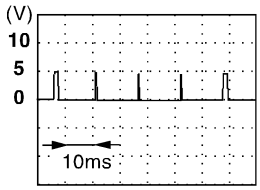
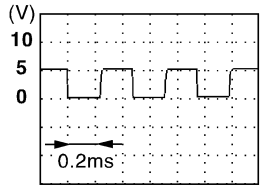
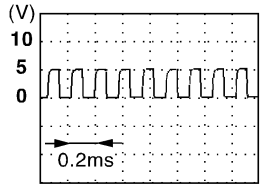
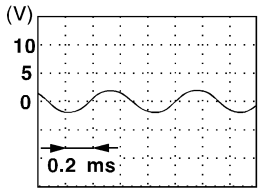
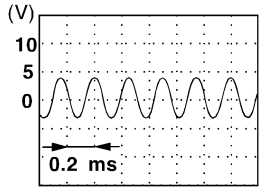
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	W	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 1V  SEF190T
			[Engine is running] ● Engine speed is 2,000 rpm	0.5 - 2V  SEF191T
4	L/B	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch OFF]** ● For a few seconds after turning ignition switch OFF	0 - 1V
			[Ignition switch OFF] ● More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
5	W/PU	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF109V
			[Engine is running] ● Engine speed is 2,000 rpm (More than 200 seconds after starting engine)	12 - 13V  SEF110V

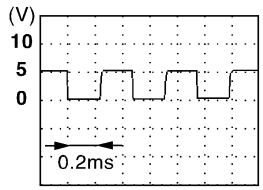
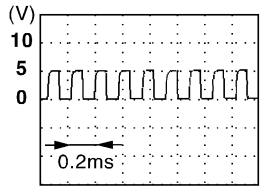
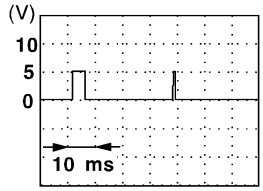
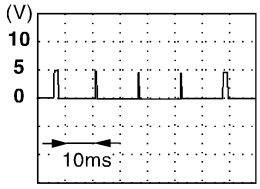
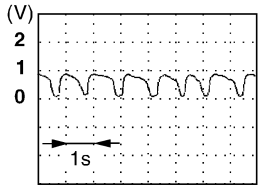
ECM Terminals and Reference Value

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
9	BR/W	Ambient air temperature switch	**[Engine is running]** ● Idle speed ● Ambient air temperature is above 23°C (73°F) ● Air conditioner is operating	0V
			[Engine is running] ● Idle speed ● Ambient air temperature is above 23°C (73°F) ● Air conditioner is operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Idle speed ● Ambient air temperature is above 23°C (73°F) ● Air conditioner is not operating	Approximately 5V
10	B/P	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
11*1	Y	Fuel pump relay	**[Ignition switch ON]** ● For 5 seconds after turning ignition switch ON **[Engine is running]**	0 - 1V
			[Ignition switch ON] ● More than 5 seconds after turning ignition switch ON	BATTERY VOLTAGE (11 - 14V)
12	G/W	Air conditioner relay	**[Engine is running]** ● Both A/C switch and blower switch are ON* *: Any mode except “OFF”, ambient air temperature above 10°C (50°F).	Approximately 0V
			[Engine is running] ● A/C switch is OFF	BATTERY VOLTAGE (11 - 14V)
14*2	Y	Fuel pump relay	**[Ignition switch ON]** ● For 5 seconds after turning ignition switch	0 - 1V
			[Ignition switch ON] ● More than 5 seconds after turning ignition switch ON	BATTERY VOLTAGE (11 - 14V)
18	OR/B	Malfunction indicator	**[Ignition switch ON]**	0 - 1V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
19	B/P	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
20	R	Start signal	**[Ignition switch ON]**	Approximately 0V
			[Ignition switch START]	BATTERY VOLTAGE (11 - 14V)
21	Y	Air conditioner pressure 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)
22	Y/R	Park/neutral position (PNP) switch	**[Ignition switch ON]** ● Gear position is “N”	Approximately 0V
			[Ignition switch ON] ● Except the above gear position	Approximately 5V

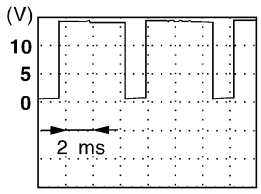
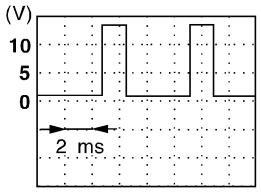
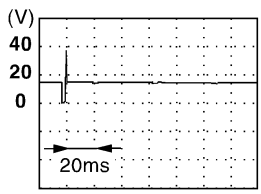
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23	G	Throttle position sensor	**[Ignition switch ON]** ● **Warm-up condition** ● Accelerator pedal fully released	0.2 - 0.8V
			[Ignition switch ON] ● Accelerator pedal fully depressed	3.5 - 4.5V
24	W/L	Ignition switch	**[Ignition switch OFF]**	0V
			[Ignition switch ON]	BATTERY VOLTAGE (11 - 14V)
25	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
28	LG/B	Throttle position switch (Closed position)	**[Ignition switch ON]** ● **Warm-up condition** ● Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch ON] ● Accelerator pedal depressed	Approximately 0V
29	W/L	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● In 2nd gear position ● 40 km/h (25 MPH)	1 - 4V  SEF111V
32	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
39	SB	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
42	G/B	Sensors' power supply	**[Ignition switch ON]**	Approximately 5V
43	B	Sensors' ground	**[Engine is running]** ● Idle speed	Approximately 0V

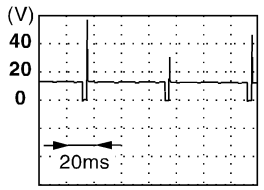
ECM Terminals and Reference Value

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
44*1 48*1	OR OR	Camshaft position sensor (Reference signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.2 - 0.5V  SEF114V
			[Engine is running] ● Engine speed is 2,000 rpm	0 - 0.5V  SEF200T
44*2	W	Camshaft position sensor (Position signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V  SEF195T
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 1.0V  SEF196T
47	L	Crankshaft position sensor (OBD)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V  SEF112V
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 0V  SEF113V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49*1	W	Camshaft position sensor (Position signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V  SEF195T
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 1.0V  SEF196T
49*2 53*2	OR OR	Camshaft position sensor (Reference signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.2 - 0.5V  SEF114V
			[Engine is running] ● Engine speed is 2,000 rpm	0 - 0.5V  SEF200T
50	W	Heated oxygen sensor 1	**[Engine is running]** ● After warning up to normal operating temperature and engine speed is 2,000 rpm.	0 - Approximately 1.0V  SEF201T
54	L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.9 - 1.8V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.9 - 2.3V
55	P	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

ECM Terminals and Reference Value

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
56	L/W	Heated oxygen sensor 2	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 3,000 rpm quickly	0 - Approximately 1.0V
59	LG/R	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
61	P/B	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature
64	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.4V
67	W	Power supply for ECM	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14V)
72	W			
69	LG/R	Data link connector	**[Ignition switch ON]** ● CONSULT-II or GST is disconnected.	Approximately 2V
80	GY/L	Power supply (Back-up)	**[Ignition switch OFF]**	BATTERY VOLTAGE (11 - 14V)
101	G/Y	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	10.5 - 11.5V  SEF645U
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	1 - 13V  SEF646U
102	W/L	Injector No. 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF204T
104	W/G	Injector No. 3		

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
109	W/R	Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  SEF205T
111	W/B	Injector No. 4		
116	B/P	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
117	W	Current return	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
119	Y/R	Heated oxygen sensor heater 1	**[Engine is running]** ● Engine speed is below 3,600 rpm.	Approximately 0.4V
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
122	G/B	Heated oxygen sensor heater 2	**[Engine is running]** ● Idle speed after driving for 2 minutes at 70 km/h (43 MPH) or more	Approximately 0.4V
			[Ignition switch ON] ● Engine is not running	BATTERY VOLTAGE (11 - 14V)
124	B/P	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

*1: Model without NATS (Nissan Anti-Theft System)
*2: Model with NATS (Nissan Anti-Theft System)

Description

NEEC1003

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MI.

The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/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)

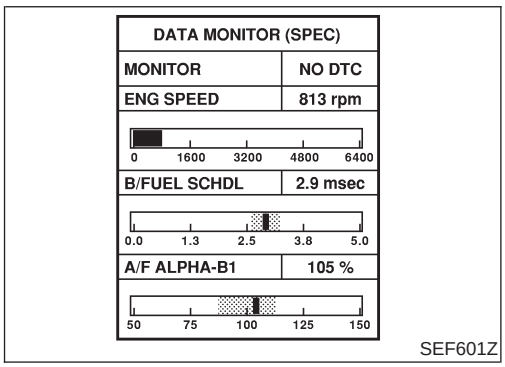
Testing Condition

NEEC1004

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 101.3 kPa (1,013 mbar, 760.0 mmHg, 29.92 inHg)±3 kPa (30 mbar, 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 A/T models, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates less than 0.9V. For M/T models, drive vehicle for 5 minutes after the engine is warmed up to normal operating temperature.

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



Inspection Procedure

NEEC1005

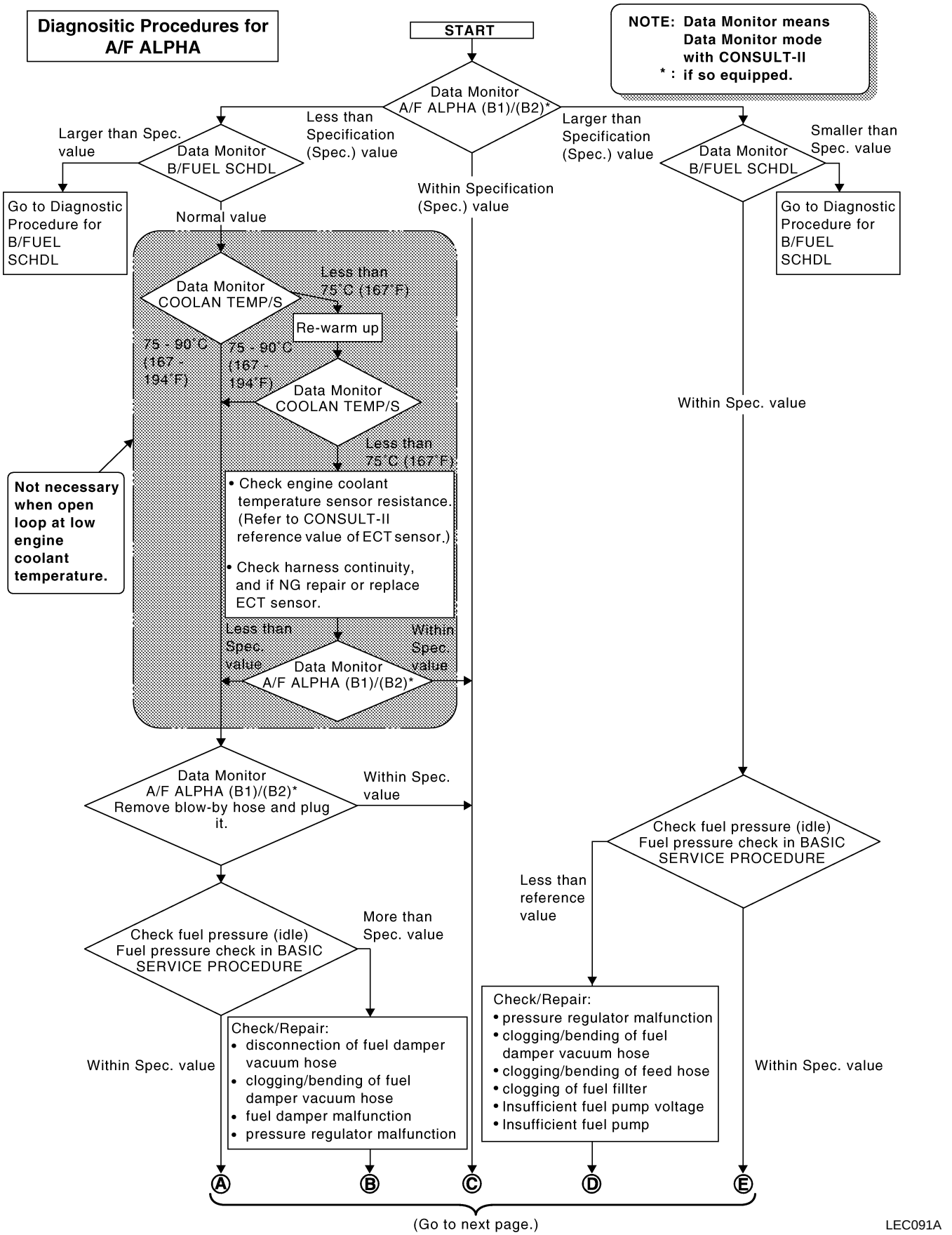
NOTE:

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

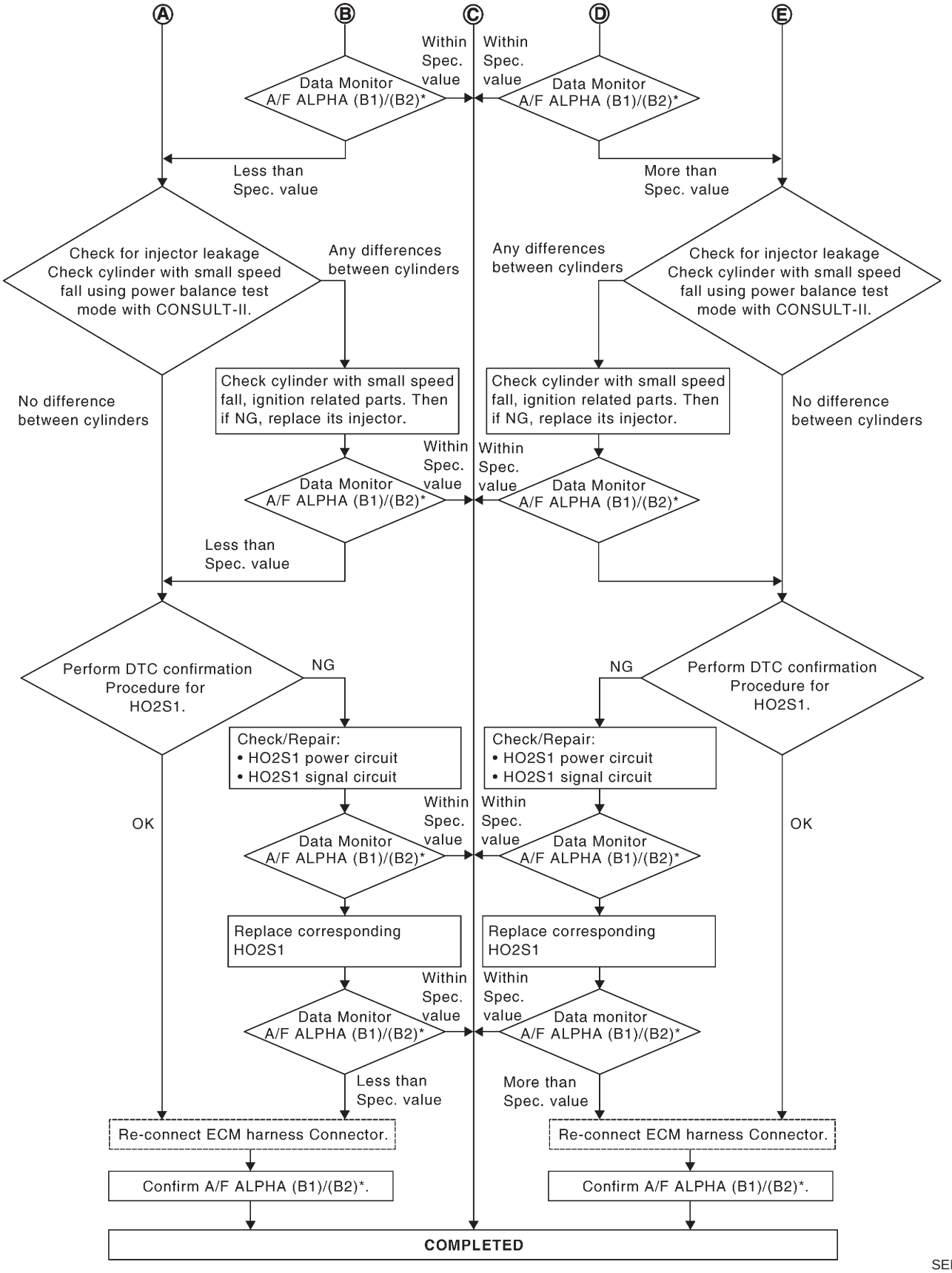
1. Perform “Basic Inspection”, EC-3086.
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to “Diagnostic Procedure”, EC-3120.

Diagnostic Procedure

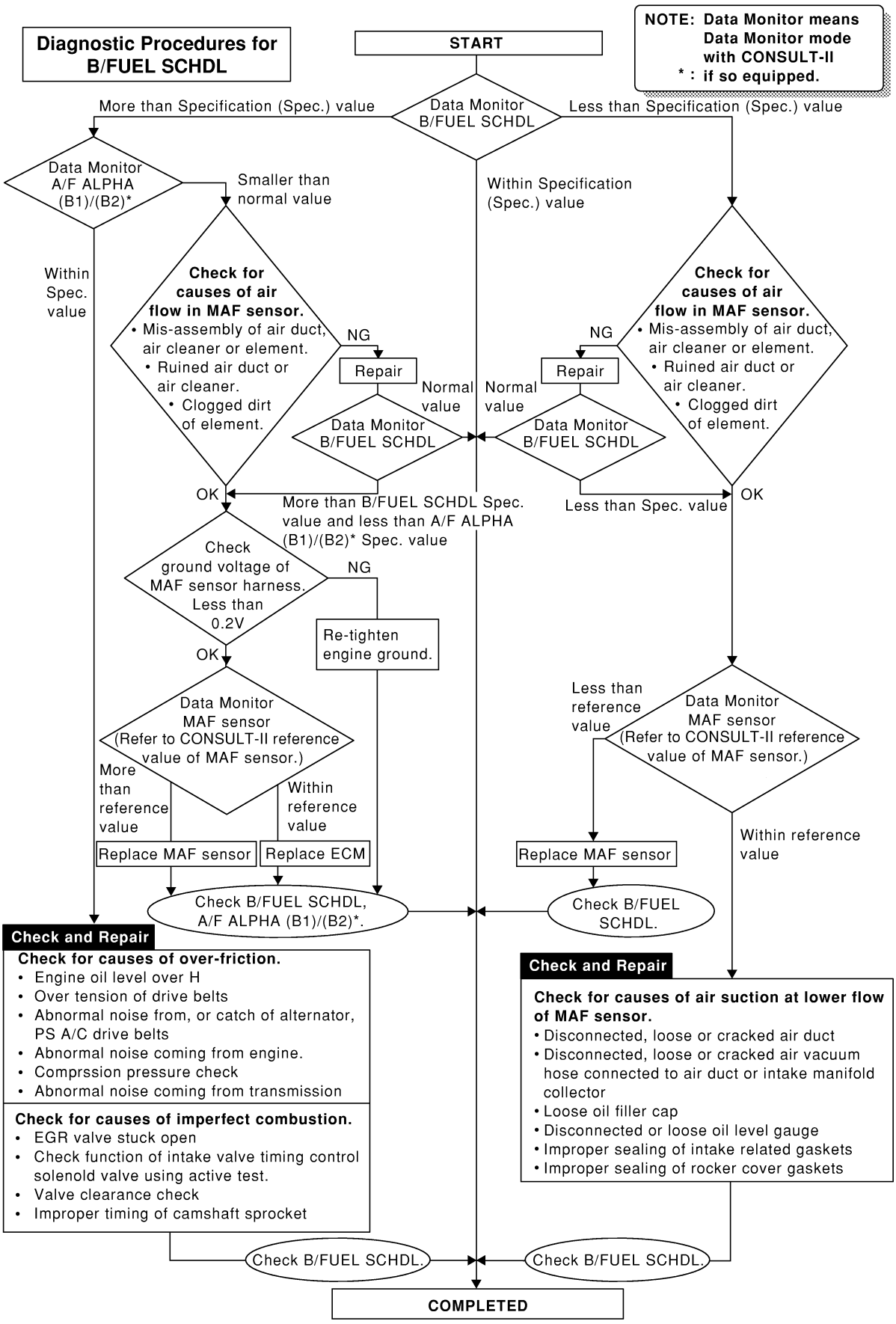
NEEC1006



LEC091A


Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
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.)
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
LEC090A

Description

NEEC0045

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

NEEC0045S01

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 TROUBLE DIAGNOSIS for PXXXX does not indicate the problem area.

Diagnostic Procedure

NEEC0046

1	**INSPECTION START**
Erase (1st trip) DTCs. Refer to "HOW TO ERASE EMISSION-RELATED INFORMATION", EC-3060.	
▶	GO TO 2.

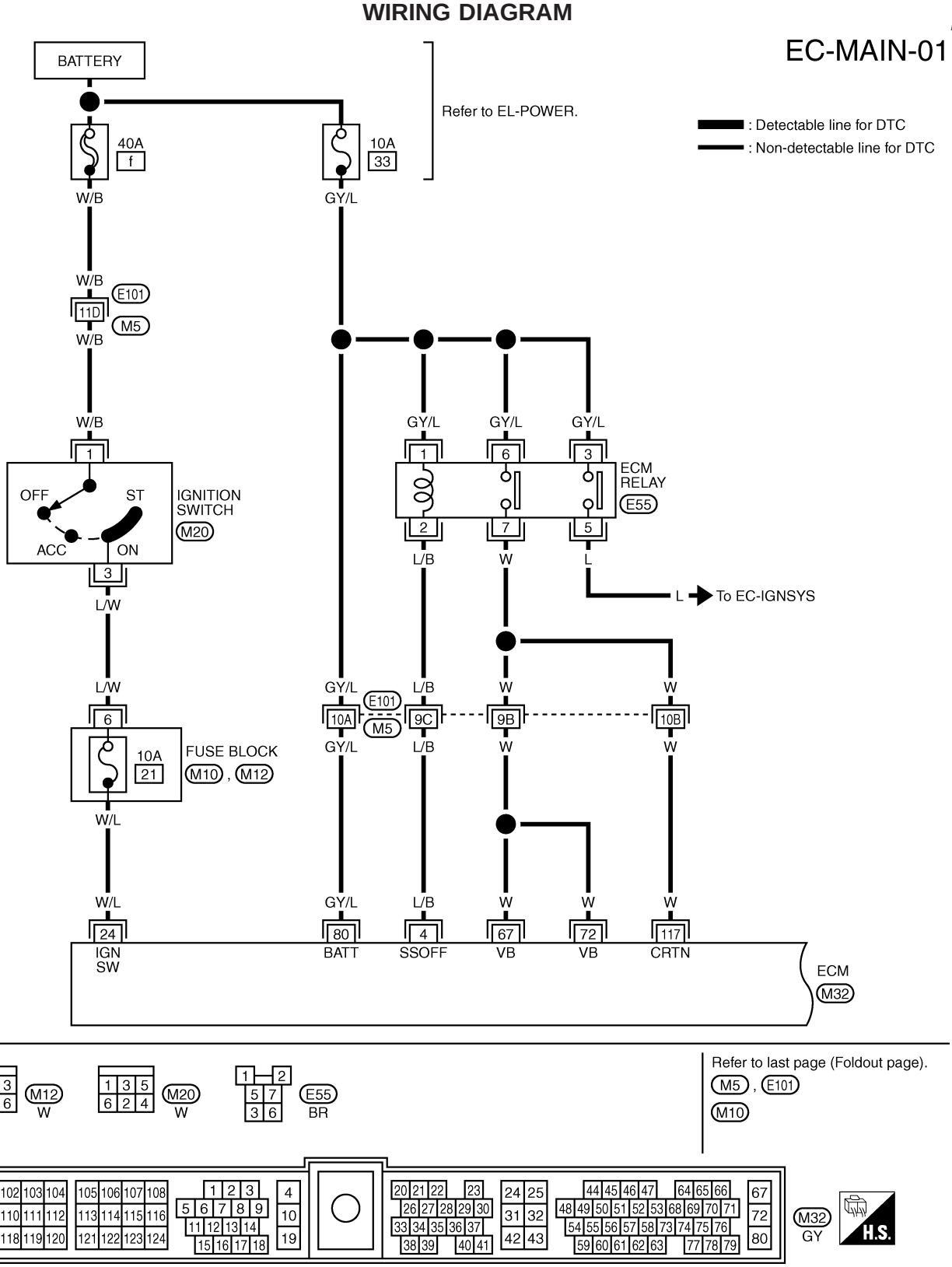
2	**CHECK GROUND TERMINALS**
Check ground terminals for corroding or loose connection. Refer to "Circuit Inspection", "GROUND INSPECTION", GI section.	
OK or NG	
OK ▶	GO TO 3.
NG ▶	Repair or replace.

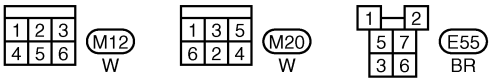
3	**SEARCH FOR ELECTRICAL INCIDENT**
Perform "Incident Simulation Tests", GI section.	
OK or NG	
OK ▶	**INSPECTION END**
NG ▶	Repair or replace.

Main Power Supply and Ground Circuit

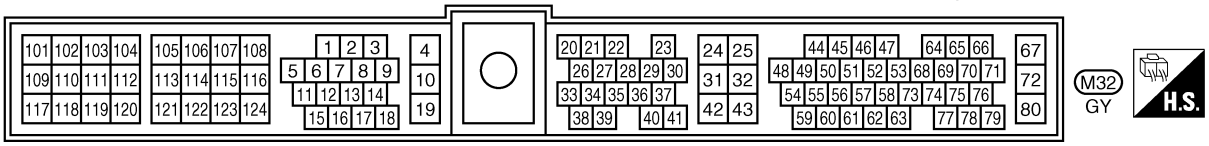
WIRING DIAGRAM

NEEC0047





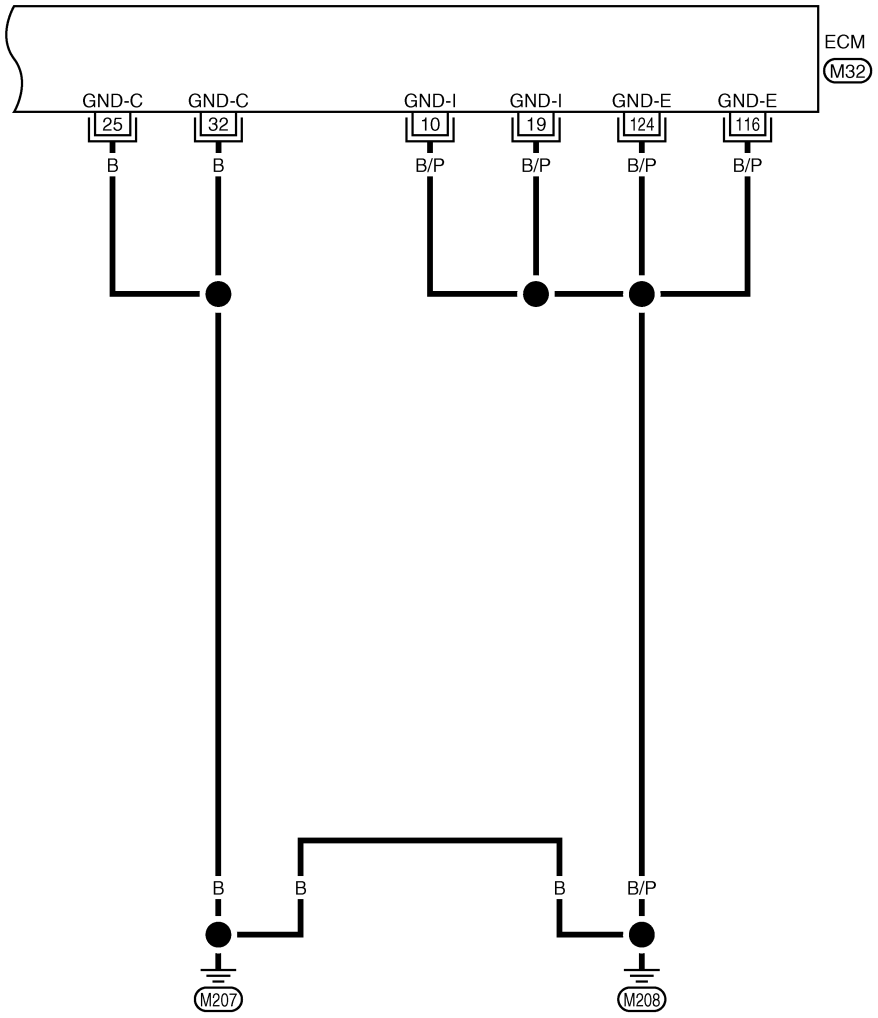
Refer to last page (Foldout page).
M5 , E101
M10

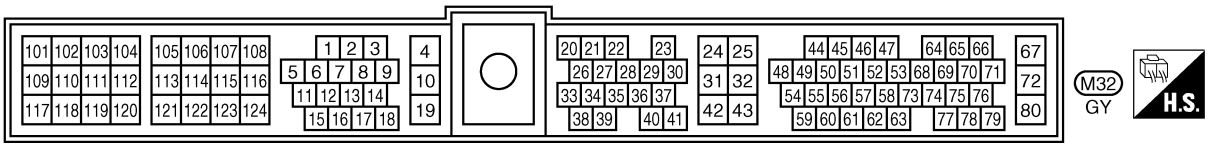


GEC233A

EC-MAIN-02

: Detectable line for DTC
: Non-detectable line for DTC





GEC234A

ECM TERMINALS AND REFERENCE VALUE

NEEC0048

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.

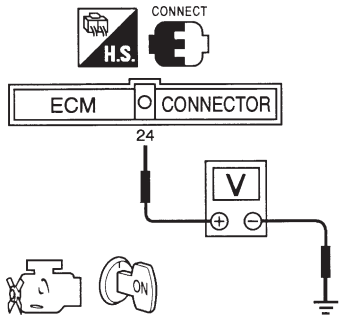
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	L/B	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch OFF]** ● For a few seconds after turning ignition switch OFF	0 - 1V
			[Ignition switch OFF] ● A few seconds passed after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
10	B/P	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
19	B/P	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
24	W/L	Ignition switch	**[Ignition switch OFF]**	0V
			[Ignition switch ON]	BATTERY VOLTAGE (11 - 14V)
25	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
32	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
67	W	Power supply for ECM	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14V)
72	W			
80	GY/L	Power supply (Back-up)	**[Ignition switch OFF]**	BATTERY VOLTAGE (11 - 14V)
116	B/P	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
117	W	Current return	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
124	B/P	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

DIAGNOSTIC PROCEDURE

=NEEC0049

1	INSPECTION START
Start engine. Is engine running? **Yes or No**	
Yes ▶	GO TO 9.
No ▶	GO TO 2.

2	CHECK POWER SUPPLY-I
1. Turn ignition switch OFF and then ON. 2. Check voltage between ECM terminal 24 and ground with CONSULT-II or tester.	



SEF600P

Voltage: Battery voltage

OK or NG

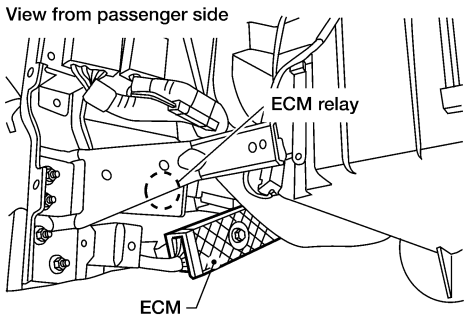
OK ▶	GO TO 4.
NG ▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● 40A fusible link ● Harness connectors E101, M5 ● Ignition switch ● Fuse block M10, M12 ● 10A fuse ● Harness for open or short between ECM and battery	
▶	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 10, 19, 25, 32, 116, 124 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.

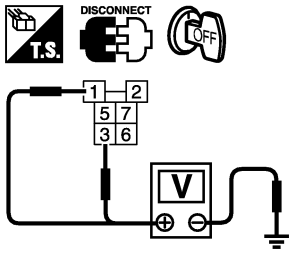
5	CHECK POWER SUPPLY-II

1. Disconnect ECM relay.



LEC106A

2. Check voltage between ECM relay terminals 1, 3 and ground with CONSULT-II or tester.



SEC313D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- 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.

7	CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 4 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 “IGNITION SIGNAL”, EC-3361.
NG	▶	GO TO 8.

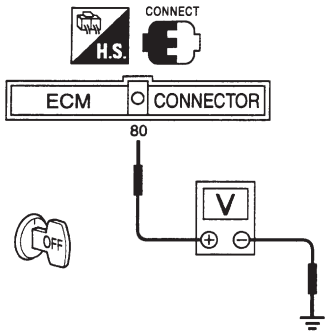
8	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- 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 POWER SUPPLY-II

1. Stop engine.
2. Check voltage between ECM terminal 80 and ground with CONSULT-II or tester.



MEC698B

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

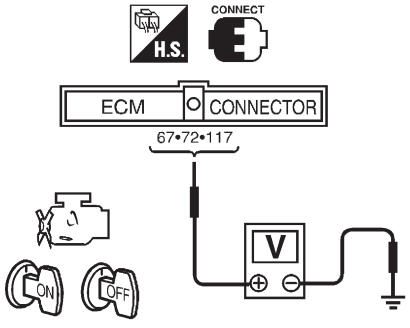
10	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- 10A fuse
- Harness for open or short between ECM and fuse

	▶	Repair harness or connectors.

11	CHECK POWER SUPPLY-III

1. Turn ignition switch ON and then OFF.
2. Check voltage between ECM terminals 67, 72, 117 and ground with CONSULT-II or tester.



SEF121V

Voltage:

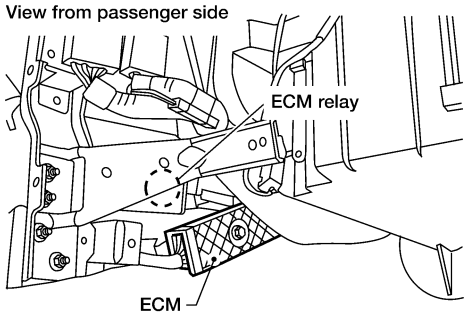
After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0V.

OK or NG

OK	▶	GO TO 19.
NG (Battery voltage does not exist.)	▶	GO TO 12.
NG (Battery voltage exists for more than a few seconds.)	▶	GO TO 18.

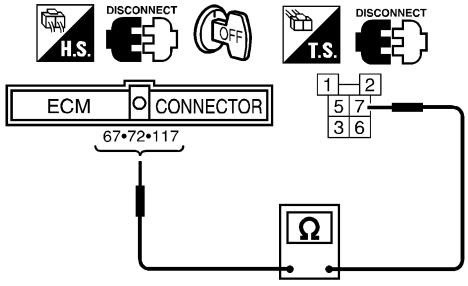
12	CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM

1. Disconnect ECM harness connector.
2. Disconnect ECM relay.



LEC106A

3. Check harness continuity between ECM terminals 67, 72, 117 and ECM relay terminal 7.



SEC267D

Continuity should exist.

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

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

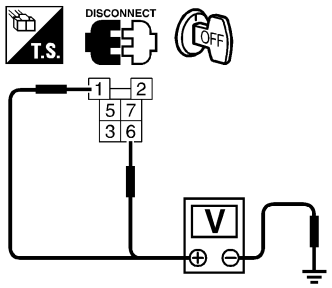
13	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness for open or short between ECM and ECM relay

	▶	Repair harness or connectors.

14	CHECK VOLTAGE BETWEEN ECM RELAY AND GROUND

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



SEC268D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 15.

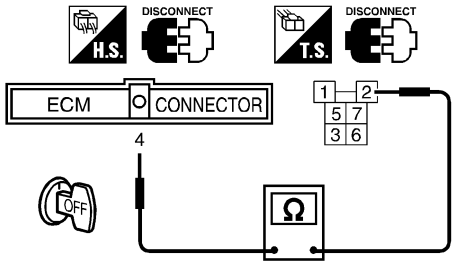
15	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness for open or short between ECM relay and fuse

	▶	Repair harness or connectors.

16	CHECK OUTPUT SIGNAL CIRCUIT

1. Check harness continuity between ECM terminal 4 and ECM relay terminal 2.



SEC269D

Continuity should exist.

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

OK or NG

OK	▶	GO TO 18.
NG	▶	GO TO 17.

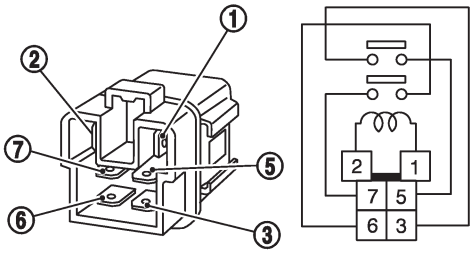
17	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness for open or short between ECM and ECM relay

	▶	Repair harness or connectors.

18	CHECK ECM RELAY

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



PBIB0077E

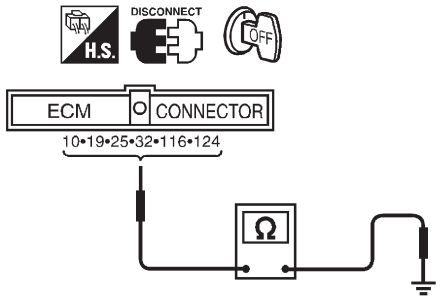
12V (1 - 2) applied: Continuity exists.
No voltage applied: No continuity

OK or NG

OK	▶	GO TO 19.
NG	▶	Replace ECM relay.

19	CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 10, 19, 25, 32, 116, 124 and engine ground.



SEF119V

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 20.
NG	▶	Repair open circuit or short to power in harness or connectors.

20	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**

Description

NEEC0136

SYSTEM DESCRIPTION

NEEC0136S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater

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

OPERATION

NEEC0136S02

Engine speed	Heated oxygen sensor 1 heater
Above 3,600 rpm	OFF
Below 3,600 rpm	ON

CONSULT-II Reference Value in Data Monitor Mode

NEEC0137

Specification data are reference values.

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

ECM Terminals and Reference Value

NEEC0138

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)
119	Y/R	Heated oxygen sensor 1 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm.	Approximately 0.4V
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NEEC0139

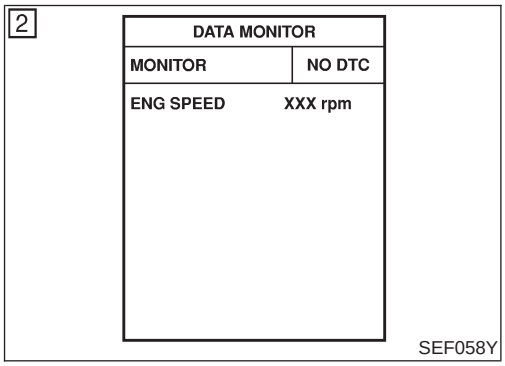
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Heated oxygen sensor 1 heater control circuit low	● The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen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

DTC Confirmation Procedure

NEEC0140

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

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



With CONSULT-II

1) Turn ignition switch ON 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-3136.

With GST

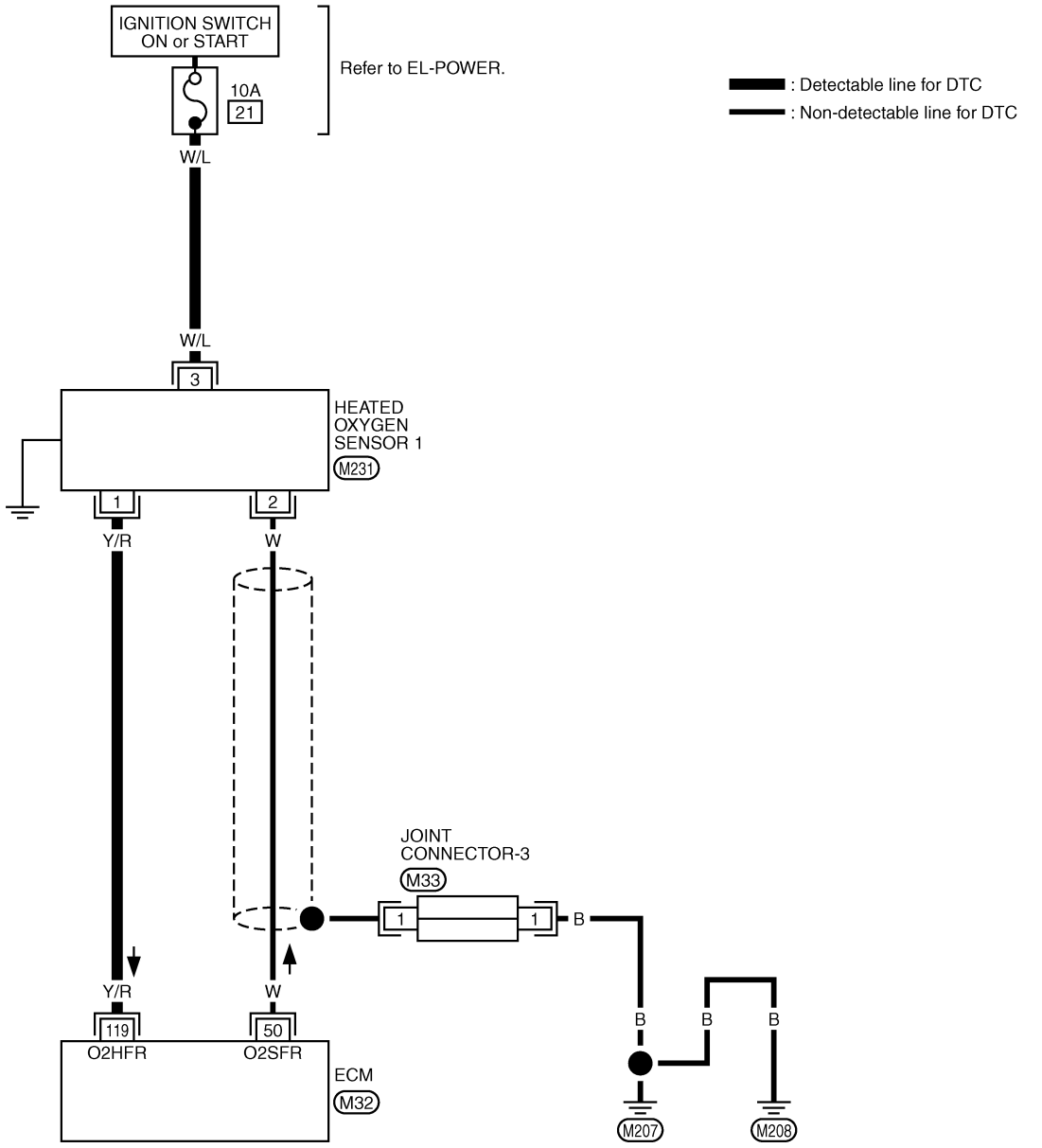
1) Start engine and run it for at least 6 seconds at idle speed.
2) Turn ignition switch OFF and wait least 5 seconds.
3) Start engine and run it for at least 6 seconds at idle speed.
4) Select “MODE 3” with GST.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-3136.

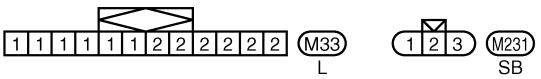
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

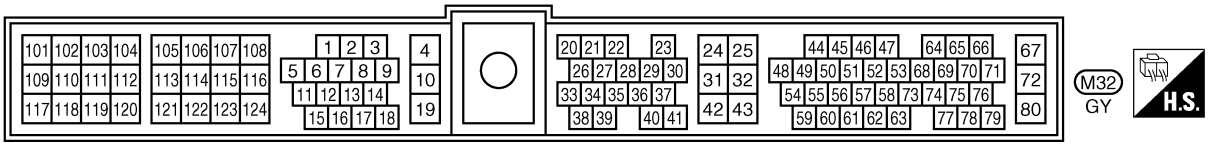
Wiring Diagram

NEEC0141

EC-O2H1B1-01







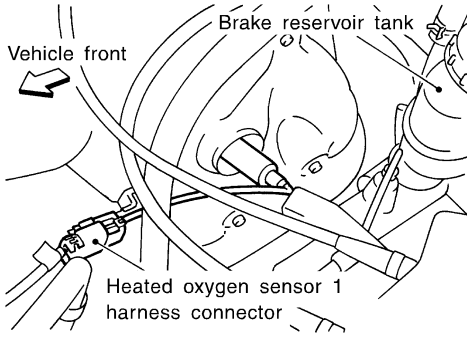
GEC247A

Diagnostic Procedure

NEEC0142

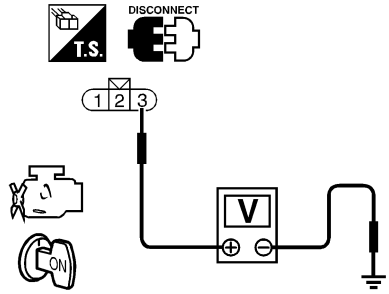
1	CHECK POWER SUPPLY

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



SEF331VC

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



SEF732Z

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and 10A fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

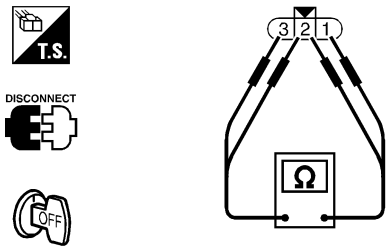
1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between heated oxygen sensor 1 terminal 1 and ECM terminal 119. Refer to the Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground or short to power.

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

Check resistance between terminals 1 and 3.



SEF731Z

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

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

Continuity should not exist.

CAUTION:

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

OK or NG

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

5	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**

Description

NEEC0180

SYSTEM DESCRIPTION

NEEC0180S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater

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

OPERATION

NEEC0180S02

Engine speed rpm	Heated oxygen sensor 2 heater
Above 4,000	OFF
Below 4,000	ON

CONSULT-II Reference Value in Data Monitor Mode

NEEC0181

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 4,000 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
	● Ignition switch ON (Engine stopped) ● Engine is running above 4,000 rpm	OFF

ECM Terminals and Reference Value

NEEC0182

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)
122	G/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	Approximately 0.4V
			[Ignition switch "ON"] ● Engine stopped	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NEEC0183

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

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

DTC Confirmation Procedure

NEEC0184

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

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

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
VHCL SPEED SE	XXX km/h
THRTL POS SEN	XXX V

SEF175Y

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-3141.

With GST

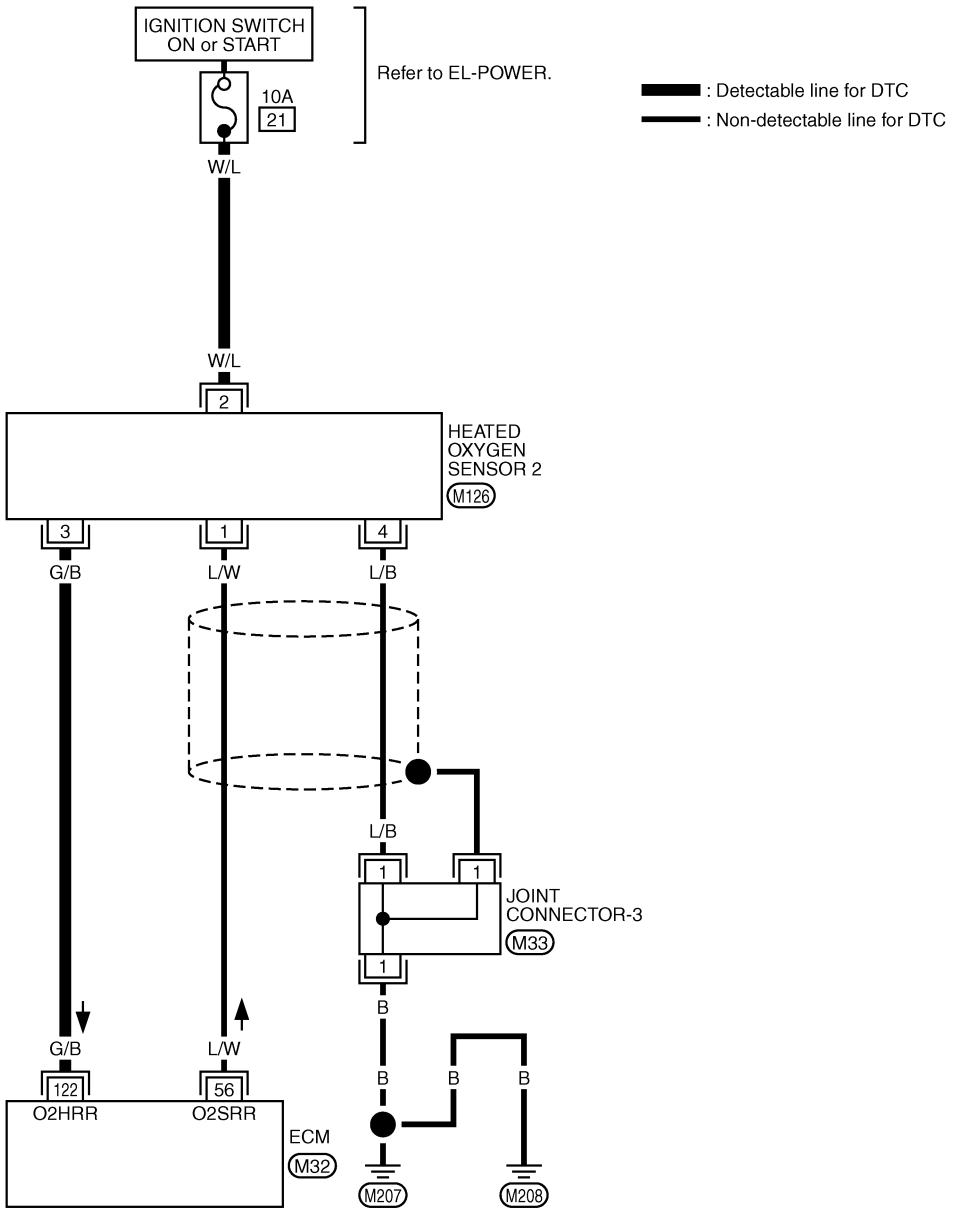
1) Start engine.
2) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) Stop vehicle and let engine idle for at least 6 seconds.
4) Turn ignition switch OFF and wait at least 10 seconds.
5) Start engine.
6) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes
7) Stop vehicle and let engine idle for at least 6 seconds.
8) Select "MODE 3" with GST.
9) If DTC is detected, go to "Diagnostic Procedure", EC-3141.

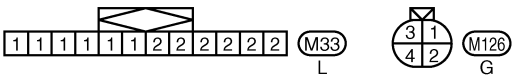
When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.

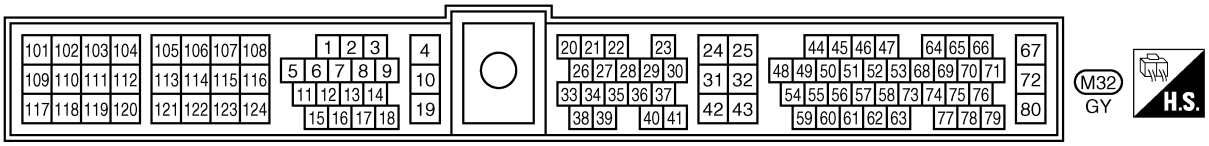
Wiring Diagram

NEEC0185

EC-O2H2B1-01







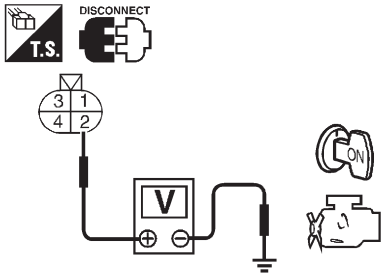
GEC248A

Diagnostic Procedure

NEEC0186

1	CHECK POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch ON.
4. Check voltage between 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.
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and 10A fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

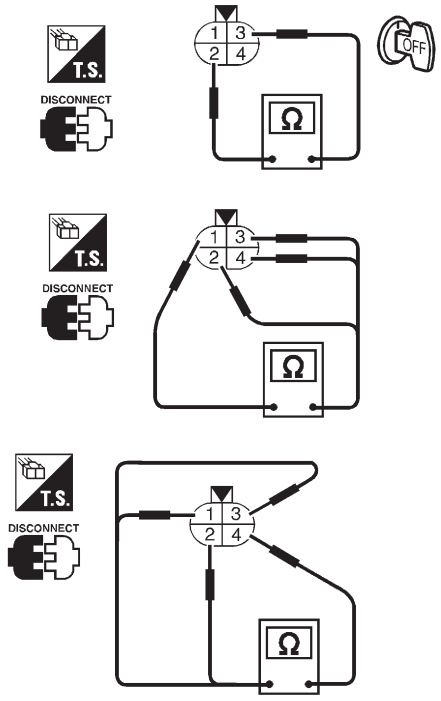
1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between heated oxygen sensor 2 terminal 3 and ECM terminal 122. Refer to the Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground or short to power.

OK or NG

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

4	CHECK HEATED OXYGEN SENSOR 2 HEATER

Check the following.
1. Check resistance between terminals 2 and 3.



SEF221W

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	

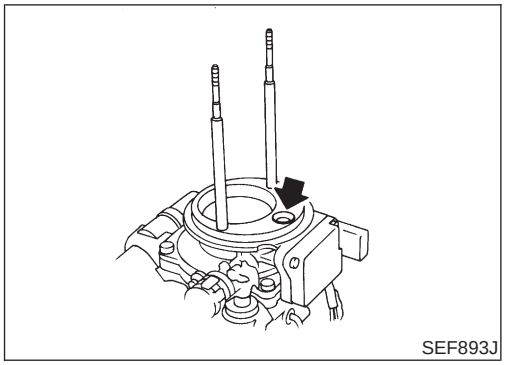
MTBL0330

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

OK or NG

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

5	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**


SEF893J

Component Description

NEEC0050

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

NEEC0051

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	0.9 - 1.8V
		2,500 rpm	1.9 - 2.3V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	9.5 - 34.0%
		2,500 rpm	13.9 - 24.9%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	0.9 - 5.8 g·m/s
		2,500 rpm	7.5 - 13.2 g·m/s

ECM Terminals and Reference Value

NEEC0052

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)
54	L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.9 - 1.8V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.9 - 2.3V
55	P	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NEEC0053

DTC No.	Malfunction is detected when ...		Check Items (Possible Cause)
P0101 0101	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

DTC No.	Malfunction is detected when ...		Check Items (Possible Cause)
P0101 0101	B)	A low voltage from the sensor is sent to ECM* under heavy load driving condition.	● 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

NEEC0053S01

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

NEEC0054

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 5 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

NEEC0054S03

NOTE:
If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch "ON") instead of running engine at idle speed.

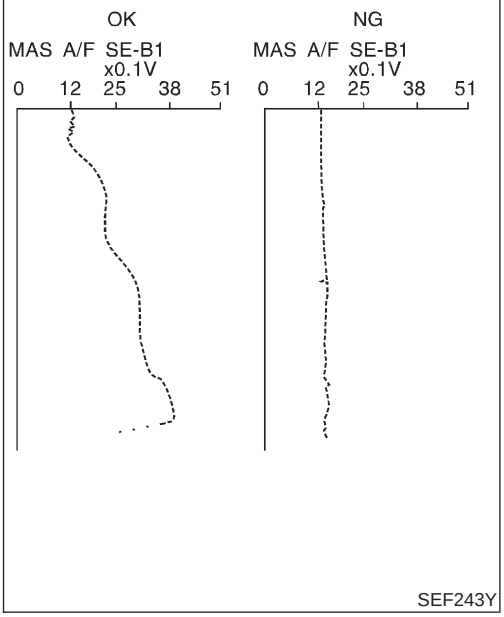
With CONSULT-II

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) Run engine for at least 10 seconds at idle speed.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-3147.

With GST

Follow the procedure "With CONSULT-II".

6



SEF243Y

7

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
VHCL SPEED SE	XXX km/h
THRTL POS SEN	XXX V

SEF175Y

CALC LOAD	20%
COOLANT TEMP	95°C
SHORT FT #1	2%
LONG FT #1	0%
SHORT FT #2	4%
LONG FT #2	0%
ENGINE SPD	2637RPM
VEHICLE SPD	0MPH
IGN ADVANCE	41.0°
INTAKE AIR	41°C
MAF	**14.1gm/sec**
THROTTLE POS	3%

SEF534P

PROCEDURE FOR MALFUNCTION B

NEEC0054S04

With CONSULT-II

1) Turn ignition switch ON.
2) Start engine and warm it up to normal operating temperature. If engine cannot be started, go to “Diagnostic Procedure”, EC-3147.
3) Select “DATA MONITOR” mode with CONSULT-II.
4) Check the voltage of “MAS A/F SE-B1” with “DATA MONITOR”.
5) Increases engine speed to about 4,000 rpm.
6) Monitor the linear voltage rise in response to engine speed increases.
   If NG, go to “Diagnostic Procedure”, EC-3147.
   If OK, go to following step.
7) Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
THRTL POS SEN	More than 3V
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

8) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3147.

Overall Function Check

NEEC0055

Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a 1st trip DTC might not be confirmed.

PROCEDURE FOR MALFUNCTION B

NEEC0055S01

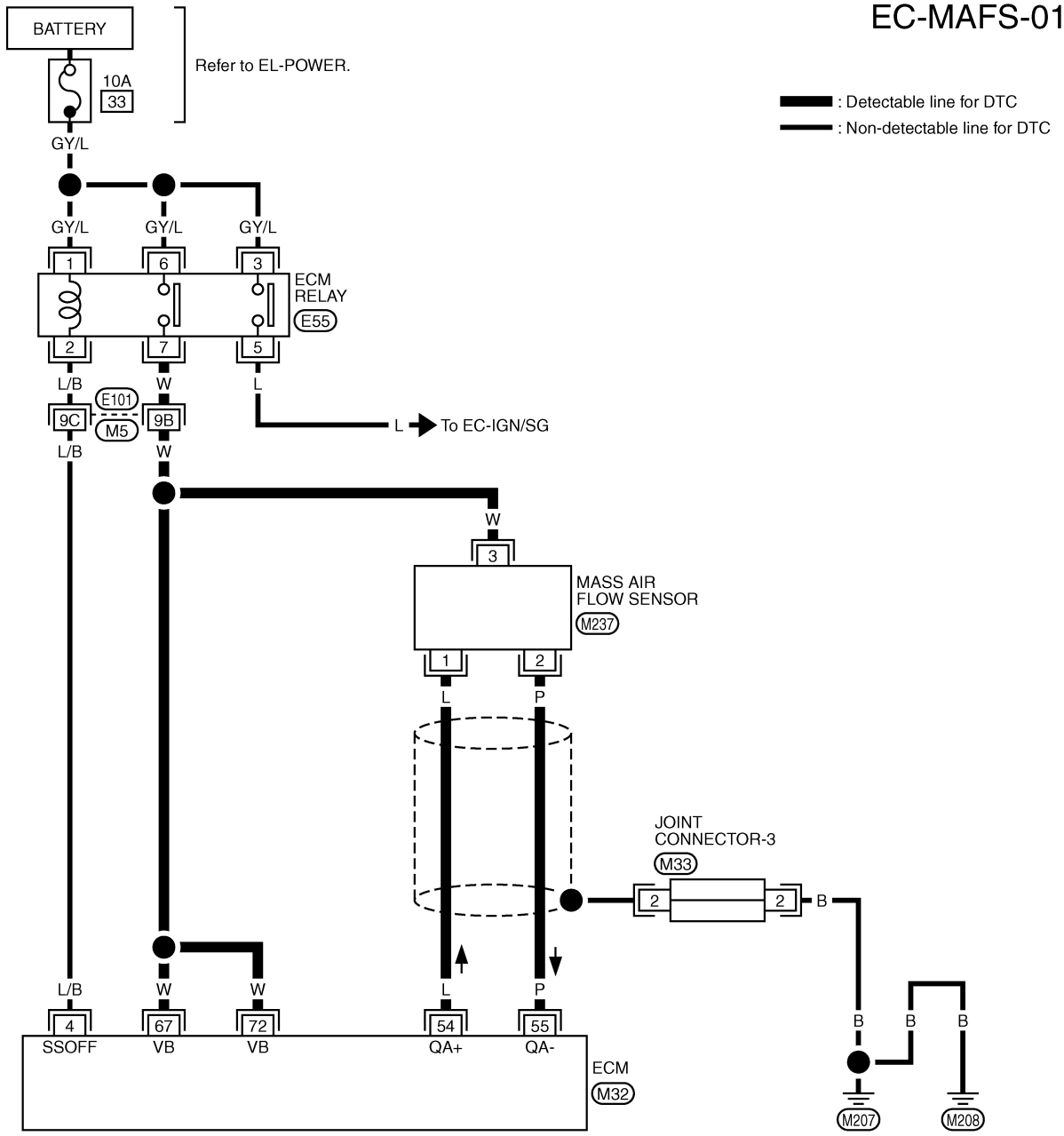
With GST

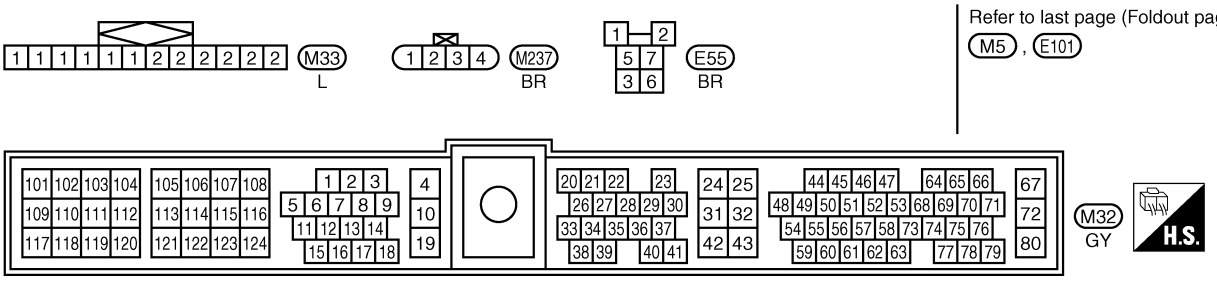
1) Turn ignition switch ON.
2) Start engine and warm it up to normal operating temperature.
3) Select “MODE 1” with GST.
4) Check the mass air flow sensor signal with “MODE 1”.
5) Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.
6) If NG, go to “Diagnostic Procedure”, EC-3147.

Wiring Diagram

NEEC0056

EC-MAFS-01





GEC237A

Diagnostic Procedure

NEEC0057

1	INSPECTION START

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

MALFUNCTION	Type
A	I
B	II

MTBL1305

Type I or Type II

Type I	▶	GO TO 3.
Type II	▶	GO TO 2.

2	CHECK INTAKE SYSTEM

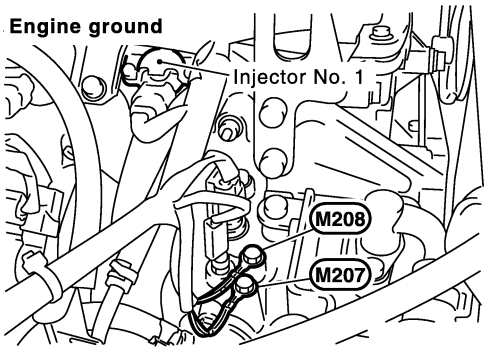
Check the followings for connection.
- Air duct
- Air cleaner
- Vacuum hoses
- Intake air passage between air duct to collector

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.

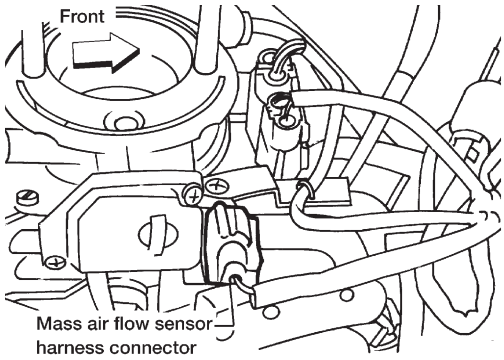


SEC309D

	▶	GO TO 4.

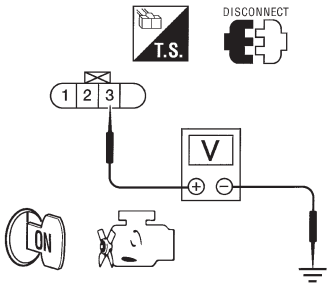
4	CHECK POWER SUPPLY

1. Disconnect mass air flow sensor harness connector.



AEC131A

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



AEC691

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- 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 2 and ECM terminal 55. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground or short to power.

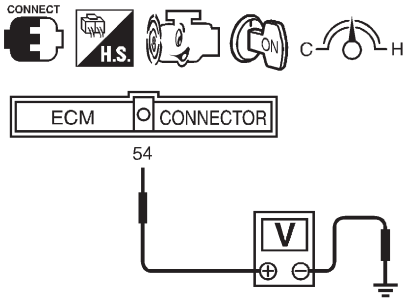
OK or NG

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

7	CHECK INPUT SIGNAL CIRCUIT	
1. Check harness continuity between terminal 1 and ECM terminal 54. Refer to wiring diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power. **OK or NG**		
OK	▶	GO TO 8.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK MASS AIR FLOW SENSOR	

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Start engine and warm it up to normal operating temperature.
4. Check voltage between ECM terminal 54 (mass air flow sensor signal) and ground.



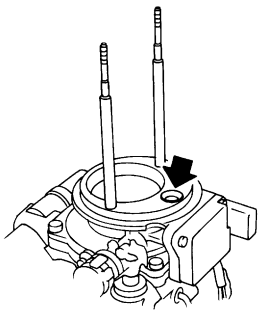
SEF326V

Conditions	Voltage V
Ignition switch “ON” (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.9 - 2.3
Idle to about 4,000 rpm*	1.3 - 1.7 to Approx. 3.0

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

MTBL0326

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



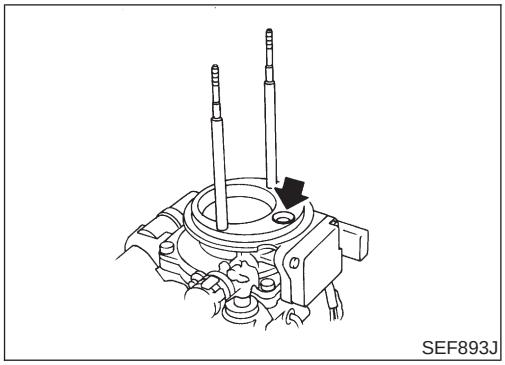
SEF893J

OK or NG

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

9	CHECK SHIELD CIRCUIT	
1. Turn ignition switch OFF. 2. Disconnect joint connector-3. 3. Check the following. ● Continuity between joint connector-3 terminal 2 and ground ● Joint connector-3 (Refer to “HARNESS LAYOUT”, in EL section.) **Continuity should exist.** 4. Also check harness for short to power. **OK or NG**		
OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT	
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.		
	▶	**INSPECTION END**


SEF893J

Component Description

NEEC1548

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

NEEC1549

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	0.9 - 1.8V
		2,500 rpm	1.9 - 2.3V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	9.5 - 34.0%
		2,500 rpm	13.9 - 24.9%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	0.9 - 5.8 g·m/s
		2,500 rpm	7.5 - 13.2 g·m/s

ECM Terminals and Reference Value

NEEC1550

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)
54	L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.9 - 1.8V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.9 - 2.3V
55	P	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NEEC1551

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0103 0103	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0102 0102	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

NEEC1551S01

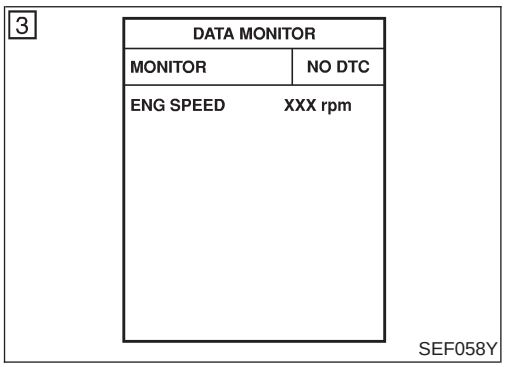
Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

NEEC1552

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 5 seconds before conducting the next test.



PROCEDURE FOR DTC P0103

NEEC1552S01

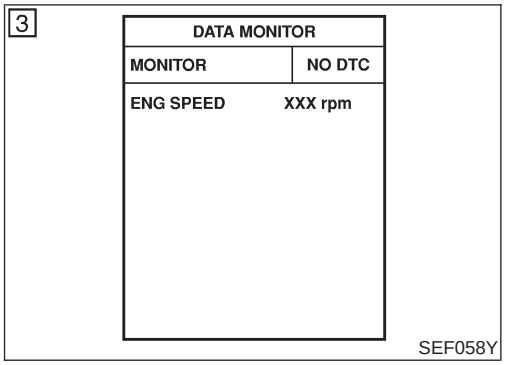
With CONSULT-II

1) Turn ignition switch ON.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 6 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3155.
   If 1st trip DTC is not detected, go to next step.
5) Start engine and let it idle for at least 6 seconds.
6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3155.

With GST

Follow the procedure “With CONSULT-II”.

DTC Confirmation Procedure



PROCEDURE FOR DTC P0102

NEEC1552S02

With CONSULT-II

1) Turn ignition switch ON.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait 5 seconds at most.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3155.

With GST

Follow the procedure “With CONSULT-II”.

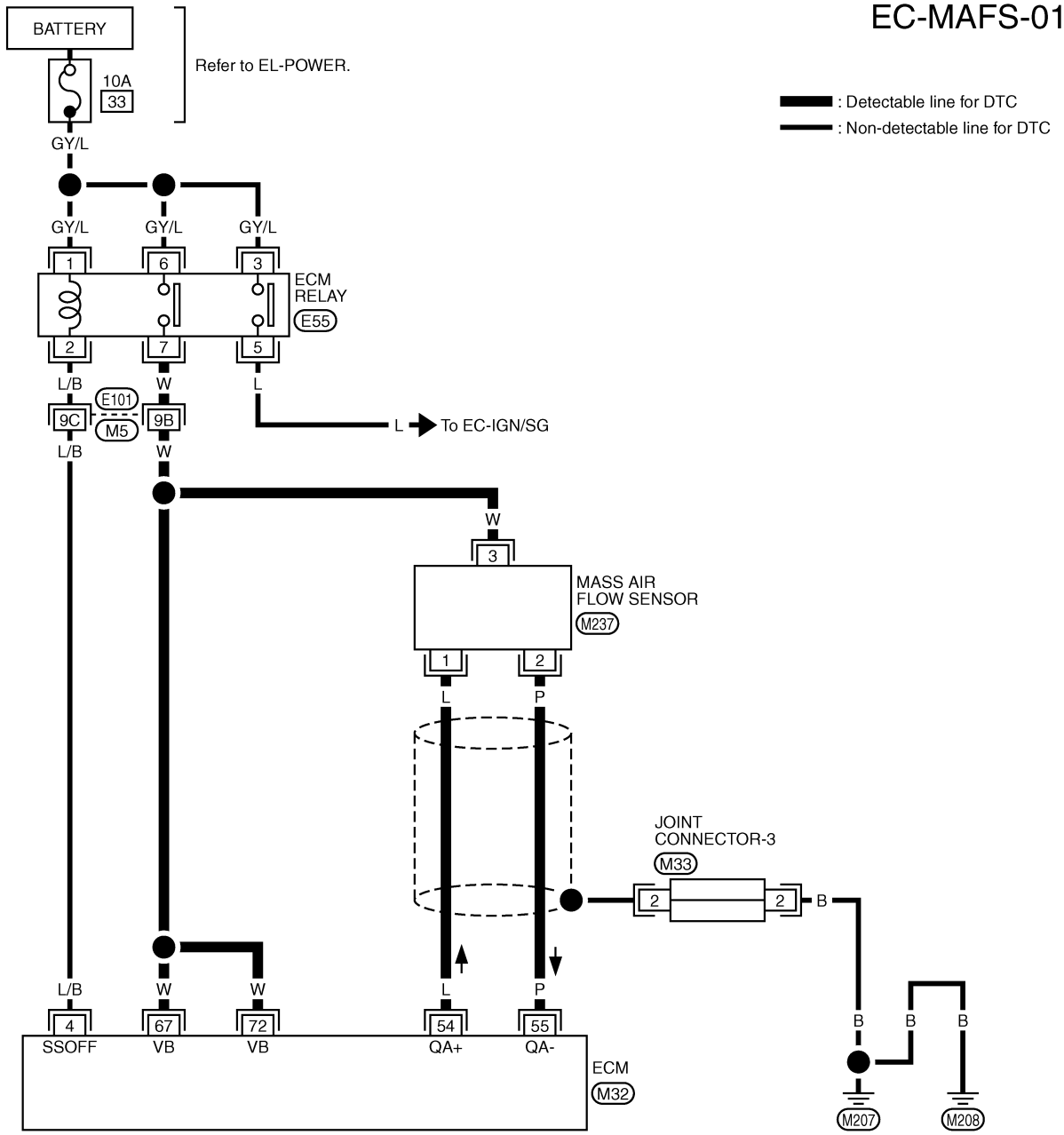
NOTE:

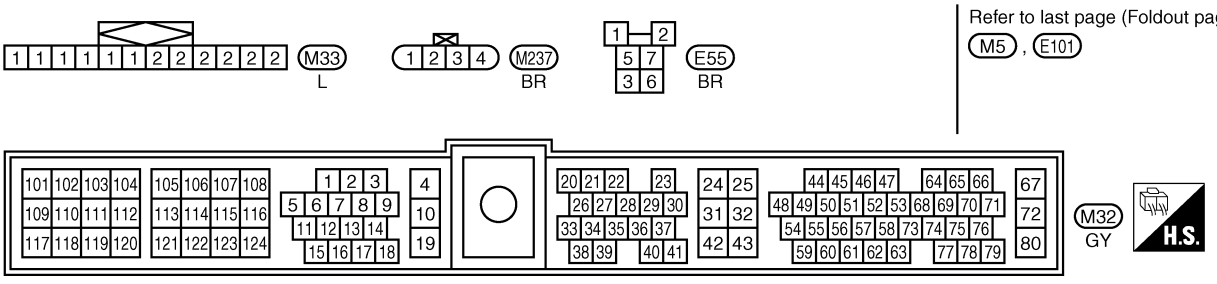
If 1st trip DTC is confirmed after more than 5 seconds, there may be malfunction C.

Wiring Diagram

NEEC1554

EC-MAFS-01





Refer to last page (Foldout page).
M5 , E101

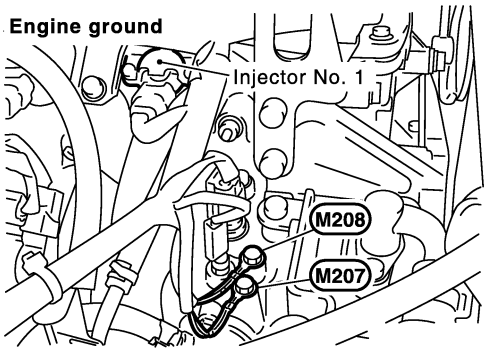
GEC237A

Diagnostic Procedure

NEEC1555

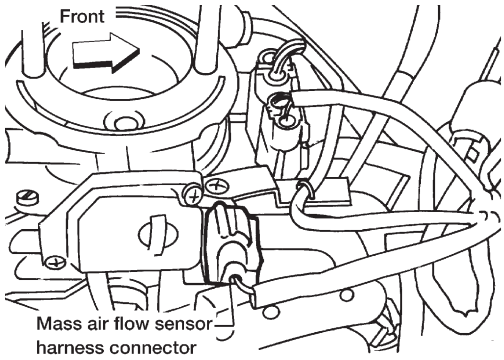
1	INSPECTION START	
Which malfunction (P0102, P0103) is duplicated? **P0102 or P0103**		
P0103	▶	GO TO 3.
P0102	▶	GO TO 2.

2	CHECK INTAKE SYSTEM	
Check the followings for connection. ● Air duct ● Air cleaner ● 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.  SEC309D		
	▶	GO TO 4.

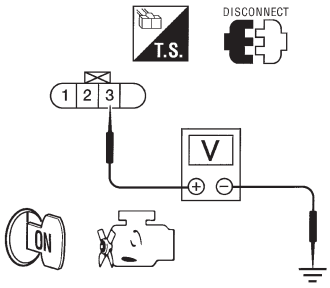
4	CHECK POWER SUPPLY

1. Disconnect mass air flow sensor harness connector.



AEC131A

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



AEC691

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

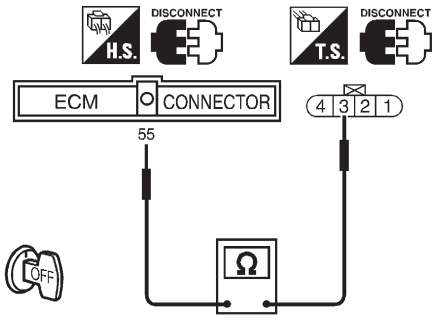
5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- 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 2 and ECM terminal 55. Refer to EC-3154.



SEF124V

Continuity should exist.

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

OK or NG

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

7	CHECK INPUT SIGNAL CIRCUIT

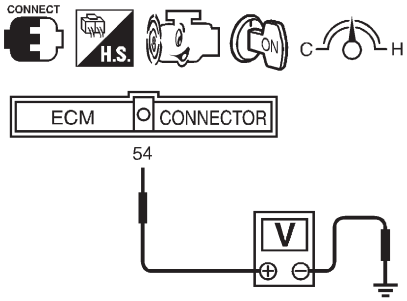
1. Check harness continuity between terminal 1 and ECM terminal 54. Refer to wiring diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

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

8 **CHECK MASS AIR FLOW SENSOR**

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Start engine and warm it up to normal operating temperature.
4. Check voltage between ECM terminal 54 (mass air flow sensor signal) and ground.



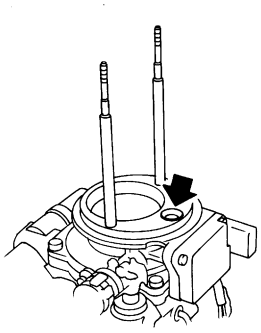
SEF326V

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.9 - 2.3
Idle to about 4,000 rpm*	1.3 - 1.7 to Approx. 3.0

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

MTBL0326

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



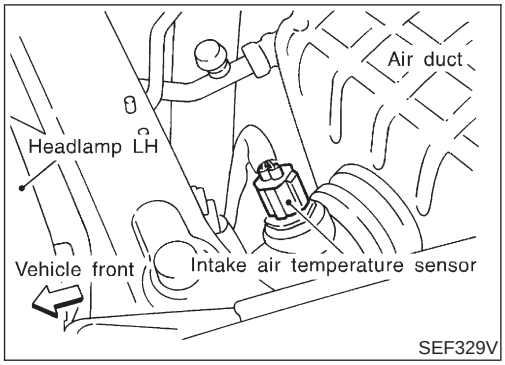
SEF893J

OK or NG

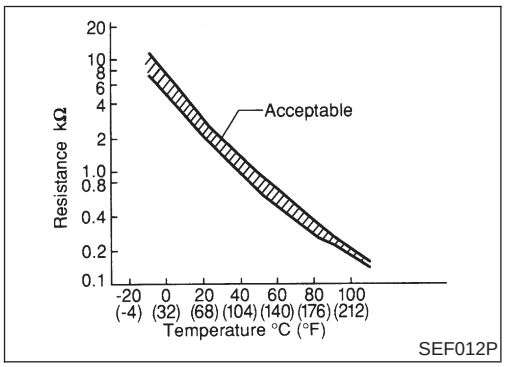
OK	▶	GO TO 9.
NG	▶	Replace mass air flow sensor.

9	CHECK SHIELD CIRCUIT	
1. Turn ignition switch OFF. 2. Disconnect joint connector-3. 3. Check the following. ● Continuity between joint connector-3 terminal 2 and ground ● Joint connector-3 (Refer to “HARNESS LAYOUT”, in EL section.) **Continuity should exist.** 4. Also check harness for short to power. **OK or NG**		
OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



SEF329V



SEF012P

Component Description

NEEC0066

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 61 (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.

ECM Terminals and Reference Value

NEEC1556

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
43	B	Sensors' ground	**[Engine is running]** ● Idle speed	Approximately 0V
61	P/B	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.

On Board Diagnosis Logic

NEEC0067

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

FAIL-SAFE MODE

NEEC0067S01

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

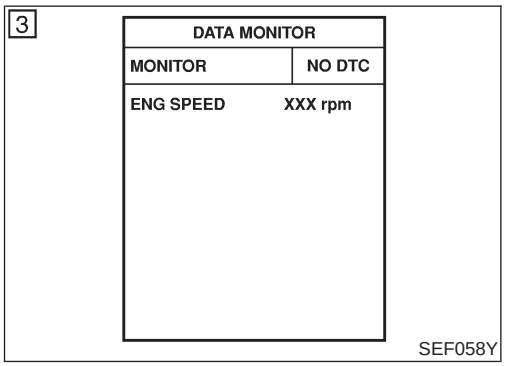
Engine operating condition in fail-safe mode
The ECM functions on the assumption that the intake air temperature is 25°C (77°F).

DTC Confirmation Procedure

NEEC0068

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 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-3163.

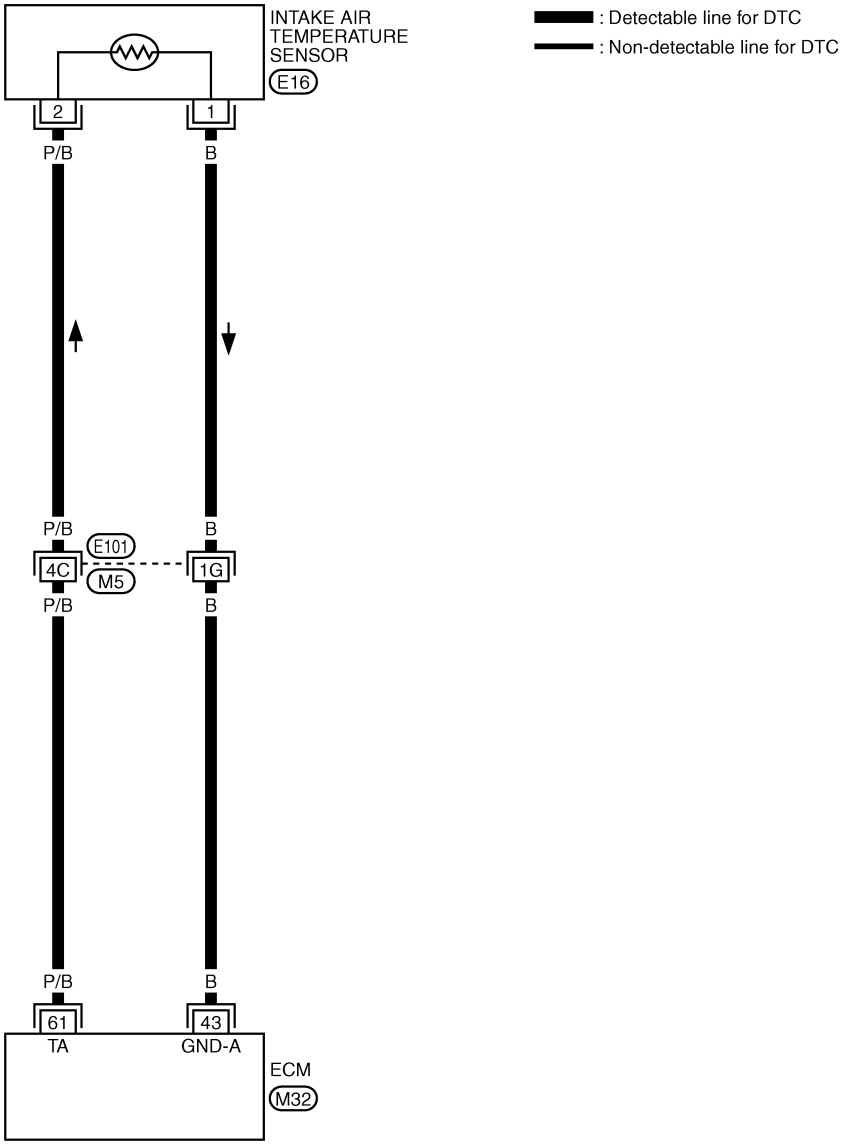
With GST

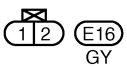
Follow the procedure “With CONSULT-II”.

Wiring Diagram

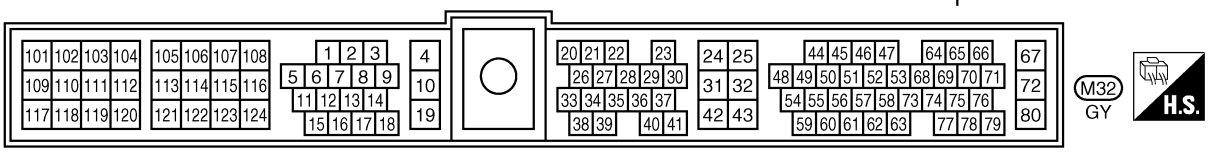
NEEC0069

EC-IATS-01





Refer to last page (Foldout page).
M5 , E101



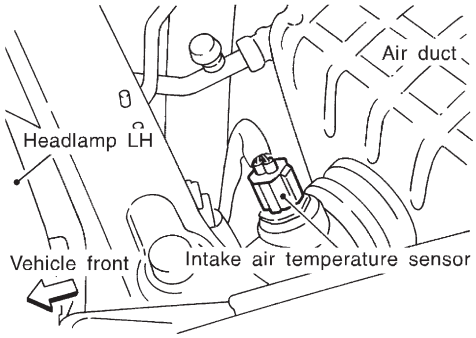
GEC238A

Diagnostic Procedure

NEEC0070

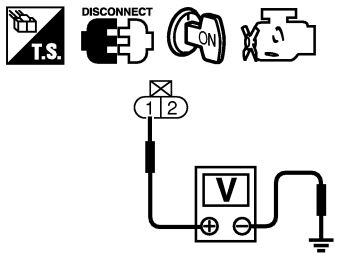
1	CHECK POWER SUPPLY

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



SEF329V

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



SEC271D

Voltage: Approximately 5V

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- 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 terminal 1 and engine ground. Refer to the Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

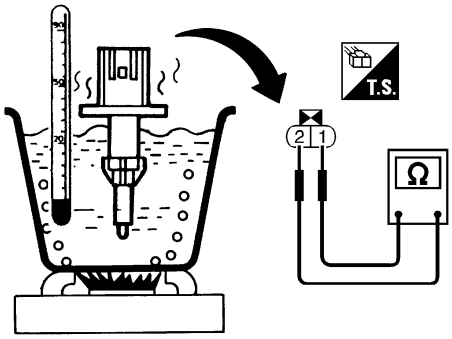
OK or NG

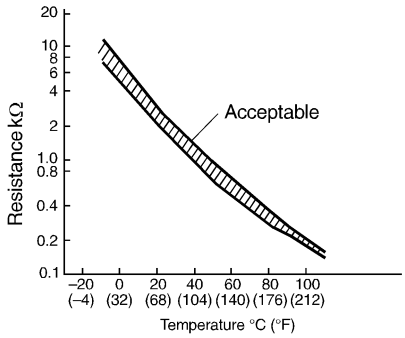
OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E101, M5 ● 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

Check resistance as shown in the figure.





SEC272D

<Reference data>

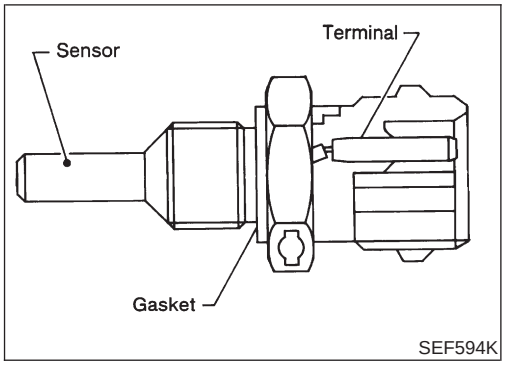
Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

MTBL1306

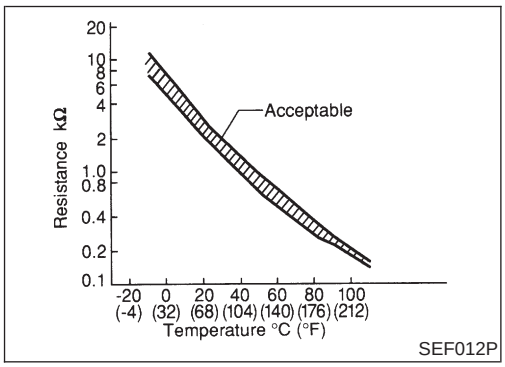
OK or NG

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

6	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



SEF594K



SEF012P

Component Description

NEEC0072

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 59 (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

NEEC0073

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

ECM Terminals and Reference Value

NEEC1557

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
43	B	Sensors' ground	**[Engine is running]** ● Idle speed	Approximately 0V
59	LG/R	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.

On Board Diagnosis Logic

NEEC0074

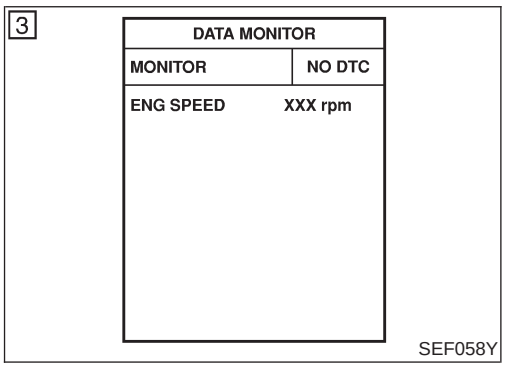
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

NEEC0074S01

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

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch to 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 to 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)



DTC Confirmation Procedure

NEEC0075

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 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-3168.

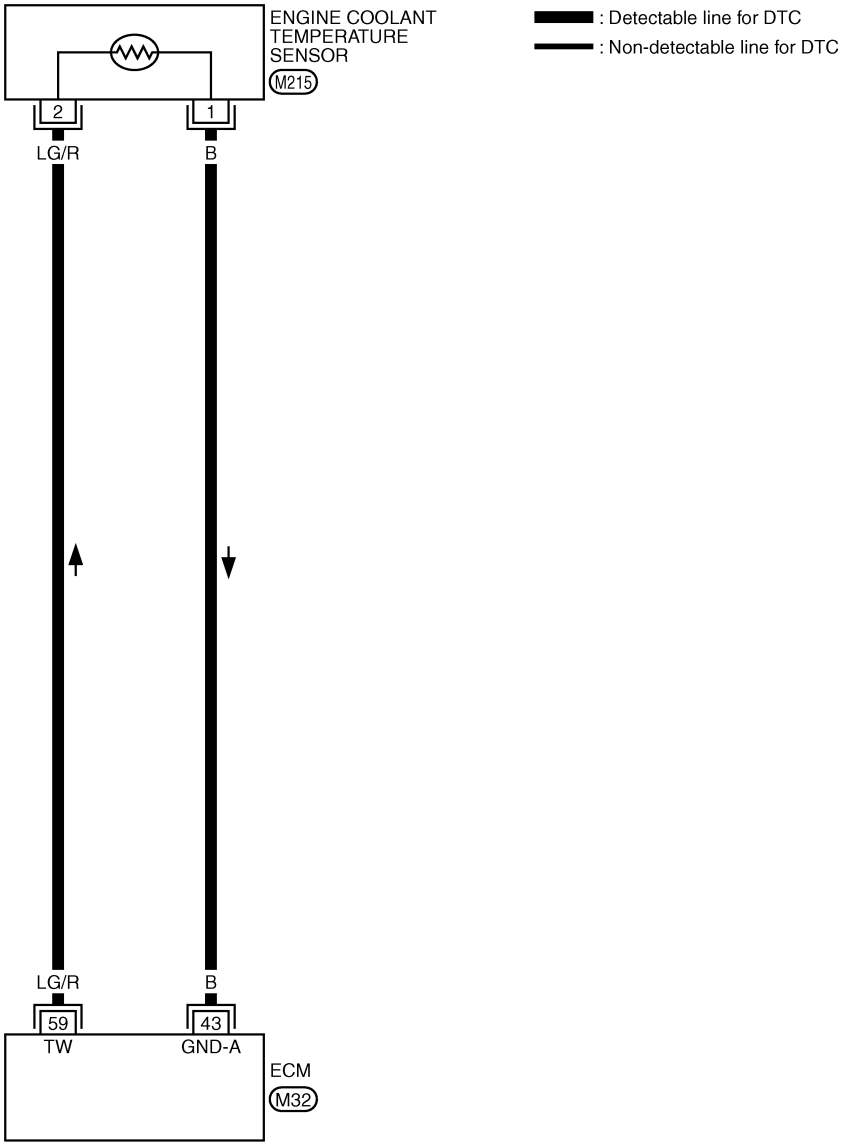
With GST

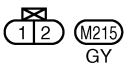
Follow the procedure “With CONSULT-II”.

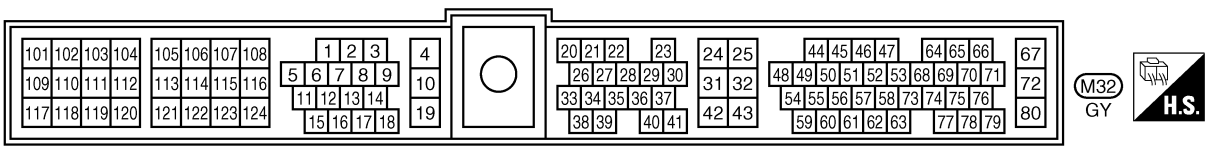
Wiring Diagram

NEEC0076

EC-ECTS-01







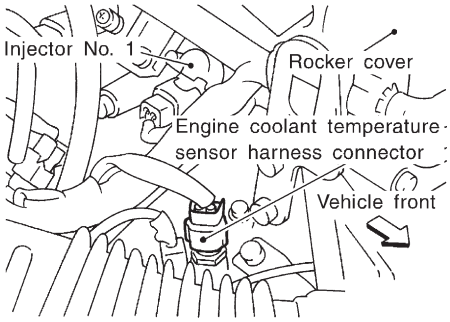
GEC239A

Diagnostic Procedure

NEEC0077

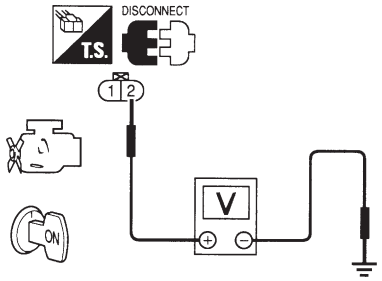
1	CHECK POWER SUPPLY

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



SEF330V

3. Turn ignition switch ON.
4. Check voltage between engine coolant temperature sensor terminal 2 and ground with CONSULT-II or tester.



SEF541P

Voltage: Approximately 5V

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 1 and engine ground. Refer to the Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

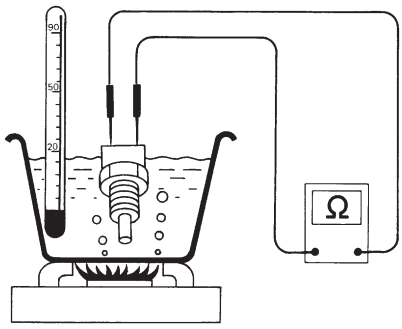
4	DETECT MALFUNCTIONING PART

Check the 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

Check resistance as shown in the figure.

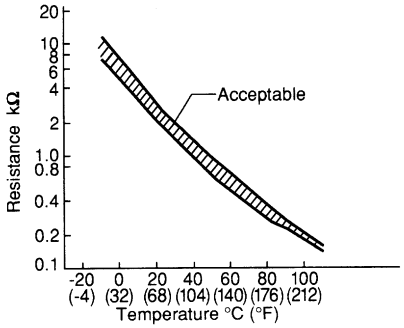


SEF152P

<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

MTBL0285



SEF012P

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace engine coolant temperature sensor.

6	CHECK INTERMITTENT INCIDENT

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.

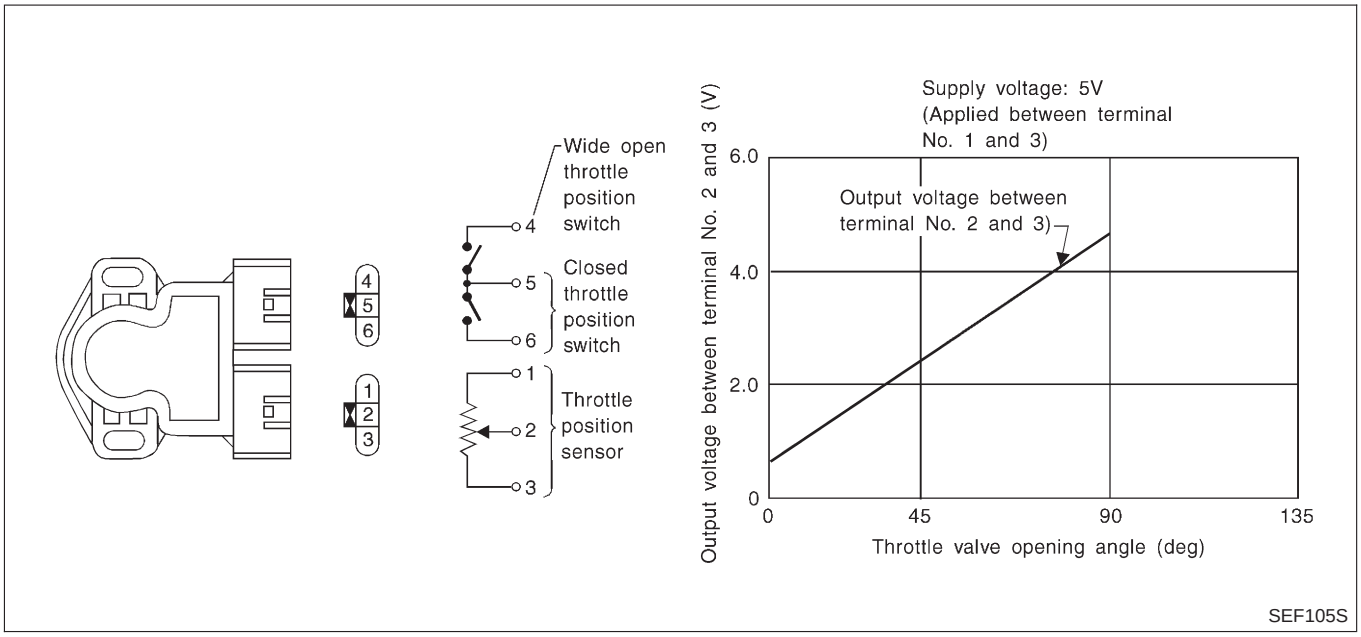
	▶	**INSPECTION END**

Component Description

NEEC0079

NOTE:
If DTC P0121, P0122 or P0123 is displayed with DTC P0510, first perform trouble diagnosis for DTC P0510, EC-3301.

The throttle position sensor responds to the accelerator pedal movement. This sensor is a type 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.



SEF105S

CONSULT-II Reference Value in Data Monitor Mode

NEEC0080

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Ignition switch: ON (Engine stopped) ● Engine: After warming up	Throttle valve: fully closed	0.2 - 0.8V
		Throttle valve: fully opened	3.5 - 4.5V
ABSOL TH·P/S	● Ignition switch: ON (Engine stopped) ● Engine: After warming up	Throttle valve: fully closed	0.0%
		Throttle valve: fully opened	Approx. 80%

ECM Terminals and Reference Value

=NEEC0081

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)
23	G	Throttle position sensor	**[Ignition switch ON]** ● **Warm-up condition** ● Accelerator pedal fully released	0.2 - 0.8V
			[Ignition switch ON] ● Accelerator pedal fully depressed	3.5 - 4.5V
42	G/B	Sensors' power supply	**[Ignition switch ON]**	Approximately 5V
43	B	Sensors' ground	**[Engine is running]** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NEEC0082

DTC No.	Malfunction is detected when ...		Check Items (Possible Cause)
P0121 0121	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor ● Fuel injector ● Camshaft position sensor ● Mass air flow sensor
	B)	A low voltage from the sensor is sent to ECM under heavy load driving condition.	● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Intake air leaks ● Throttle position sensor

DTC Confirmation Procedure

=NEEC0083

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION A

NEEC0083S02

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 10 seconds.
   If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.

Selector lever	Suitable position except “N” (Higher gear position such as 3rd or 4th is better to keep low engine rpm.)
Accelerator pedal	Released
Vehicle speed	As slow as possible

4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3175.

With GST

Follow the procedure “With CONSULT-II”.

6

DATA MONITOR	
MONITOR	NO DTC
THRTL POS SEN	XXX V
ABSOL TH-P/S	XXX %

SEF177Y

PROCEDURE FOR MALFUNCTION B

NEEC0083S03

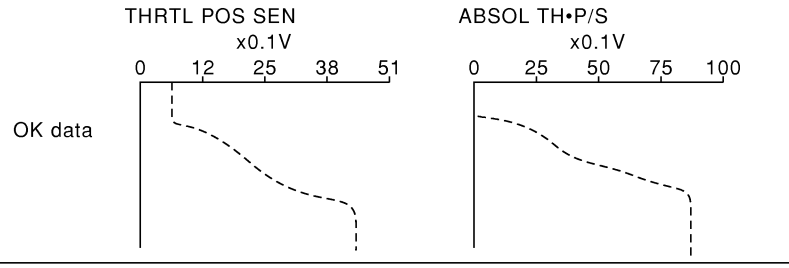
CAUTION:
Always drive vehicle at a safe speed.

With CONSULT-II

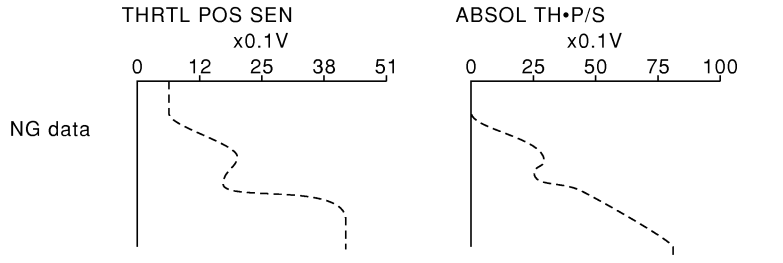
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch OFF and wait at least 5 seconds.
3) Turn ignition switch ON.
4) Select “MANU TRIG” in “DATA MONITOR” mode with CONSULT-II.
5) Select “THRTL POS SEN” and “ABSOL TH·P/S” in “DATA MONITOR” mode with CONSULT-II.
6) Press RECORD on CONSULT-II screen at the same time accelerator pedal is depressed.
7) Print out the recorded graph and check the following:

- The voltage rise is linear in response to accelerator pedal depression.
- The voltage when accelerator pedal is fully depressed is approximately 4V.
  If NG, go to “Diagnostic Procedure”, EC-3175.
  If OK, go to following step.

7



Trigger	THRTL POS SEN	ABSOL TH/PO SEN
	V	%
00"43	2.52	48.8
00"44	2.64	52.0
00"45	2.76	54.9
00"46	2.88	57.4
00"47	3.00	60.5
00"48	3.12	63.3
00"49	3.24	66.1
00"50	3.34	68.9
00"51	3.46	71.4
00"52	3.56	74.2
00"53	3.68	77.0
00"54	3.80	79.8



Trigger	THRTL POS SEN	ABSOL TH/PO SEN
	V	%
00"33	1.96	38.7
00"34	2.02	39.1
00"35	2.08	39.5
00"36	2.14	39.9
00"37	2.20	41.3
00"38	2.26	42.7
00"39	2.32	44.4
00"41	2.26	42.7
00"42	2.20	41.3
00"43	2.58	50.4
00"44	2.66	52.5
00"45	2.76	54.9

SEF245Y

9

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

SEF178Y

8) Select “AUTO TRIG” in “DATA MONITOR” mode with CONSULT-II.
9) Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
MAS A/F SE-B1	More than 3V
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

10) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3175.

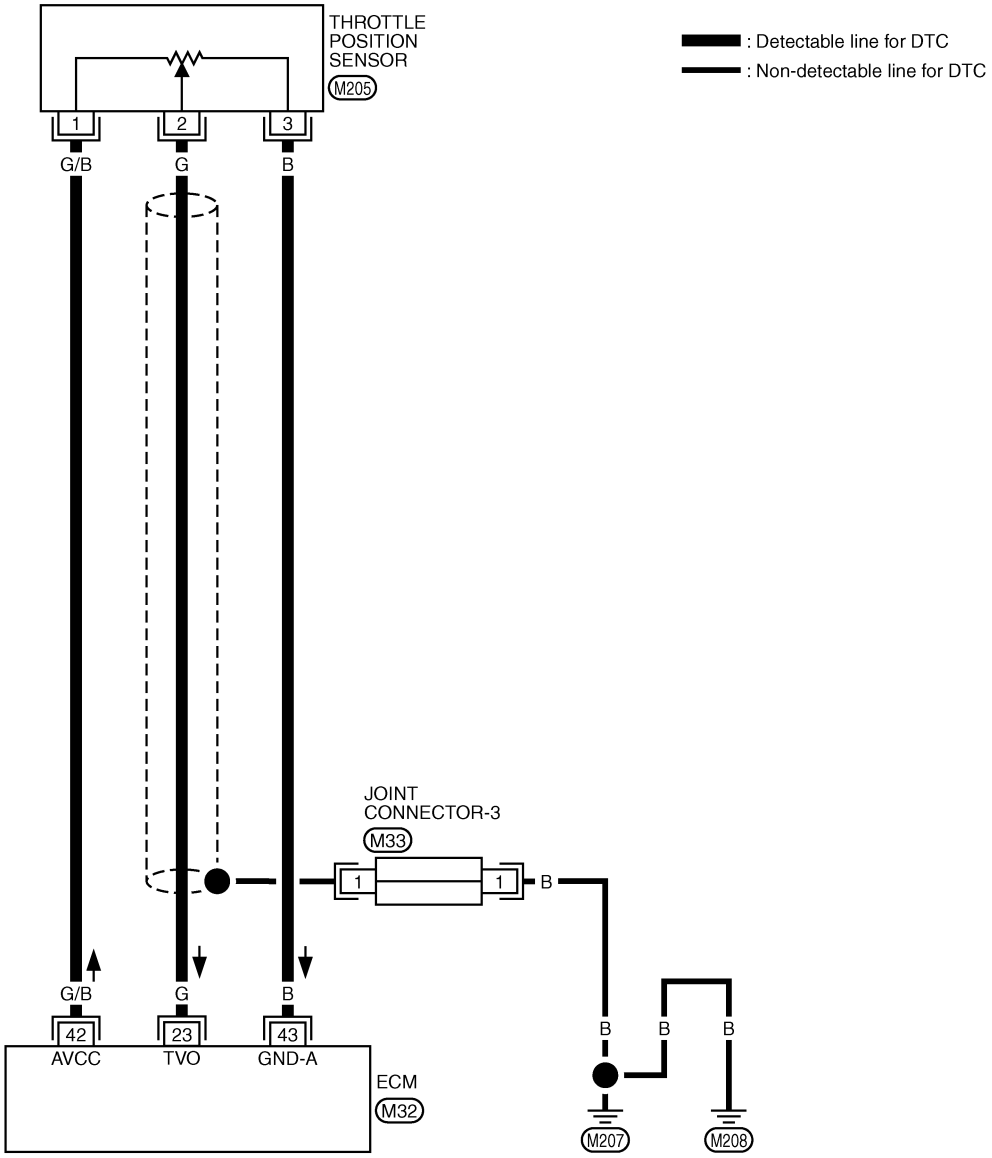
With GST

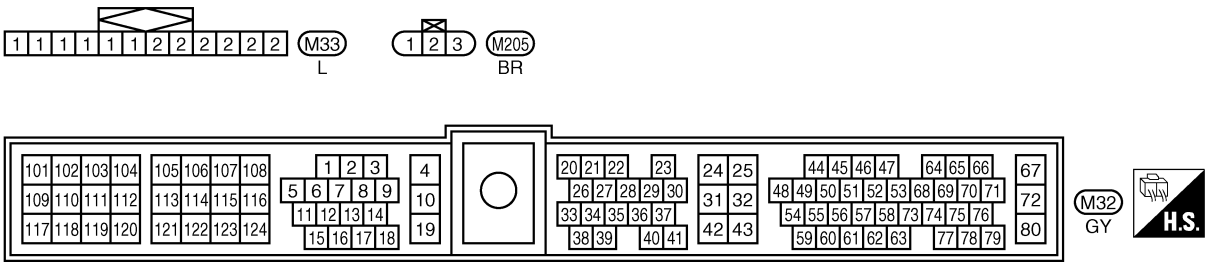
Follow the procedure “With CONSULT-II”.

Wiring Diagram

NEEC0084

EC-TPS-01





GEC243A

Diagnostic Procedure

NEEC0085

1	INSPECTION START

Which malfunction A or B is duplicated?

MALFUNCTION	Type
A	A
B	B

MTBL1307

Type A or B

Type A	▶	GO TO 4.
Type B	▶	GO TO 2.

2	ADJUST THROTTLE POSITION SENSOR

1. Check the following items. Refer to “Basic Inspection”, EC-3086.

Items	Specifications
Ignition timing	15° ± 2° BTDC
Base idle speed	650 ± 50 rpm (in “N” position)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.1 mm (0.004 in): ON 0.3 mm (0.012 in): OFF
Target idle speed	700 ± 50 rpm (in “N” position)

MTBL1315

OK or NG

OK	▶	GO TO 3.

3	CHECK INTAKE SYSTEM

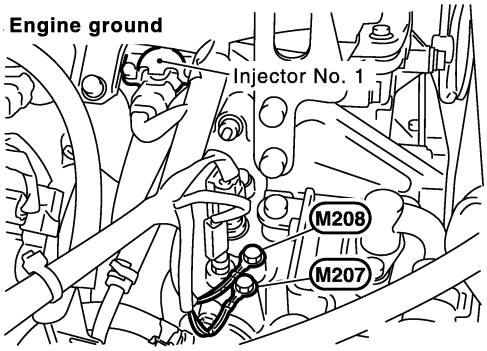
Check the following for connection.
- Air duct
- Air cleaner
- Vacuum hoses
- Intake air passage between air duct to intake manifold collector

OK or NG

OK	▶	GO TO 4.
NG	▶	Reconnect the parts.

4	RETIGHTEN GROUND SCREWS

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

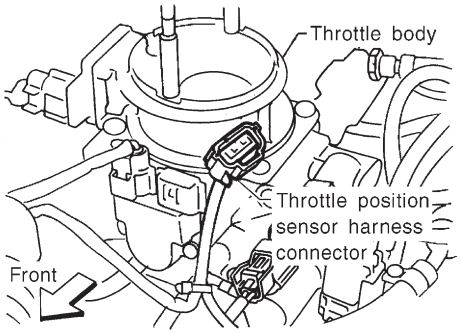


SEC309D

	▶	GO TO 5.

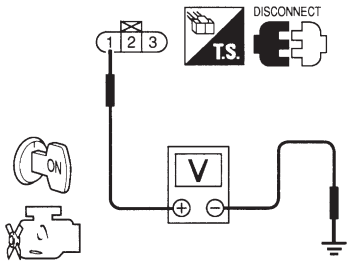
5	CHECK POWER SUPPLY

1. Disconnect throttle position sensor harness connector.



SEF265S

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



SEF564P

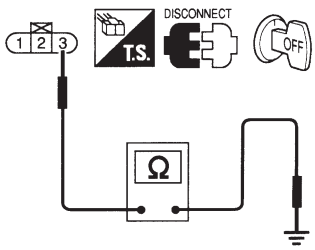
Voltage: Approximately 5V

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair harness or connectors.

6	CHECK GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check harness continuity between throttle position sensor terminal 3 and engine ground. Refer to the Wiring Diagram.



SEF565P

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 harness for open or short between ECM and throttle position sensor.	
▶	Repair open circuit or short to power in harness or connectors.

8	CHECK INPUT SIGNAL CIRCUIT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 23 and terminal 2. Refer to the Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power.	
OK or NG	
OK (With CONSULT-II) ▶	GO TO 9.
OK (Without CONSULT-II) ▶	GO TO 10.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

9	CHECK THROTTLE POSITION SENSOR

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Stop engine and turn ignition switch ON.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Check voltage of “THRTL POS SEN” under the following conditions.

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

SEF179Y

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

Throttle valve conditions	Voltage V
Completely closed	0.2 - 0.8 (a)
Partially open	Between (a) and (b)
Completely open	3.5 - 4.5 (b)

MTBL0579

If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-3086.

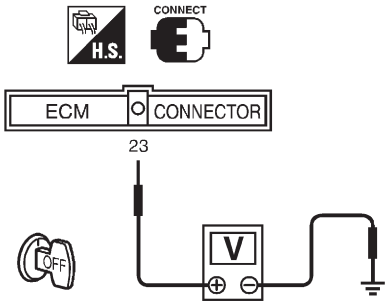
OK or NG

OK (Type B in step 1) ▶	GO TO 11.
OK (Type A or C in step 1) ▶	GO TO 14.
NG ▶	Replace throttle position sensor. To adjust it, perform “Basic Inspection”, EC-3086.

10	CHECK THROTTLE POSITION SENSOR

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Stop engine and turn ignition switch ON.
4. Check voltage between ECM terminal 23 (Throttle position sensor signal) and ground under the following conditions.



SEF767W

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

Throttle valve conditions	Voltage V
Completely closed	0.2 - 0.8 (a)
Partially open	Between (a) and (b)
Completely open	3.5 - 4.5 (b)

MTBL0579

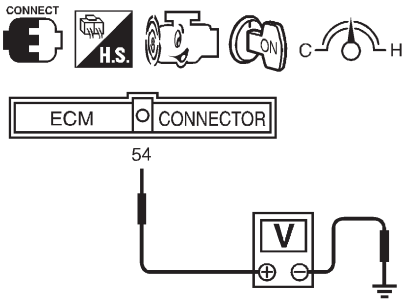
If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-3086.

OK or NG

OK (Type B in step 1)	▶	GO TO 11.
OK (Type A or C in step 1)	▶	GO TO 14.
NG	▶	Replace throttle position sensor. To adjust it, perform “Basic Inspection”, EC-3086.

11	CHECK MASS AIR FLOW SENSOR

1. Turn ignition switch ON.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 54 (mass air flow sensor signal) and ground.



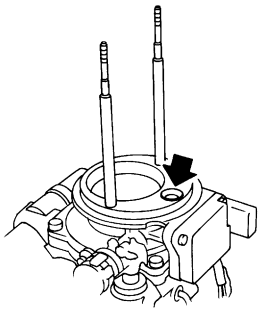
SEF326V

Conditions	Voltage V
Ignition switch “ON” (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.9 - 2.3
Idle to about 4,000 rpm*	1.3 - 1.7 to Approx. 3.0

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

MTBL0326

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 wire for damage or dust.



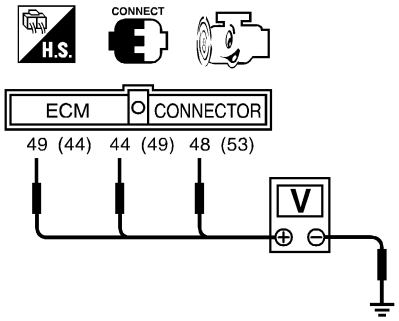
SEF893J

OK or NG

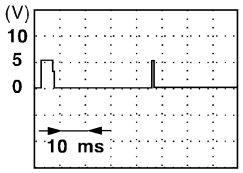
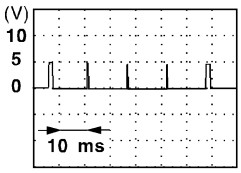
OK	▶	GO TO 12.
NG	▶	Replace mass air flow sensor.

12	CHECK CAMSHAFT POSITION SENSOR

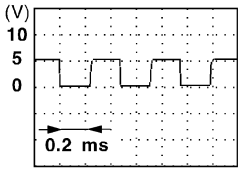
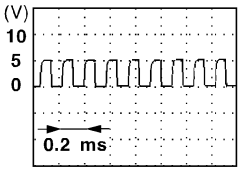
1. Start engine and warm it up to normal operating temperature.
2. Check voltage between ECM terminals 49 or (44)* and engine ground, ECM terminals 44, 48 or (49, 53)* and engine ground.



Terminal 44, 48 or (49, 53)* and engine ground

Condition	Idle	2,000 rpm
Voltage	0.2 - 0.5V	0 - 0.5V
Pulse signal		

Terminal 49 or (44)* and engine ground

Condition	Idle	2,000 rpm
Voltage	Approximately 2.5V	Approximately 1.0V
Pulse signal		

SEC273D

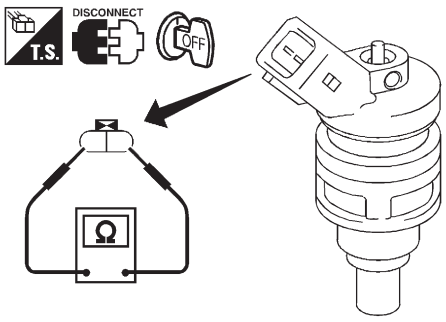
*: Model with NATS (Nissan Anti-Theft System)

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace distributor assembly with camshaft position sensor.

13	CHECK FUEL INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.



SEF836Q

Resistance: 10 - 14Ω [at 25°C (77°F)]

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace fuel injector.

14	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Remove joint connector-3.
3. Check the following.

- Continuity between joint connector-3 terminal 2 and ground
- Joint connector-3
  (Refer to “HARNESS LAYOUT”, EL section.)

  Continuity should exist.

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

OK or NG

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

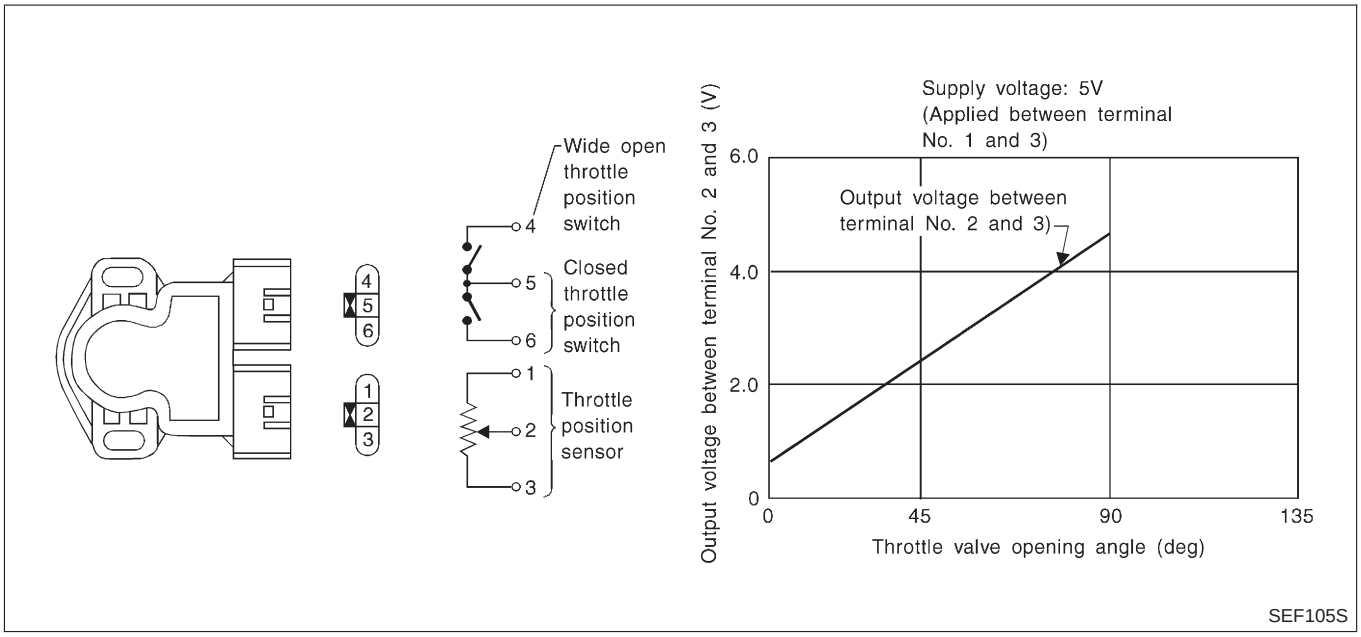
15	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**

Component Description

NEEC1558

NOTE:
If DTC P0121, P0122 or P0123 is displayed with DTC P0510, first perform trouble diagnosis for DTC P0510, EC-3301.

The throttle position sensor responds to the accelerator pedal movement. This sensor is a type 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.



SEF105S

CONSULT-II Reference Value in Data Monitor Mode

NEEC1559

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Ignition switch: ON (Engine stopped) ● Engine: After warming up	Throttle valve: fully closed	0.2 - 0.8V
		Throttle valve: fully opened	3.5 - 4.5V
ABSOL TH·P/S	● Ignition switch: ON (Engine stopped) ● Engine: After warming up	Throttle valve: fully closed	0.0%
		Throttle valve: fully opened	Approx. 80%

ECM Terminals and Reference Value

=NEEC1560

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)
23	G	Throttle position sensor	**[Ignition switch ON]** ● **Warm-up condition** ● Accelerator pedal fully released	0.2 - 0.8V
			[Ignition switch ON] ● Accelerator pedal fully depressed	3.5 - 4.5V
42	G/B	Sensors' power supply	**[Ignition switch ON]**	Approximately 5V
43	B	Sensors' ground	**[Engine is running]** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NEEC1561

DTC No.	Trouble diagnosis name	DTC Detecting Condition	Possible Cause
P0122 0122	Throttle position sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.*	● Harness or connectors (The sensor circuit is open or shorted.) ● Throttle position sensor
P0123 0123	Throttle position sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.*	

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

Detected items	Engine operating condition in fail-safe mode	
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

=NEEC1562

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

CAUTION:
Always drive vehicle at a safe speed.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**
- **This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.**

2

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

SEF065Y

With CONSULT-II

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-3186.

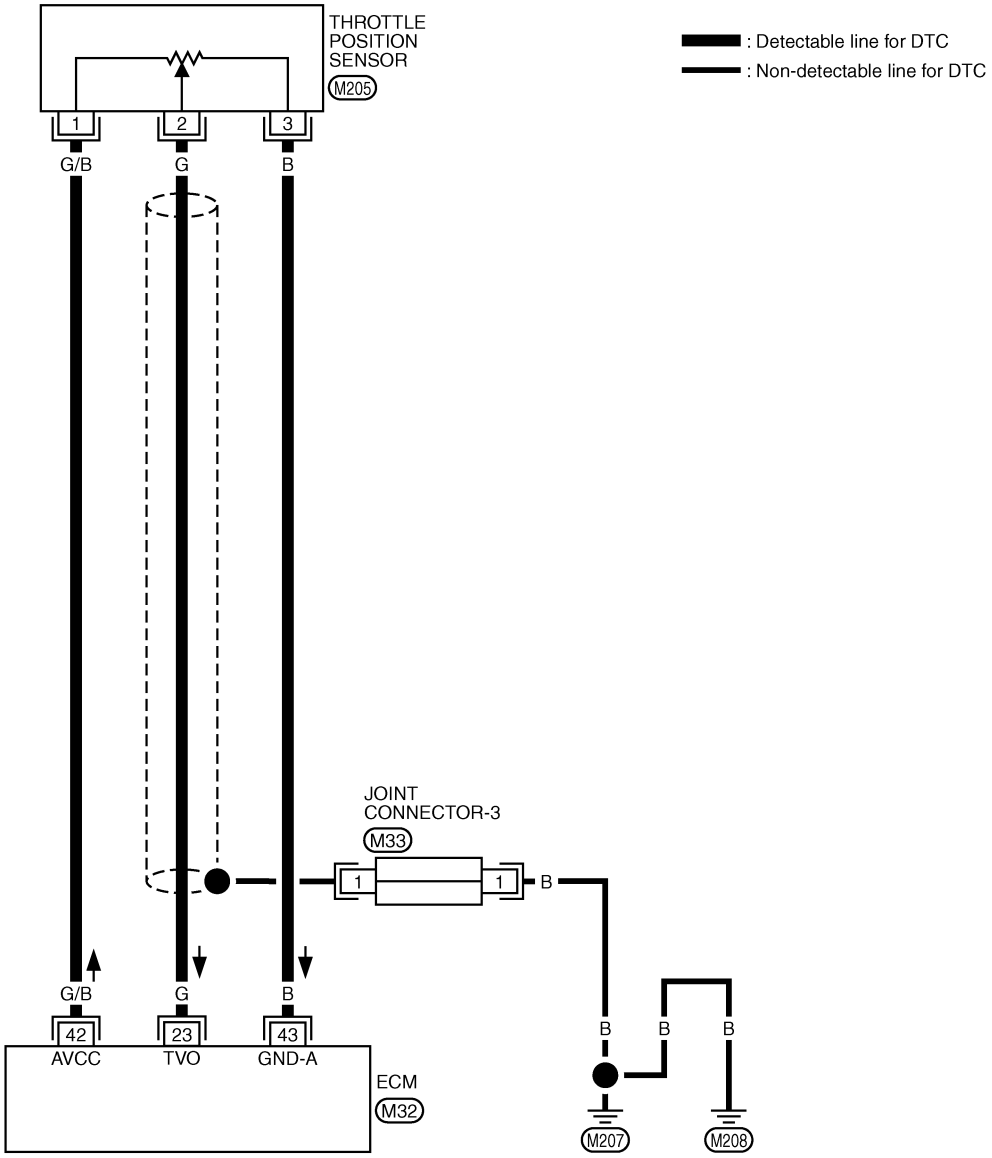
With GST

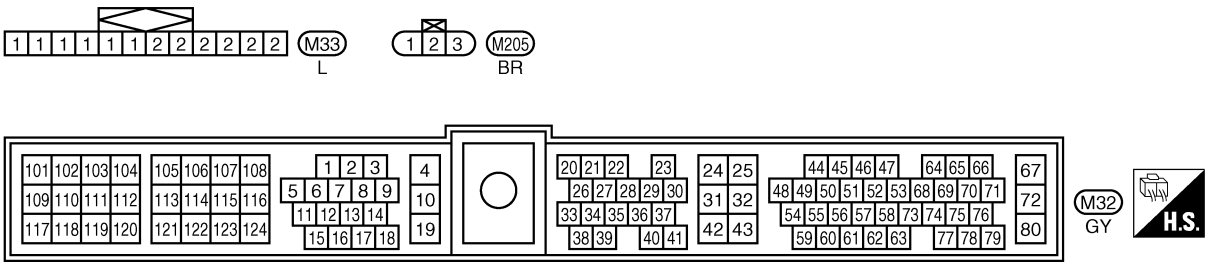
Follow the procedure “With CONSULT-II”.

Wiring Diagram

NEEC1563

EC-TPS-01





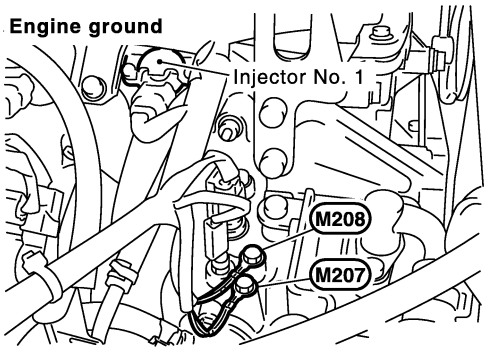
GEC243A

Diagnostic Procedure

NEEC1564

1	RETIGHTEN GROUND SCREWS

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

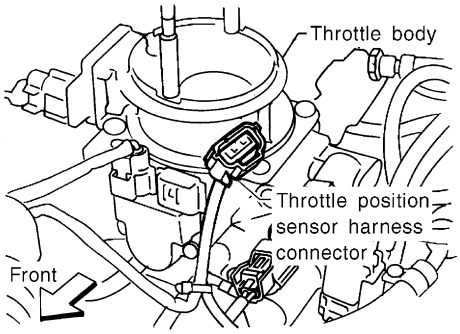


SEC309D

▶	GO TO 2.

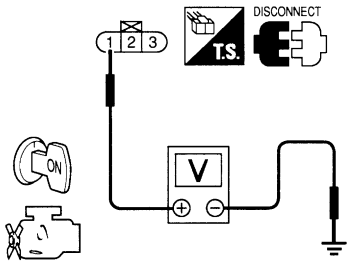
2	CHECK POWER SUPPLY

1. Disconnect throttle position sensor harness connector.



SEF265S

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



SEF564P

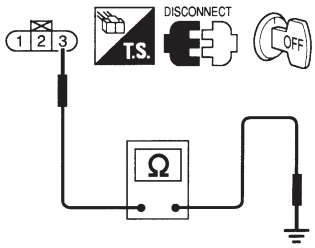
Voltage: Approximately 5V

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair harness or connectors.

3	CHECK GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check harness continuity between throttle position sensor terminal 3 and engine ground. Refer to the Wiring Diagram.



SEF565P

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 harness for open or short between ECM and throttle position sensor.

	▶	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 23 and terminal 2.
   Refer to the Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT-II)	▶	GO TO 6.
OK (Without CONSULT-II)	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK THROTTLE POSITION SENSOR

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Stop engine and turn ignition switch ON.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Check voltage of “THRTL POS SEN” under the following conditions.

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

SEF179Y

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

Throttle valve conditions	Voltage V
Completely closed	0.2 - 0.8 (a)
Partially open	Between (a) and (b)
Completely open	3.5 - 4.5 (b)

MTBL0579

If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-3086.

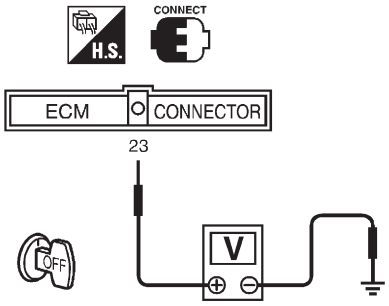
OK or NG

OK (Type B in step 1)	▶	GO TO 8.
OK (Type A or C in step 1)	▶	GO TO 11.
NG	▶	Replace throttle position sensor. To adjust it, perform “Basic Inspection”, EC-3086.

7	CHECK THROTTLE POSITION SENSOR

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Stop engine and turn ignition switch ON.
4. Check voltage between ECM terminal 23 (Throttle position sensor signal) and ground under the following conditions.



SEF767W

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

Throttle valve conditions	Voltage V
Completely closed	0.2 - 0.8 (a)
Partially open	Between (a) and (b)
Completely open	3.5 - 4.5 (b)

MTBL0579

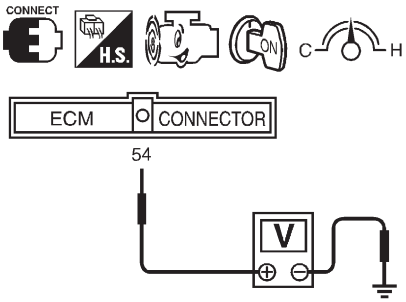
If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-3086.

OK or NG

OK (Type B in step 1)	▶	GO TO 8.
OK (Type A or C in step 1)	▶	GO TO 11.
NG	▶	Replace throttle position sensor. To adjust it, perform “Basic Inspection”, EC-3086.

8	CHECK MASS AIR FLOW SENSOR

1. Turn ignition switch ON.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 54 (mass air flow sensor signal) and ground.



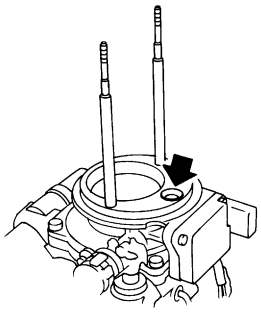
SEF326V

Conditions	Voltage V
Ignition switch “ON” (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.9 - 2.3
Idle to about 4,000 rpm*	1.3 - 1.7 to Approx. 3.0

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

MTBL0326

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 wire for damage or dust.



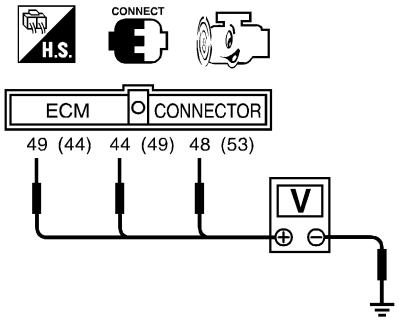
SEF893J

OK or NG

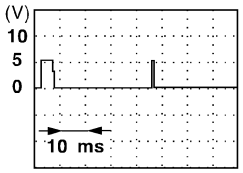
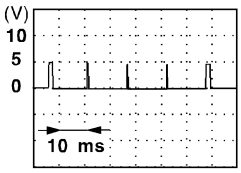
OK	▶	GO TO 9.
NG	▶	Replace mass air flow sensor.

9	CHECK CAMSHAFT POSITION SENSOR

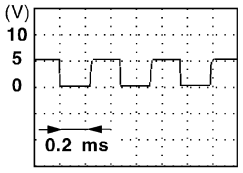
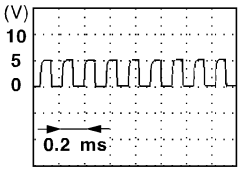
1. Start engine and warm it up to normal operating temperature.
2. Check voltage between ECM terminals 49 or (44)* and engine ground, ECM terminals 44, 48 or (49, 53)* and engine ground.



Terminal 44, 48 or (49, 53)* and engine ground

Condition	Idle	2,000 rpm
Voltage	0.2 - 0.5V	0 - 0.5V
Pulse signal		

Terminal 49 or (44)* and engine ground

Condition	Idle	2,000 rpm
Voltage	Approximately 2.5V	Approximately 1.0V
Pulse signal		

SEC273D

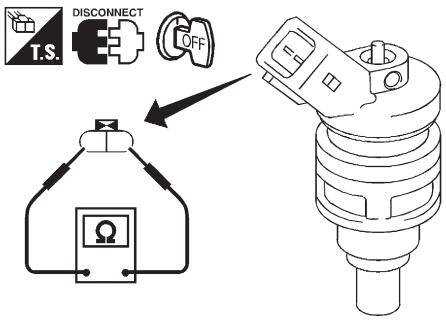
*: Model with NATS (Nissan Anti-Theft System)

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace distributor assembly with camshaft position sensor.

10	CHECK FUEL INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.



SEF836Q

Resistance: 10 - 14Ω [at 25°C (77°F)]

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace fuel injector.

11	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Remove joint connector-3.
3. Check the following.

- Continuity between joint connector-3 terminal 2 and ground
- Joint connector-3
  (Refer to “HARNESS LAYOUT”, EL section.)

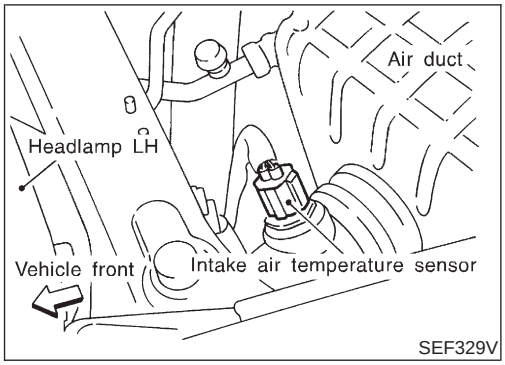
  Continuity should exist.

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

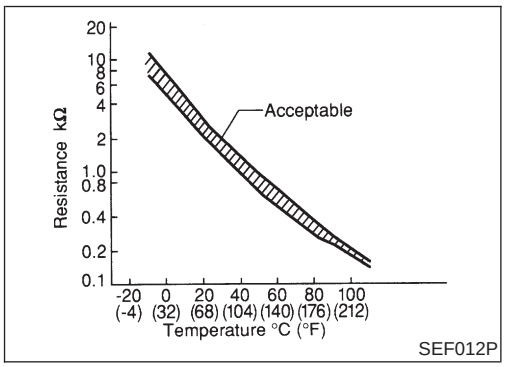
OK or NG

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

12	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



SEF329V



SEF012P

Component Description

NEEC1565

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 61 (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.

ECM Terminals and Reference Value

NEEC1570

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
43	B	Sensors' ground	**[Engine is running]** ● Idle speed	Approximately 0V
61	P/B	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.

On Board Diagnosis Logic

NEEC1566

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0127 0127	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor

DTC Confirmation Procedure

=NEEC1567

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

CAUTION:
Always drive vehicle at a safe speed.

TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

5

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

SEF176Y

With CONSULT-II

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

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

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

2) Turn ignition switch ON.
3) Select “DATA MONITOR” mode with CONSULT-II.
4) Start engine.
5) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3195.

With GST

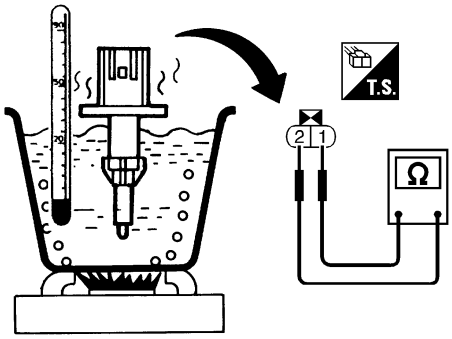
Follow the procedure “With CONSULT-II”.

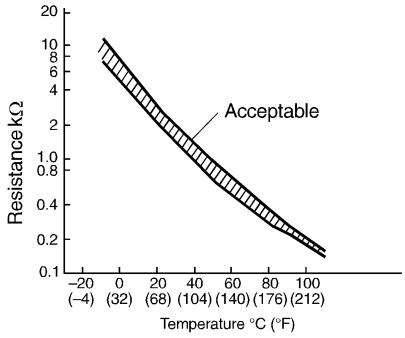
Diagnostic Procedure

NEEC1569

1	CHECK INTAKE AIR TEMPERATURE SENSOR

Check resistance as shown in the figure.





SEC272D

<Reference data>

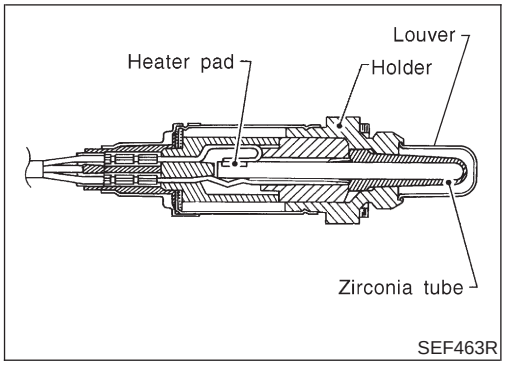
Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

MTBL1306

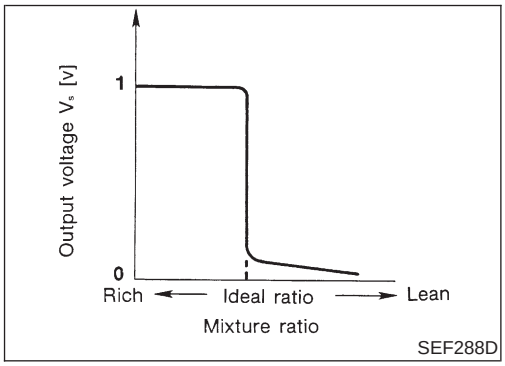
OK or NG

OK	▶	GO TO 2.
NG	▶	Replace intake air temperature sensor.

2	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NEEC0128

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0129

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.

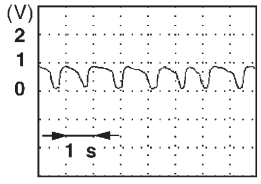
ECM Terminals and Reference Value

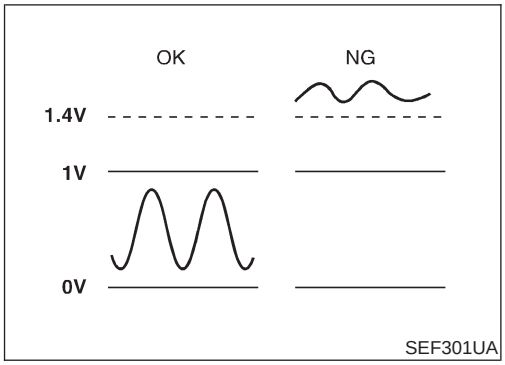
NEEC0130

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	W	Heated oxygen sensor 1	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

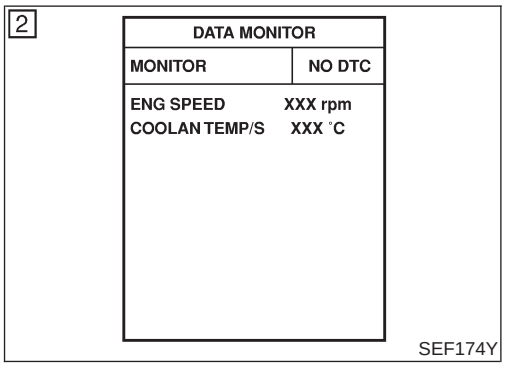


On Board Diagnosis Logic

NEEC0131

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 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



DTC Confirmation Procedure

NEEC0132

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 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 5 seconds.
3) Turn ignition switch ON.
4) Select “DATA MONITOR” mode with CONSULT-II.
5) Restart engine and let it idle for 35 seconds.
6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3199.

With GST

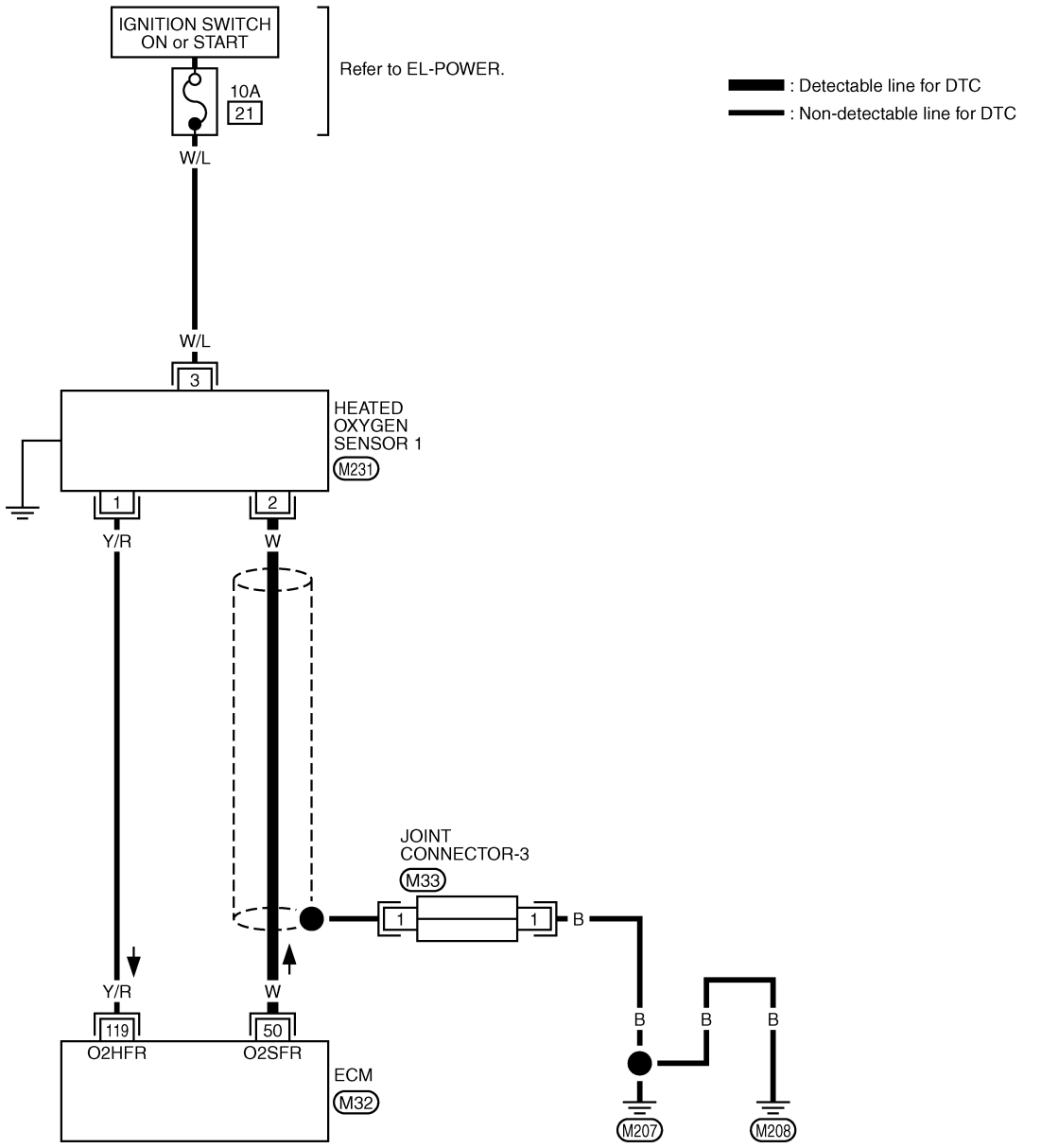
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch OFF and wait at least 5 seconds.
3) Restart engine and let it idle for 35 seconds.
4) Turn ignition switch OFF and wait at least 5 seconds.
5) Restart engine and let it idle for 35 seconds.
6) Select “MODE 3” with GST.
7) If DTC is detected, go to “Diagnostic Procedure”, EC-3199.

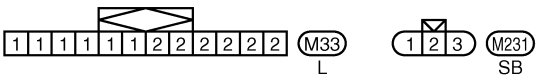
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

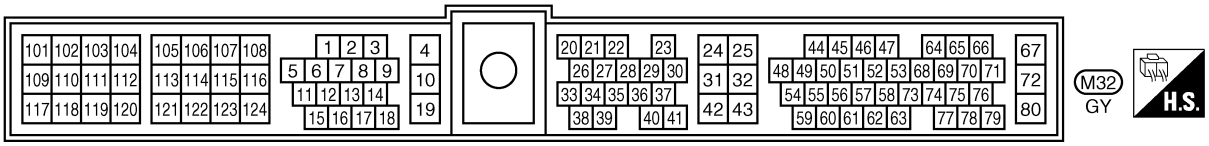
Wiring Diagram

NEEC0133

EC-O2S1B1-01







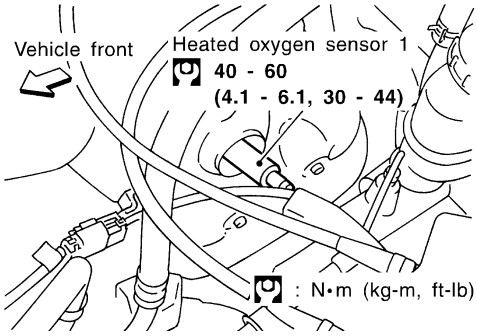
GEC245A

Diagnostic Procedure

NEEC0134

1	RETIGHTEN HEATED OXYGEN SENSOR 1

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



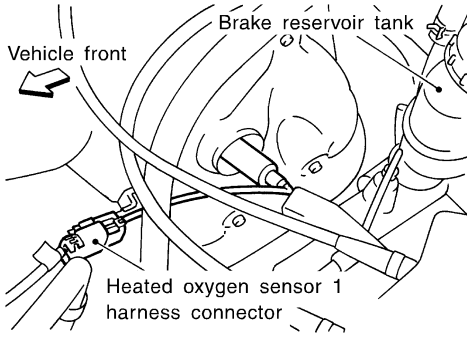
SEF332VC

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 harness connector and ECM harness connector.



SEF331VC

2. Check harness continuity between ECM terminal 50 and terminal 2. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 50 (or terminal 2) and ground. Refer to wiring diagram.
   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 harness connector for water.
Water should not exist.

OK or NG

OK (With CONSULT-II)	▶	GO TO 4.
OK (Without CONSULT-II)	▶	GO TO 5.
NG	▶	Repair or replace harness connector.

4	CHECK HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Select “MANU TRIG” in “DATA MONITOR” mode, and the trigger point is adjusted to 100%.
4. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)” in item selection.
5. Hold engine speed at 2,000 rpm under no load during the following steps.
6. Touch “START” on CONSULT-II screen.

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

SEF646Y

7. 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:

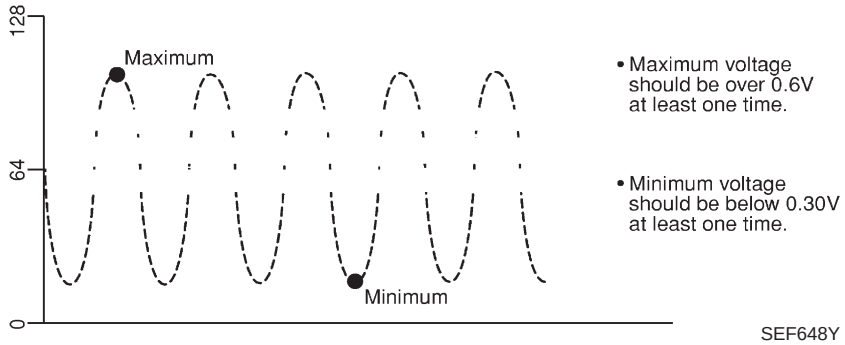
cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L				

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

SEF217YA

- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

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



SEF648Y

CAUTION:

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

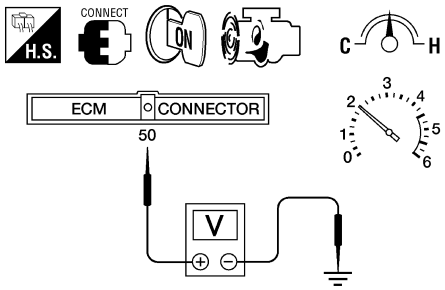
OK or NG

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

5	CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Set voltmeter probes between ECM terminal 50 (Heated oxygen sensor 1 signal) and engine ground.



AEC873A

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

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

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

6	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Remove joint connector-3.
3. Check the following.

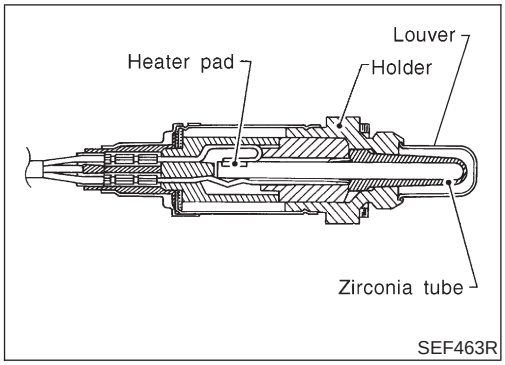
- Continuity between joint connector-3 terminal 1 and ground
- Joint connector-3
  (Refer to “HARNESS LAYOUT”, EL section.)
  Continuity should exist.

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

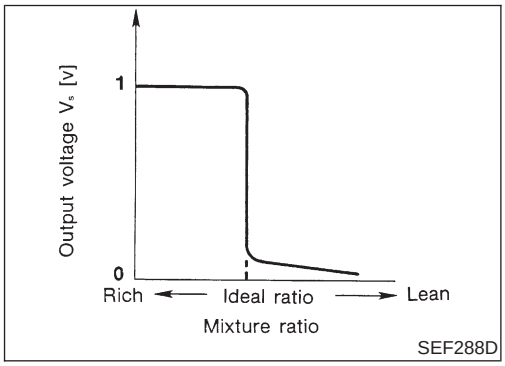
OK or NG

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

7	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NEEC0119

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0120

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.

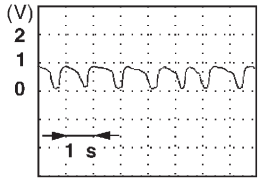
ECM Terminals and Reference Value

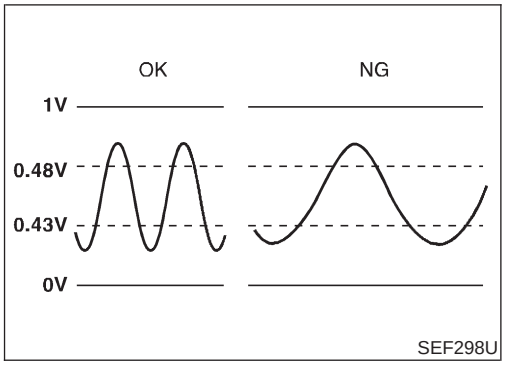
NEEC0121

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	W	Heated oxygen sensor 1	**[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

NEEC0122

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

DTC No.	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 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV ● Mass air flow sensor

6

HO2S1 (B1) P0133	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V

SEF656Y

6

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

SEF657Y

6

HO2S1 (B1) P0133
COMPLETED

SEF658Y

DTC Confirmation Procedure

NEEC0123

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 5 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 5 seconds.
3) Turn ignition switch ON and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3.0 minutes.

NOTE:

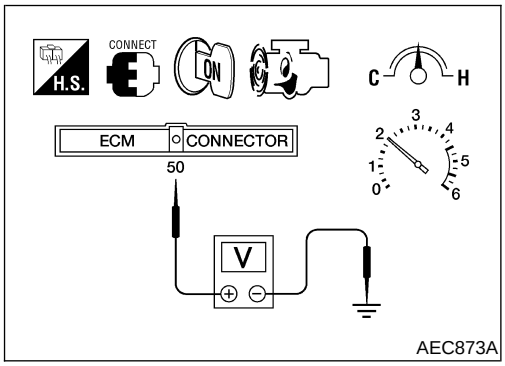
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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

ENG SPEED	1,750 - 3,750 rpm
Vehicle speed	More than 80 km/h (More than 50 MPH)
B/FUEL SCHDL	3.5 - 15.5 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-3206.



Overall Function Check

NEEC0124

Use this procedure to check the overall function of the heated oxygen sensor 1 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 50 (Heated oxygen sensor 1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

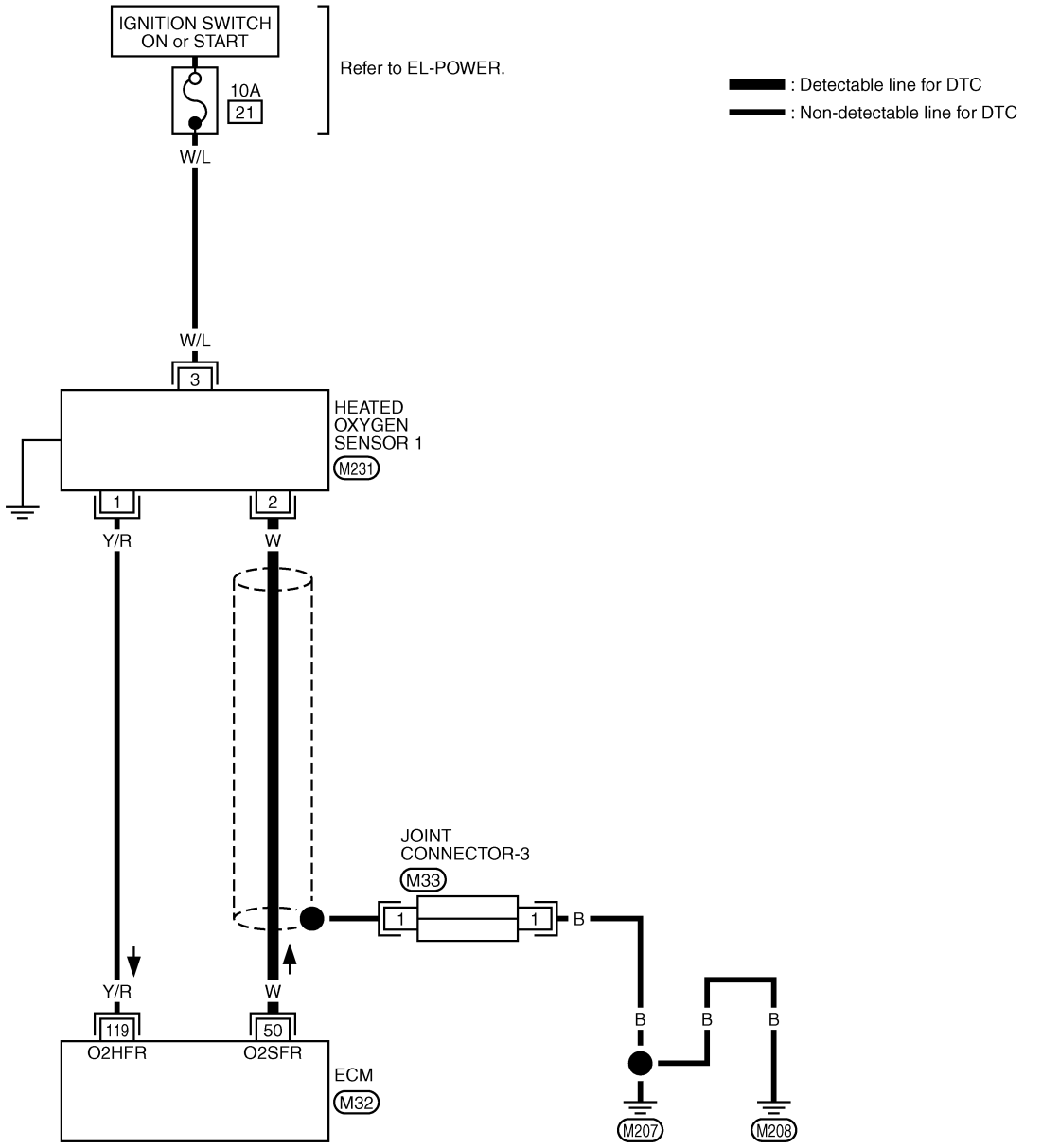
- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times within 10 seconds.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

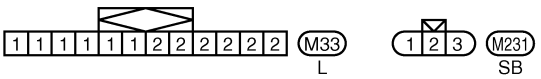
4) If NG, go to “Diagnostic Procedure”, EC-3206.

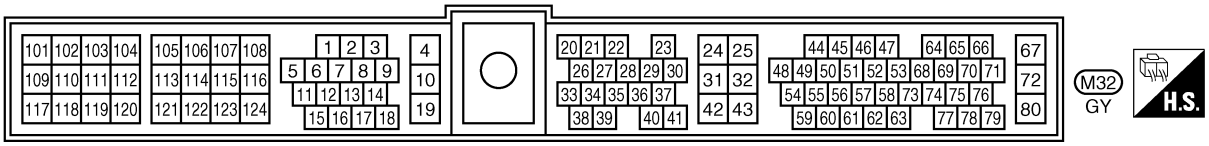
Wiring Diagram

NEEC0125

EC-O2S1B1-01







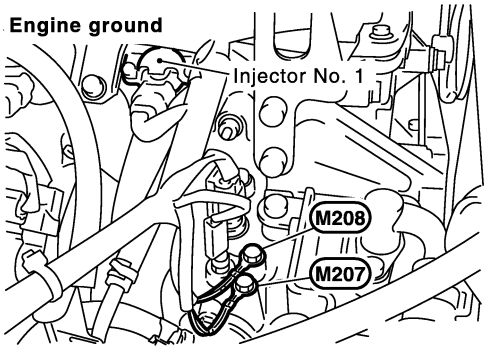
GEC245A

Diagnostic Procedure

NEEC0126

1	RETIGHTEN GROUND SCREWS

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

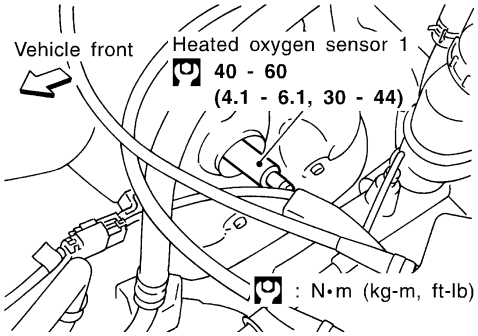


SEC309D

▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.



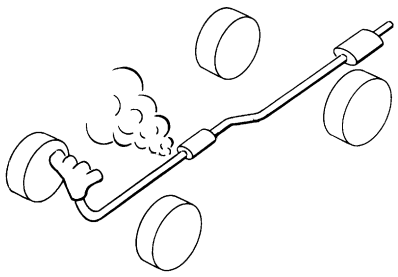
SEF332VC

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.



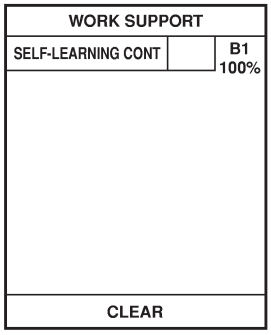
SEF099P

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair or replace.

4	CHECK FOR INTAKE AIR LEAK	
Listen for an intake air leak between the mass air flow sensor and the intake manifold. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Repair or replace.

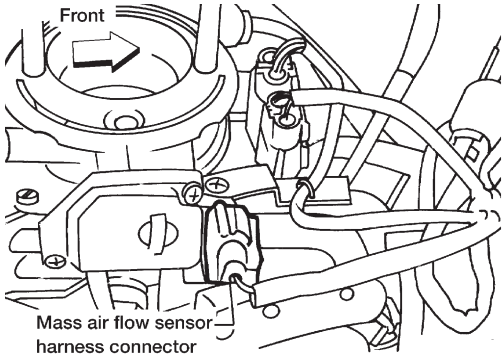
5	CLEAR THE SELF-LEARNING DATA	
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II. 3. Clear the self-learning control coefficient by touching “CLEAR”.		



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.



AEC131A

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-3060.
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-3237, 3244.
No	▶	GO TO 6.

6	CHECK INPUT SIGNAL CIRCUIT

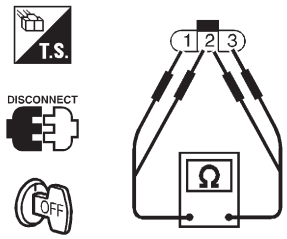
1. Turn ignition switch “OFF.”
2. Disconnect heated oxygen sensor 1 harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal 50 and terminal 2. Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 50 (or terminal 2) and ground. Refer to wiring diagram.
   Continuity should not exist.
5. 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

Check resistance between terminals 3 and 1.



SEF220W

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.

CAUTION:

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

OK or NG

OK (With CONSULT-II)	▶	GO TO 8.
OK (Without CONSULT-II)	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 1.

8	CHECK HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Select “MANU TRIG” in “DATA MONITOR” mode, and the trigger point is adjusted to 100%.
4. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)” in item selection.
5. Hold engine speed at 2,000 rpm under no load during the following steps.
6. Touch “START” on CONSULT-II screen.

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

SEF646Y

7. 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:

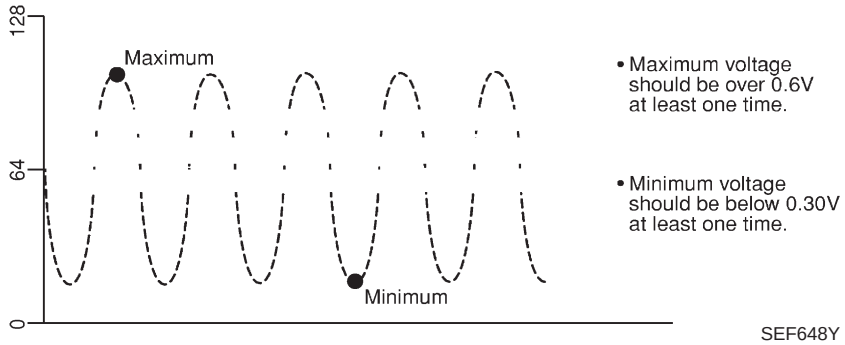
cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L				

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

SEF217YA

- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

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



SEF648Y

CAUTION:

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

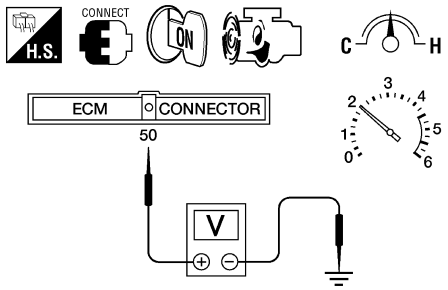
OK or NG

OK	▶	GO TO 10.
NG	▶	Replace heated oxygen sensor 1.

9	CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Set voltmeter probes between ECM terminal 50 (Heated oxygen sensor 1 signal) and engine ground.



AEC873A

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

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 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:

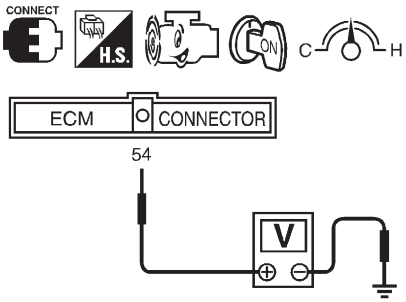
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12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

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace heated oxygen sensor 1.

10	CHECK MASS AIR FLOW SENSOR

1. Turn ignition switch ON.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 54 (mass air flow sensor signal) and ground.



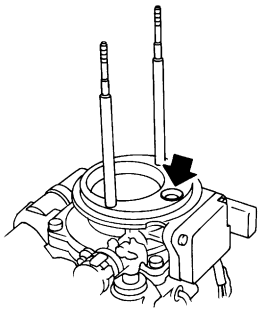
SEF326V

Conditions	Voltage V
Ignition switch “ON” (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.9 - 2.3
Idle to about 4,000 rpm*	1.3 - 1.7 to Approx. 3.0

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

MTBL0326

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 wire for damage or dust.



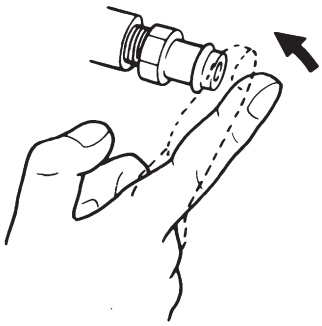
SEF893J

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace mass air flow sensor.

11	CHECK PCV VALVE

1. With engine running at idle, remove PCV valve from breather separator.
2. 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.



SEC137A

OK or NG

OK	▶	GO TO 12.
NG	▶	Repair or replace PCV valve.

12	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Remove joint connector-3.
3. Check the following.

- Continuity between joint connector-3 terminal 1 and ground
- Joint connector-3
  (Refer to “HARNESS LAYOUT”, EL section.)

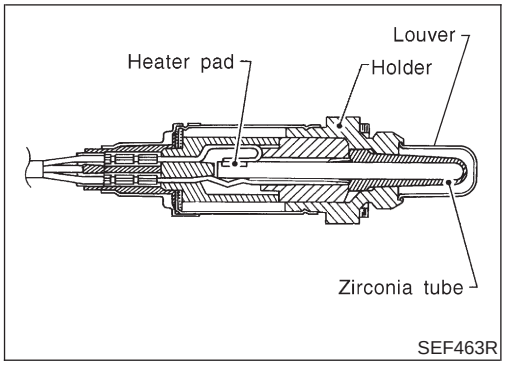
  Continuity should exist.

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

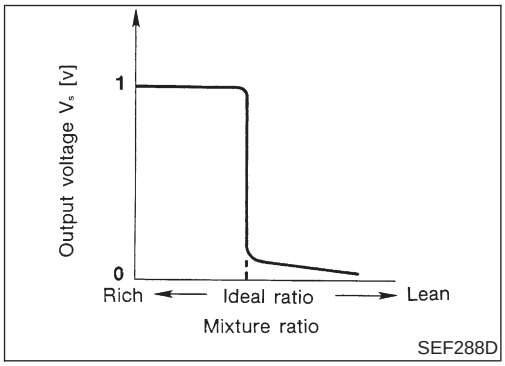
OK or NG

OK	▶	GO TO 13.
NG	▶	Repair open circuit, short to power in harness or connectors.

13	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NEEC0094

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0095

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.

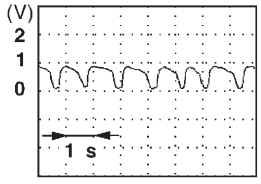
ECM Terminals and Reference Value

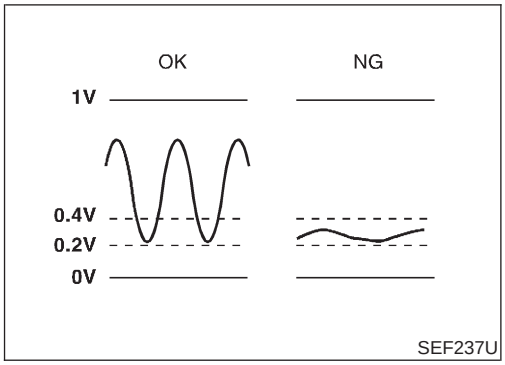
NEEC0096

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	W	Heated oxygen sensor 1	**[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

NEEC0097

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

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0134 0134	● The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

5

HO2S1 (B1) P0134	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V

LEC032A

5

HO2S1 (B1) P0134	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V

LEC033A

5

HO2S1 (B1) P0134
COMPLETED

LEC034A

DTC Confirmation Procedure

NEEC0098

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 5 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

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

NOTE:

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

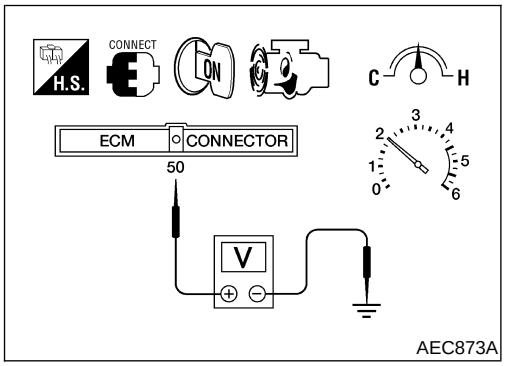
5) When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,400 - 4,000 rpm
Vehicle speed	64 - 130 km/h (40 - 81 MPH)
B/FUEL SCHDL	3.5 - 17 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-3217.



Overall Function Check

NEEC0099

Use this procedure to check the overall function of the heated oxygen sensor 1 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 50 (Heated oxygen sensor 1 signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

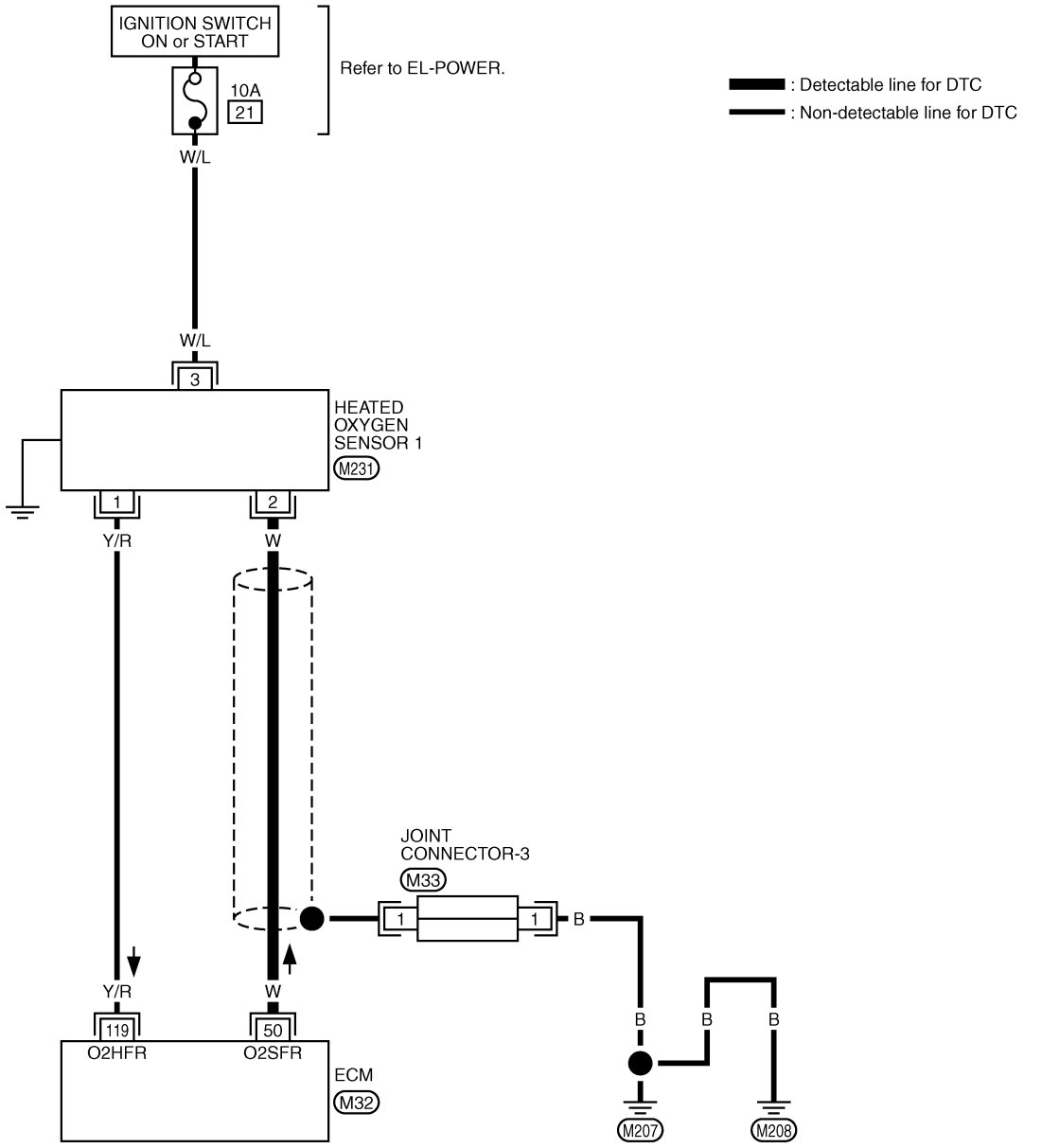
- The voltage does not remain in the range of 0.2 - 0.4V.

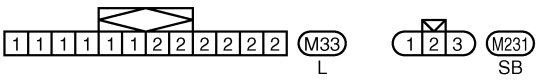
4) If NG, go to "Diagnostic Procedure", EC-3217.

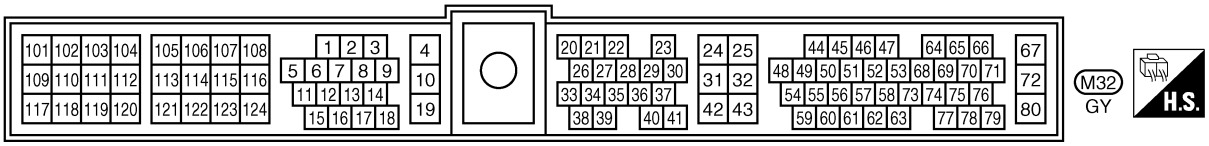
Wiring Diagram

NEEC0100

EC-O2S1B1-01







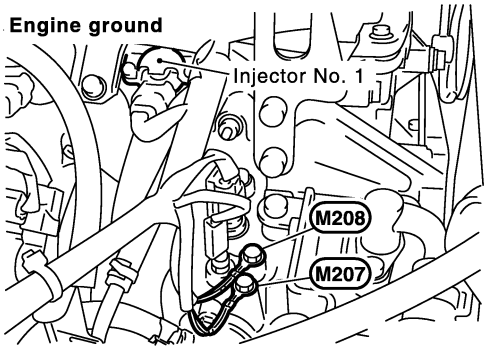
GEC245A

Diagnostic Procedure

NEEC0101

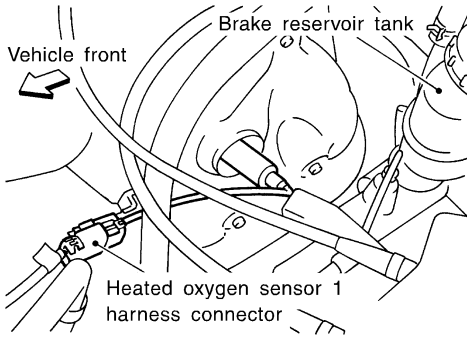
1	INSPECTION START

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



SEC309D

3. Disconnect heated oxygen sensor 1 harness connector.



SEF331VC

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 50 and terminal 2. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 50 (or terminal 2) and ground. Refer to wiring diagram.
   Continuity should not exist.
4. Also check harness for short to power.

OK or NG

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

3	CHECK HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Select “MANU TRIG” in “DATA MONITOR” mode, and the trigger point is adjusted to 100%.
4. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)” in Item Selection.
5. Hold engine speed at 2,000 rpm under no load during the following steps.
6. Touch “START” on CONSULT-II screen.

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

SEF646Y

7. 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:

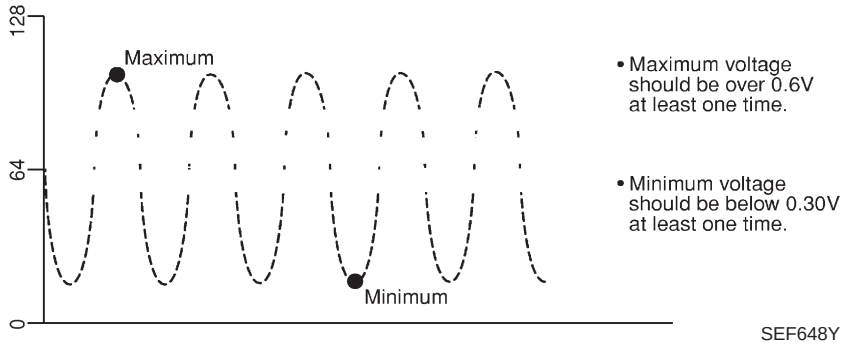
cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L				

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

SEF217YA

- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

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



SEF648Y

CAUTION:

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

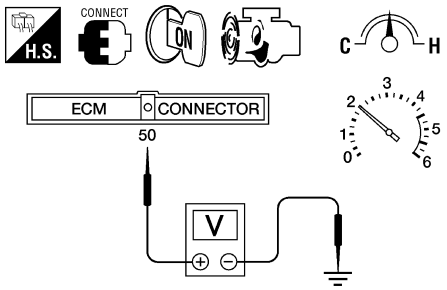
OK or NG

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

4	CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Set voltmeter probes between ECM terminal 50 (Heated oxygen sensor 1 signal) and engine ground.



AEC873A

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

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

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

5	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Remove joint connector-3.
3. Check the following.

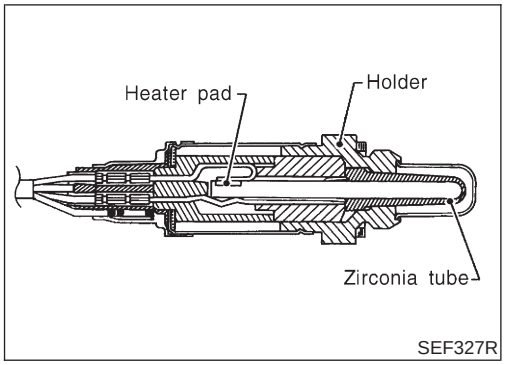
- Continuity between joint connector-3 terminal 1 and ground
- Joint connector-3
  (Refer to “HARNESS LAYOUT”, EL section.)
  Continuity should exist.

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

OK or NG

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

6	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



Component Description

NEEC0171

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0172

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

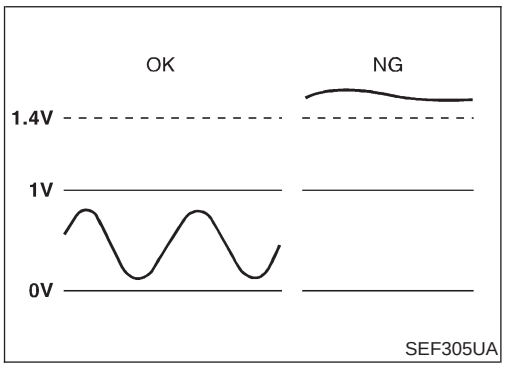
ECM Terminals and Reference Value

NEEC0173

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)
56	L/W	Heated oxygen sensor 2	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 3,000 rpm	0 - Approximately 1.0V

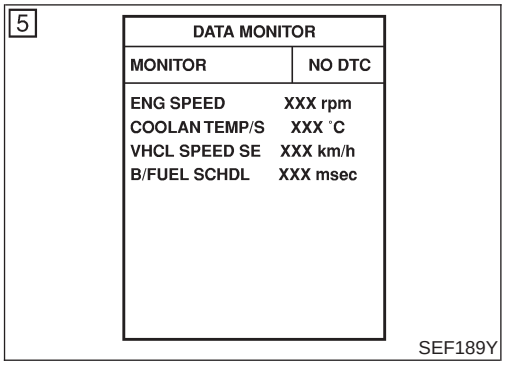


On Board Diagnosis Logic

NEEC0174

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether 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)
P0138 0138	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2



DTC Confirmation Procedure

NEEC0175

NOTE:

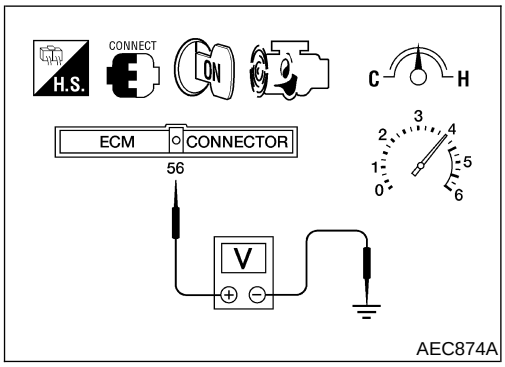
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

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) Maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	1,100 - 3,600 rpm
VHCL SPEED SE	32 - 120 km/h (20 - 75 MPH)
B/FUEL SCHDL	3.5 - 15.5 msec
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	Suitable position

4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-3223.



Overall Function Check

NEEC0176

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

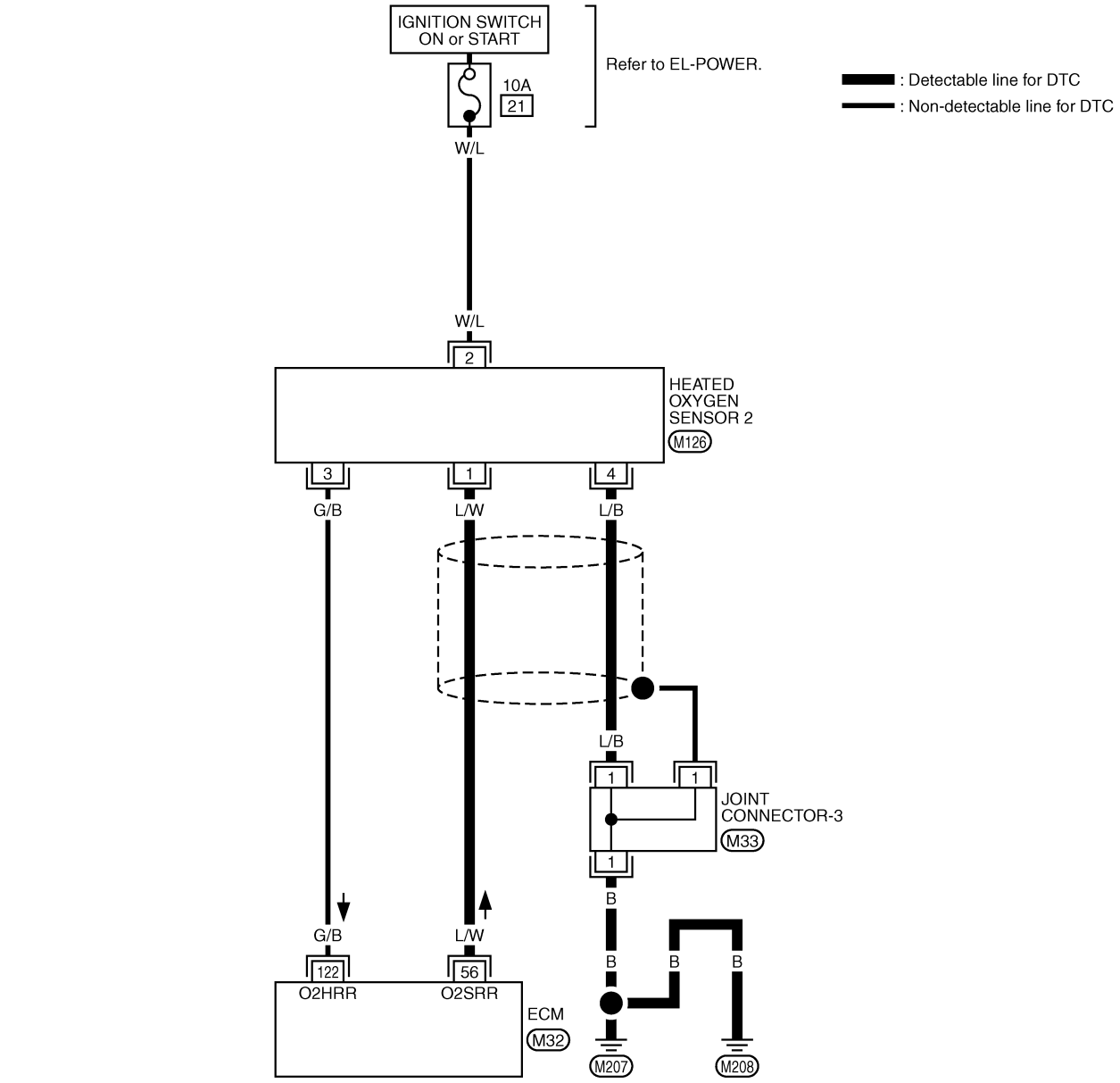
Without CONSULT-II

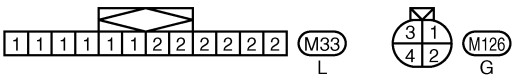
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.
4) Check the voltage after revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 1.4V during this procedure.
5) If NG, go to "Diagnostic Procedure", EC-3223.

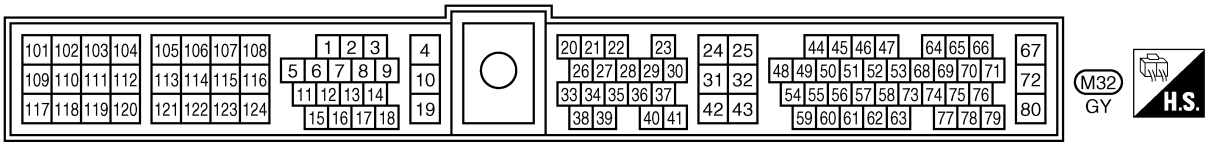
Wiring Diagram

NEEC0177

EC-O2S2B1-01







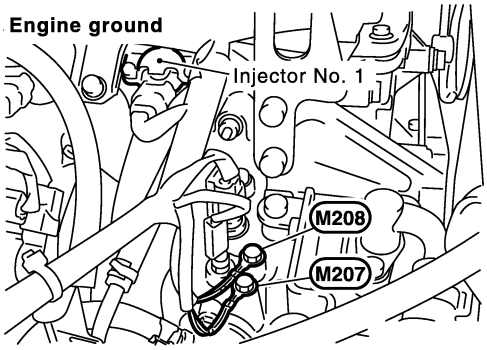
GEC246A

Diagnostic Procedure

NEEC0178

1	RETIGHTEN GROUND SCREWS

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



SEC309D

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal 56 and terminal 1. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 56 (or terminal 1) and ground. Refer to wiring diagram.
   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 following.
- Harness for open or short between heated oxygen sensor 2 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 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-3
- Harness for open or short between heated oxygen sensor 2 and engine ground

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

6	CHECK HARNESS CONNECTOR
Check heated oxygen sensor 2 harness connector for water. **Water should not exist.**	
OK or NG	
OK (With CONSULT-II) ▶	GO TO 7.
OK (Without CONSULT-II) ▶	GO TO 8.
NG ▶	Repair or replace harness connector.

7	CHECK HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Reconnect all harness connectors disconnected.
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. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.
5. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.

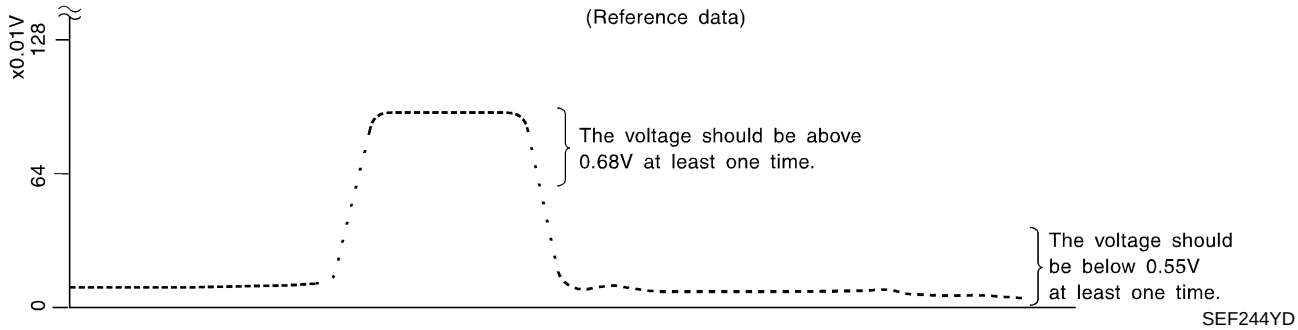
ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

“HO2S2 (B1)” should be above 0.56V at least once when the “FUEL INJECTION” is +25%. “HO2S2 (B1)” should be below 0.54V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



SEF244YD

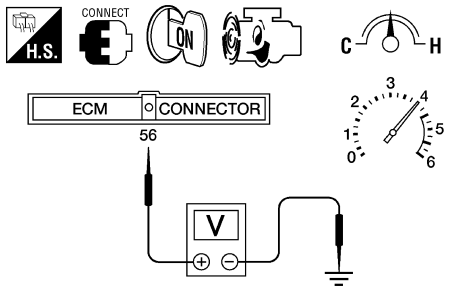
OK or NG

OK ▶	GO TO 9.
NG ▶	Replace heated oxygen sensor 2.

8	CHECK HEATED OXYGEN SENSOR 2

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
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. Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.



AEC874A

5. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.56V at least once.
   If the voltage is above 0.56V at step 4, step 5 is not necessary.
6. Check the voltage when revving up to 5,000 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 (M/T), "D" position with "OD" OFF (A/T).
   The voltage should be below 0.54V 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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 2.

9	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect joint connector-3.
3. Check harness continuity between joint connector-3 terminal 1 and ground. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to power.
5. Then reconnect joint connector-3.

OK or NG

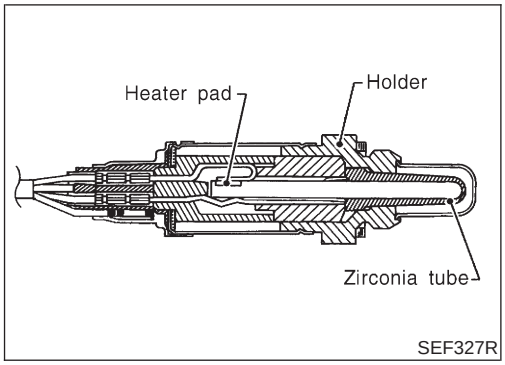
OK	▶	GO TO 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3 (Refer to "HARNESS LAYOUT", EL section.)
- Harness for open or short between joint connector-3 and engine ground

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

11	**CHECK INTERMITTENT INCIDENT**
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



Component Description

NEEC0162

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0163

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

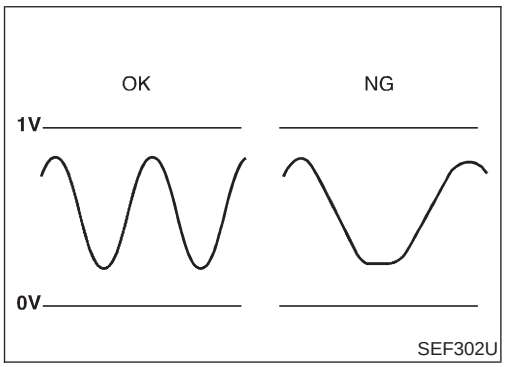
ECM Terminals and Reference Value

NEEC0164

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)
56	L/W	Heated oxygen sensor 2	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 3,000 rpm	0 - Approximately 1.0V



On Board Diagnosis Logic

NEEC0165

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

NEEC0166

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 5 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

NEEC0166S01

Procedure for COND1

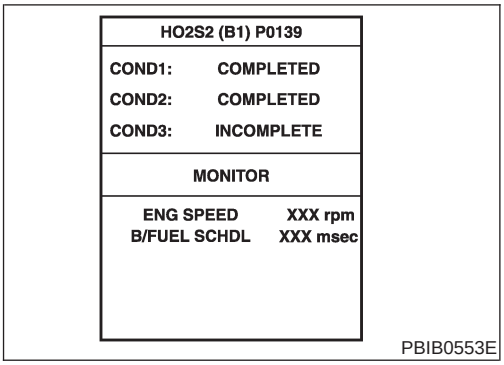
NEEC0166S0101

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 5 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	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector level	Suitable position

NOTE:

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

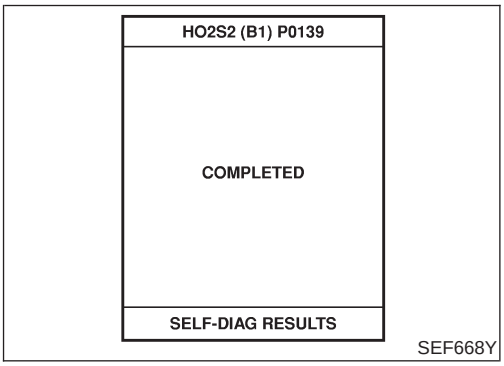


Procedure for COND2

NEEC0166S0102

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

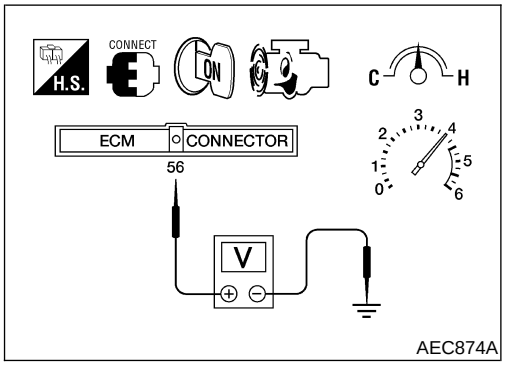
NOTE:
If “COMPLETED” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

NEEC0166S0103

1. Stop vehicle and let is idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-3231, “Diagnostic Procedure”.



Overall Function Check

NEEC0167

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

CAUTION:
Always drive vehicle at a safe speed.

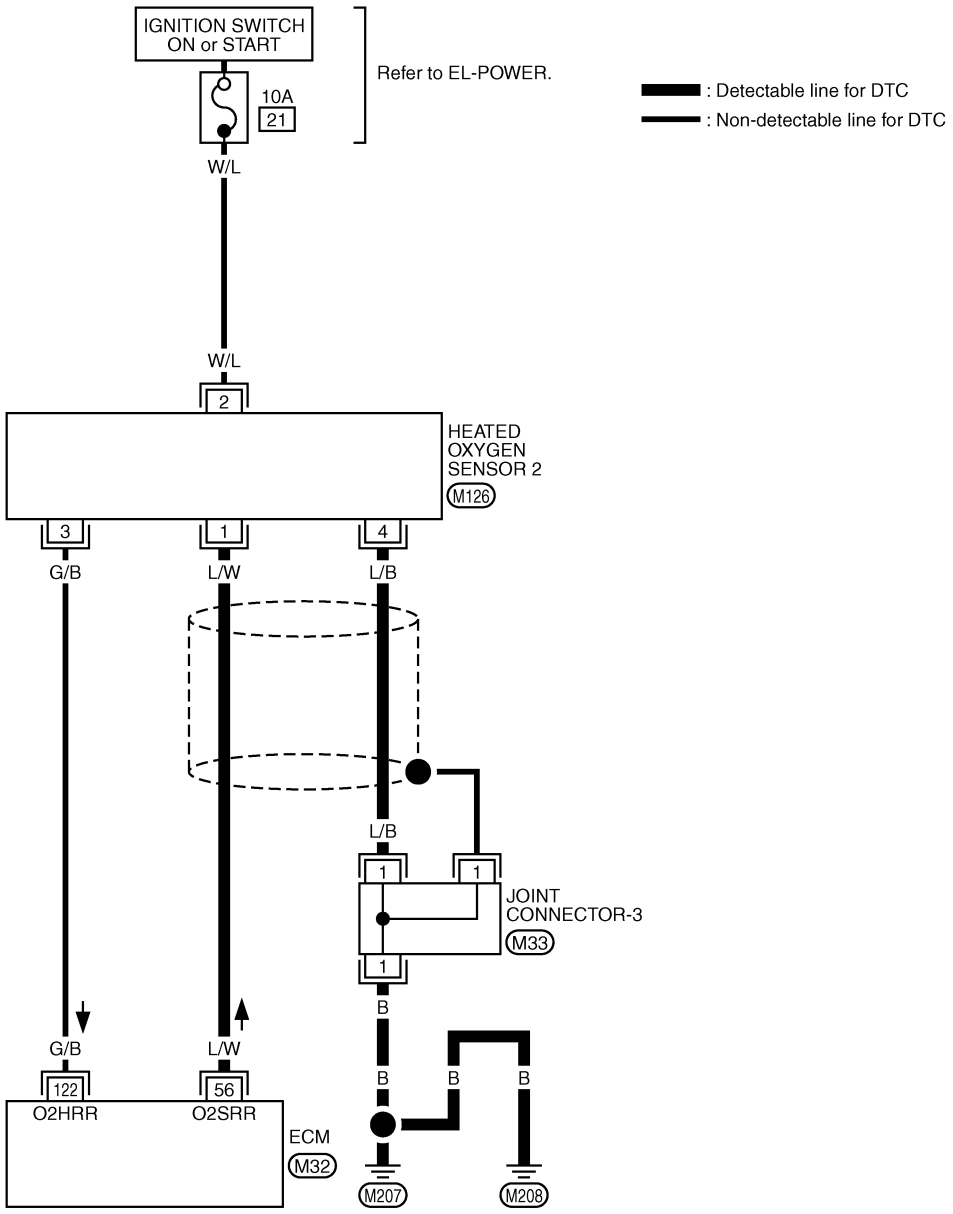
Without CONSULT-II

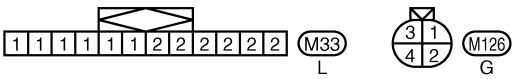
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.
4) Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should 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-3231.

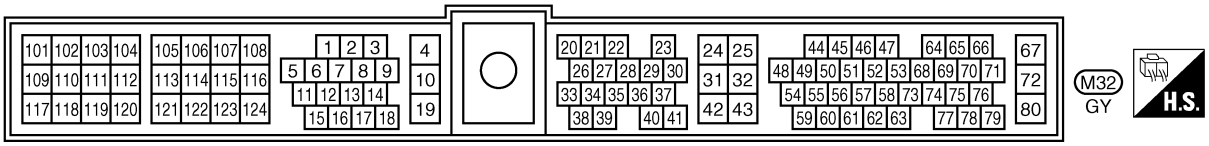
Wiring Diagram

NEEC0168

EC-O2S2B1-01







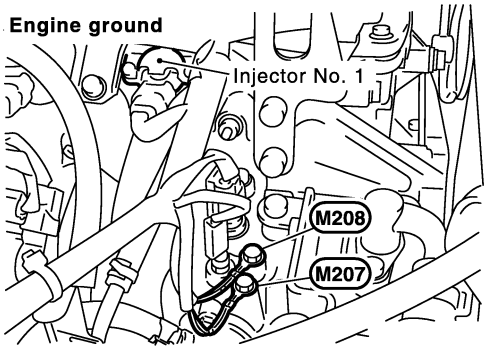
GEC246A

Diagnostic Procedure

NEEC0169

1	RETIGHTEN GROUND SCREWS

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



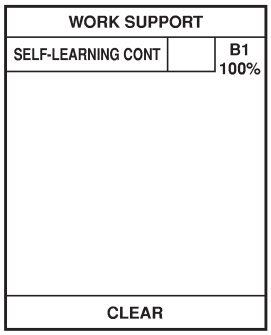
SEC309D

▶	GO TO 2.

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.

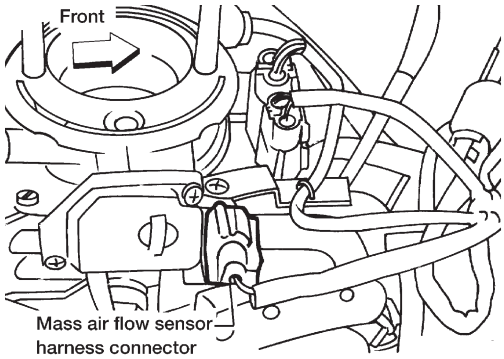


SEF215Z

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.



AEC131A

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-3060.
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 or P0172. Refer to EC-3237 or EC-3244.
No	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal 56 and terminal 1. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 56 (or terminal 1) and ground. Refer to wiring diagram.
   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 following. ● Harness for open or short between heated oxygen sensor 2 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 terminal 4 and engine ground. Refer to the Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to power. **OK or NG**	
OK (With CONSULT-II) ▶	GO TO 7.
OK (Without CONSULT-II) ▶	GO TO 8.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-3 ● Harness for open or short between heated oxygen sensor 2 and engine ground	
▶	Repair open circuit or short to power in harness or connectors.

7	CHECK HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Reconnect all harness connectors disconnected.
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. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.
5. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.

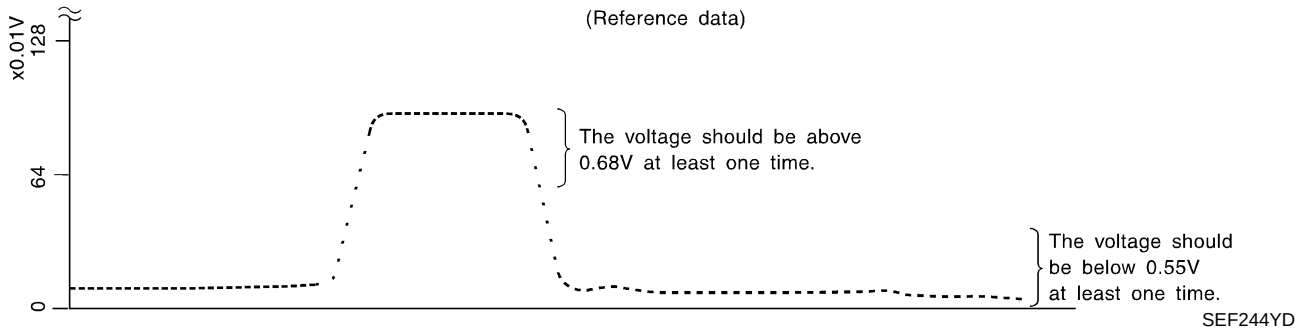
ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

“HO2S2 (B1)” should be above 0.56V at least once when the “FUEL INJECTION” is +25%. “HO2S2 (B1)” should be below 0.54V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



SEF244YD

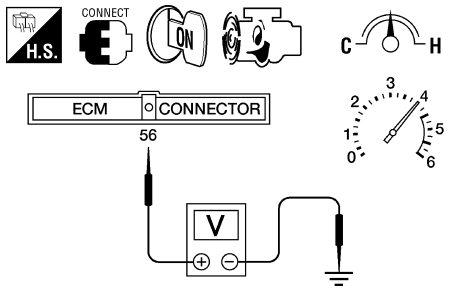
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 2.

8	CHECK HEATED OXYGEN SENSOR 2

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
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. Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.



AEC874A

5. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.56V at least once.
   If the voltage is above 0.56V at step 4, step 5 is not necessary.
6. Check the voltage when revving up to 5,000 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 (M/T), "D" position with "OD" OFF (A/T).
   The voltage should be below 0.54V 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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 2.

9	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect joint connector-3.
3. Check harness continuity between joint connector-3 terminal 1 and 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 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3 (Refer to "HARNESS LAYOUT", EL section.)
- Harness for open or short between joint connector-3 and engine ground

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

11	**CHECK INTERMITTENT INCIDENT**
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**

On Board Diagnosis Logic

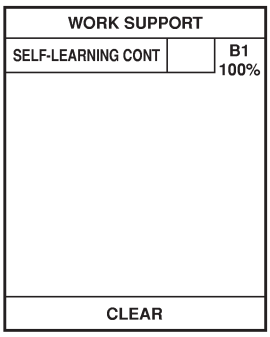
NEEC0188

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

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensor 1	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 • Injectors • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor • Incorrect PCV hose connection

4



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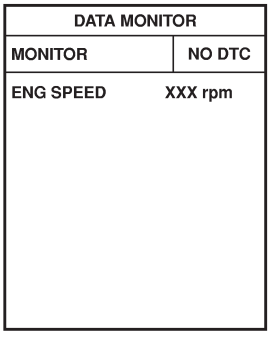
6



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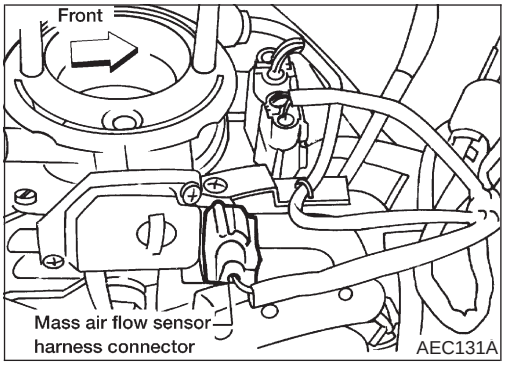


AEC131A

DTC Confirmation Procedure

NEEC0189

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 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 5 seconds.
3) Turn ignition switch ON and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4) Clear the self-learning control coefficient by touching “CLEAR”.
5) Select “DATA MONITOR” mode with CONSULT-II.
6) Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-3240.
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-3240. If engine does not start, visually check for exhaust and intake air leak.

With GST

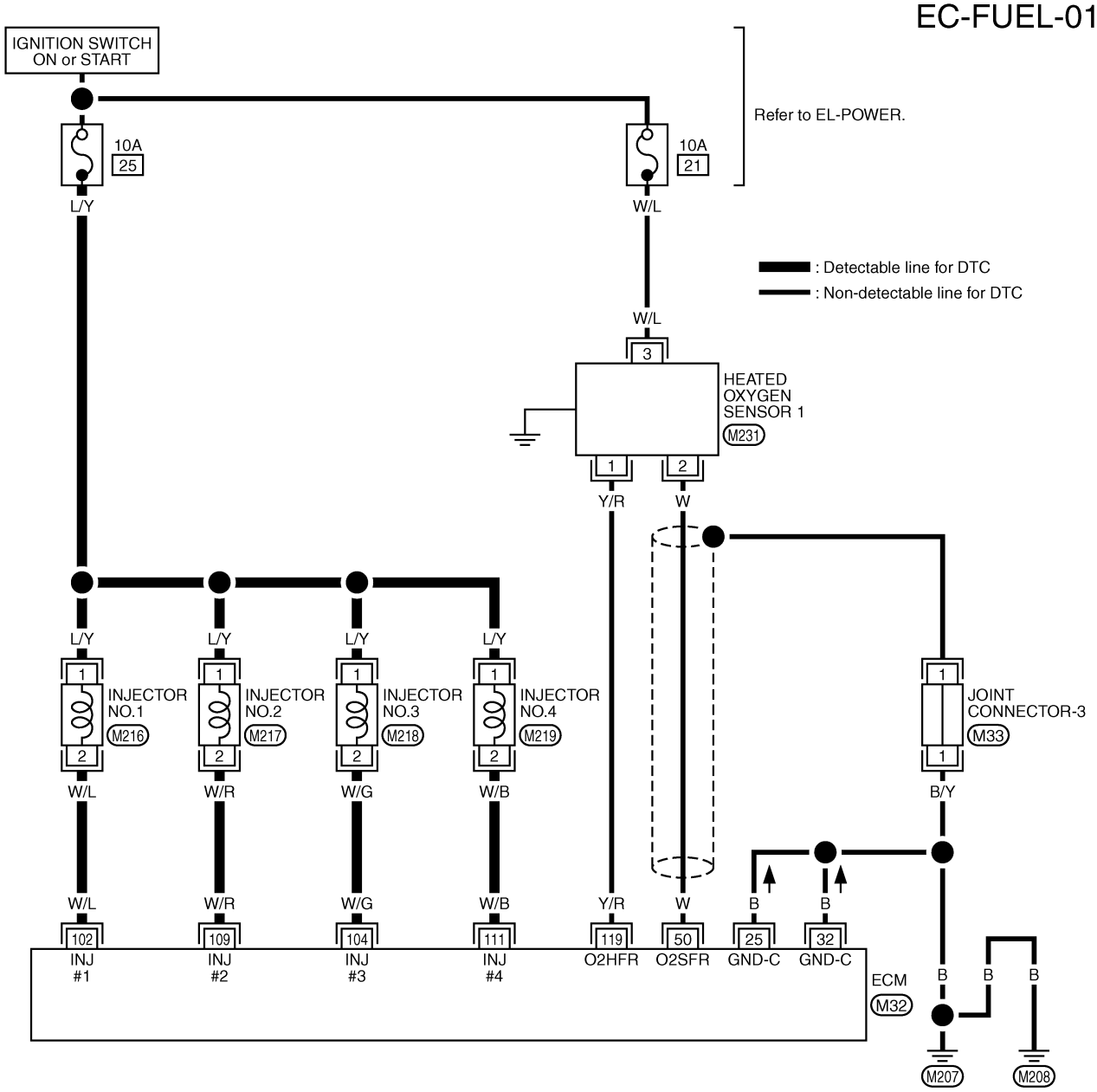
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch OFF and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select “MODE 7” with GST. Make sure DTC P0102 is detected.
6) Select “MODE 4” with GST and erase the DTC P0102.
7) Start engine again and run it for at least 10 minutes at idle speed.

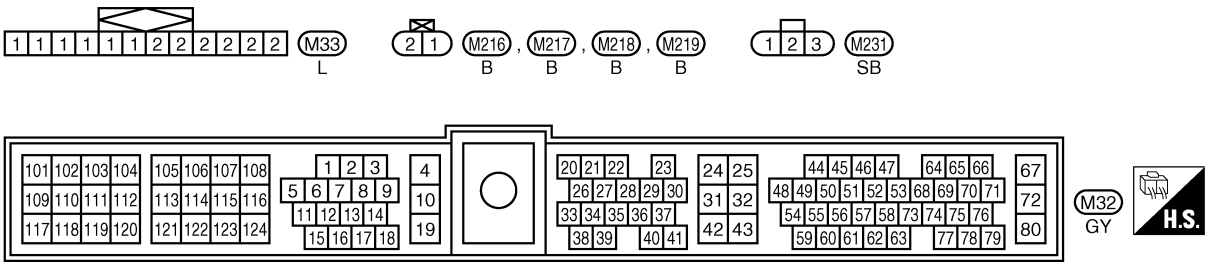
8) Select “MODE 7” with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-3240.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
10) Crank engine while depressing accelerator pedal. If engine starts, go to “Diagnostic Procedure”, EC-3240. If engine does not start, visually check for exhaust and intake air leak.

Wiring Diagram

NEEC0190

EC-FUEL-01





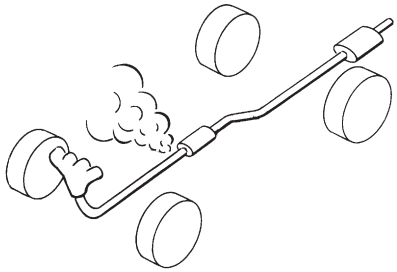
GEC296A

Diagnostic Procedure

NEEC0191

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 AND PCV HOSE

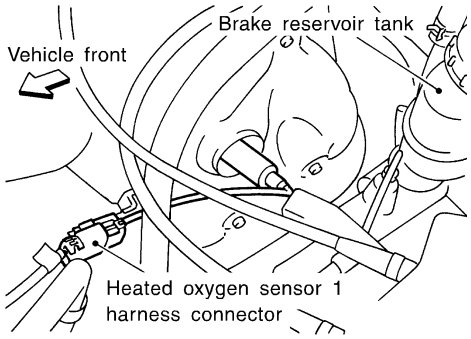
1. Listen for an intake air leak between the mass air flow sensor and the intake manifold.
2. Check PCV hose connection.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair or replace.

3	CHECK HEATED OXYGEN SENSOR 1 CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector and ECM harness connector.



SEF331VC

3. Check harness continuity between ECM terminal 50 and terminal 2. Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 50 (or terminal 2) and ground. Refer to wiring diagram.
   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-3033.
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-3378.)
- Fuel pressure regulator (Refer to EC-3034.)
- Fuel lines (Refer to “Checking Fuel Lines”, MA section.)
- Fuel filter for clogging

	▶	Repair or replace.

6	CHECK MASS AIR FLOW SENSOR

With CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.
   at idling: 0.9 - 5.8 g·m/sec
   at 2,500 rpm: 7.5 - 13.2 g·m/sec

With GST
1. Start engine and warm it up to normal operating temperature.
2. Check mass air flow sensor signal in MODE 1 with GST.
   at idling: 0.9 - 5.8 g·m/sec
   at 2,500 rpm: 7.5 - 13.2 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-3143.

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.

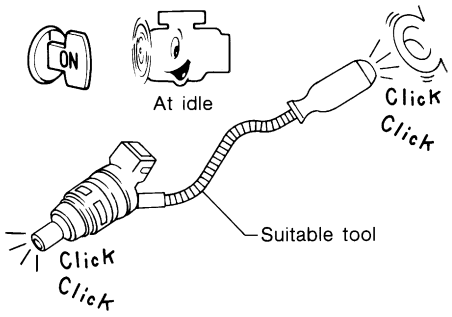
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX %

SEF981Z

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-3370.

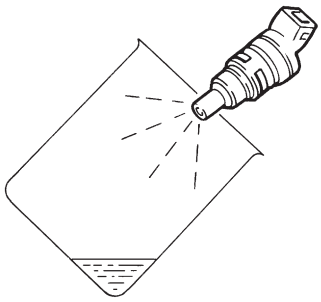
8	REMOVE INJECTOR

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-3034.
   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 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-3123.	
▶	**INSPECTION END**

On Board Diagnosis Logic

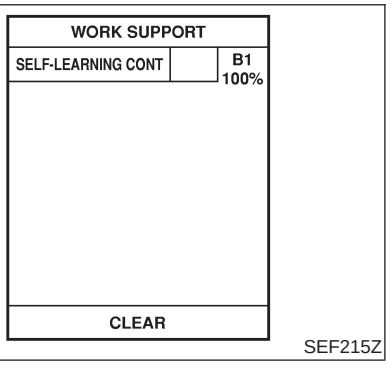
NEEC0192

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too 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	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection & mixture ratio control	Injectors

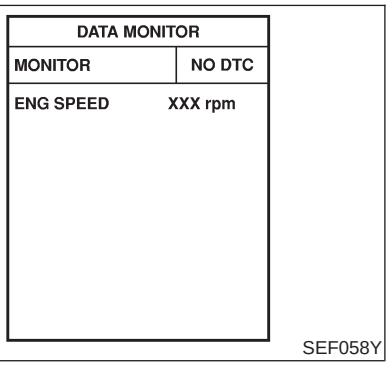
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0172 0172	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	• Heated oxygen sensor 1 • Injectors • Exhaust gas leaks • Incorrect fuel pressure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

4

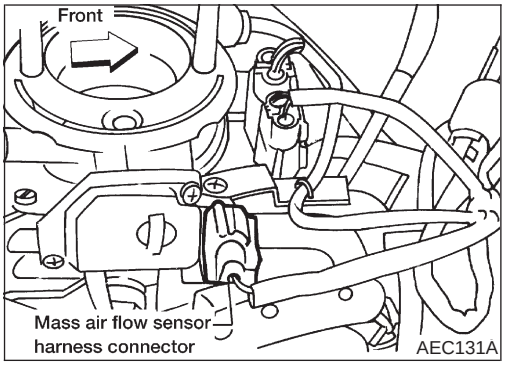


SEF215Z

6



SEF058Y



AEC131A

DTC Confirmation Procedure

NEEC0193

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 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 5 seconds.
3) Turn ignition switch ON and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4) Clear the self-learning control coefficient by touching “CLEAR”.
5) Select “DATA MONITOR” mode with CONSULT-II.
6) Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-3247.
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-3247. If engine does not start, remove ignition plugs and check for fouling, etc.

With GST

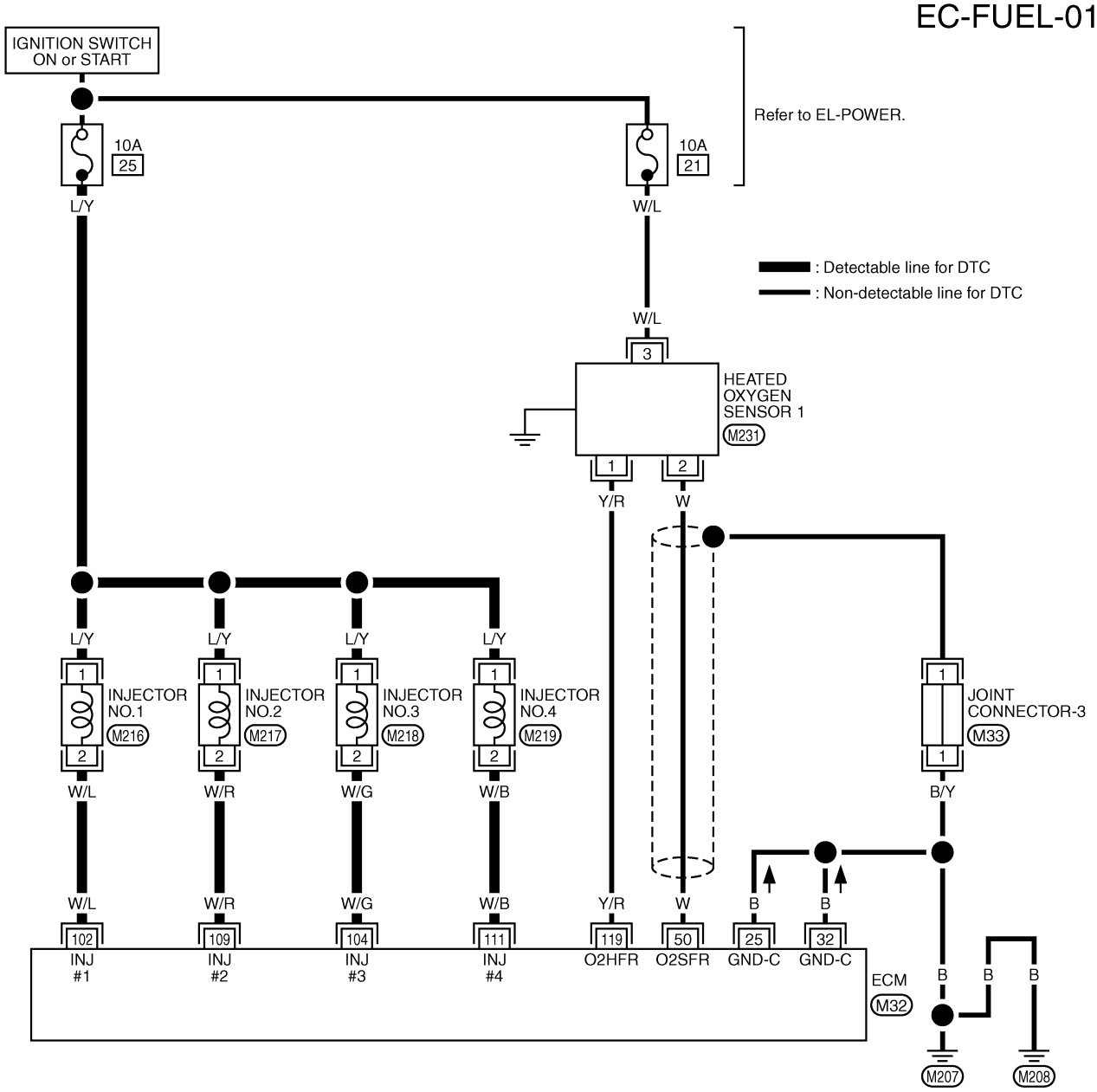
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch OFF and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select “MODE 7” with GST. Make sure 1st trip DTC P0102 is detected.
6) Select “MODE 4” with GST and erase the 1st trip DTC P0102.

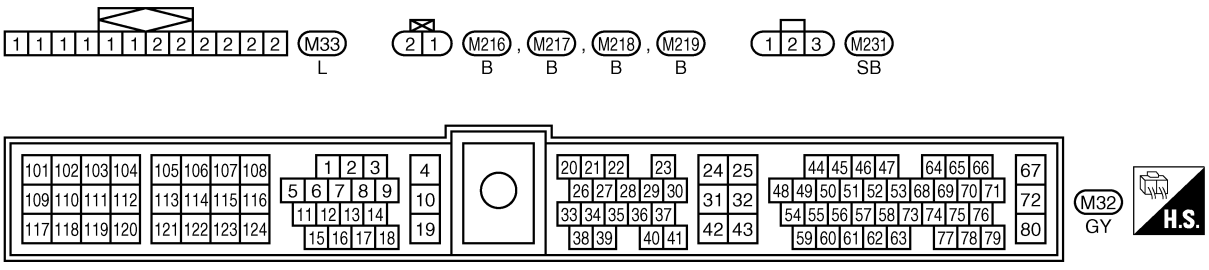
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select “MODE 7” with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to “Diagnostic Procedure”, EC-3247.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
10) Crank engine while depressing accelerator pedal.
If engine starts, go to “Diagnostic Procedure”, EC-3247. If engine does not start, remove ignition plugs and check for fouling, etc.

Wiring Diagram

NEEC0194

EC-FUEL-01





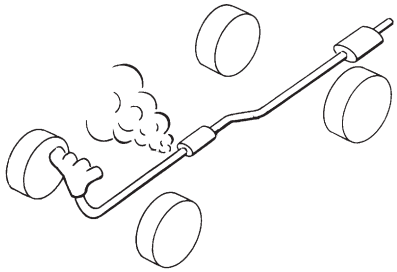
GEC296A

Diagnostic Procedure

NEEC0195

1	CHECK FOR EXHAUST AIR LEAK

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



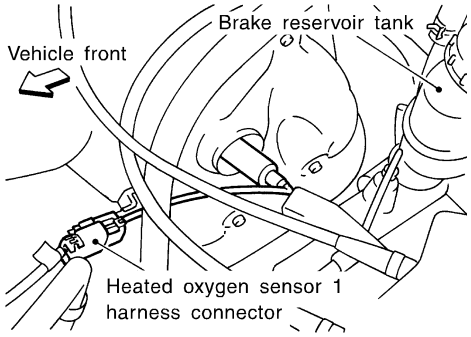
SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK HEATED OXYGEN SENSOR 1 CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector and ECM harness connector.



SEF331VC

3. Check harness continuity between ECM terminal 50 and terminal 2. Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 50 (or terminal 2) and ground. Refer to wiring diagram.
   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-3033. 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-3378.) ● Fuel pressure regulator (Refer to EC-3034.)		
	▶	Repair or replace.

5	CHECK MASS AIR FLOW SENSOR	
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II. **at idling: 0.9 - 5.8 g·m/sec** **at 2,500 rpm: 7.5 - 13.2 g·m/sec**		
With GST 1. Start engine and warm it up to normal operating temperature. 2. Check mass air flow sensor signal in MODE 1 with GST. **at idling: 0.9 - 5.8 g·m/sec** **at 2,500 rpm: 7.5 - 13.2 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-3143, EC-3151.

6	CHECK FUNCTION OF INJECTORS

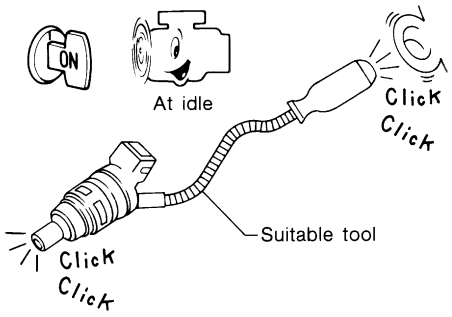
With CONSULT-II
1. Install all parts removed.
2. Start engine.
3. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.

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

SEF981Z

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-3370.

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-3034.
   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.

9	**CHECK INTERMITTENT INCIDENT**
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NEEC0202

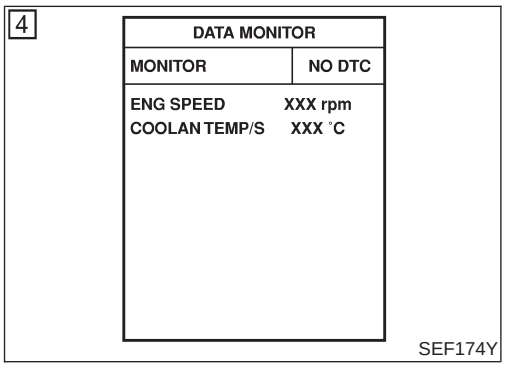
When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the CKP sensor signal to vary, the ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (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 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 ● The injector circuit is open or shorted ● Injectors ● Intake air leak ● The ignition secondary circuit is open or shorted ● Lack of fuel ● Drive plate/Flywheel ● Heated oxygen sensor 1 ● Incorrect distributor rotor
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

NEEC0203

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 5 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 5 seconds.
4) Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.

NOTE:
Refer to the freeze frame data for the test driving conditions.

5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3252.

With GST
Follow the procedure “With CONSULT-II”.

Diagnostic Procedure

NEEC0204

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	PERFORM POWER BALANCE TEST

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.

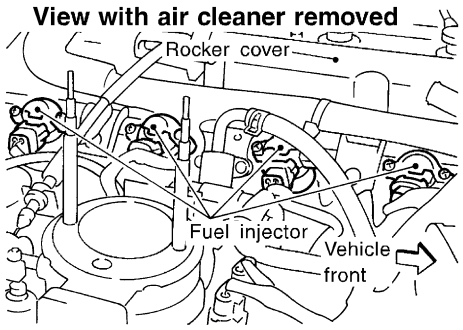
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX %

SEF981Z

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?



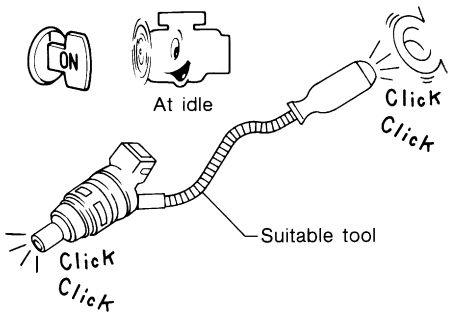
SEF319V

Yes or No

Yes	▶	GO TO 4.
No	▶	GO TO 7.

4	CHECK INJECTOR

Does each injector make an operating sound at idle?



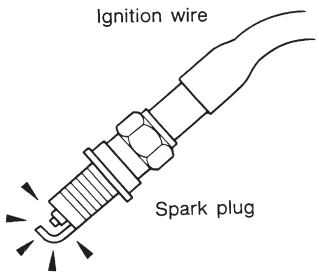
MEC703B

Yes or No

Yes	▶	GO TO 5.
No	▶	Check injector(s) and circuit(s). Refer to EC-3370.

5	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.



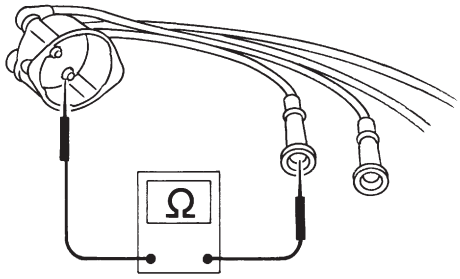
SEF282G

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	CHECK IGNITION WIRES

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.



SEF174P

Resistance:

13.6 - 18.4 kΩ/m (4.15 - 5.61 kΩ/ft) at 25°C (77°F)

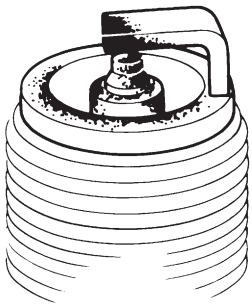
If the resistance exceeds the above specification, inspect ignition wire to distributor cap connection. Clean connection or replace the ignition wire with a new one.

OK or NG

OK	▶	Check distributor rotor head for incorrect parts. Check ignition coil, power transistor and their circuits. Refer to EC-3361.
NG	▶	Replace.

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 "ENGINE MAINTENANCE", MA section.

8	CHECK COMPRESSION PRESSURE

Refer to EM section.

- Check compression pressure.

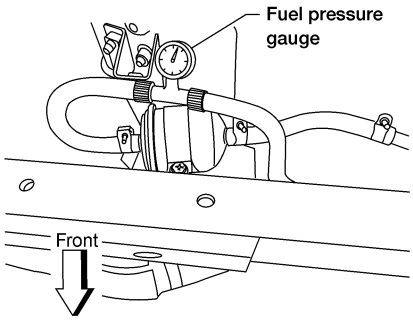
Standard:
1,226 kPa (12.3 bar, 12.5 kg/cm^2, 178 psi)/300 rpm
Minimum:
1,030 kPa (10.3 bar, 10.5 kg/cm^2, 149 psi)/300 rpm
Difference between each cylinder:
98 kPa (0.98 bar, 1.0 kg/cm^2, 14 psi)/300 rpm

OK or NG

OK	▶	GO TO 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-3033.
3. Install fuel pressure gauge and check fuel pressure.



AEC064B

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-3378.) ● Fuel pressure regulator (Refer to EC-3034.) ● Fuel lines (Refer to “Checking Fuel Lines”, MA section). ● Fuel filter for clogging	
▶	Repair or replace.

11	CHECK IGNITION TIMING

1. Check the following items. Refer to “Basic Inspection”, EC-3086.

Items	Specifications
Ignition timing	15° ± 2° BTDC
Base idle speed	650 ± 50 rpm (in “N” position)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.1 mm (0.004 in): ON 0.3 mm (0.012 in): OFF
Target idle speed	700 ± 50 rpm (in “N” position)

MTBL1315

OK or NG

OK (With CONSULT-II)	▶	GO TO 12.
OK (Without CONSULT-II)	▶	GO TO 13.
NG	▶	Adjust ignition timing.

12	CHECK HEATED OXYGEN SENSOR 1

With CONSULT-II

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

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

SEF646Y

6. Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:

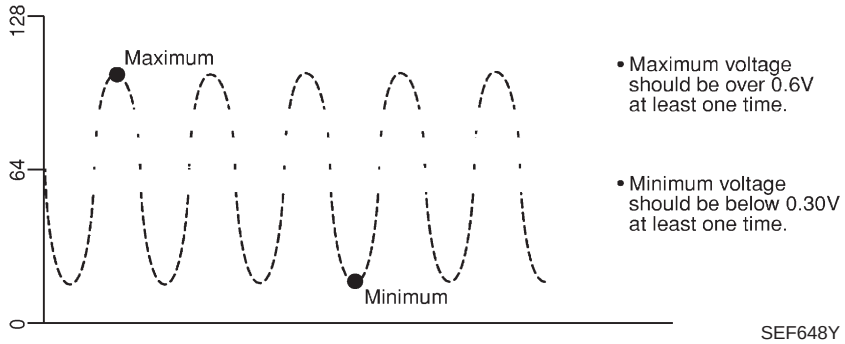
cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L-R

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

SEF217YA

- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

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



SEF648Y

CAUTION:

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

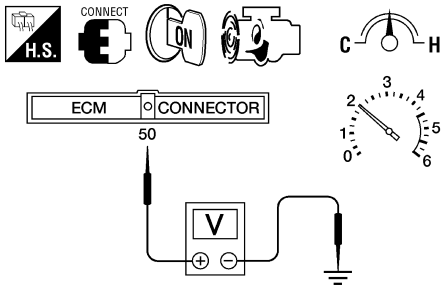
OK or NG

OK	▶	GO TO 14.
NG	▶	Replace heated oxygen sensor 1.

13	CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 50 (Heated oxygen sensor 1 signal) and ECM ground.



AEC873A

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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace heated oxygen sensor 1.

14	CHECK MASS AIR FLOW SENSOR

With CONSULT-II

Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

at idling: 0.9 - 5.8 g·m/sec
at 2,500 rpm: 7.5 - 13.2 g·m/sec

With GST

Check mass air flow sensor signal in MODE 1 with GST.

at idling: 0.9 - 5.8 g·m/sec
at 2,500 rpm: 7.5 - 13.2 g·m/sec

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 15.

15	CHECK CONNECTORS

Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-3143, EC-3151.

OK or NG

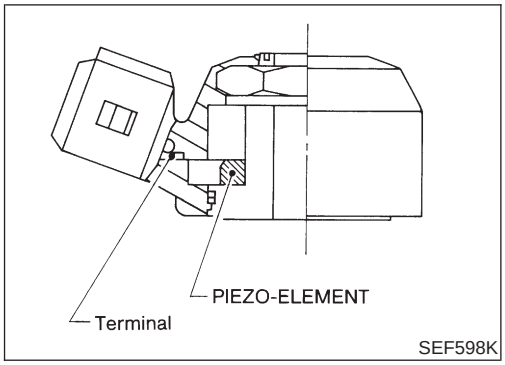
NG	▶	Repair or replace it.

Diagnostic Procedure

16	CHECK SYMPTOM MATRIX CHART	
Check items on the rough idle symptom in “Symptom Matrix Chart”, EC-3102.		
OK or NG		
OK	▶	GO TO 17.
NG	▶	Repair or replace.

17	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-3060.		
	▶	GO TO 18.

18	CHECK INTERMITTENT INCIDENT	
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.		
	▶	**INSPECTION END**



Component Description

NEEC0206

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.

ECM Terminals and Reference Value

NEEC0207

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

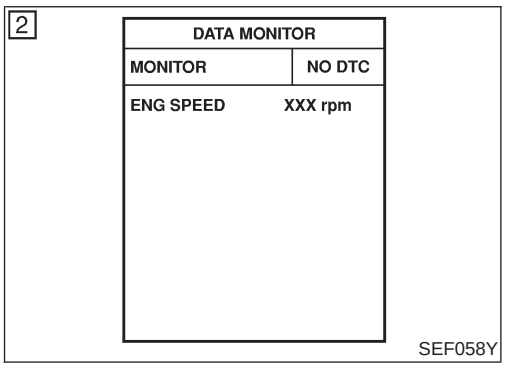
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
64	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.4V

On Board Diagnosis Logic

NEEC0208

DTC No.	Trouble diagnosis name	DTC Detecting Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	



DTC Confirmation Procedure

NEEC0209

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch OFF and wait at least 5 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-3262.

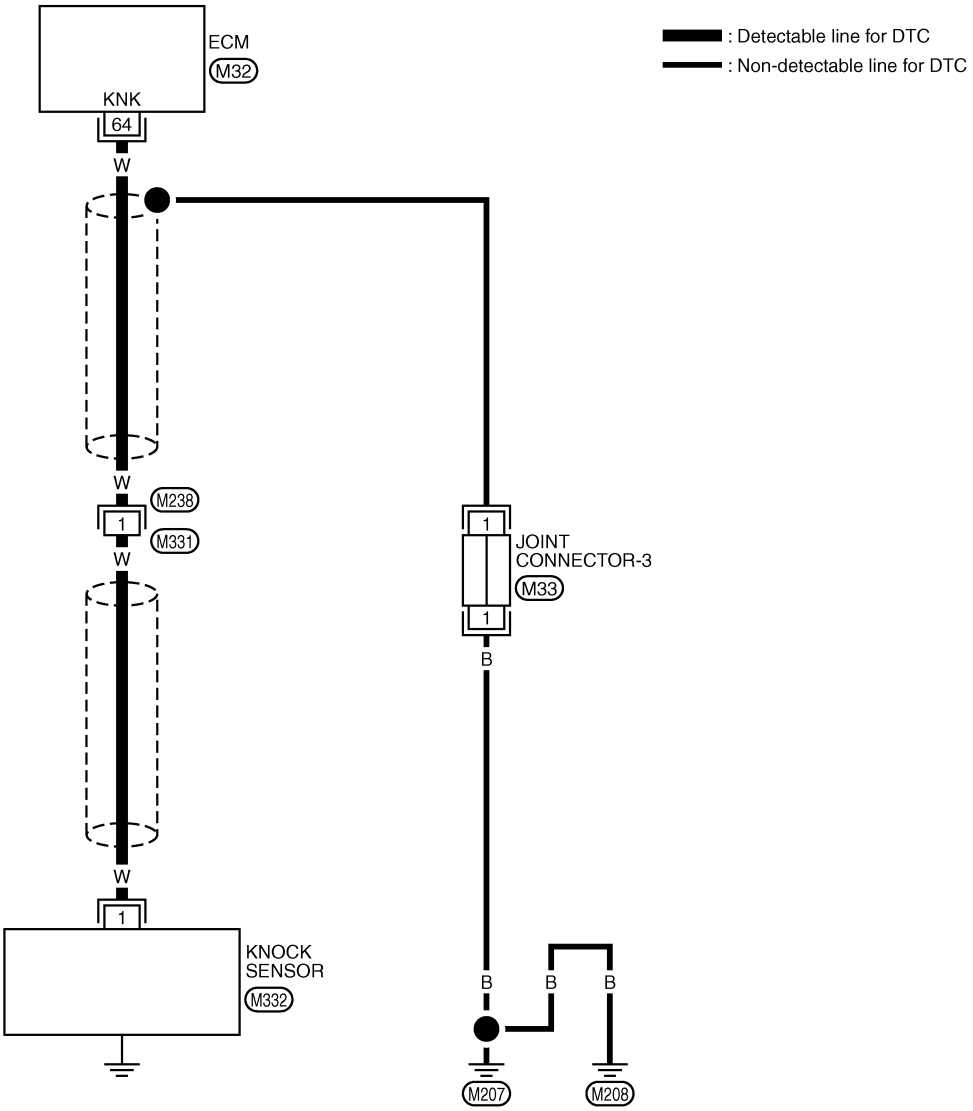
With GST

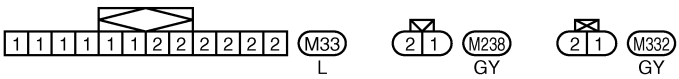
Follow the procedure "With CONSULT-II".

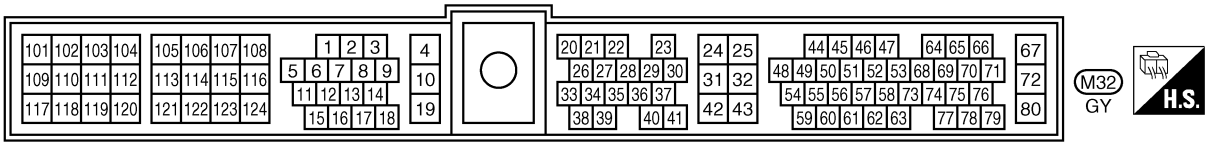
Wiring Diagram

NEEC0210

EC-KS-01







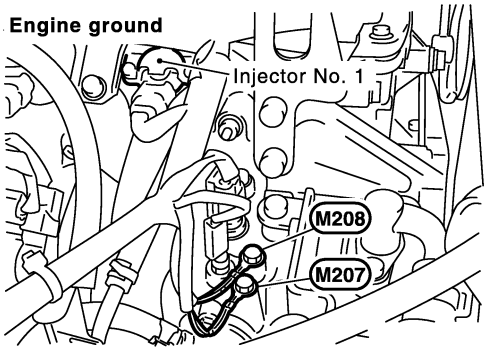
GEC242A

Diagnostic Procedure

NEEC0211

1	RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

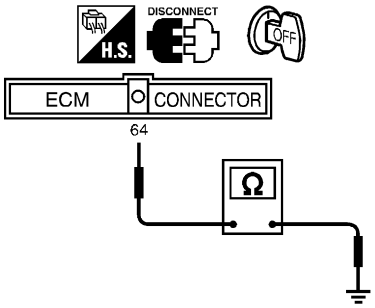


SEC309D

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT-1

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 64 and ground.



SEF173V

Resistance: Approximately 500 - 620 kΩ [at 25°C (77°F)]

It is necessary to use an ohmmeter which can measure more than 10 MΩ.

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

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

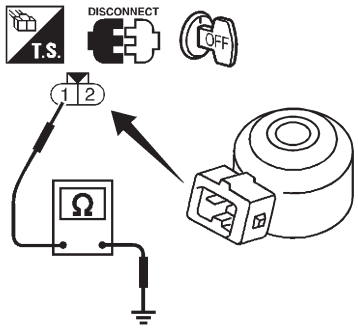
1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 64 and knock sensor terminal 1. Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK KNOCK SENSOR

Use an ohmmeter which can measure more than 10 MΩ.
1. Disconnect knock sensor harness connector.
2. Check resistance between terminal 1 and ground.



SEF174V

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.

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace knock sensor.

5	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Remove joint connector-3.
3. Check the following. Refer to the wiring diagram.
- Continuity between joint connector-3 terminal 1 and ground
- Joint connector-3 (Refer to “HARNESS LAYOUT”, EL section.)

Continuity should exist.

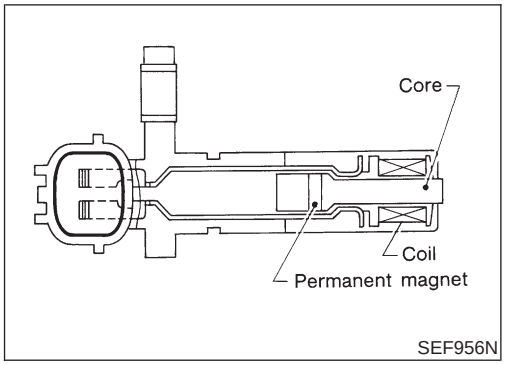
4. Also check harness for short to power.
5. Then reconnect harness connectors.

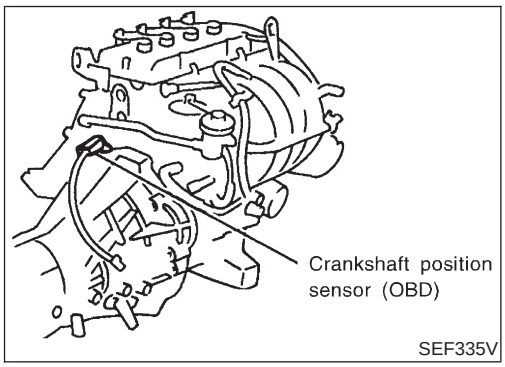
OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the joint connector-3. (Refer to “HARNESS LAYOUT”, EL section.)	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
	▶ **INSPECTION END**





Component Description

NEEC0213

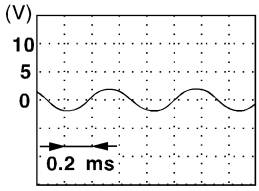
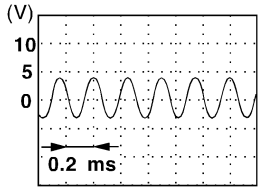
The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the 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 directly used to control the engine system. It is used only for the on board diagnosis.

ECM Terminals and Reference Value

NEEC0214

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

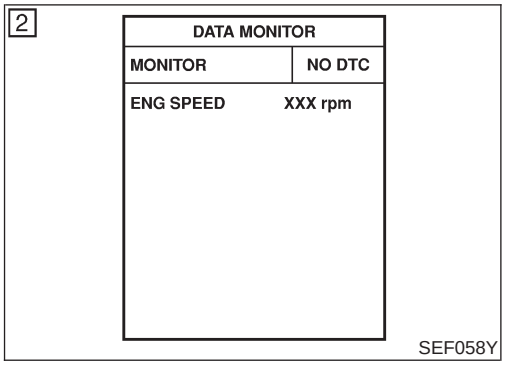
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (AC Voltage)
47	L	Crankshaft position sensor (OBD)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	
			[Engine is running] ● Engine speed is 2,000 rpm	

On Board Diagnosis Logic

NEEC0215

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0335 0335	● 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) ● Dead battery



DTC Confirmation Procedure

NEEC0216

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 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 15 seconds at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3267.

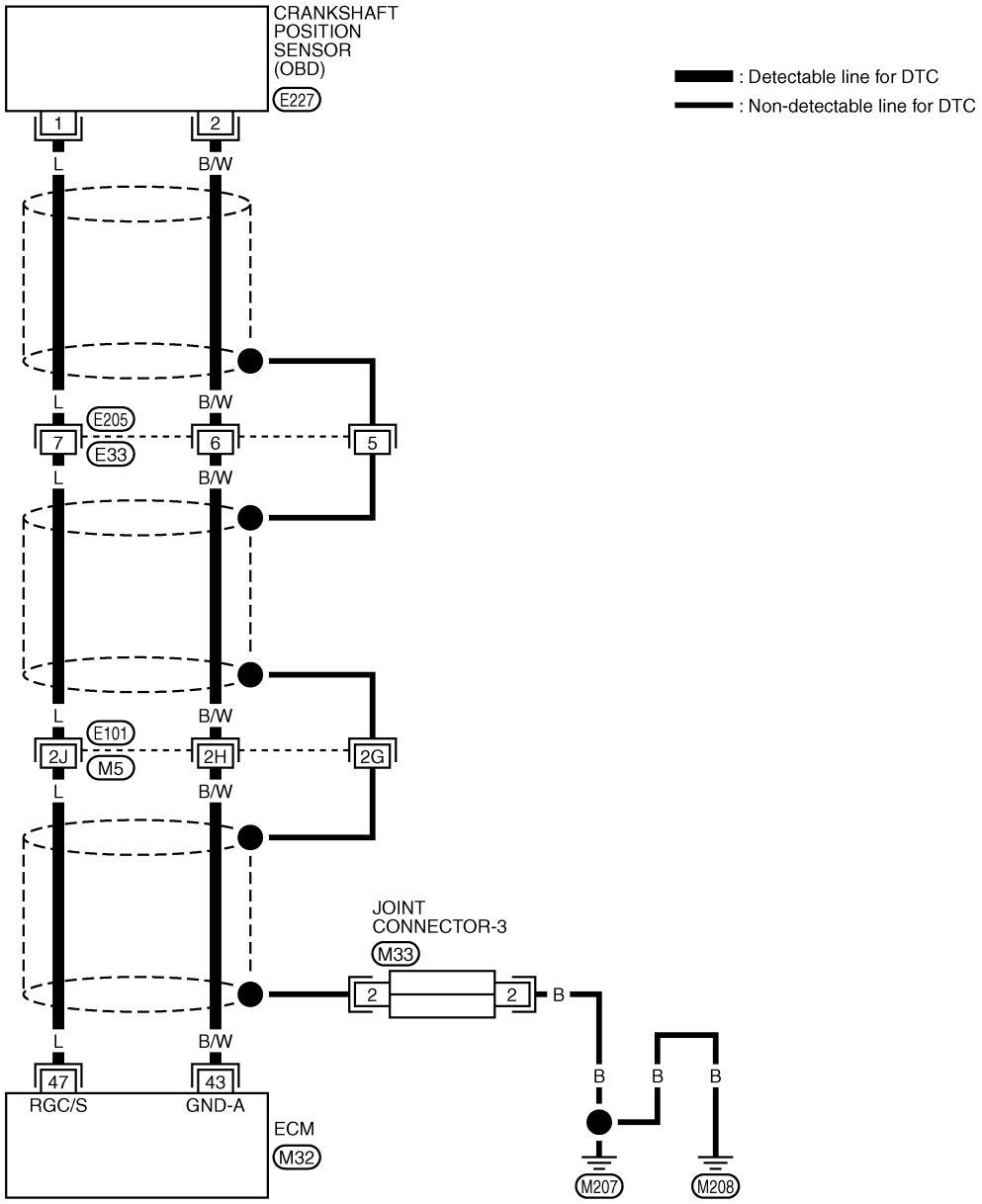
With GST

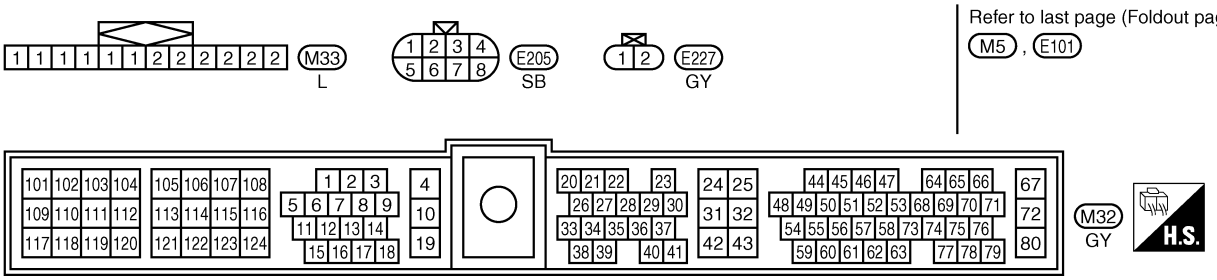
Follow the procedure “With CONSULT-II”.

Wiring Diagram

NEEC0217

EC-CKPS-01





Refer to last page (Foldout page).
(M5), (E101)

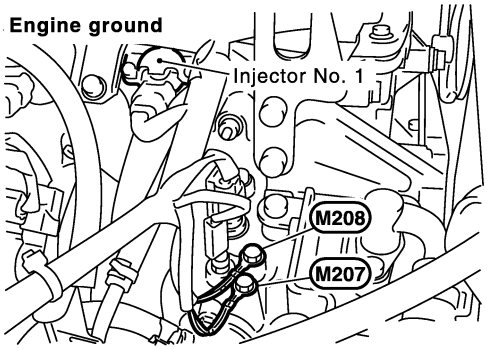
GEC236A

Diagnostic Procedure

NEEC0218

1	RETIGHTEN GROUND SCREWS

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

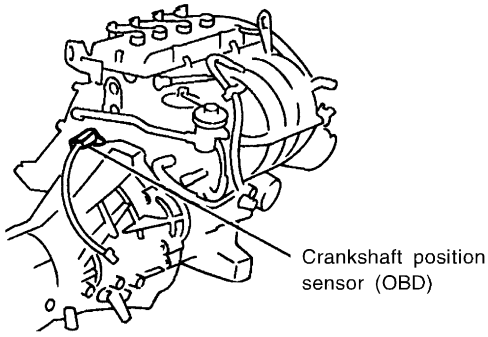


SEC309D

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.



SEF335V

2. Check continuity between ECM terminal 47 and terminal 1. Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E205, E33
- Harness connectors E101, M5
- 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 connector. 2. Check harness continuity between crankshaft position sensor (OBD) terminal 2 and engine ground. Refer to the wiring diagram. **Continuity should exist.** 3. Also check harness for short to power. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	GO TO 5.

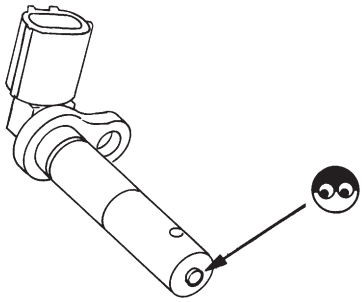
5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E205, E33 ● Harness connectors E101, M5 ● Harness for open or short between crankshaft position sensor (OBD) and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK SHIELD CIRCUIT	
1. Turn ignition switch OFF. 2. Disconnect harness connectors E205, E33. 3. Check harness continuity between harness connector E33 terminal 5 and 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 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E101, M5 ● Joint connector-3 (Refer to “HARNESS LAYOUT”, EL section.) ● Harness for open or short between harness connector E33 and engine ground	
▶	Repair open circuit or short to power in harness or connectors.

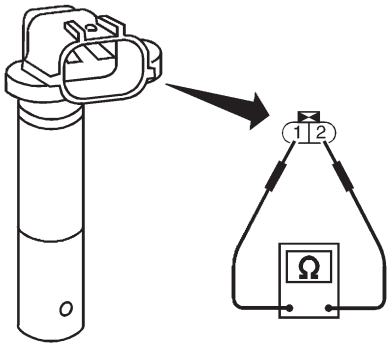
8	CHECK CRANKSHAFT POSITION SENSOR (OBD)

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.



SEF960N

5. Check resistance as shown in the figure.



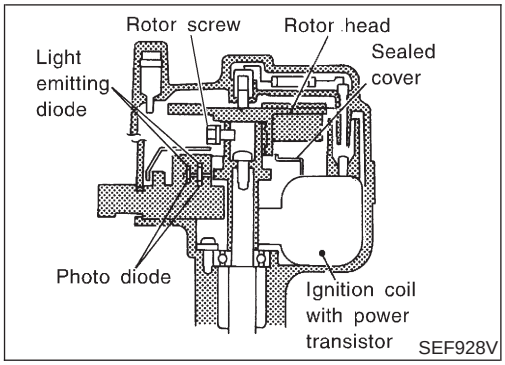
SEF231W

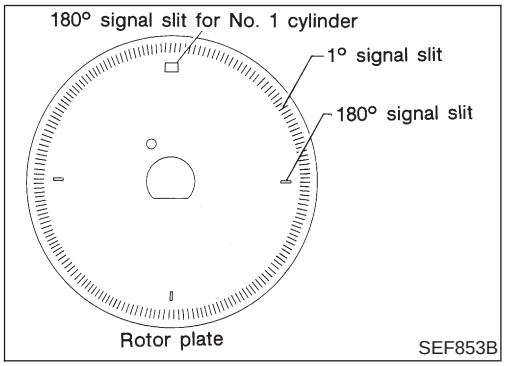
Resistance: Approximately 512 - 632Ω [at 20°C (68°F)]

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace crankshaft position sensor (OBD).

9	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**





Component Description

NEEC0220

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.

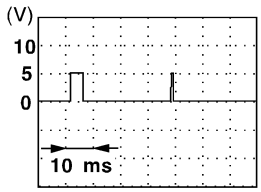
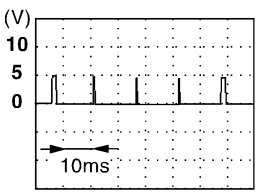
ECM Terminals and Reference Value

NEEC0221

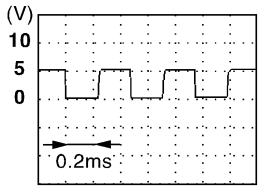
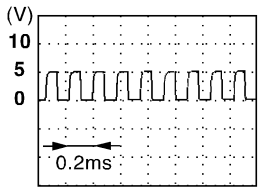
Specification data are reference values and are measured between each terminal and ground.

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/B	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] ● More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
44*1 48*1 (49)*2 (53)*2	OR OR OR OR	Camshaft position sensor (Reference signal)	**[Engine is running]** (Warm-up condition) ● Idle speed	0.2 - 0.5V 
			[Engine is running] ● Engine speed is 2,000 rpm	0 - 0.5V 

ECM Terminals and Reference Value

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
(44)*2 49*1	W	Camshaft position sensor (Position signal)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.5V 
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 1.0V 
67	W	Power supply for ECM	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14V)
72	W			
117	W	Current return	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)

*1: Model without NATS (Nissan Anti-Theft System)
*2: Model with NATS (Nissan Anti-Theft System)

On Board Diagnosis Logic

NEEC0222

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 section.) ● Starting system circuit (Refer to SC section.) ● 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

=NEEC0223

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 5 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V.

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION A

NEEC0223S01

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-3274.

With GST

Follow the procedure “With CONSULT-II”.

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION B AND C

NEEC0223S02

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-3274.

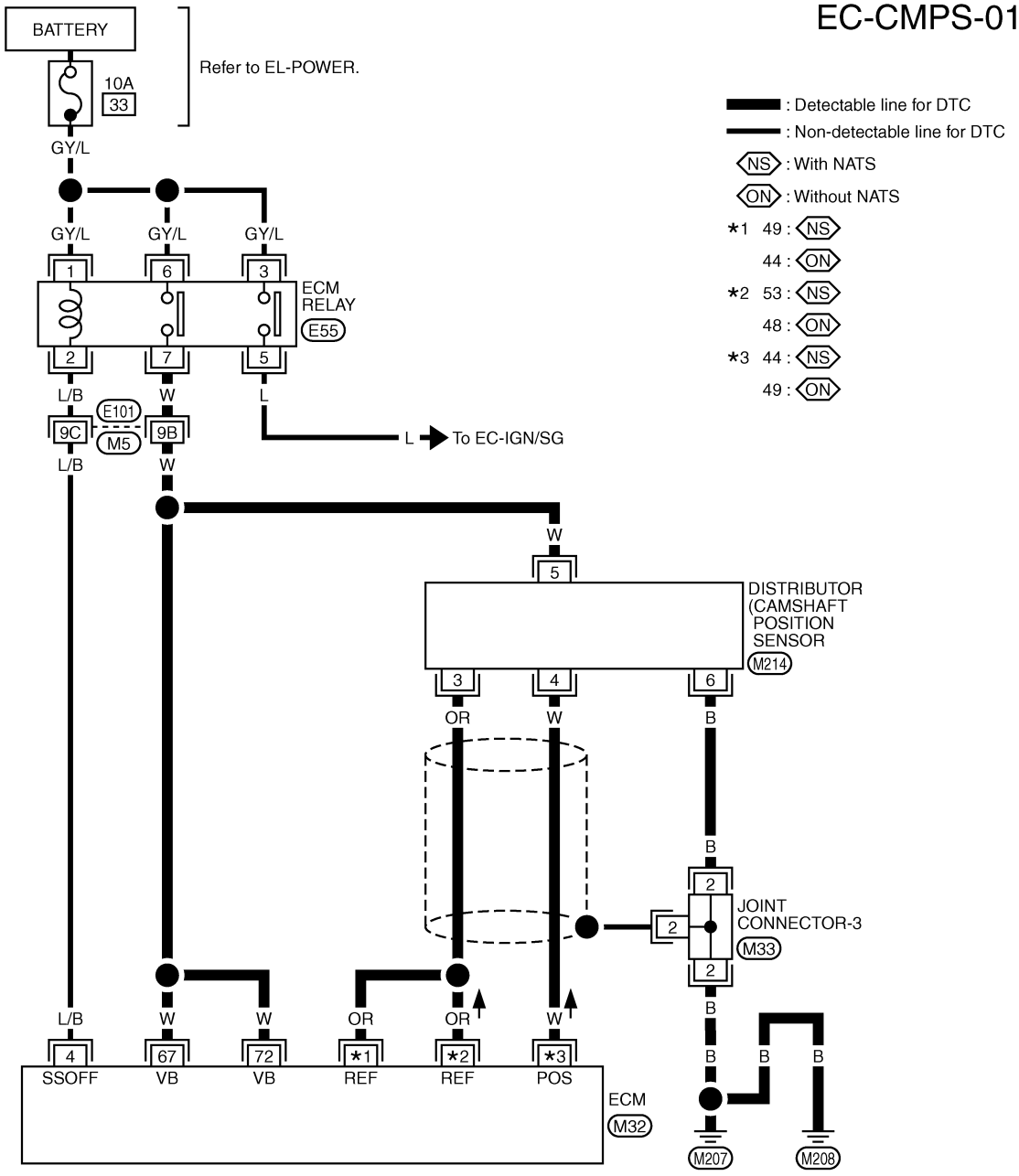
With GST

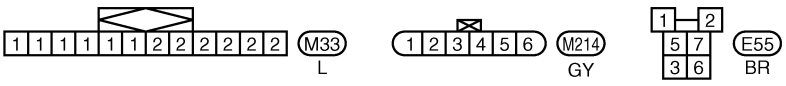
Follow the procedure “With CONSULT-II”.

Wiring Diagram

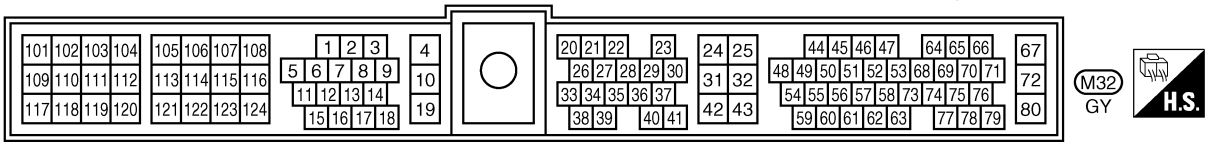
NEEC0224

EC-CMPS-01





Refer to last page (Foldout page).
M5 , E101

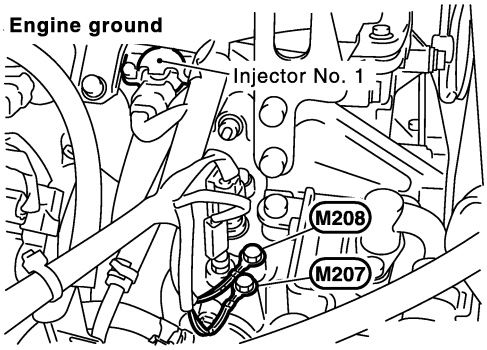


GEC235A

Diagnostic Procedure

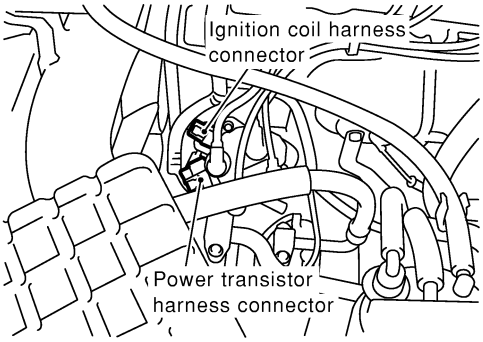
NEEC0225

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 section.)

2	RETIGHTEN GROUND SCREWS	
1. Turn ignition switch OFF. 2. Loosen and retighten engine ground screws.		
		 SEC309D
	▶	GO TO 3.

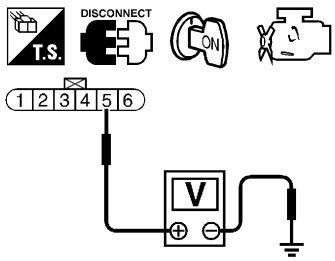
3	CHECK POWER SUPPLY

1. Disconnect camshaft position sensor harness connector.



SEC276D

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



SEF040S

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness for open or short between camshaft position sensor and ECM relay
- Harness for open or short between camshaft position sensor 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 4 and ECM terminal 49 or (44)*, sensor terminal 3 and ECM terminals 44, 48 or (49, 53)*. Refer to wiring diagram.
   Continuity should exist.
   *: Model with NATS (Nissan Anti-Theft System)
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. Turn ignition switch OFF.
2. Check harness continuity between distributor (camshaft position sensor) terminal 6 and engine ground. Refer to the wiring diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

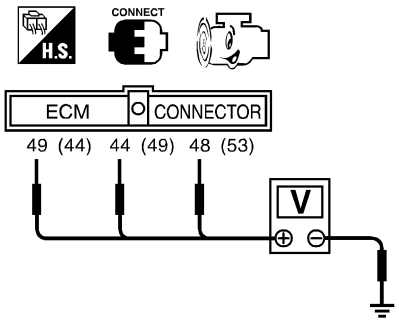
7	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-3
- Harness for open or short between camshaft position sensor and engine ground

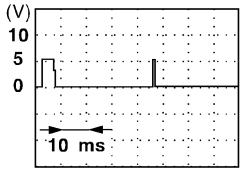
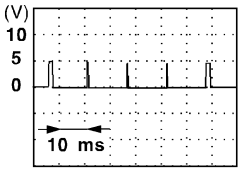
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK CAMSHAFT POSITION SENSOR

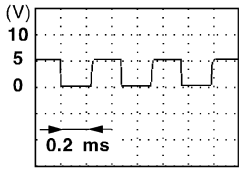
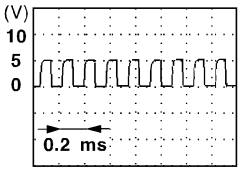
1. Reconnect all harness connector disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 49 or (44)* and engine ground, ECM terminals 44, 48 or (49, 53)* and engine ground.



Terminal 44, 48 or (49, 53)* and engine ground

Condition	Idle	2,000 rpm
Voltage	0.2 - 0.5V	0 - 0.5V
Pulse signal		

Terminal 49 or (44)* and engine ground

Condition	Idle	2,000 rpm
Voltage	Approximately 2.5V	Approximately 1.0V
Pulse signal		

SEC273D

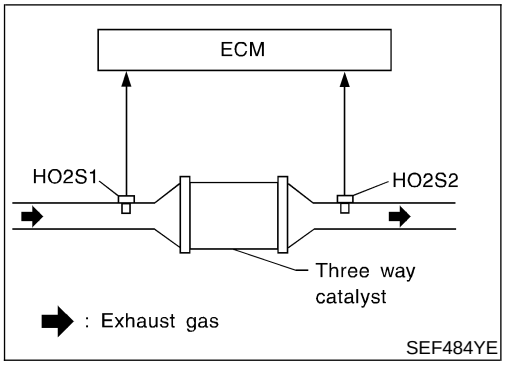
*: Model with NATS (Nissan Anti-Theft System)

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace camshaft position sensor.

9	CHECK SHIELD CIRCUIT	
1. Turn ignition switch OFF. 2. Disconnect joint connector-3. 3. Check the following. ● Continuity between joint connector-3 terminal 2 and ground ● Joint connector-3 (Refer to “HARNESS LAYOUT”, EL section.) **Continuity should exist.** 4. Also check harness for short to power. 5. Then reconnect joint connector-3.		
OK or NG		
OK	▶	GO TO 10.
NG	▶	Repair open circuit, short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



SEF484YE

On Board Diagnosis Logic

NEEC1050

The ECM monitors the switching frequency ratio of heated oxygen sensor 1 and 2.

A three way catalyst with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst 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

3

SRT WORK SUPPORT	
CATALYST	INCMP
HO2S HTR	CMPLT
HO2S	INCMP
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec

PBIB0566E

7

SRT WORK SUPPORT	
CATALYST	CMPLT
HO2S HTR	CMPLT
HO2S	INCMP
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec

PBIB0567E

SELF DIAG RESULTS	
DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

SEF560X

DTC Confirmation Procedure

NEEC1051

NOTE:

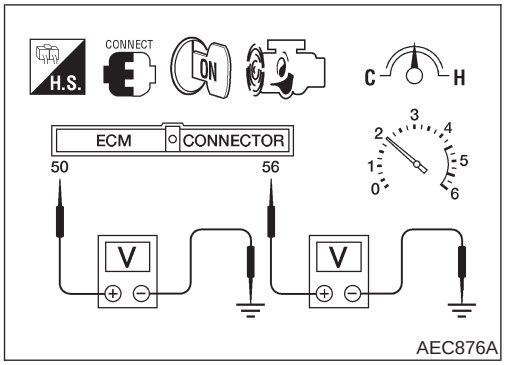
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- **Open engine hood before conducting following procedure.**
- **Do not hold engine speed more than specified minutes below.**

With CONSULT-II

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 2,500 to 3,500 rpm and hold it for 3 consecutive minutes then release then accelerator pedal completely.
   If "INCMP" of "CATALYST" changes to "CMPLT", go to step 7.
5) Wait 5 seconds at idle.
6) Rev engine up to 2,500 to 3,500 rpm and hold it until "INCMP" of "CATALYST" changes to "CMPLT". (It will take maximum of approximately 5 minute.)
7) Select "SELF-DIAG RESULTS" mode with CONSULT-II.
   If the 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-3280. If not "COMPLT" stop engine and cool down "COOLANT TEMP/SE" to less than 70°C (158°F) and then retest from step 1).



Overall Function Check

NEEC0242

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

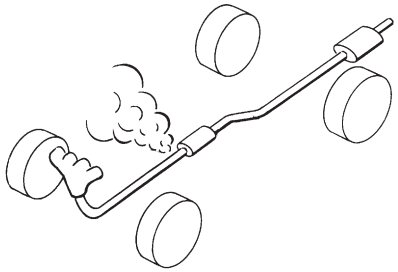
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeters probes between ECM terminals 50 (Heated oxygen sensor 1 signal), 56 (Heated oxygen sensor 2 signal) and engine ground.
4) Keep engine speed at 2,000 rpm constant under no load.
5) Make sure that the voltage switching frequency (high & low) between ECM terminal 56 and engine ground is much less than that of ECM terminal 50 and engine ground.
   Switching frequency ratio = A/B
   A: Heated oxygen sensor 2 voltage switching frequency
   B: Heated oxygen sensor 1 voltage switching frequency
   This ratio should be less than 0.75.
   If the ratio is greater than above, it means three way catalyst does not operate properly.

NOTE:
If the voltage at terminal 50 does not switch periodically more than 5 times within 10 seconds at step 4, perform trouble diagnosis for DTC P0133 first. (See EC-3202.)

Diagnostic Procedure

=NEEC0243

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 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	
1. Check the following items. Refer to “Basic Inspection”, EC-3086.		

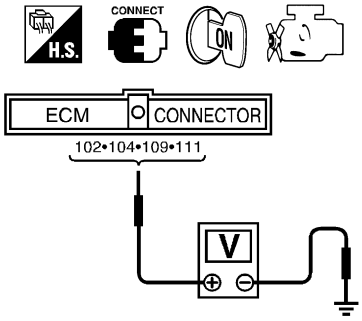
Items	Specifications
Ignition timing	15° ± 2° BTDC
Base idle speed	650 ± 50 rpm (in “N” position)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.1 mm (0.004 in): ON 0.3 mm (0.012 in): OFF
Target idle speed	700 ± 50 rpm (in “N” position)

MTBL1315

OK or NG		
OK	▶	GO TO 5.
NG	▶	Adjust ignition timing.

5	CHECK INJECTORS

1. Refer to Wiring Diagram for Injectors, EC-3370.
2. Stop engine and then turn ignition switch ON.
3. Check voltage between ECM terminals 102, 104, 109 and 111 and ground with CONSULT-II or tester.



LEC041A

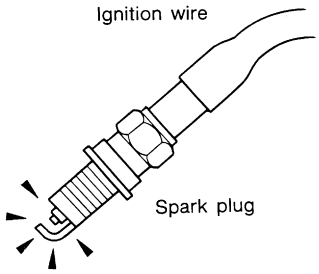
Battery voltage should exist.

OK or NG

OK	▶	GO TO 6.
NG	▶	Perform “Diagnostic Procedure” INJECTOR, EC-3371.

6	CHECK IGNITION SPARK

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.



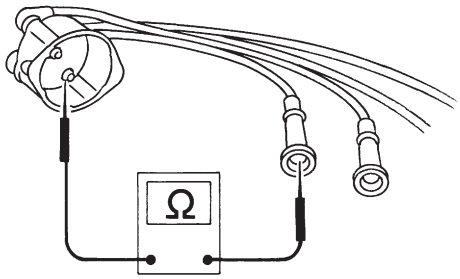
SEF282G

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	CHECK IGNITION WIRES

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.



SEF174P

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.

OK or NG

OK	▶	Check ignition coil, power transistor and their circuits. Refer to EC-3361.
NG	▶	Replace.

8	CHECK INJECTOR

1. Turn ignition switch OFF.
2. Remove injector assembly. Refer to EC-3034.
   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-3123.

Trouble is fixed.	▶	**INSPECTION END**
Trouble is not fixed.	▶	Replace three way catalyst.

Description

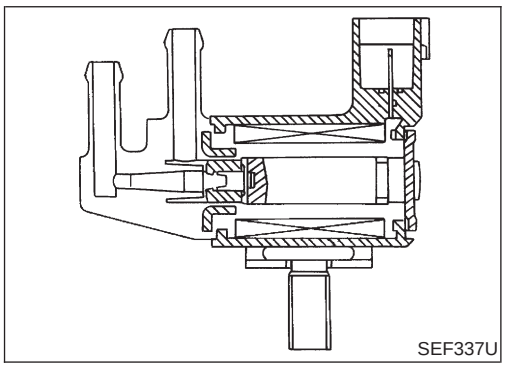
NEEC0248

SYSTEM DESCRIPTION

NEEC0248S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Throttle position switch	Closed throttle position		
Heated oxygen sensor 1	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

NEEC0248S02

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

NEEC0249

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch “OFF” ● Shift lever: “N” ● No-load	Idle (Vehicle stopped)	0%
		2,000 rpm	—

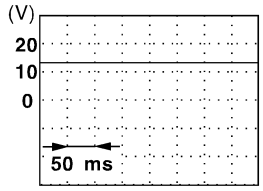
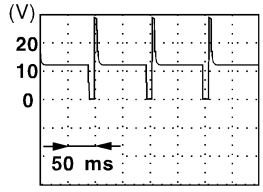
ECM Terminals and Reference Value

NEEC0250

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

CAUTION:

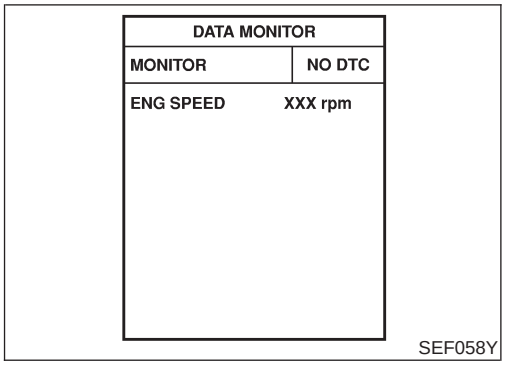
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	L/B	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)
5	W/PU	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V) 
			[Engine is running] ● Engine speed is 2,000 rpm (More than 200 seconds after starting engine)	BATTERY VOLTAGE (11 - 14V) 
67	W	Power supply for ECM	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14V)
72	W			
117	W	Current return	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NEEC0251

DTC No.	Trouble diagnosis name	DTC Detecting Condition	Possible Cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve.	● Harness or connectors (The sensor circuit is shorted.) ● EVAP canister purge volume control solenoid valve



DTC Confirmation Procedure

=NEEC0252

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Turn ignition switch ON.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and let it idle for at least 30 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3287

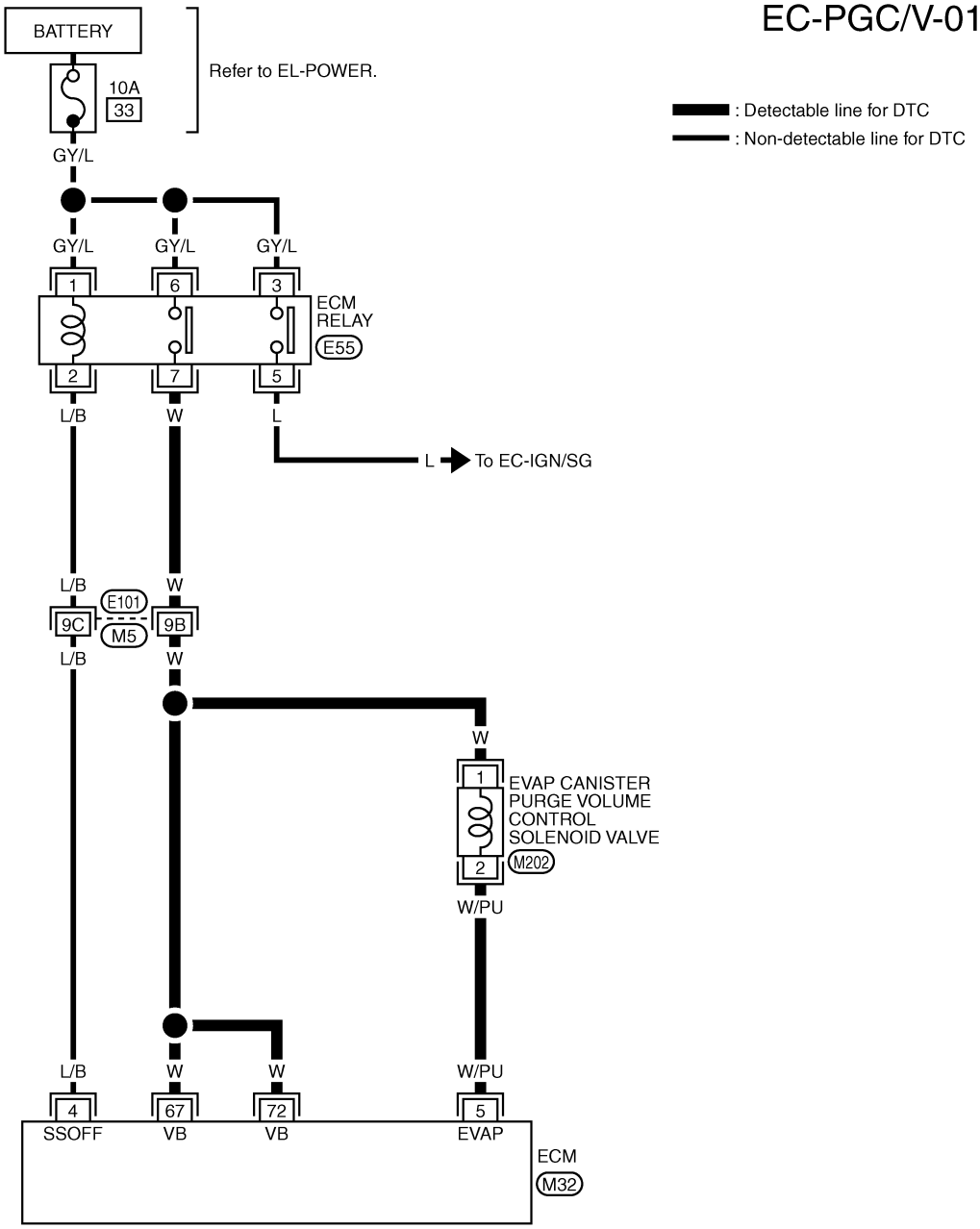
With GST

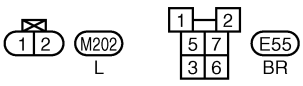
Follow the procedure “With CONSULT-II”.

Wiring Diagram

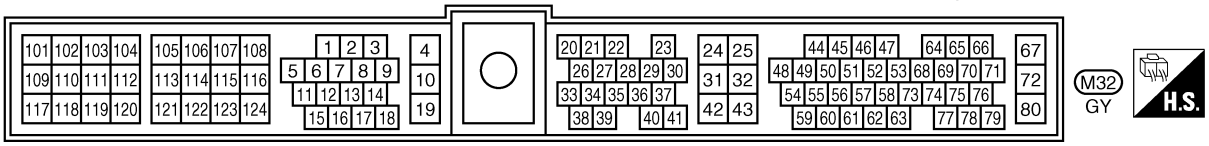
NEEC0253

EC-PGC/V-01





Refer to last page (Foldout page).
(M5), (E101)



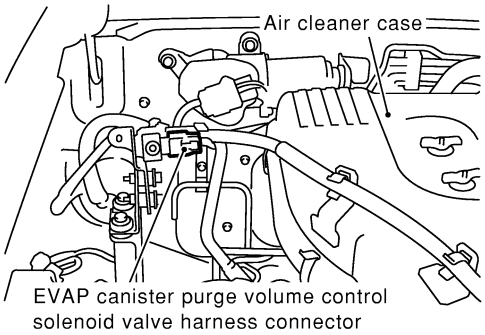
GEC249A

Diagnostic Procedure

NEEC0254

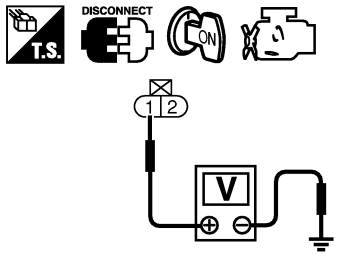
1	CHECK POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEC307D

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



SEC275D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

	▶	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 5 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 (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the harness for open or short between EVAP canister purge volume control solenoid valve and ECM.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN
THRTL POS SEN	XXX V

SEF801Y

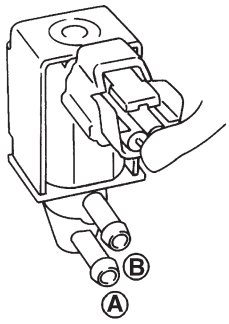
OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

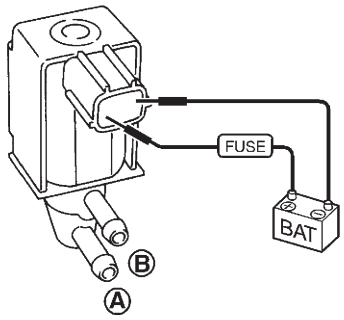


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



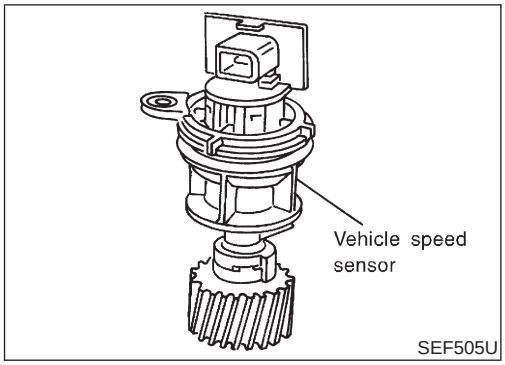
Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

SEF335X

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

7	CHECK INTERMITTENT INCIDENT
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



Component Description

NEEC0272

The vehicle speed sensor is installed in the transmission. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

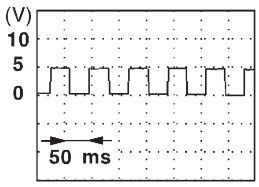
ECM Terminals and Reference Value

NEEC0273

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)
29	W/L	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● In 2nd gear position ● Vehicle speed is 40 km/h (25 MPH)	1 - 4V  SEF003W

On Board Diagnosis Logic

NEEC0274

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

NEEC0275

CAUTION:

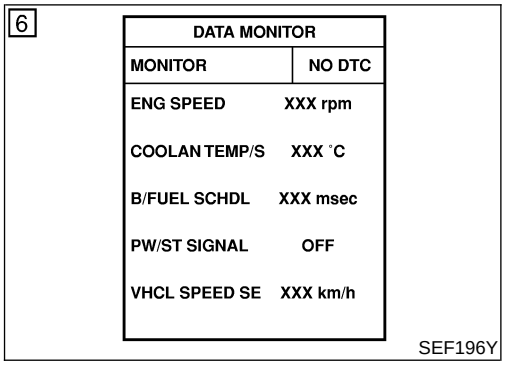
Always drive vehicle at a safe speed.

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch OFF and wait at least 5 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.

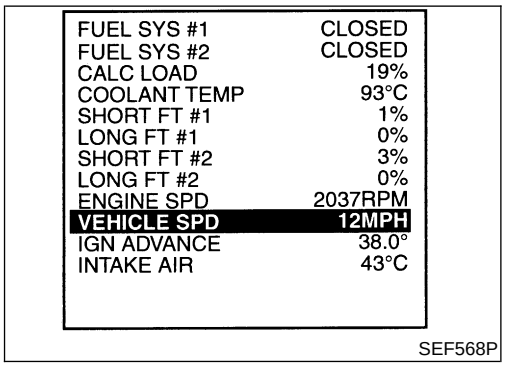


With CONSULT-II

1) Start engine
2) Read vehicle speed sensor signal 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-3294.
   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 1 minute.

ENG SPEED	1,800 - 6,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	7 - 15 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF

7) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3294.



Overall Function Check

NEEC0276

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a 1st trip DTC might not be confirmed.

With GST

1) Lift up drive wheels.
2) Start engine.
3) Read vehicle speed 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-3294.

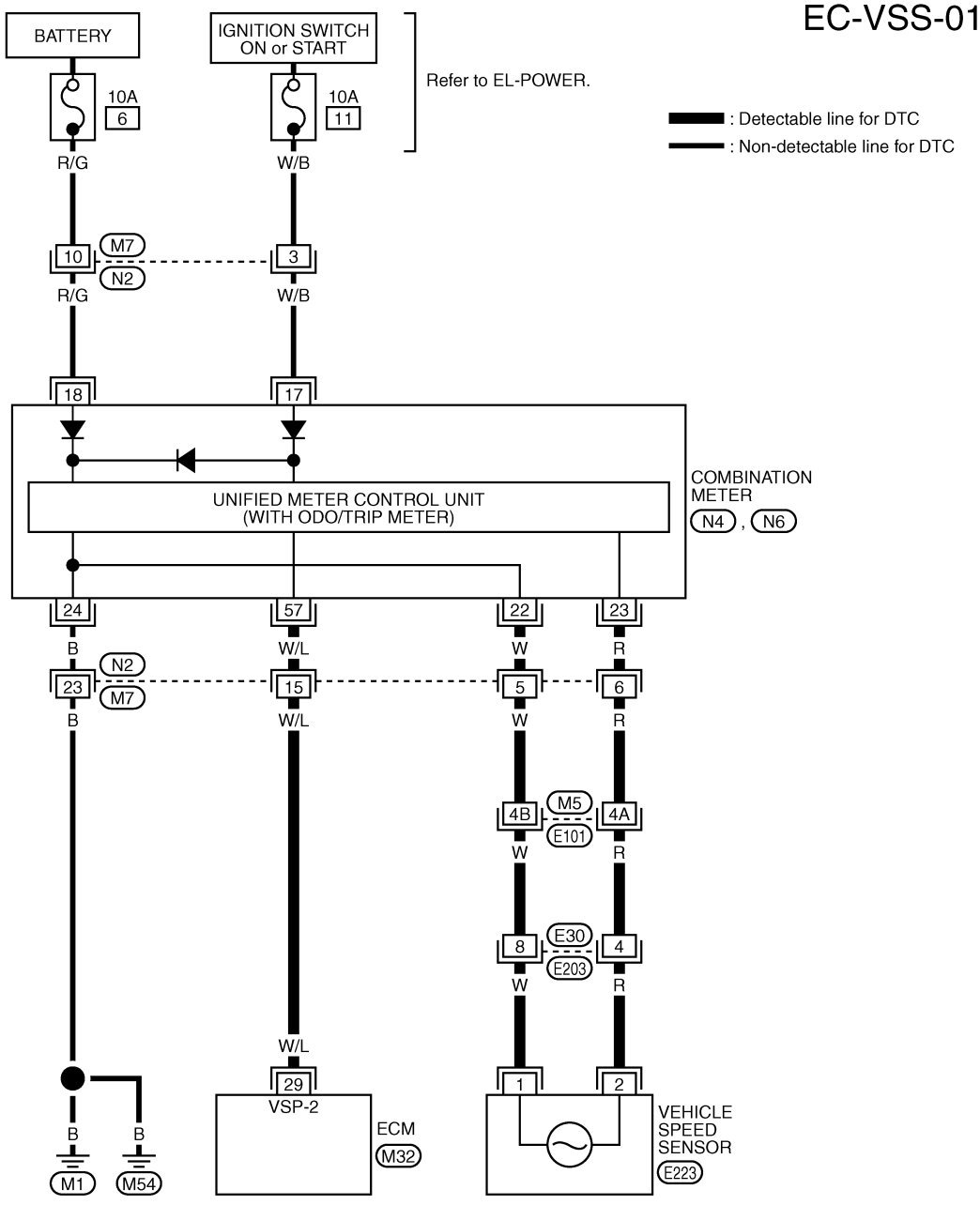
Wiring Diagram

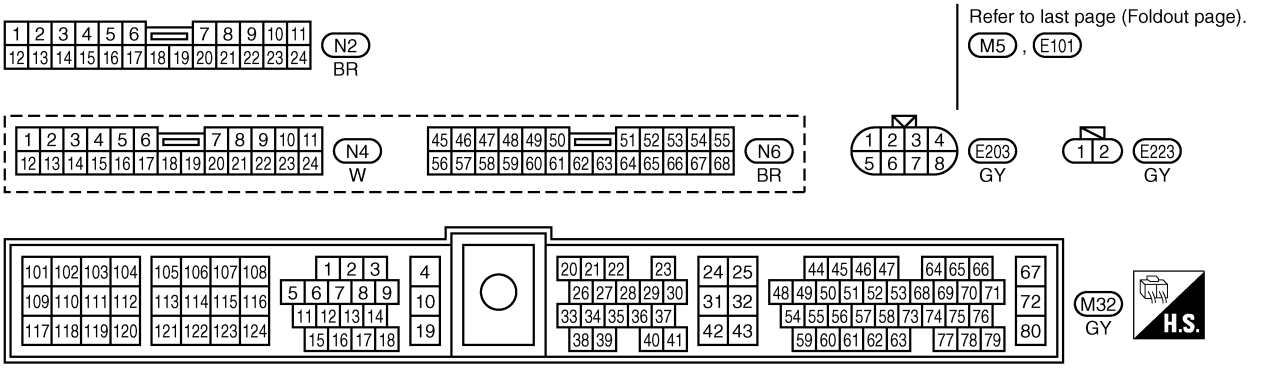
NEEC0277

WITH TACHOMETER

NEEC0277S01

EC-VSS-01





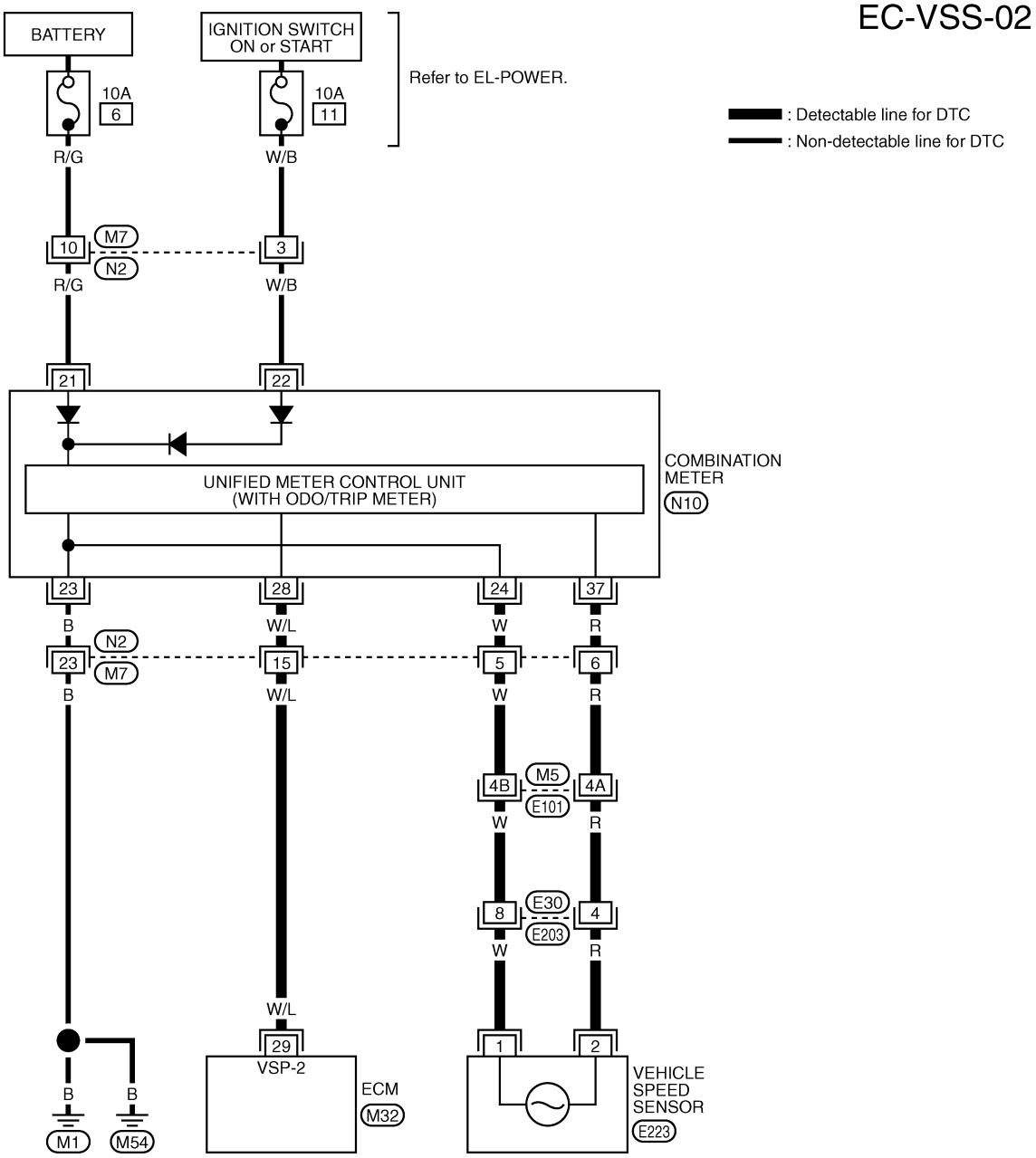
GEC250A

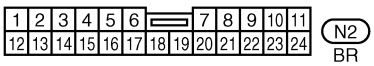
Wiring Diagram

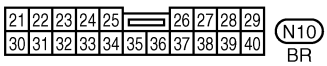
WITHOUT TACHOMETER

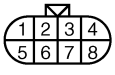
NEEC0277S02

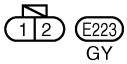
EC-VSS-02



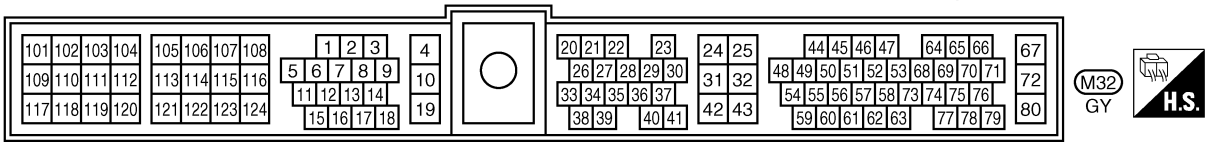








Refer to last page (Foldout page).
M5 , E101



GEC251A

Diagnostic Procedure

WITH TACHOMETER

NEEC1054

NEEC1054S01

1	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector and combination meter harness connector.

		Harness connector	Terminal
Combination meter harness connector	With tachometer	N16	57
	Without tachometer	N10	28

MTBL1308

3. Check harness continuity between ECM terminal 29 and meter terminal 57 (With tachometer), 28 (Without tachometer). 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 N2, M7
- 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	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors N2, M7
- Harness connectors M5, E101
- Harness connectors E30, E203
- Harness for open or short between combination meter and vehicle speed sensor

	▶	Repair harness or connectors. Check vehicle speed sensor and its circuit. Refer to EL section.

5	CHECK INTERMITTENT INCIDENT

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.

	▶	**INSPECTION END**

Description

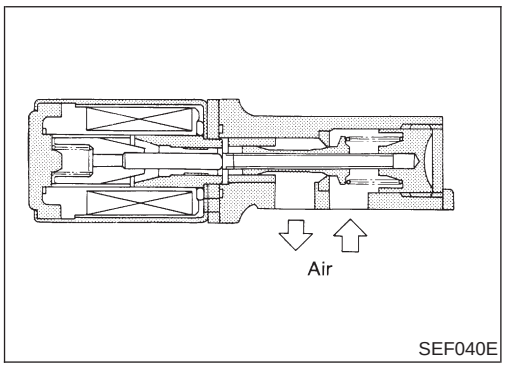
NEEC1594

SYSTEM DESCRIPTION

NEEC1594S01

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		
PNP switch	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		

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which bypasses the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time 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 and cooling fan operation).



SEF040E

COMPONENT DESCRIPTION

NEEC1594S02

The IAC valve-AAC valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of air that will flow through the valve. The more air that flows through the valve, the higher the idle speed.

CONSULT-II Reference Value in Data Monitor Mode

NEEC1595

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” ● No-load	Idle	Approx. 30%
		2,000 rpm	—

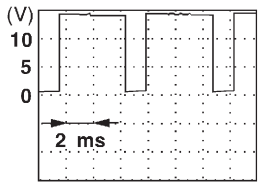
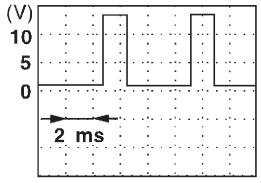
ECM Terminals and Reference Value

=NEEC1596

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	G/Y	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	10.5 - 11.5V  SEF015W
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	1 - 13V  SEF016W

On Board Diagnosis Logic

NEEC1597

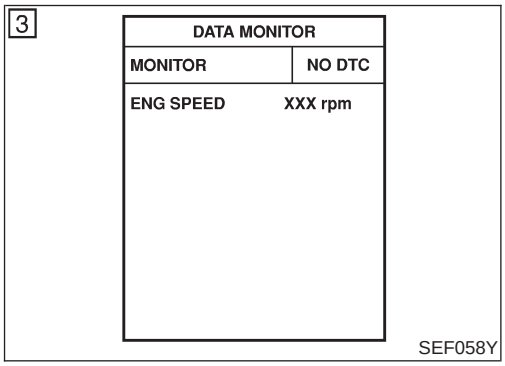
DTC No.		Malfunction is detected when ...	Check Items (Possible Cause)
P0505 0505	A)	The IACV-AAC valve does not operate properly.	● Harness or connectors (The IACV-AAC valve circuit is open.) ● IACV-AAC valve
	B)	The IACV-AAC valve does not operate properly.	● Harness or connectors (The IACV-AAC valve circuit is shorted.) ● IACV-AAC valve

DTC Confirmation Procedure

=NEEC1598

NOTE:

- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.
- **Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "Procedure for malfunction B".**



PROCEDURE FOR MALFUNCTION A

NEEC1598S01

TESTING CONDITION:

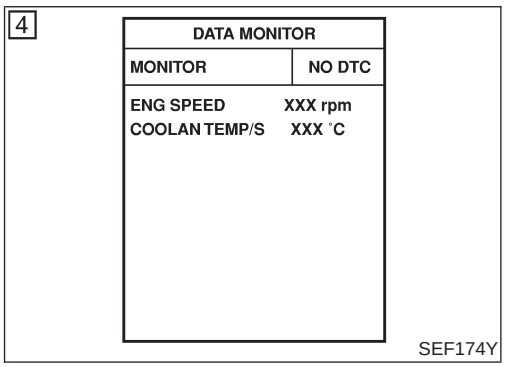
Before performing the following procedure, confirm battery voltage is more than 10.5V with ignition switch ON.

With CONSULT-II

1) Turn ignition switch ON.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it at idle at least 2 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-3299.

With GST

Follow the procedure "With CONSULT-II".



PROCEDURE FOR MALFUNCTION B

NEEC1598S02

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch OFF and wait at least 5 seconds.
3) Turn ignition switch ON again and select "DATA MONITOR" mode with CONSULT-II.
4) Start engine and run it for at least 6 minute at idle speed.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-3299.

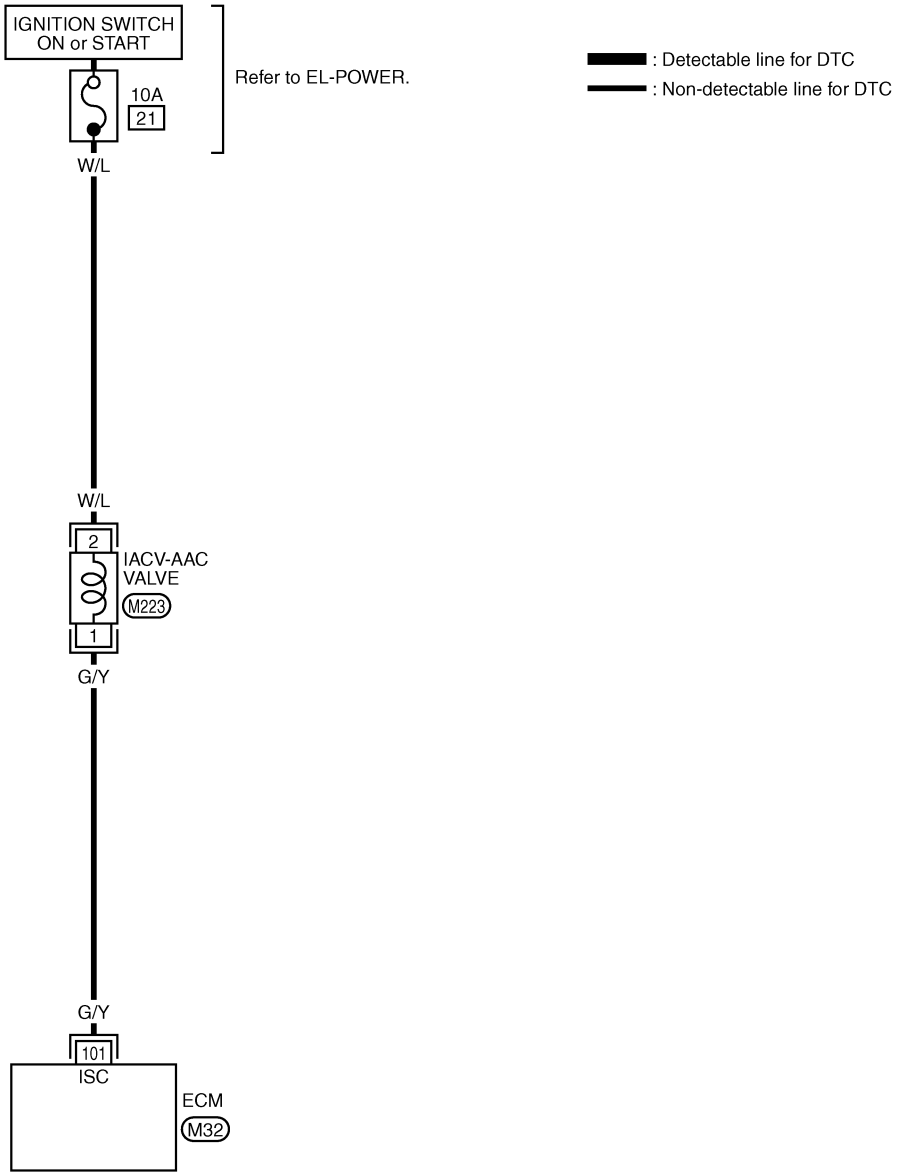
With GST

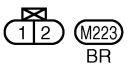
Follow the procedure "With CONSULT-II".

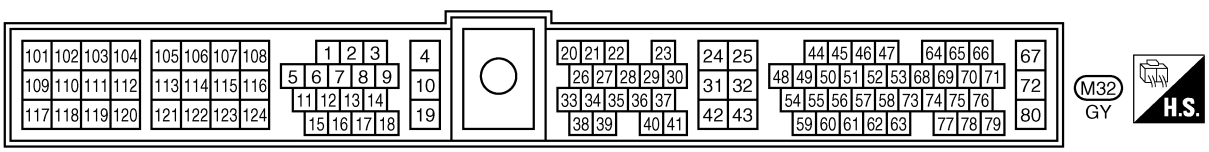
Wiring Diagram

NEEC1599

EC-AAC/V-01







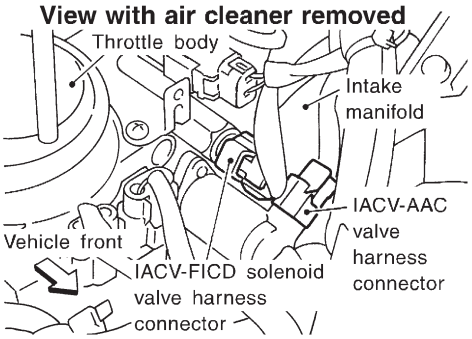
GEC252A

Diagnostic Procedure

NEEC1600

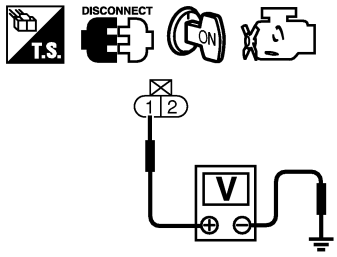
1	CHECK POWER SUPPLY

1. Stop engine.
2. Disconnect IACV-AAC valve harness connector.



SEF342V

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



SEC271D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness for open or short between IACV-AAC valve and 10A fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

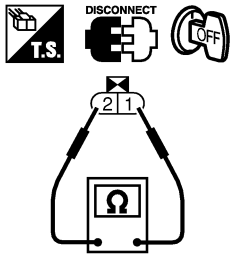
1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 101 and terminal 1. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

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 IACV-AAC VALVE

Disconnect IACV-AAC valve harness connector.
- Check IACV-AAC valve resistance.



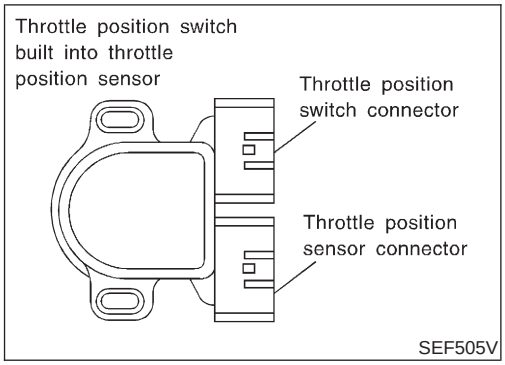
SEC284D

Resistance: Approximately 10 Ω [at 25°C (77°F)]
- Check plunger for seizing or sticking.
- Check for broken spring.

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace IACV-AAC valve.

5	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



Component Description

NEEC0287

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit.
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.

ECM Terminals and Reference Value

NEEC0288

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)
28	LG/B	Throttle position switch (Closed position)	**[Ignition switch ON]** ● **Warm-up condition** ● Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch ON] ● Accelerator pedal depressed	Approximately 0V

On Board Diagnosis Logic

NEEC0289

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

4

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
CLSD THL/P SW	ON

SEF197Y

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

SEF198Y

DTC Confirmation Procedure

=NEEC0290

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 5 seconds before conducting the next test.

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Select "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT-II and check the value under the following conditions.

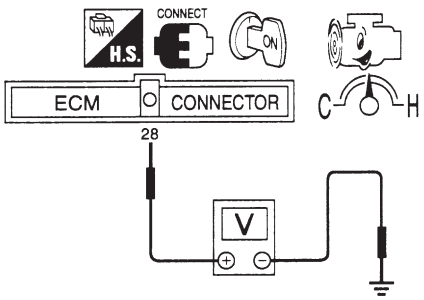
Condition	Signal indication
Throttle valve: Idle position	ON
Throttle valve: Slightly open	OFF

If the result is NG, go to "Diagnostic Procedure", EC-3304.
If OK, go to following step.

3) Select "DATA MONITOR" mode with CONSULT-II.
4) Drive the vehicle for at least 5 consecutive seconds under the following condition.

THRTL POS SEN	More than 2.5V
VHCL SPEED SE	More than 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.

5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-3304.



SEF422Q

Overall Function Check

NEEC0291

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 28 (Closed throttle position switch signal) and ground under the following conditions.

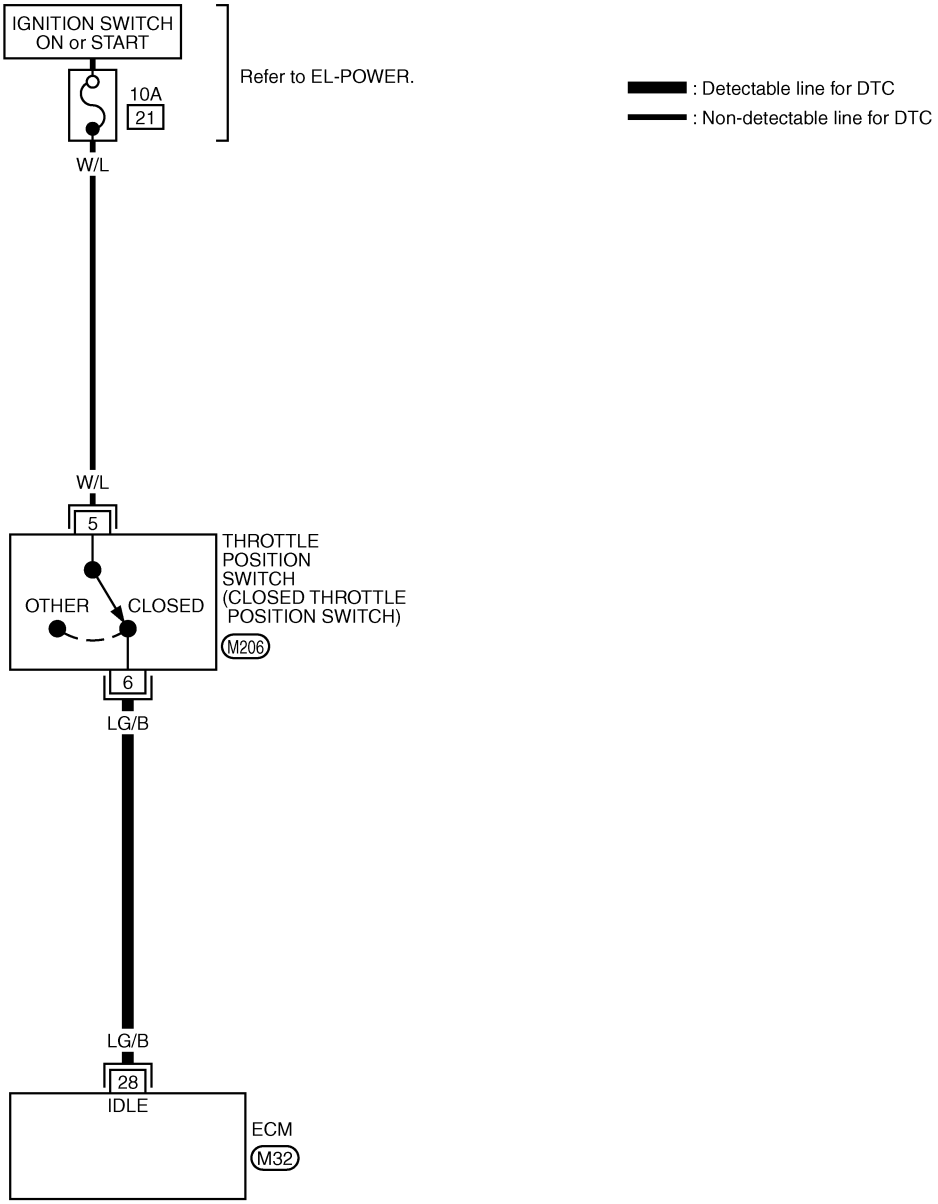
Condition	Voltage
At idle	Battery voltage
At 2,000 rpm	Approximately 0 - 1V

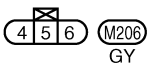
3) If NG, go to "Diagnostic Procedure", EC-3304.

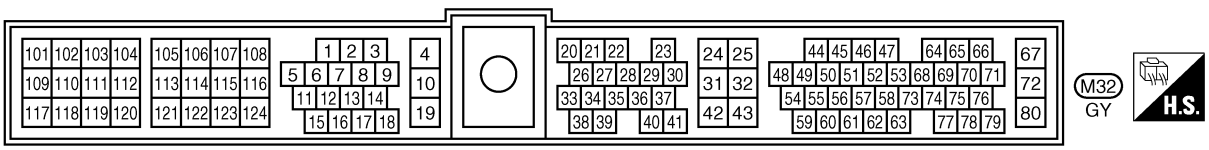
Wiring Diagram

NEEC0292

EC-TP/SW-01







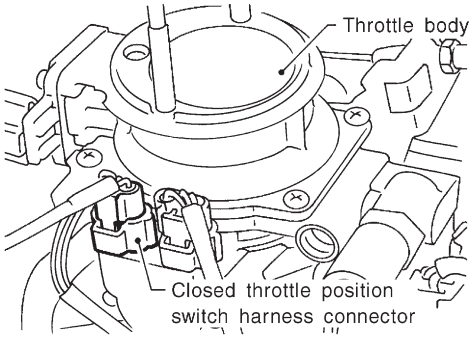
GEC244A

Diagnostic Procedure

NEEC0293

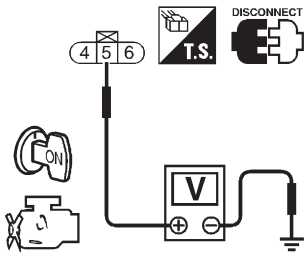
1	CHECK POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect throttle position switch harness connector.



SEF158S

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



SEF715U

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

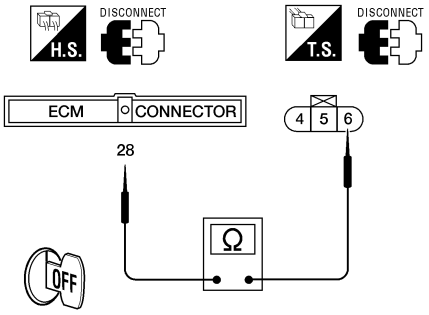
2	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness for open or short between throttle position switch and 10A 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 28 and terminal 6.



AEC571A

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	ADJUST THROTTLE POSITION SWITCH IDLE POSITION

1. Check the following items. Refer to “Basic Inspection”, EC-3086.

Items	Specifications
Ignition timing	15° ± 2° BTDC
Base idle speed	650 ± 50 rpm (in “N” position)
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.1 mm (0.004 in): ON 0.3 mm (0.012 in): OFF
Target idle speed	700 ± 50 rpm (in “N” position)

MTBL1315

	▶	GO TO 6.

6	CHECK CLOSED THROTTLE POSITION SWITCH

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.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
CLSD THL/P SW	ON

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

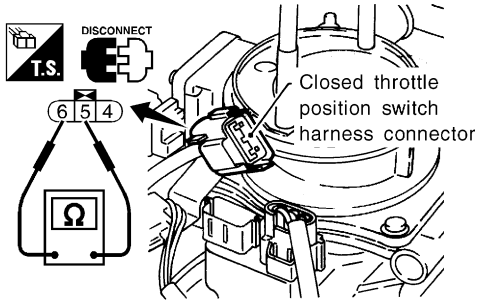
SEF721Z

NOTE:
Measurement must be made with closed throttle position switch installed in vehicle.
If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-3086.

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 5 and 6 under the following conditions.



SEF159S

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

MTBL0299

NOTE:
Continuity measurement must be made with closed throttle position switch installed in vehicle.
If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-3086.

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

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace throttle position switch.

7	CHECK THROTTLE POSITION SENSOR

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 voltage of “THRTL POS SEN” under the following conditions.

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

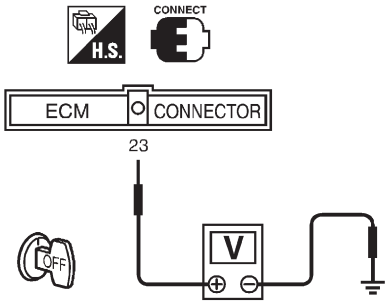
SEF198Y

NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.
If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-3086.

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

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and turn ignition switch ON.
3. Check voltage between ECM terminal 23 (Throttle position sensor signal) and ground under the following conditions.



SEF767W

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)

MTBL0329

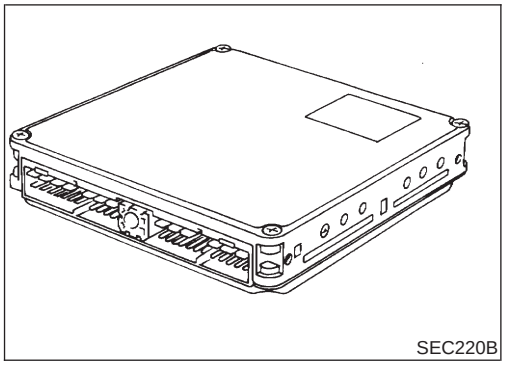
NOTE:
Voltage measurement must be made with throttle position sensor installed in vehicle.
If NG, adjust closed throttle position switch. Refer to “Basic Inspection”, EC-3086.

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

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace throttle position sensor.

8	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**


SEC220B

Component Description

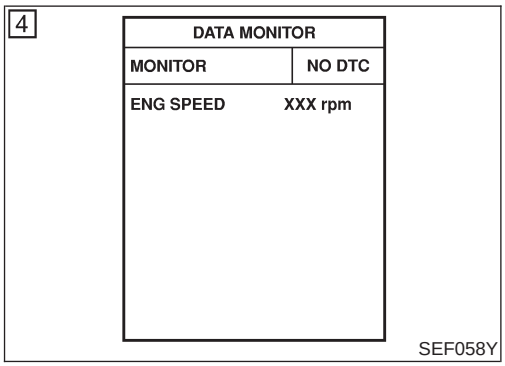
NEEC0295

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

NEEC0296

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0605 0605	● ECM calculation function is malfunctioning.	● ECM



SEF058Y

DTC Confirmation Procedure

NEEC0297

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 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 30 seconds at idle speed.
5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3309.

With GST

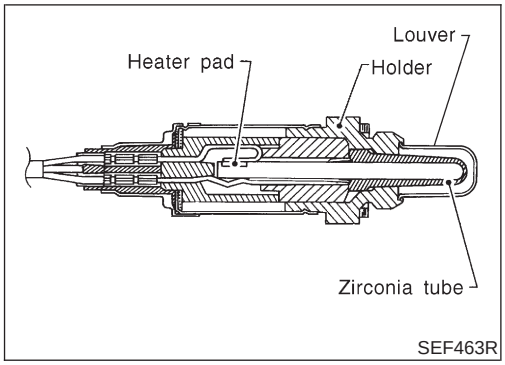
Follow the procedure “With CONSULT-II”.

Diagnostic Procedure

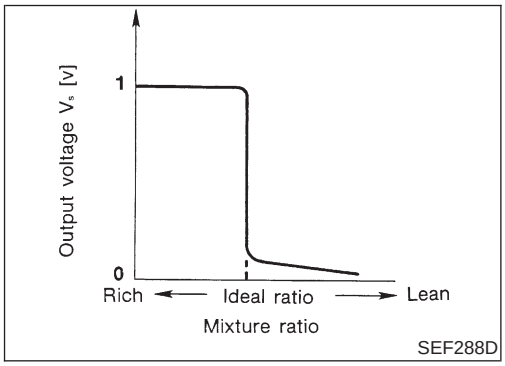
NEEC0298

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 previous page. 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 previous page. 5. Is the 1st trip DTC P0605 displayed again?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	**INSPECTION END**

2	REPLACE ECM
1. Replace ECM. 2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-3231, “NVIS (Nissan Vehicle Immobilizer System — NATS”.	
▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NEEC0103

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0104

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.

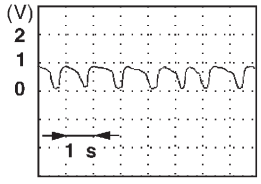
ECM Terminals and Reference Value

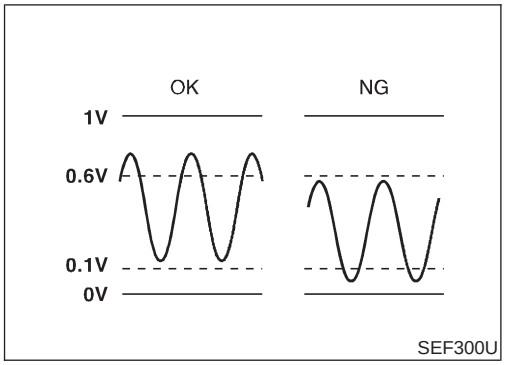
NEEC0105

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	W	Heated oxygen sensor 1	**[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

NEEC0106

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1143 1143	● The maximum and minimum voltages from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks

6

HO2S1 (B1) P1143	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V

LEC053A

6

HO2S1 (B1) P1143	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
THRTL POS SEN	XXX V

LEC054A

6

HO2S1 (B1) P1143
COMPLETED

LEC055A

DTC Confirmation Procedure

NEEC0107

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 5 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 5 seconds.
3) Turn ignition switch ON and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3.0 minutes.

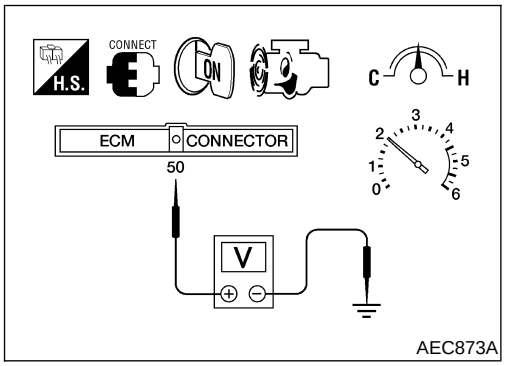
NOTE:
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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

ENG SPEED	1,200 - 3,150 rpm
Vehicle speed	Less than 100 km/h (Less than 62 MPH)
B/FUEL SCHDL	3.5 - 15 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-3312.



Overall Function Check

NEEC0108

Use this procedure to check the overall function of the heated oxygen sensor 1 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 50 (Heated oxygen sensor 1 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.

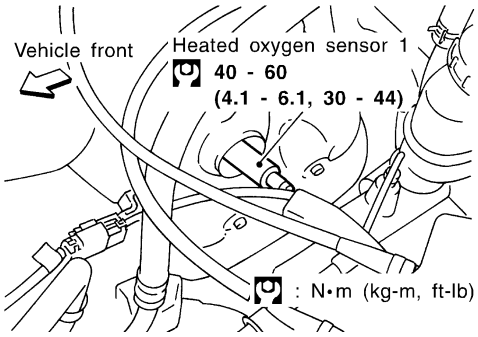
4) If NG, go to “Diagnostic Procedure”, EC-3312.

Diagnostic Procedure

NEEC0109

1	RETIGHTEN HEATED OXYGEN SENSOR 1

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



SEF332VC

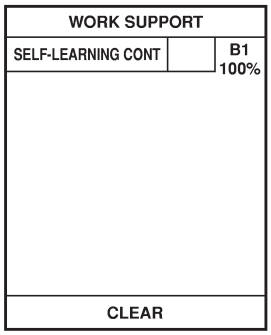
Tightening torque:
40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

▶	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-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.

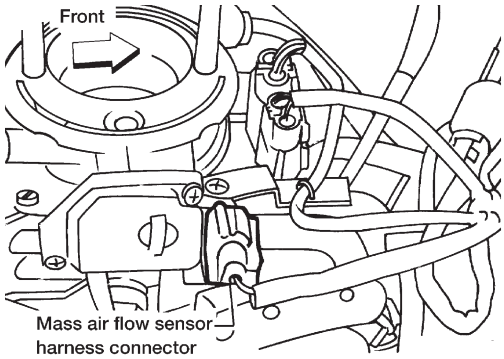


SEF215Z

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.



AEC131A

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-3060.
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-3237.
No	▶	GO TO 3.

3	CHECK HEATED OXYGEN SENSOR 1 HEATER

Check resistance between terminals 3 and 1. Refer to wiring diagram.

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

Check continuity between terminals 2 and 1, 3 and 2. Refer to wiring diagram.

Continuity should not exist.

CAUTION:

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

OK or NG

OK (With CONSULT-II)	▶	GO TO 4.
OK (Without CONSULT-II)	▶	GO TO 5.
NG	▶	Replace heated oxygen sensor 1.

4	CHECK HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Select “MANU TRIG” in “DATA MONITOR” mode, and the trigger point is adjusted to 100%.
4. Select “HO2S1 (B1)” AND “HO2S1 MNTR (B1)” in Item Selection.
5. Hold engine speed at 2,000 rpm under no load during the following steps.
6. Touch “START” on CONSULT-II screen.

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

SEF646Y

7. 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:

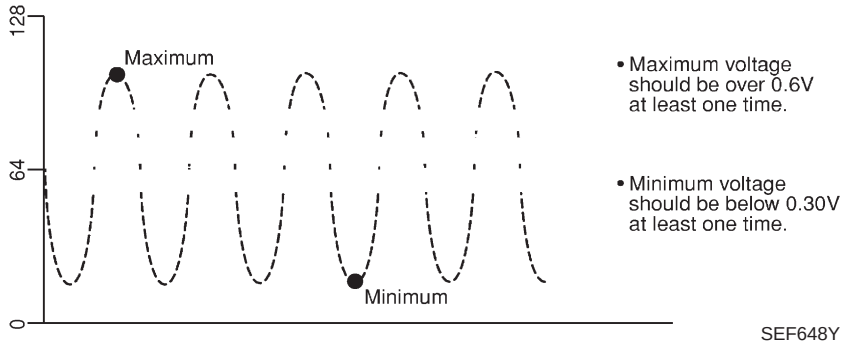
cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L				

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

SEF217YA

- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

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



SEF648Y

CAUTION:

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

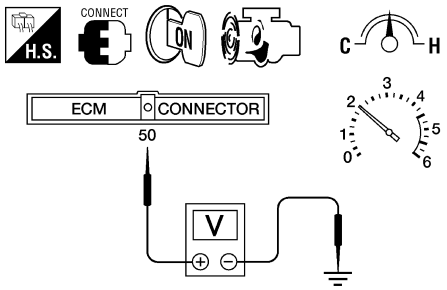
OK or NG

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

5	CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Set voltmeter probes between ECM terminal 50 (Heated oxygen sensor 1 signal) and engine ground.



AEC873A

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

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 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.

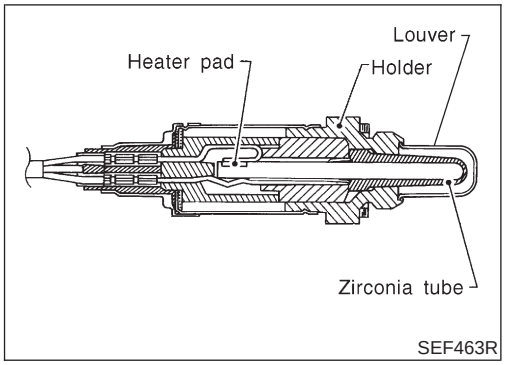
CAUTION:

- **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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

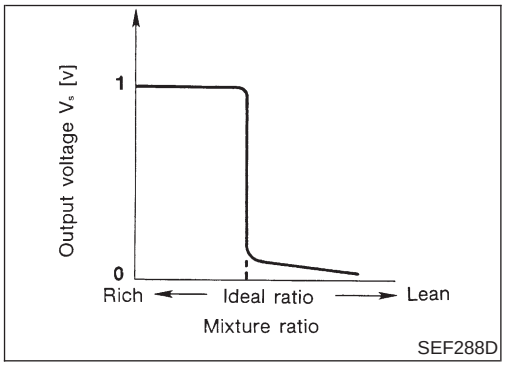
OK or NG

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

6	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123. Refer to “Wiring Diagram”, EC-3216, for circuit.	
▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NEEC0111

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0112

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.

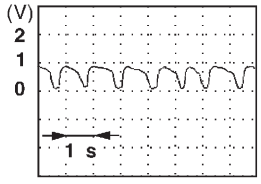
ECM Terminals and Reference Value

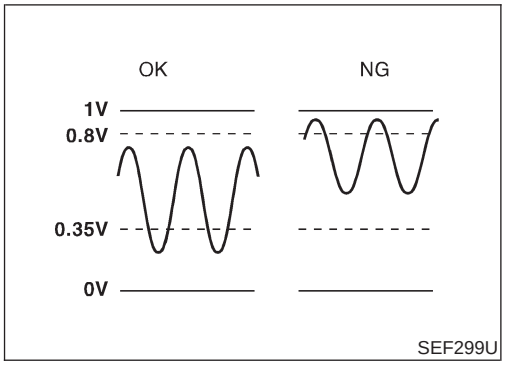
NEEC0113

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	W	Heated oxygen sensor 1	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF008W

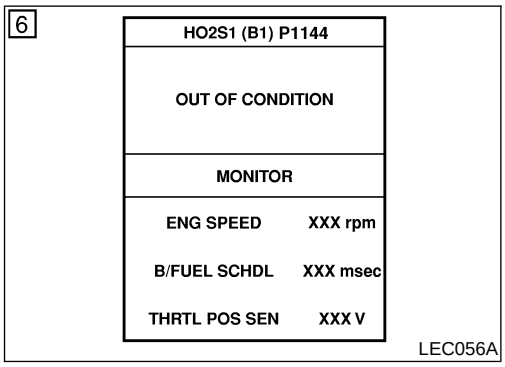


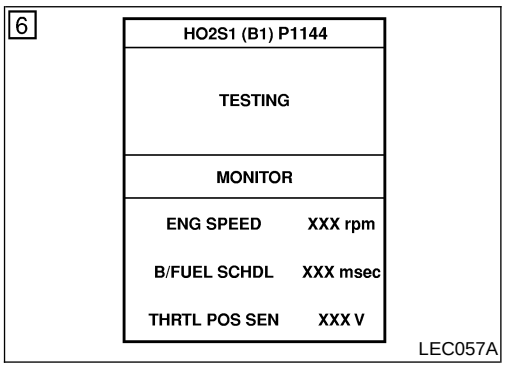
On Board Diagnosis Logic

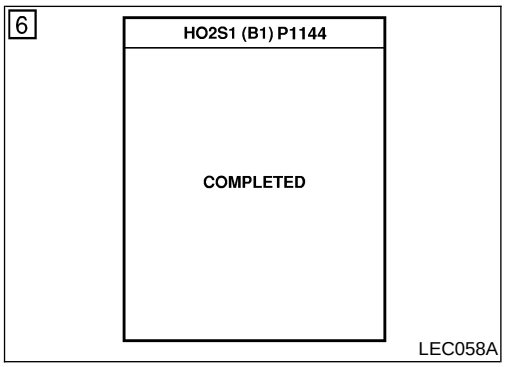
NEEC0114

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1144 1144	● The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors







DTC Confirmation Procedure

NEEC0115

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 5 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 5 seconds.
3) Turn ignition switch ON and select “HO2S1 (B1) P1144” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4) Touch “START”.
5) Start engine and let it idle for at least 3.0 minutes.

NOTE:

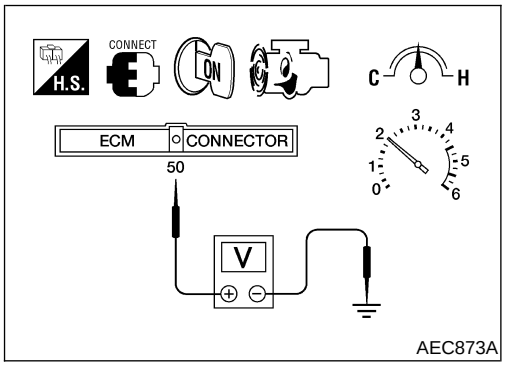
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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

ENG SPEED	1,200 - 3,150 rpm
Vehicle speed	Less than 100 km/h (Less than 62 MPH)
B/FUEL SCHDL	3.5 - 15 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-3319.



Overall Function Check

NEEC0116

Use this procedure to check the overall function of the front heated oxygen sensor 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 50 (Heated oxygen sensor 1 signal) and ECM 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.

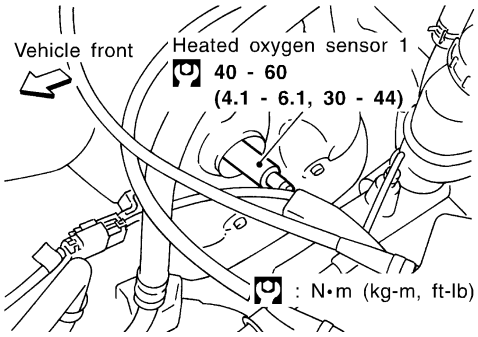
4) If NG, go to “Diagnostic Procedure”, EC-3319.

Diagnostic Procedure

NEEC0117

1	RETIGHTEN HEATED OXYGEN SENSOR 1

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



SEF332VC

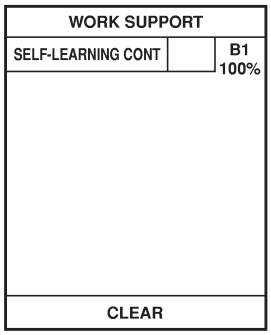
Tightening torque:
40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

▶	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-LEARNING CONT” in “ACTIVE TEST” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.

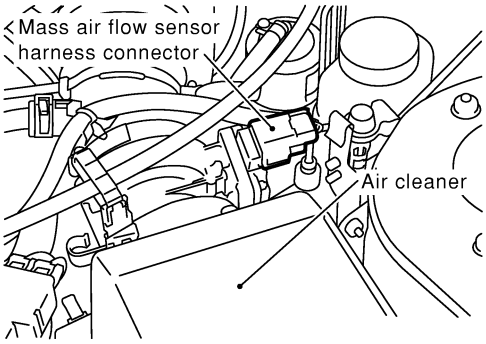


SEF215Z

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.



SEF293W

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-3060.
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 P0172. Refer to EC-3244.
No	▶	GO TO 3.

3	CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 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	
Check resistance between terminals 3 and 1. Refer to wiring diagram. **Resistance: 2.3 - 4.3 Ω at 25°C (77°F)** Check continuity between terminals 2 and 1, 3 and 2. Refer to wiring diagram. **Continuity should not exist.** **CAUTION:** ● **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.** ● **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**		
OK or NG		
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Replace heated oxygen sensor 1.

5	CHECK HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Select “MANU TRIG” in “DATA MONITOR” mode, and the trigger point is adjusted to 100%.
4. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)” in item selection.
5. Hold engine speed at 2,000 rpm under no load during the following steps.
6. Touch “RECORD” on CONSULT-II screen.

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

SEF646Y

7. 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:

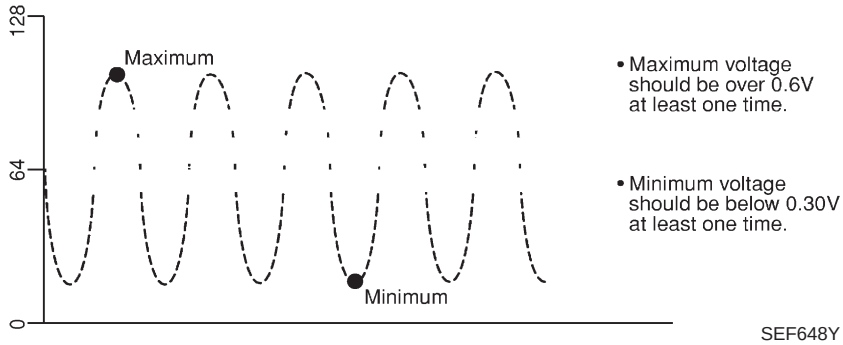
cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R	L-R-L-R-L			

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

SEF217YA

- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.

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



SEF648Y

CAUTION:

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

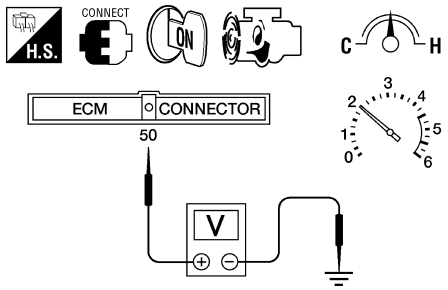
OK or NG

OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 1.

6	CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Set voltmeter probes between ECM terminal 50 (Heated oxygen sensor 1 signal) and engine ground.



AEC873A

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

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 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.

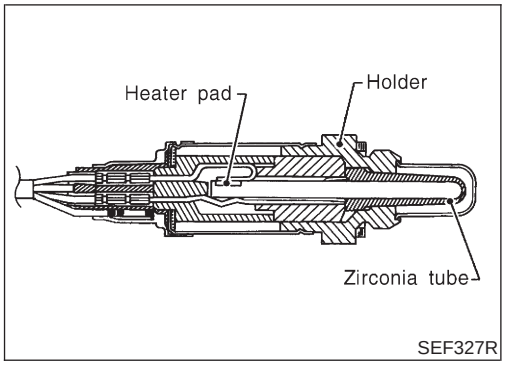
CAUTION:

- **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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace heated oxygen sensor 1.

7	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123. Refer to “Wiring Diagram”, EC-3216, for circuit.	
▶	**INSPECTION END**



Component Description

NEEC0144

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0145

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

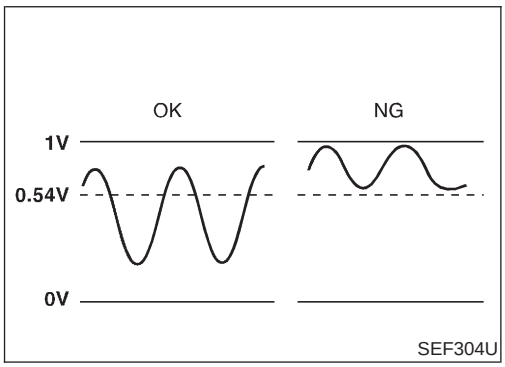
ECM Terminals and Reference Value

NEEC0146

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)
56	L/W	Heated oxygen sensor 2	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 3,000 rpm quickly	0 - Approximately 1.0V

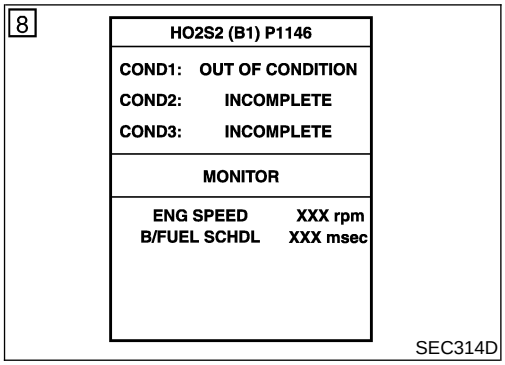


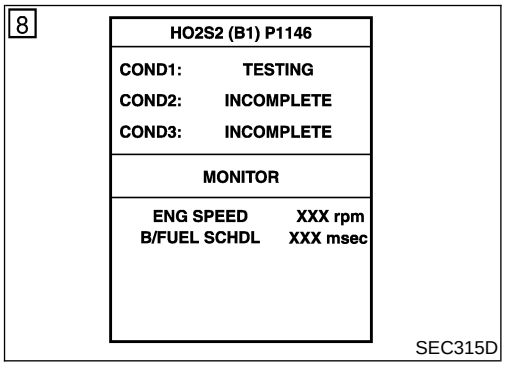
On Board Diagnosis Logic

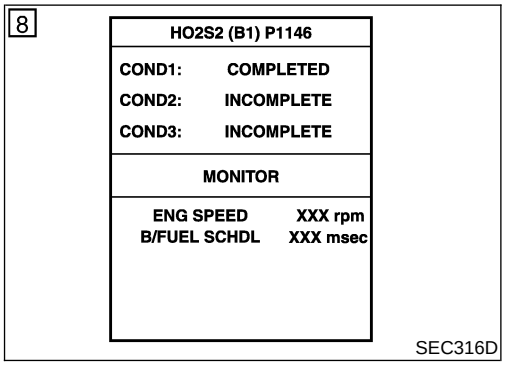
NEEC0147

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the 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)
P1146 1146	● 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 ● Fuel pressure ● Injectors







DTC Confirmation Procedure

NEEC0148

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 5 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

NEEC0148S01

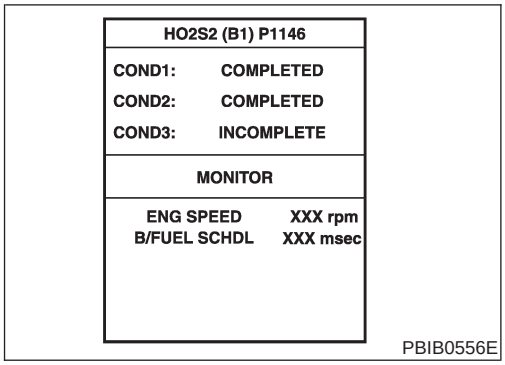
Procedure for COND1

NEEC0148S0101

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 5 seconds.
3. Turn ignition switch "ON" and select "HO2S2 (B1) P1146" 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	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector level	Suitable position

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



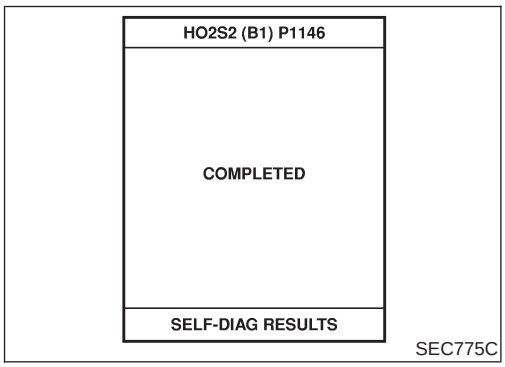
PBIB0556E

Procedure for COND2

NEEC0148S0102

1. While driving, release accelerator pedal completely from the above condition [step 8] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED”. (If 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”.

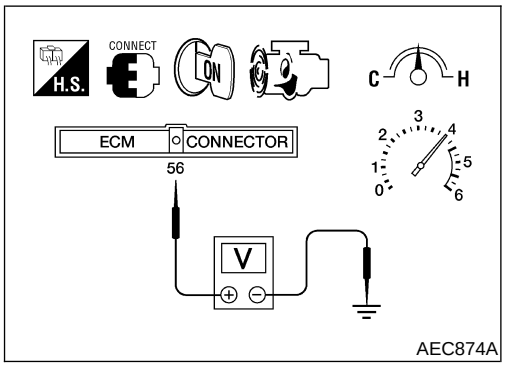


SEC775C

Procedure for COND3

NEEC0148S0103

1. Stop vehicle and let is idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-3328, “Diagnostic Procedure”.



AEC874A

Overall Function Check

NEEC0149

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

CAUTION:
Always drive vehicle at a safe speed.

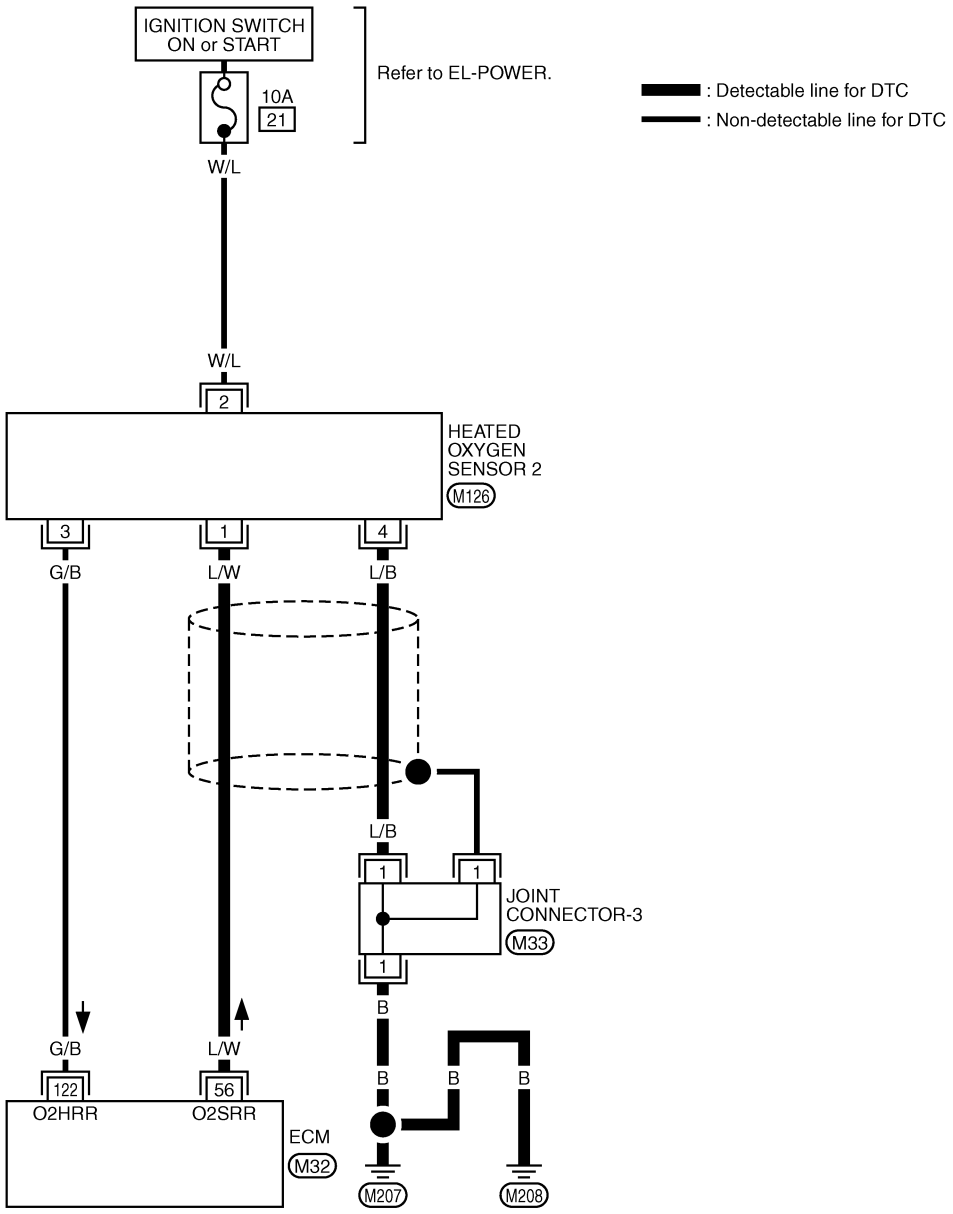
Without CONSULT-II

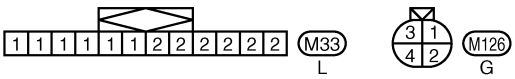
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.54V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.54V at least once during this procedure.
6) If NG, go to “Diagnostic Procedure”, EC-3328.

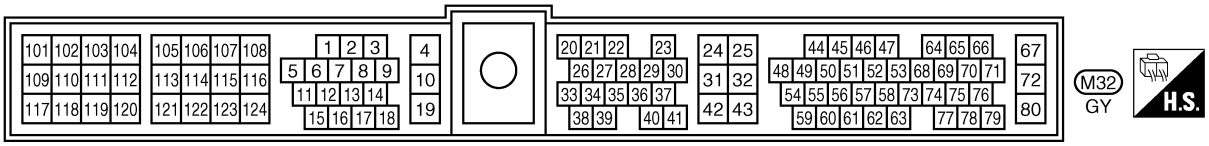
Wiring Diagram

NEEC0150

EC-O2S2B1-01







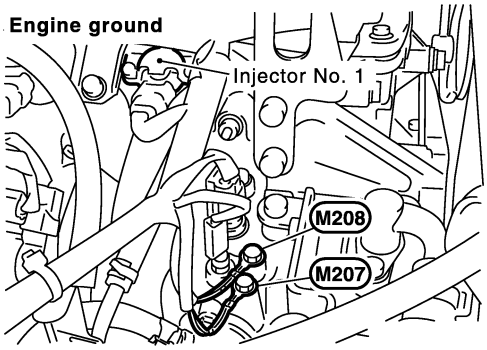
GEC246A

Diagnostic Procedure

NEEC0151

1	RETIGHTEN GROUND SCREWS

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



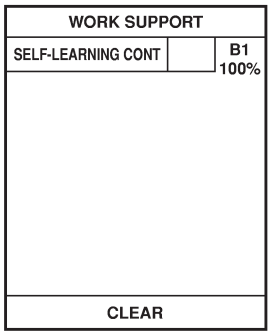
SEC309D

▶	GO TO 2.

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.

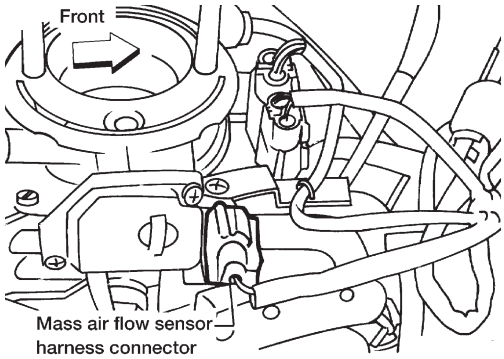


SEF215Z

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.



AEC131A

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-3060.
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-3244.
No	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal 56 and terminal 1. Refer to wiring diagram.
   Continuity should exist.
4. Check harness continuity between ECM terminal 56 (or terminal 1) and ground. Refer to wiring diagram.
   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 following. ● Harness for open or short between heated oxygen sensor 2 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 terminal 4 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to power. **OK or NG**	
OK (With CONSULT-II) ▶	GO TO 7.
OK (Without CONSULT-II) ▶	GO TO 8.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-3 ● Harness for open or short between heated oxygen sensor 2 and engine ground	
▶	Repair open circuit or short to power in harness or connectors.

7	CHECK HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Reconnect all harness connectors disconnected.
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. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.
5. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.

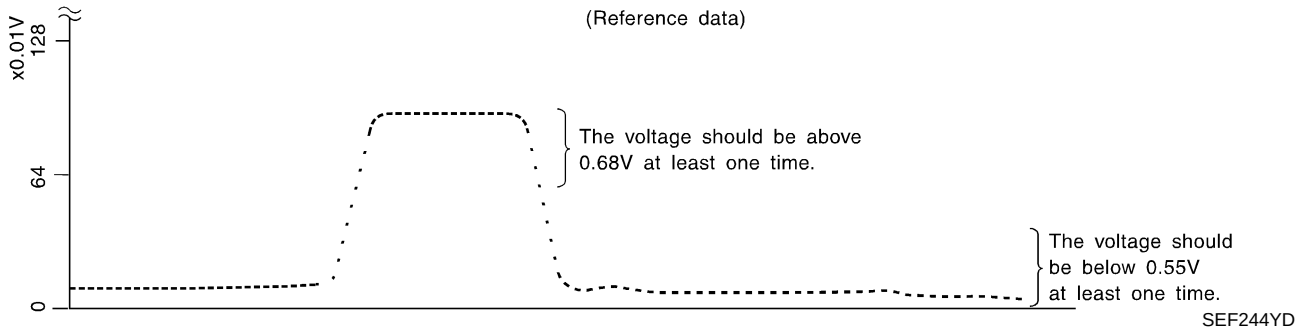
ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

“HO2S2 (B1)” should be above 0.56V at least once when the “FUEL INJECTION” is +25%. “HO2S2 (B1)” should be below 0.54V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



SEF244YD

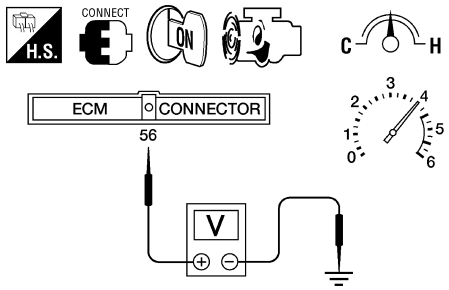
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 2.

8	CHECK HEATED OXYGEN SENSOR 2

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
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. Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.



AEC874A

5. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.56V at least once.
   If the voltage is above 0.56V at step 4, step 5 is not necessary.
6. Check the voltage when revving up to 5,000 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 (M/T), “D” position with “OD” OFF (A/T).
   The voltage should be below 0.54V 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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 2.

9	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect joint connector-3.
3. Check harness continuity between joint connector-3 terminal 1 and 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 11.
NG	▶	GO TO 10.

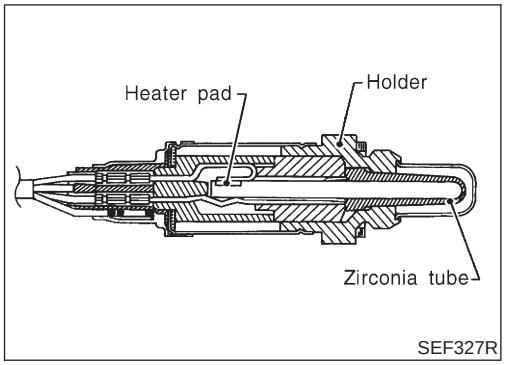
10	DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3 (Refer to “HARNESS LAYOUT”, EL section.)
- Harness for open or short between joint connector-3 and engine ground

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

11	**CHECK INTERMITTENT INCIDENT**
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



Component Description

NEEC0153

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

CONSULT-II Reference Value in Data Monitor Mode

NEEC0154

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

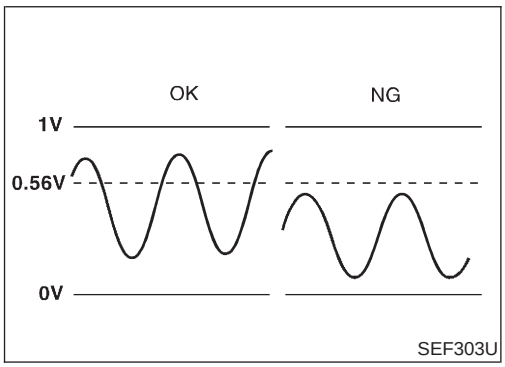
ECM Terminals and Reference Value

NEEC0155

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)
56	L/W	Heated oxygen sensor 2	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 3,000 rpm quickly	0 - Approximately 1.0V

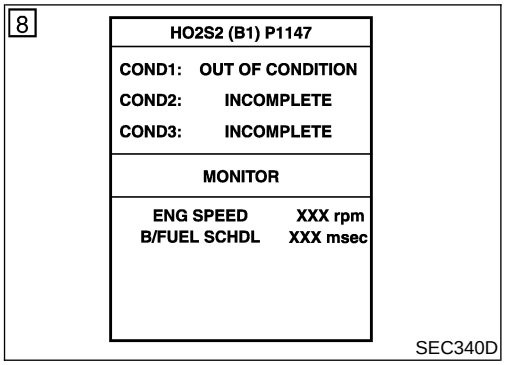


On Board Diagnosis Logic

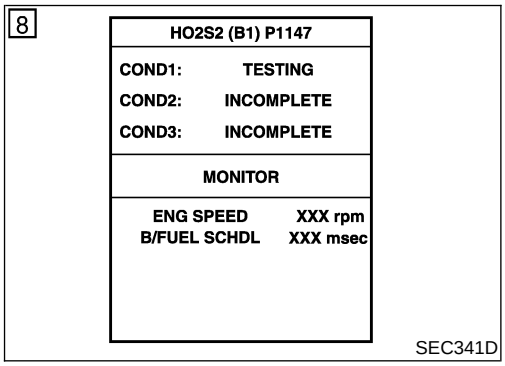
NEEC0156

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

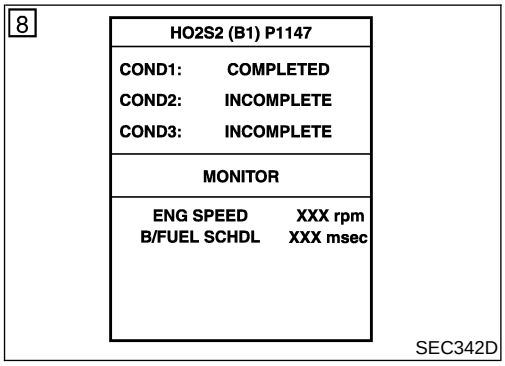
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1147 1147	● The maximum voltage from the sensor does not reach the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks



SEC340D



SEC341D



SEC342D

DTC Confirmation Procedure

NEEC0157

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 5 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

NEEC0157S01

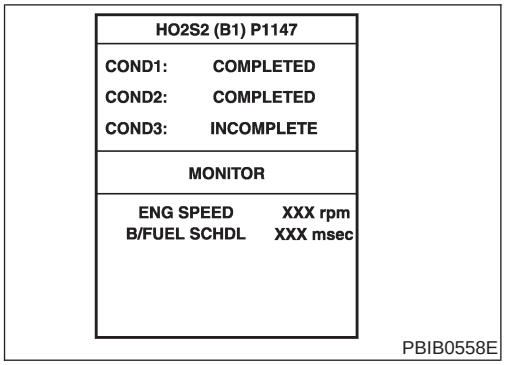
Procedure for COND1

NEEC0157S0101

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 5 seconds.
3. Turn ignition switch "ON" and select "HO2S2 (B1) P1147" 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	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector level	Suitable position

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

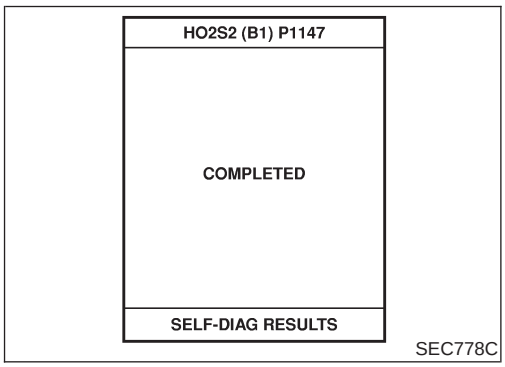


Procedure for COND2

NEEC0157S0102

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

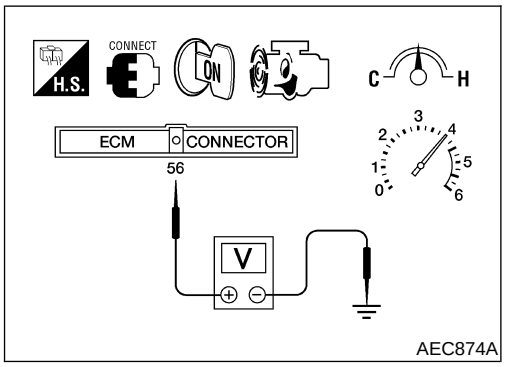
NOTE:
If “COMPLETED” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

NEEC0157S0103

1. Stop vehicle and let is idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-3338, “Diagnostic Procedure”.



Overall Function Check

NEEC0158

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.

CAUTION:
Always drive vehicle at a safe speed.

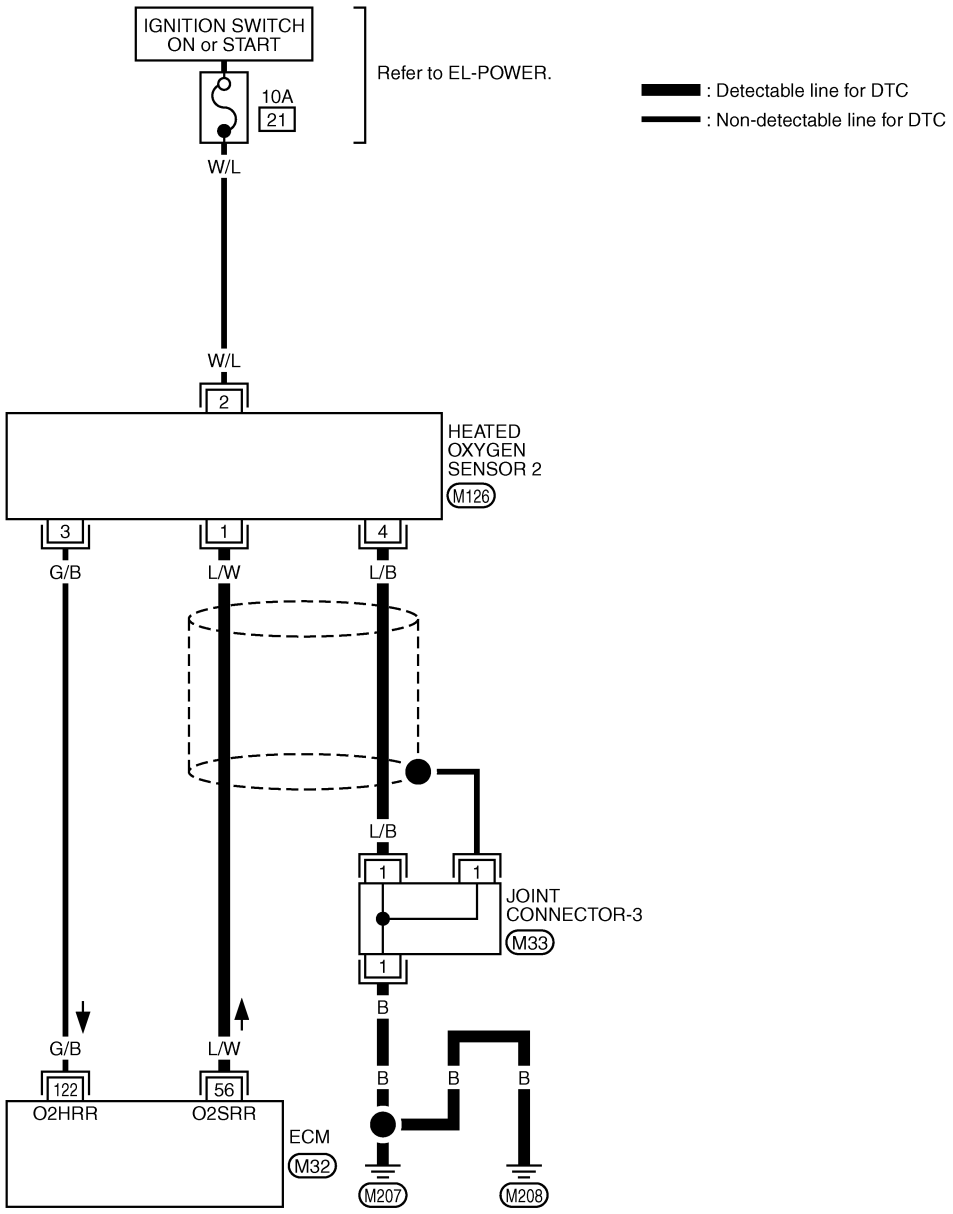
Without CONSULT-II

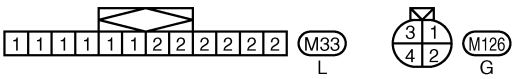
1) Start engine and drive vehicle at a speed of 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.56V 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 above 0.56V at least once during this procedure.
6) If NG, go to “Diagnostic Procedure”, EC-3338.

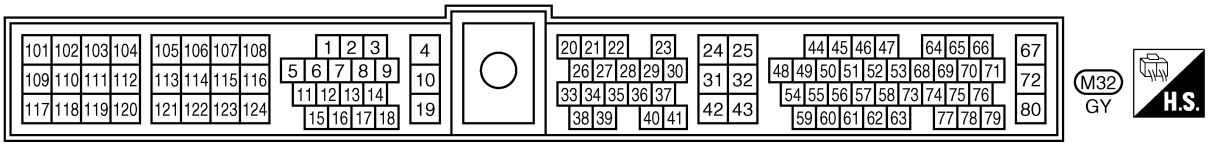
Wiring Diagram

NEEC0159

EC-O2S2B1-01







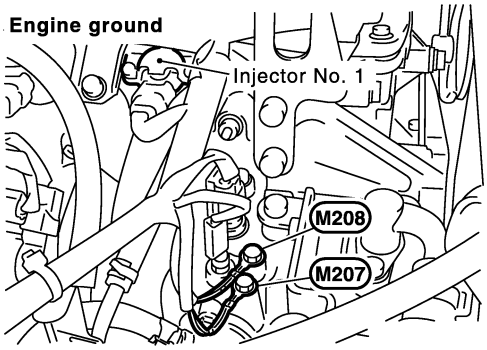
GEC246A

Diagnostic Procedure

NEEC0160

1	RETIGHTEN GROUND SCREWS

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



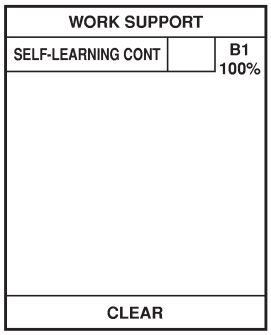
SEC309D

▶	GO TO 2.

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.

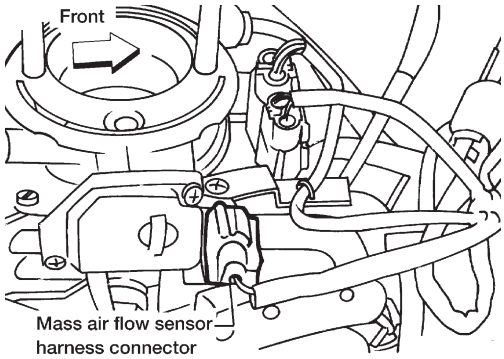


SEF215Z

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.



AEC131A

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-3060.
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-3237.
No	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 2 harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal 56 and terminal 1. Refer to wiring diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 56 (or terminal 1) and ground. Refer to wiring diagram.
   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 following. ● Harness for open or short between ECM and heated oxygen sensor 2	
▶	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 terminal 4 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to power. **OK or NG**	
OK (With CONSULT-II) ▶	GO TO 7.
OK (Without CONSULT-II) ▶	GO TO 8.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Joint connector-3 ● Harness for open or short between heated oxygen sensor 2 and engine ground	
▶	Repair open circuit or short to power in harness or connectors.

7	CHECK HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Reconnect all harness connectors disconnected.
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. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.
5. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.

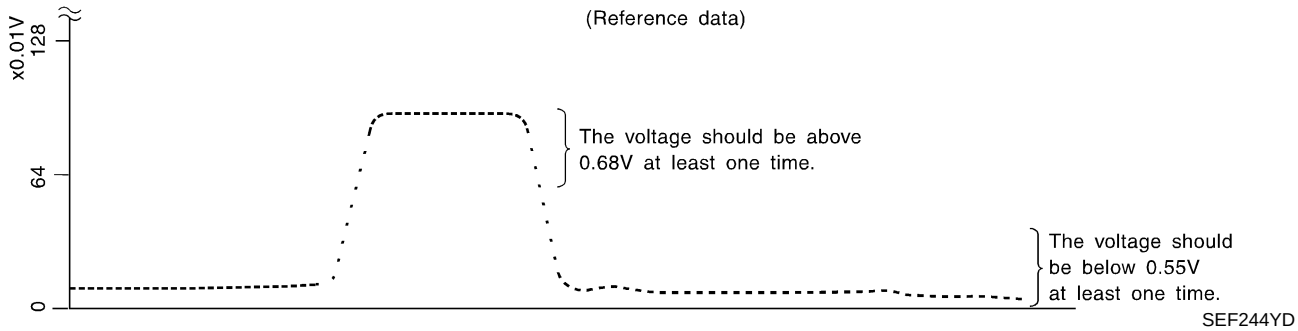
ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

“HO2S2 (B1)” should be above 0.56V at least once when the “FUEL INJECTION” is +25%. “HO2S2 (B1)” should be below 0.54V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

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



SEF244YD

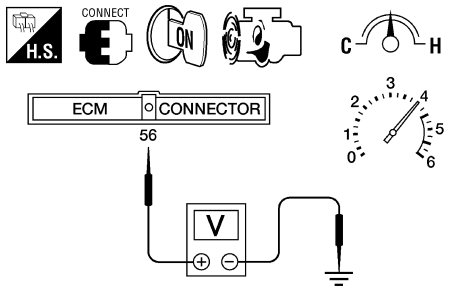
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 2.

8	CHECK HEATED OXYGEN SENSOR 2

Without CONSULT-II

1. Reconnect all harness connectors disconnected.
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. Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.



AEC874A

5. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.56V at least once.
   If the voltage is above 0.56V at step 4, step 5 is not necessary.
6. Check the voltage when revving up to 5,000 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 (M/T), “D” position with “O/D” OFF (A/T).
   The voltage should be below 0.54V 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 J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace heated oxygen sensor 2.

9	CHECK SHIELD CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect joint connector-3.
3. Check harness continuity between joint connector-3 terminal 1 and 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 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3 (Refer to “HARNESS LAYOUT”, EL section.)
- Harness for open or short between joint connector-3 and engine ground

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

11	**CHECK INTERMITTENT INCIDENT**
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NEEC1534

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.

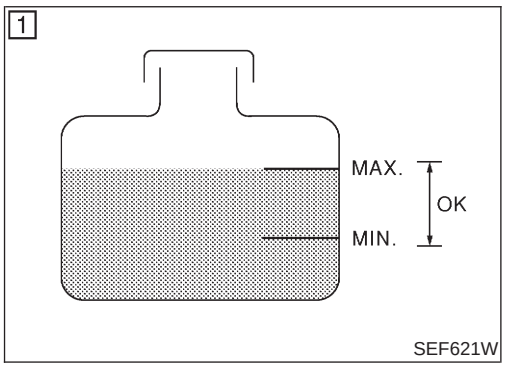
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1217 1217	● Engine coolant temperature reaches an abnormally high temperature.	● Cooling fan (crankshaft driven) Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat ● Engine coolant temperature sensor For more information, refer to “MAIN 11 CAUSES OF OVERHEATING”, EC-3348.

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to MA section, “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 section, “Anti-freeze Coolant Mixture Ratio”.

2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.



Overall Function Check

NEEC1535

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

1) 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-3345.

2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-3345.

Diagnostic Procedure

NEEC1536

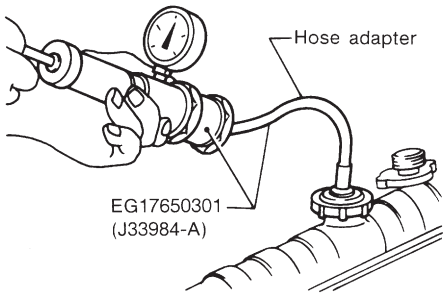
1	CHECK COOLING SYSTEM FOR LEAK

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

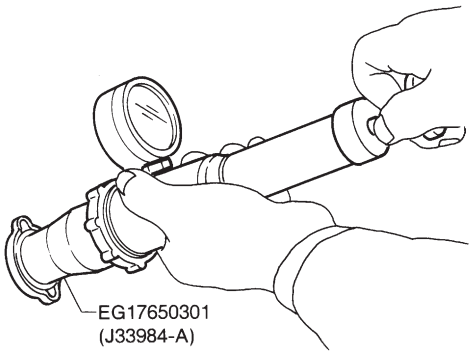
Pressure should not drop.

OK or NG

OK	▶	GO TO 2.
NG	▶	**Check the following for leak.** ● Hose ● Radiator ● Water pump Refer to LC section, “Water Pump”.

2	CHECK RADIATOR CAP

Apply pressure to cap with a tester.



SLC755A

Radiator cap relief pressure:

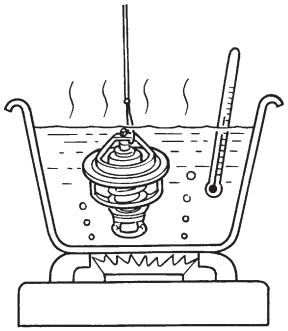
78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

OK or NG

OK	▶	GO TO 3.
NG	▶	Replace radiator cap.

3	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:
76.5°C (170°F) [standard]
Valve lift:
More than 8 mm/90°C (0.31 in/194°F)

3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

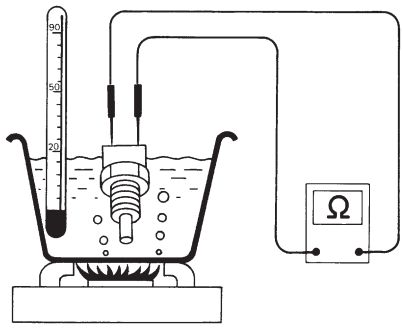
For details, refer to LC section, “Thermostat”.

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace thermostat.

4	CHECK ENGINE COOLANT TEMPERATURE SENSOR

Check resistance as shown in the figure.

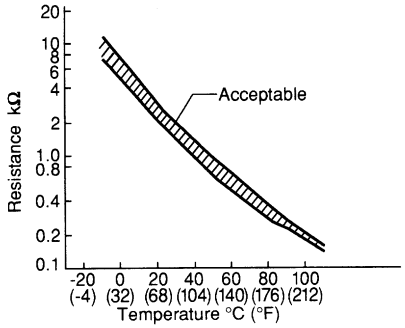


SEF152P

<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

MTBL0285



SEF012P

OK or NG

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

5	CHECK MAIN 11 CAUSES

If the cause cannot be isolated, go to “MAIN 11 CAUSES OF OVERHEATING”, EC-3348.

▶ **INSPECTION END**

Perform FINAL CHECK by the following procedure after repair is completed.

1. Warm up engine. Run the vehicle for at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
2. Stop vehicle and let engine idle. Check the intake and exhaust systems for leaks by listening for noise or visually inspecting the components.
3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform “OVERALL FUNCTION CHECK”.

Main 11 Causes of Overheating

NEEC1537

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 section, “RECOMMENDED FLUIDS AND LUBRICANTS”.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA section, “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) 59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See LC section, “System Check”.
ON*2	5	● Coolant leaks	● Visual	No leaks	See LC section, “System Check”.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See LC section, “Thermostat” and LC section, “Radiator”.
OFF	7	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	8	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA section, “Changing Engine Coolant”.
OFF*4	9	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See MA section, “ENGINE MAINTENANCE”.
OFF	10	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM section, “Inspection”.
	11	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM section, “Inspection”.

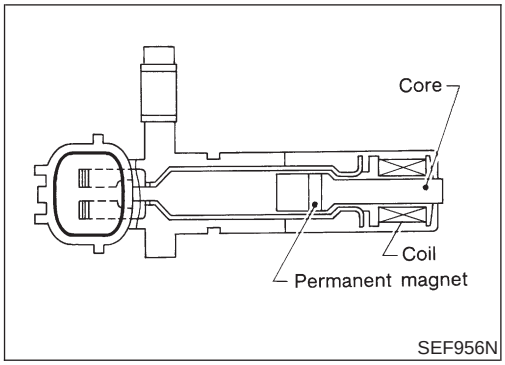
*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

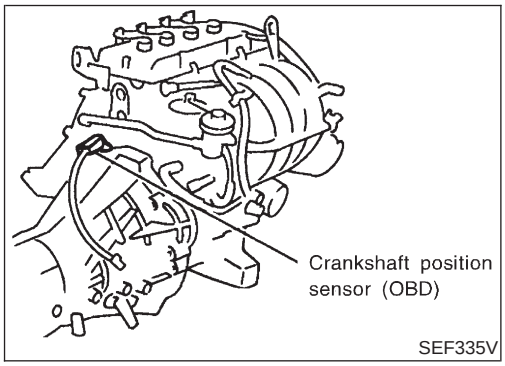
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to LC section, “OVERHEATING CAUSE ANALYSIS”.



SEF956N



SEF335V

Component Description

NEEC0327

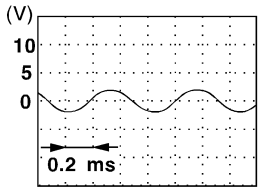
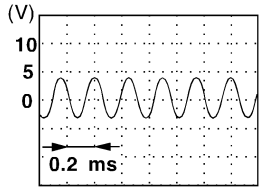
The crankshaft position sensor (OBD) is located on the transmission housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of 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

NEEC0328

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)
43	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
47	L	Crankshaft position sensor (OBD)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approx. 0V 
			[Engine is running] ● Engine speed is 2,000 rpm	Approx. 0V 

On Board Diagnosis Logic

NEEC0329

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1336 1336	• A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM.	• Harness or connectors • Crankshaft position sensor (OBD) • Flywheel

2

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

DTC Confirmation Procedure

NEEC0330

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 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 minutes at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3352.

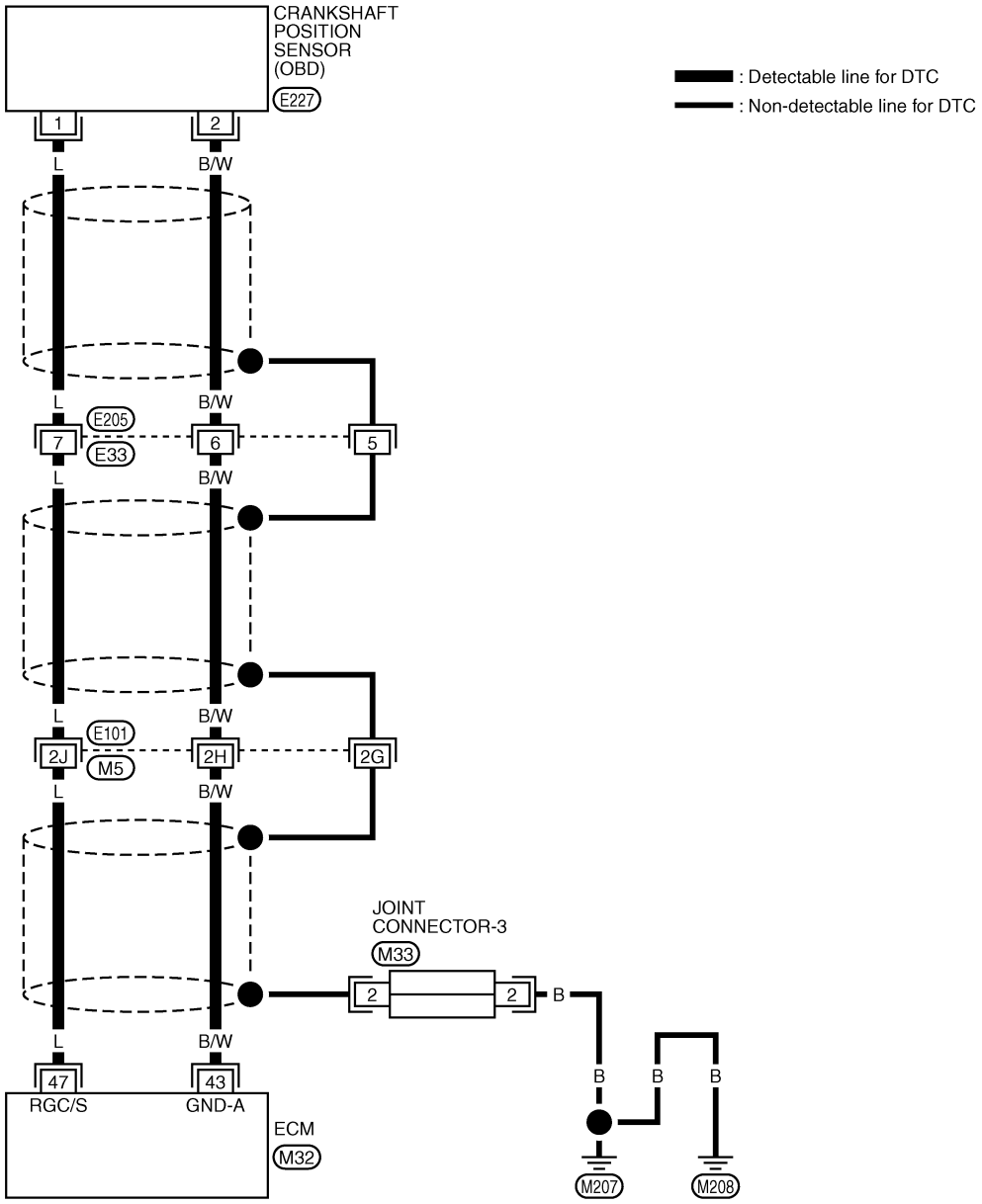
With GST

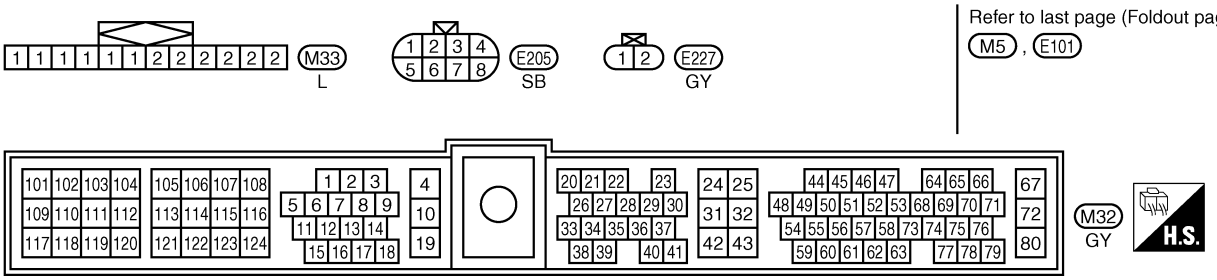
Follow the procedure “With CONSULT-II”.

Wiring Diagram

NEEC0331

EC-CKPS-01





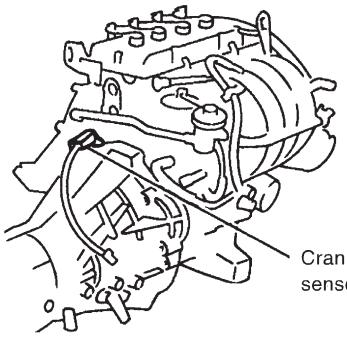
Refer to last page (Foldout page).
(M5), (E101)

GEC236A

Diagnostic Procedure

NEEC0332

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.	
 SEF335V	
2. Check continuity between ECM terminal 47 and terminal 1. Refer to wiring diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power.	
OK or NG	
OK ▶	GO TO 4.
NG ▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E205, E33 ● Harness connectors E101, M5 ● 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 crankshaft position sensor (OBD) terminal 2 and engine ground. Refer to the 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 E205, E33 ● Harness connectors E101, M5 ● 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.

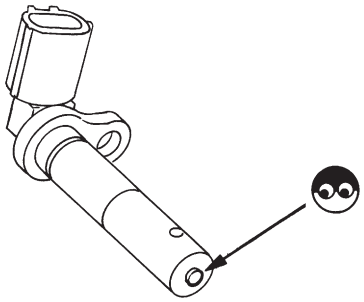
6	CHECK SHIELD CIRCUIT	
1. Turn ignition switch OFF. 2. Disconnect harness connectors E205, E33. 3. Check harness continuity between harness connector E33 terminal 5 and ground. Refer to wiring diagram. **Continuity should exist** 4. Also check harness for short to power. 5. Then reconnect harness connectors.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E101, M5 ● Joint connector-3 (Refer to “HARNESS LAYOUT”, EL section.) ● Harness for open or short between harness connector E33 and engine ground		
	▶	Repair open circuit or short to power in harness or connectors.

8	CHECK IMPROPER INSTALLATION	
Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD). Then retest.		
Trouble is not fixed.	▶	GO TO 9.

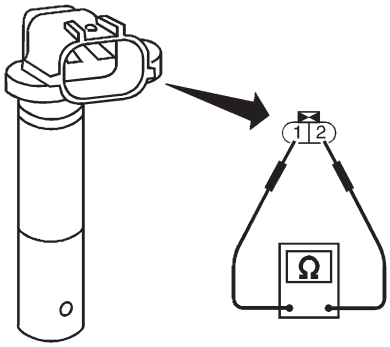
9	CHECK CRANKSHAFT POSITION SENSOR (OBD)

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.



SEF960N

5. Check resistance as shown in the figure.



SEF231W

Resistance: Approximately 512 - 632Ω [at 20°C (68°F)]

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace crankshaft position sensor (OBD).

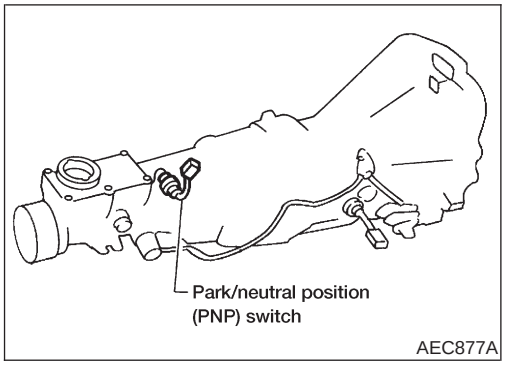
10	CHECK GEAR TOOTH

Visually check for chipping flywheel or drive plate gear tooth (cog).

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace the flywheel.

11	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



Component Description

NEEC0424

When the gear position is “N” or “P”, 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

NEEC0425

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

NEEC0426

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

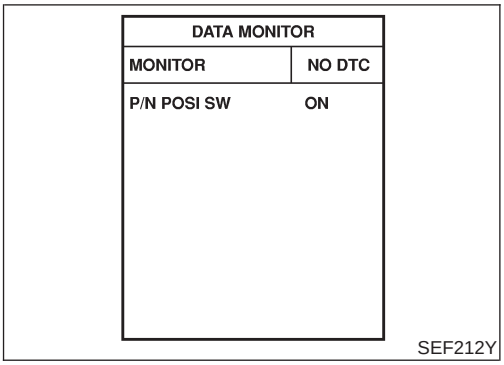
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM’s transistor. Use a ground other than ECM terminals, such as the ground.

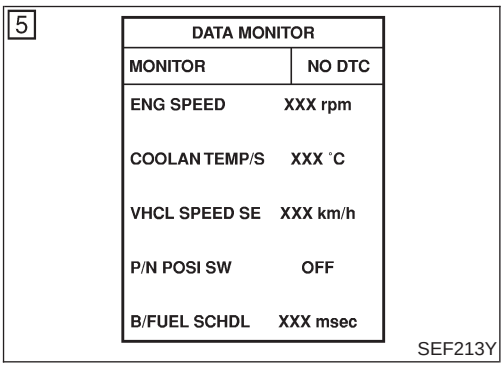
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22	Y/R	PNP switch	**[Ignition switch “ON”]** ● Gear position is “N”	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	Approximately 5V

On Board Diagnosis Logic

NEEC0427

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

=NEEC0428

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 5 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.

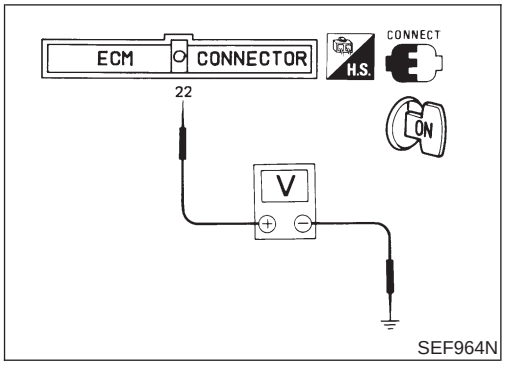
Position (Selector lever)	Known-good signal
“N”	ON
Except the above position	OFF

If NG, go to “Diagnostic Procedure”, EC-3359.
If OK, go to following step.

3) Select “DATA MONITOR” mode with CONSULT-II.
4) Start engine and warm it up to normal operating temperature.
5) Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,400 - 4,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.5 - 17 msec
VHCL SPEED SE	More than 64 km/h (More than 40 MPH)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-3359.



Overall Function Check

=NEEC0429

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 22 (PNP switch signal) and body ground under the following conditions.

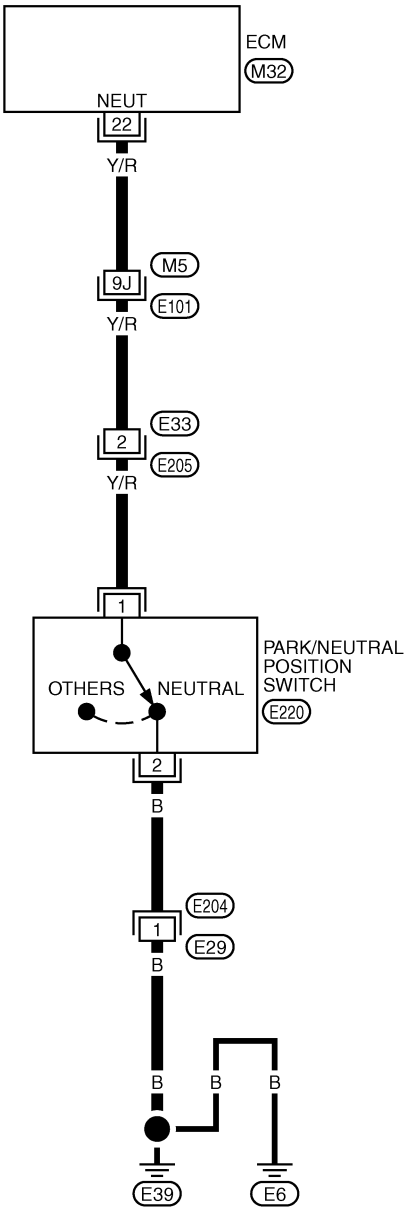
Condition (Gear position)	Voltage (V) (Known-good data)
“N” position	Approx. 0
Except the above position	Approx. 5

3) If NG, go to “Diagnostic Procedure”, EC-3359.

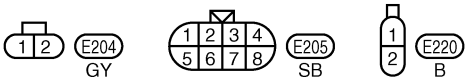
Wiring Diagram

NEEC0430

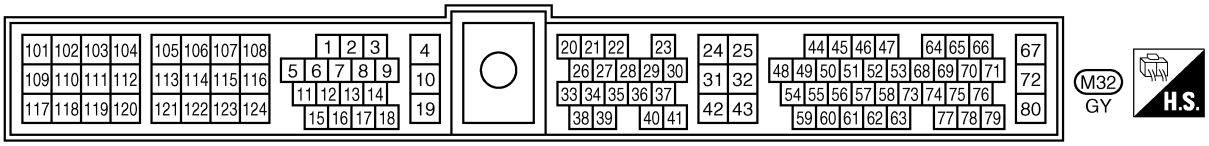
EC-PNP/SW-01



: Detectable line for DTC
: Non-detectable line for DTC



Refer to last page (Foldout page).
M5 , E101



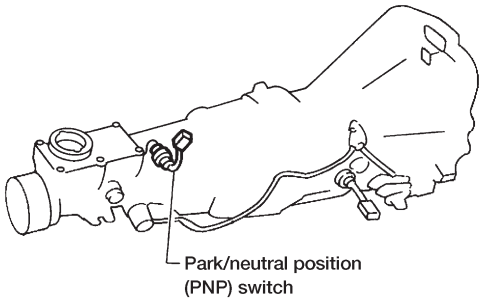
GEC253A

Diagnostic Procedure

NEEC1059

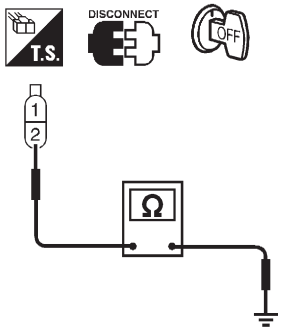
1	CHECK GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect park neutral position (PNP) switch harness connector.



AEC877A

3. Check harness continuity between terminal 2 and body ground.



SEF218V

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

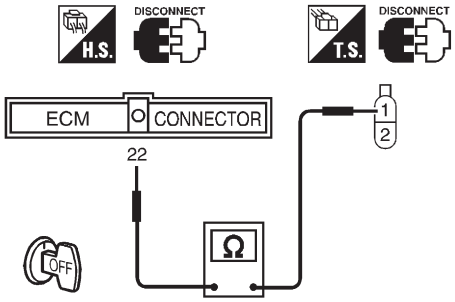
2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E204, E29
- 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 22 and terminal 1.



SEF219V

Continuity should exist.

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

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M5, E101
- Harness connectors E33, E205
- 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 section.

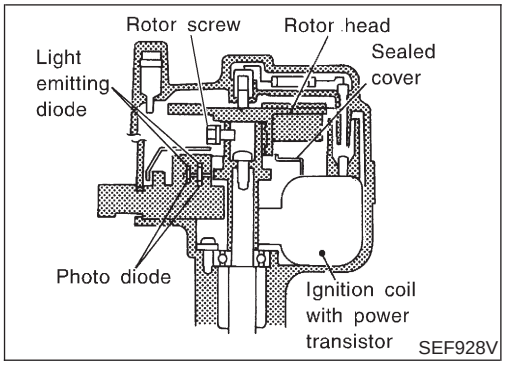
OK or NG

OK	▶	GO TO 6.
NG	▶	Replace PNP switch.

6	CHECK INTERMITTENT INCIDENT

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.

	▶	**INSPECTION END**



Component Description

NEEC0319

IGNITION COIL & POWER TRANSISTOR

NEEC0319S01

The ignition signal from the ECM is sent to the power transistor. The power transistor switches the ignition coil primary circuit on and off. 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.

NOTE:

The rotor screw which secures the distributor rotor head to the distributor shaft must be tightened properly.

: 3.3 - 3.9 N·m (0.34 - 0.40 kg-m, 29.5 - 34.7 in-lb)

CONSULT-II Reference Value in Data Monitor Mode

NEEC0320

MONITOR ITEM	CONDITION		SPECIFICATION
IGN TIMING	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: “N” • No-load	Idle	Approx. 15° BTDC
		2,000 rpm	More than 30° BTDC

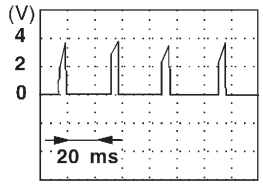
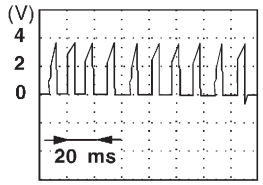
ECM Terminals and Reference Value

=NEEC0321

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

CAUTION:

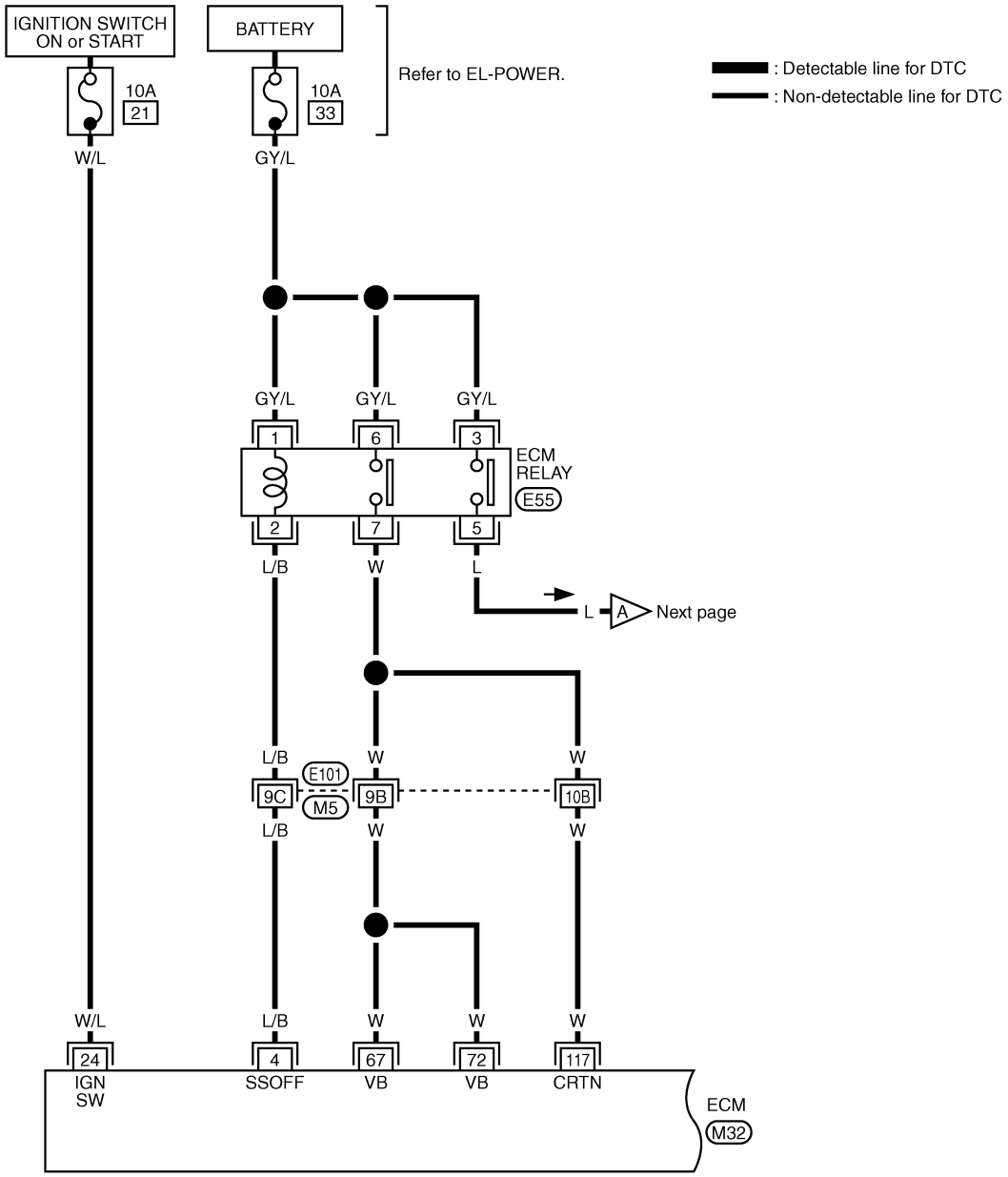
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

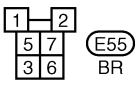
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	W/PU	Ignition signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.5V  SEF996V
			[Engine is running] ● Engine speed is 2,000 rpm	0.2 - 1.0V  SEF997V

Wiring Diagram

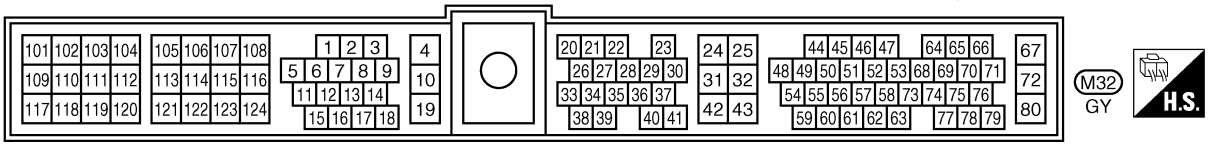
NEEC0324

EC-IGNSYS-01



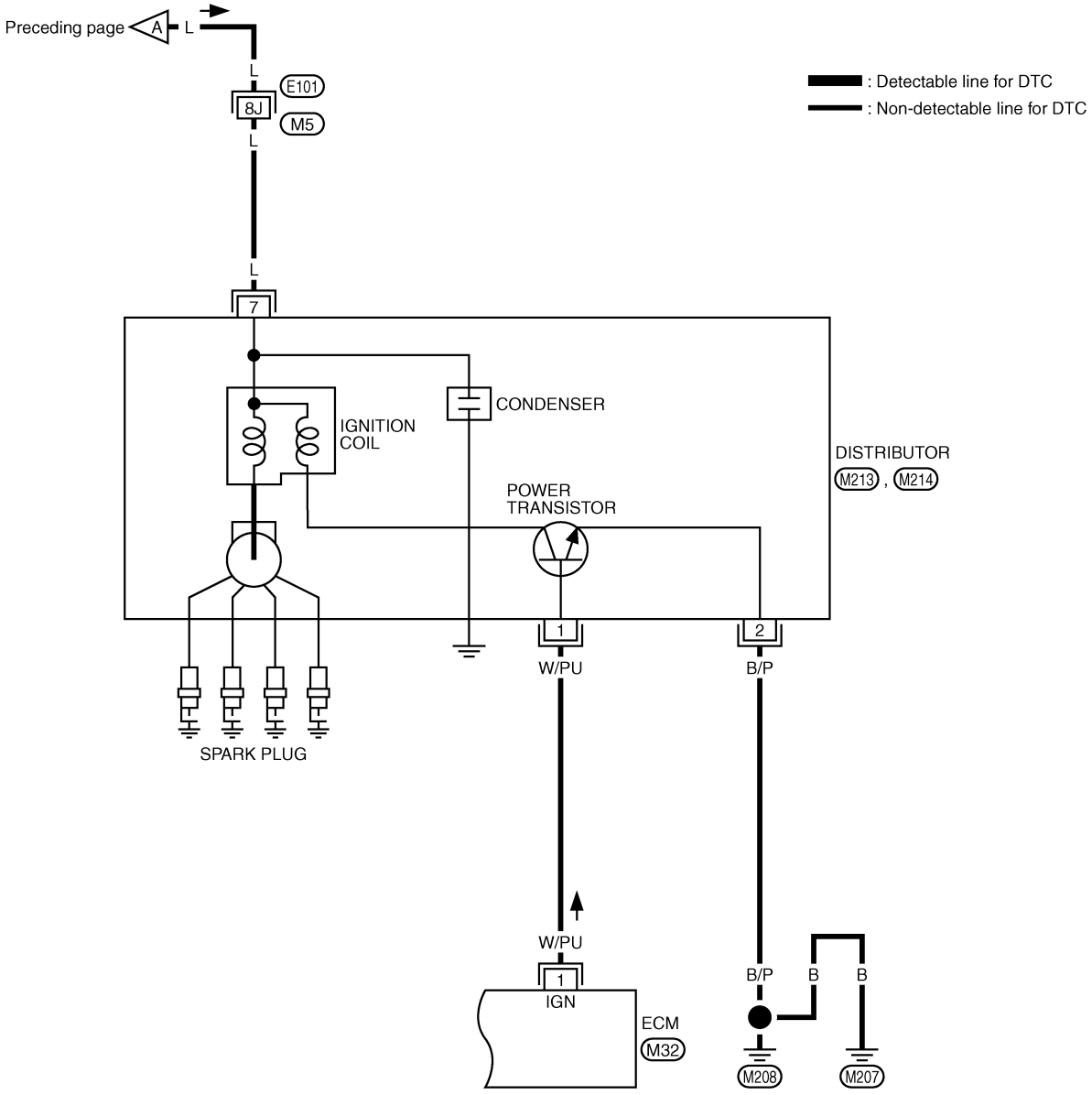


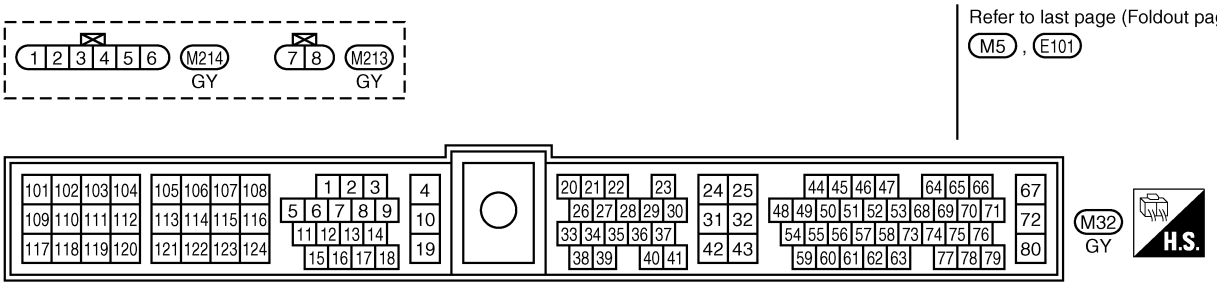
Refer to last page (Foldout page).
M5 , E101



GEC240A

EC-IGNSYS-02





GEC241A

Diagnostic Procedure

NEEC0325

1	INSPECTION START
Turn ignition switch “OFF”, and restart engine. **Is engine running?**	
Yes or No	
Yes (With CONSULT-II) ▶	GO TO 2.
Yes (Without CONSULT-II) ▶	GO TO 3.
No ▶	GO TO 4.

2	CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that all circuits do not produce a momentary engine speed drop.

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

SEF981Z

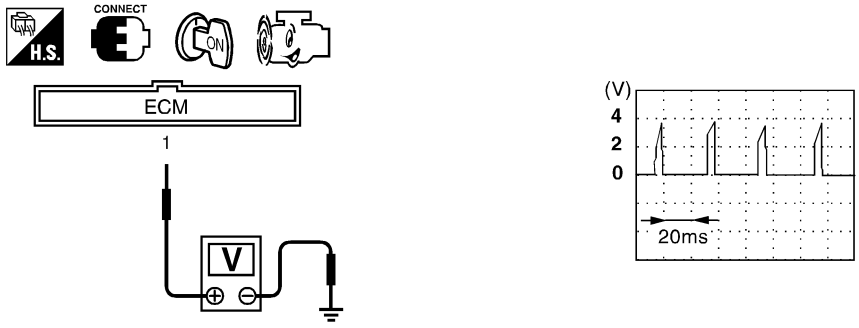
OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 7.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminal 1 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



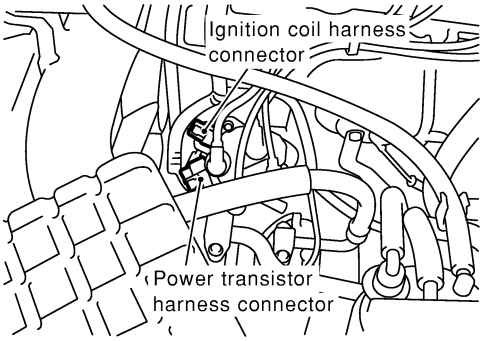
SEF984Z

OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 7.

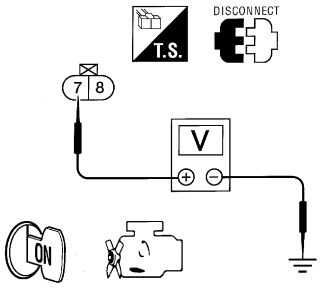
4	CHECK POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.



SEC276D

3. Turn ignition switch ON.
4. Check voltage between terminal 7 and ground with CONSULT-II or tester.



AEC698

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness for open or short between ignition coil and ECM relay
- Harness for open or short between ECM relay and fuse

	▶	Repair harness or connectors.

6	CHECK GROUND CIRCUIT

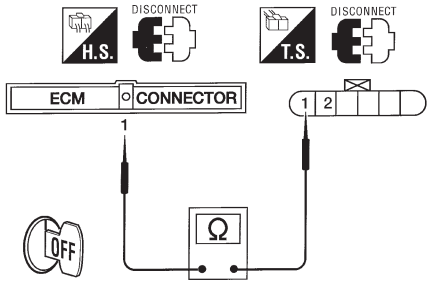
1. Turn ignition switch OFF.
2. Disconnect power transistor harness connector.
3. Check harness continuity between power transistor terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

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

7	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 1 and power transistor terminal 1.



AEC700

Continuity should exist.

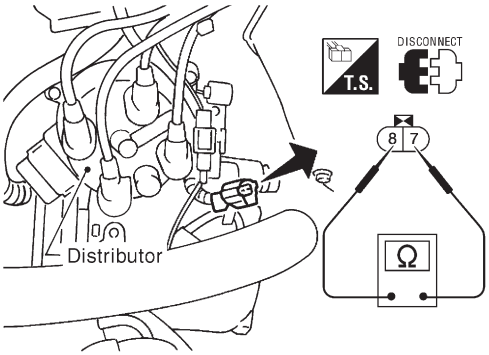
3. Also check harness for short to ground and short to power.

OK or NG

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

8	CHECK IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Remove distributor cap.
3. Check resistance as shown in the figure.



AEC150A

Terminal	Resistance [at 25°C (77°F)]
7 - 8	Less than 1Ω
7 - 9	7 - 13Ω

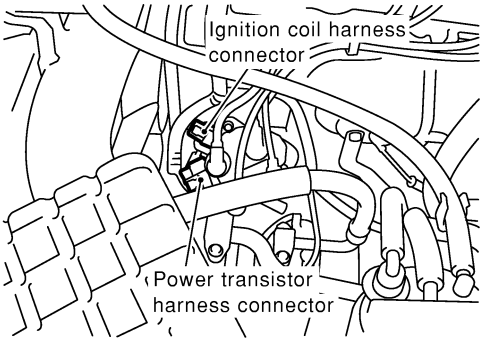
MTBL0300

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace distributor assembly as a unit.

9	CHECK POWER TRANSISTOR

1. Disconnect camshaft position sensor & power transistor harness connector and ignition coil harness connector.



SEC276D

2. Check resistance between camshaft position sensor & power transistor and ignition coil terminals as follows. Refer to wiring diagram.

Terminal No. (Polality)	Resistance Ω [at 25°C (77°F)]
7 (+) - 2 (–)	Except 0 or ∞
1 (+) - 7 (–)	Except 0
1 (+) - 2 (–)	

MTBL1309

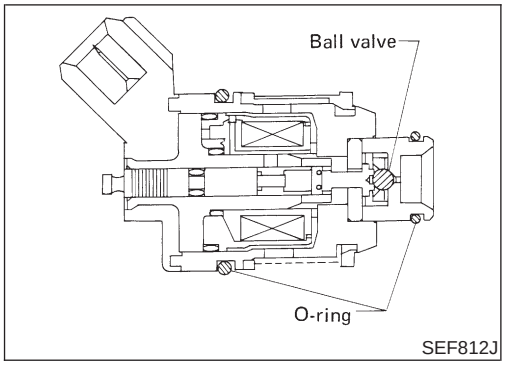
OK or NG

OK	▶	GO TO 10.
NG	▶	Replace distributor assembly.

10	CHECK INTERMITTENT INCIDENT

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.

	▶	**INSPECTION END**



Component Description

NEEC0435

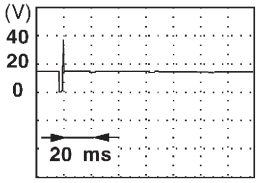
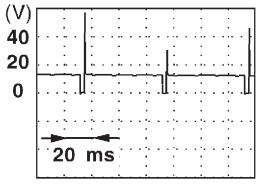
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends 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.

ECM Terminals and Reference Value

NEEC0437

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

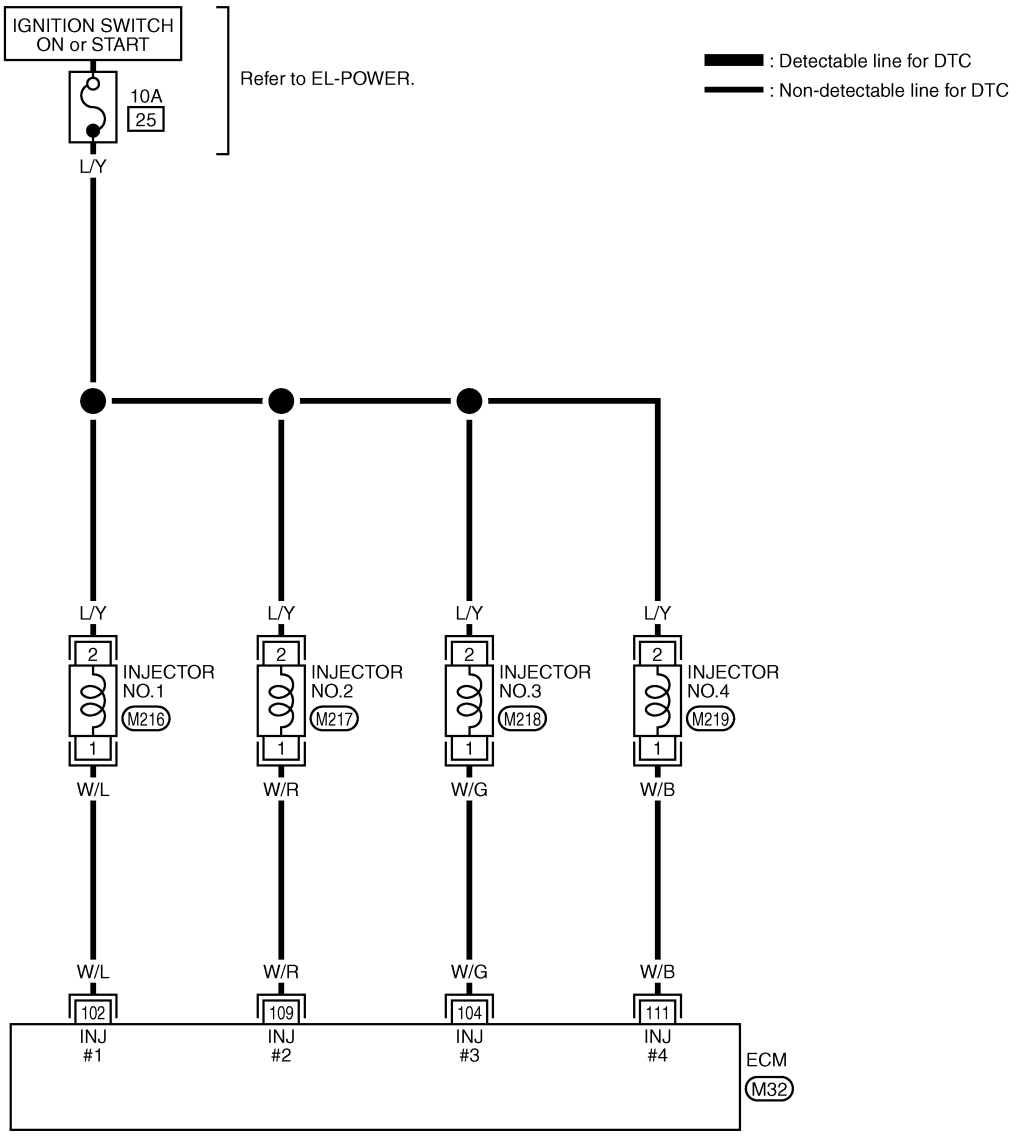
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

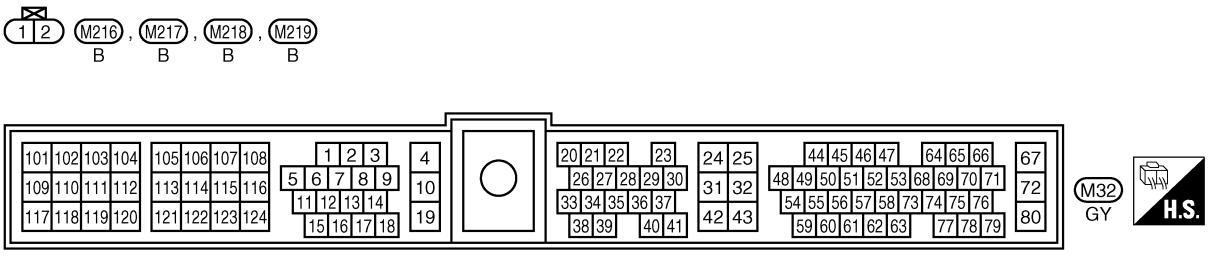
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102 104 109 111	W/L W/G W/R W/B	Injector No. 1 Injector No. 3 Injector No. 2 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF011W
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  SEF012W

Wiring Diagram

NEEC0434

EC-INJECT-01





GEC254A

Diagnostic Procedure

NEEC0438

1	CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.

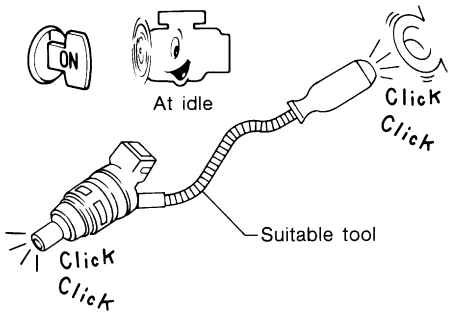
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX %

SEF981Z

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

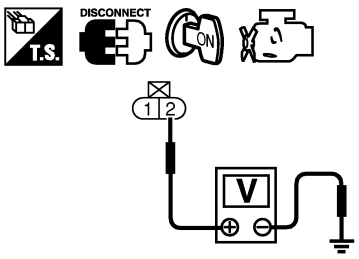
Clicking noise should be heard.

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 injector terminal 2 and ground with CONSULT-II or tester.



SEC277D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- 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 terminal 1 and ECM terminals 102, 104, 109, 111. 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.

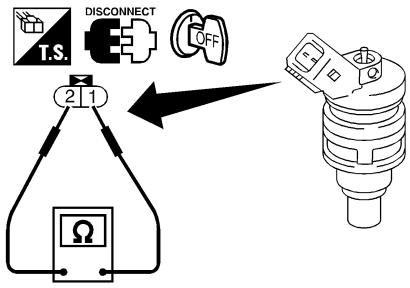
5	DETECT MALFUNCTIONING PART

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

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.



SEC278D

Resistance: 7.3 - 9.9Ω [at 25°C (77°F)]

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace injector.

7	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**

CONSULT-II Reference Value in Data Monitor Mode

NEEC0441

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

ECM Terminals and Reference Value

NEEC0442

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

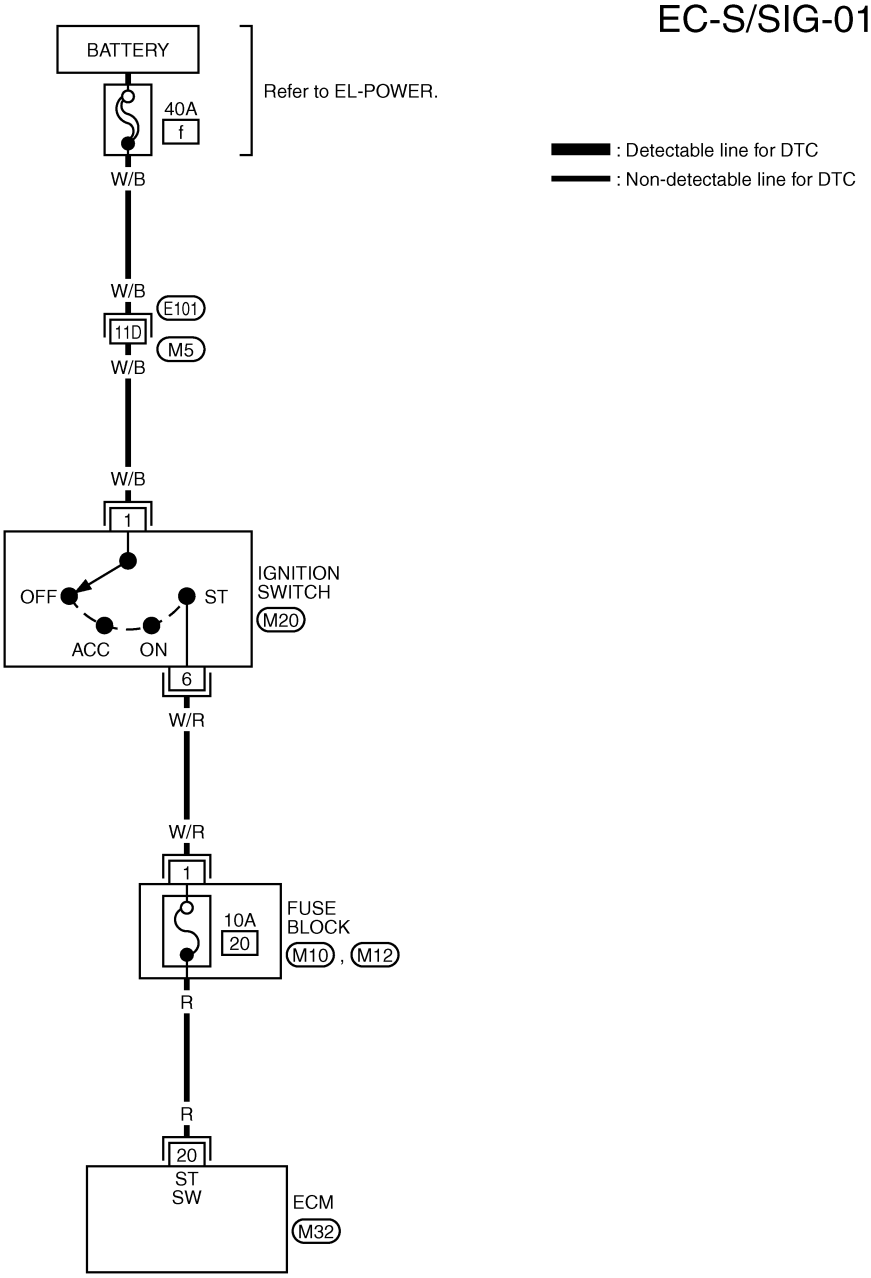
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

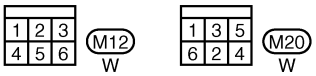
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
20	R	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

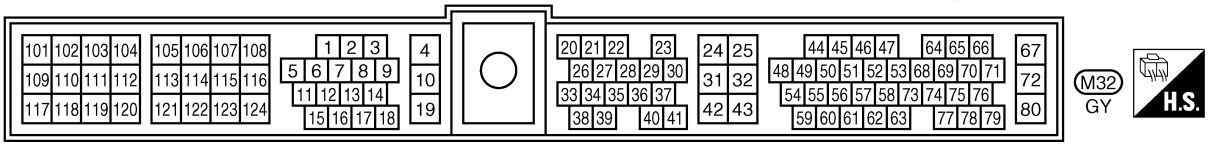
NEEC0440

EC-S/SIG-01





Refer to last page (Foldout page).
M5 , E101
M10



GEC255A

Diagnostic Procedure

=NEEC0443

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

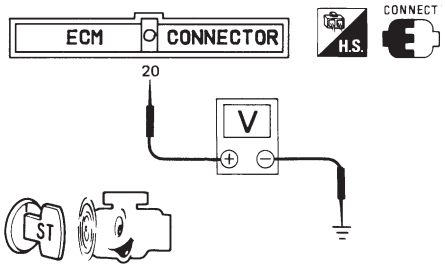
OK or NG

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 20 and ground under the following conditions.



SEF109P

Condition	Voltage
Ignition switch “START”	Battery voltage
Except above	Approximately 0V

MTBL0143

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART	
Check the following. ● 40A fuse ● Harness connectors E101, M5 ● Harness for open or short between ignition switch and 40A fuse		
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 INPUT SIGNAL CIRCUIT	
1. Turn ignition switch OFF. 2. Disconnect ECM harness connector and ignition switch. 3. Check harness continuity between ECM terminal 20 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 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART	
Check the following. ● Fuse block connectors M10, M12 ● Harness for open or short between ECM and ignition switch		
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	
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.		
	▶	**INSPECTION END**

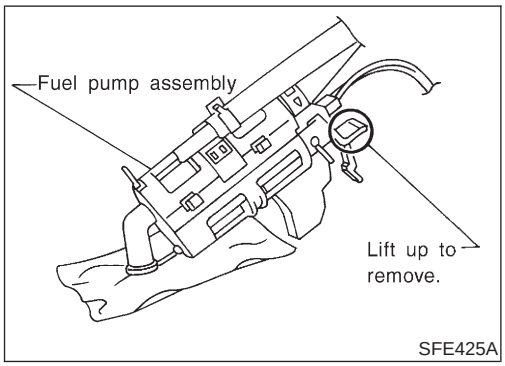
System Description

NEEC0444

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Fuel pump control	Fuel pump relay
Ignition switch	Start signal		

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 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 5 seconds.
Engine running and cranking	Operates.
Except as shown above	Stops.



Component Description

NEEC0501

The fuel pump with a fuel damper is an in-tank type (the pump and damper are located in the fuel tank).

CONSULT-II Reference Value in Data Monitor Mode

NEEC0445

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking	ON
	● Except as shown above	OFF

ECM Terminals and Reference Value

=NEEC0446

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.

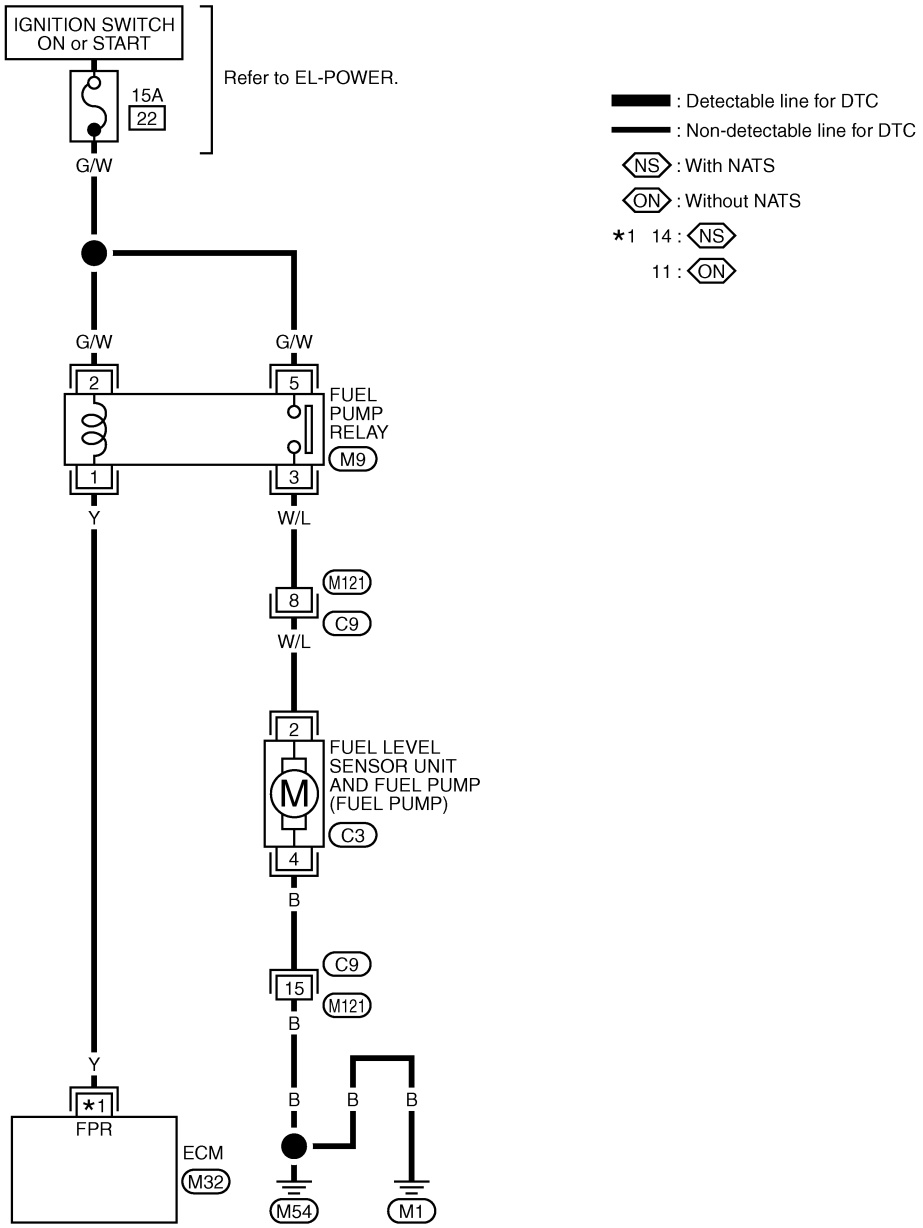
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11*1	Y	Fuel pump relay	**[Ignition switch "ON"]** ● For 5 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1V
			[Ignition switch "ON"] ● More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
14*2	Y	Fuel pump relay	**[Ignition switch ON]** ● For 5 seconds after turning ignition switch	0 - 1V
			[Ignition switch ON] ● More than 5 seconds after turning ignition switch ON	BATTERY VOLTAGE (11 - 14V)

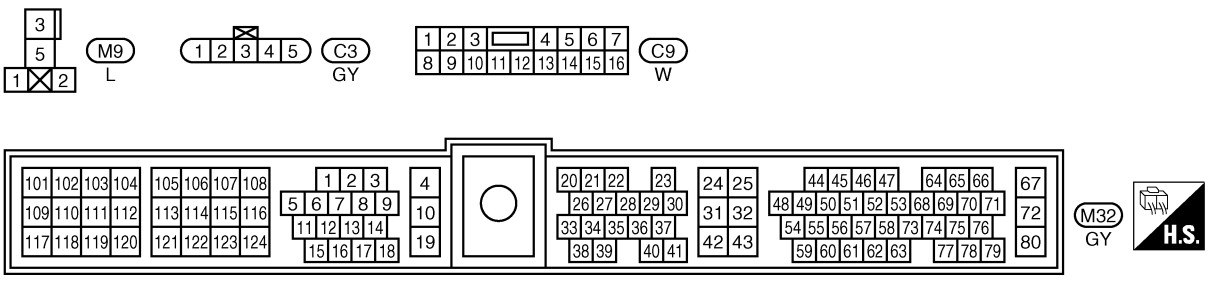
*1: Model without NATS (Nissan Anti-Theft System)
*2: Model with NATS (Nissan Anti-Theft System)

Wiring Diagram

NEEC0447

EC-F/PUMP-01





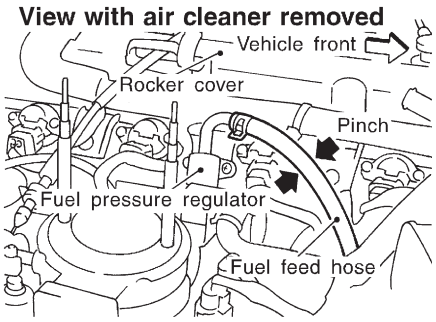
GEC256A

Diagnostic Procedure

NEEC1074

1	CHECK OVERALL FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.



SEF348V

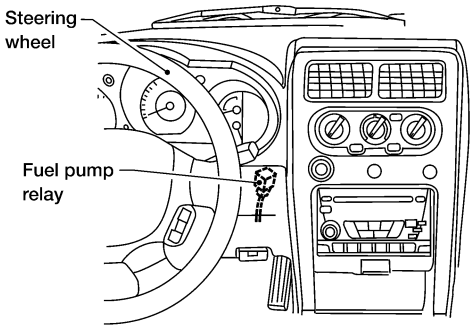
Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

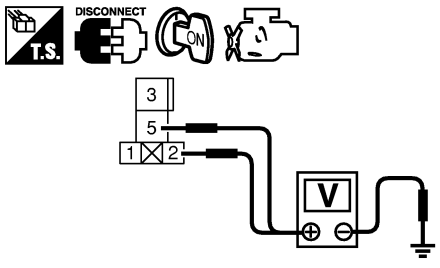
2	CHECK POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect fuel pump relay.



LEC103A

3. Turn ignition switch ON.
4. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



SEC279D

Voltage: Battery voltage

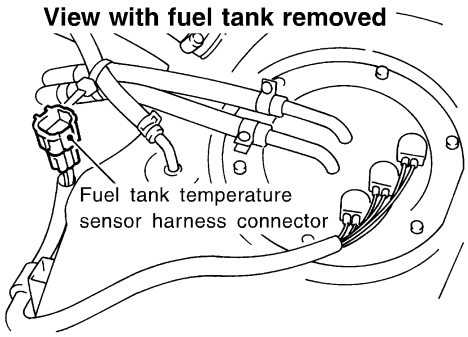
OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● 15A fuse ● Harness for open or short between fuse and fuel pump relay	
▶	Repair harness or connectors.

4	CHECK FUEL PUMP CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF334VA

3. Check harness continuity between fuel pump terminal 4 and body ground, fuel pump terminal 2 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 connectors M121, C9 ● 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 11 or (14)* and fuel pump relay terminal 1. Refer to wiring diagram.
   *: Model with NATS (Nissan Anti-Theft System)
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

7	CHECK FUEL PUMP RELAY

With CONSULT-II

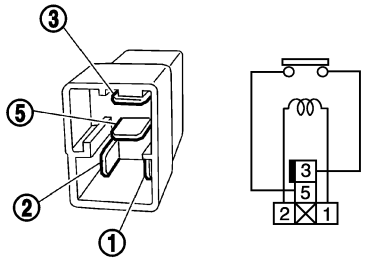
1. Reconnect fuel pump relay, fuel level sensor unit and fuel pump harness connector and ECM harness connector.
2. Turn ignition switch ON.
3. Turn fuel pump relay “ON” and “OFF” in “ACTIVE TEST” mode with CONSULT-II and check operating sound.

ACTIVE TEST	
FUEL PUMP RELAY	ON
MONITOR	
ENG SPEED	XXX rpm

SEF724Z

Without CONSULT-II

Check continuity between terminals 3 and 5.



PBIB0098E

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

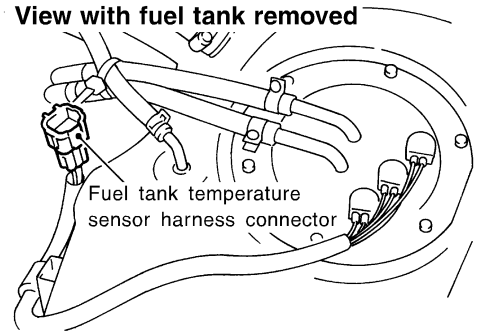
MTBL0306

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace fuel pump relay.

8	CHECK FUEL PUMP

1. Disconnect fuel level sensor and fuel pump harness connector. Refer to wiring diagram.



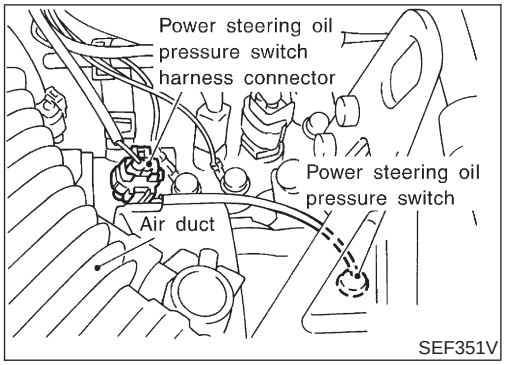
SEC280D

2. Check resistance between terminals 2 and 4.
   Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace fuel pump.

9	CHECK INTERMITTENT INCIDENT
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.	
▶	**INSPECTION END**



Component Description

NEEC0451

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

NEEC0452

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

NEEC0453

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

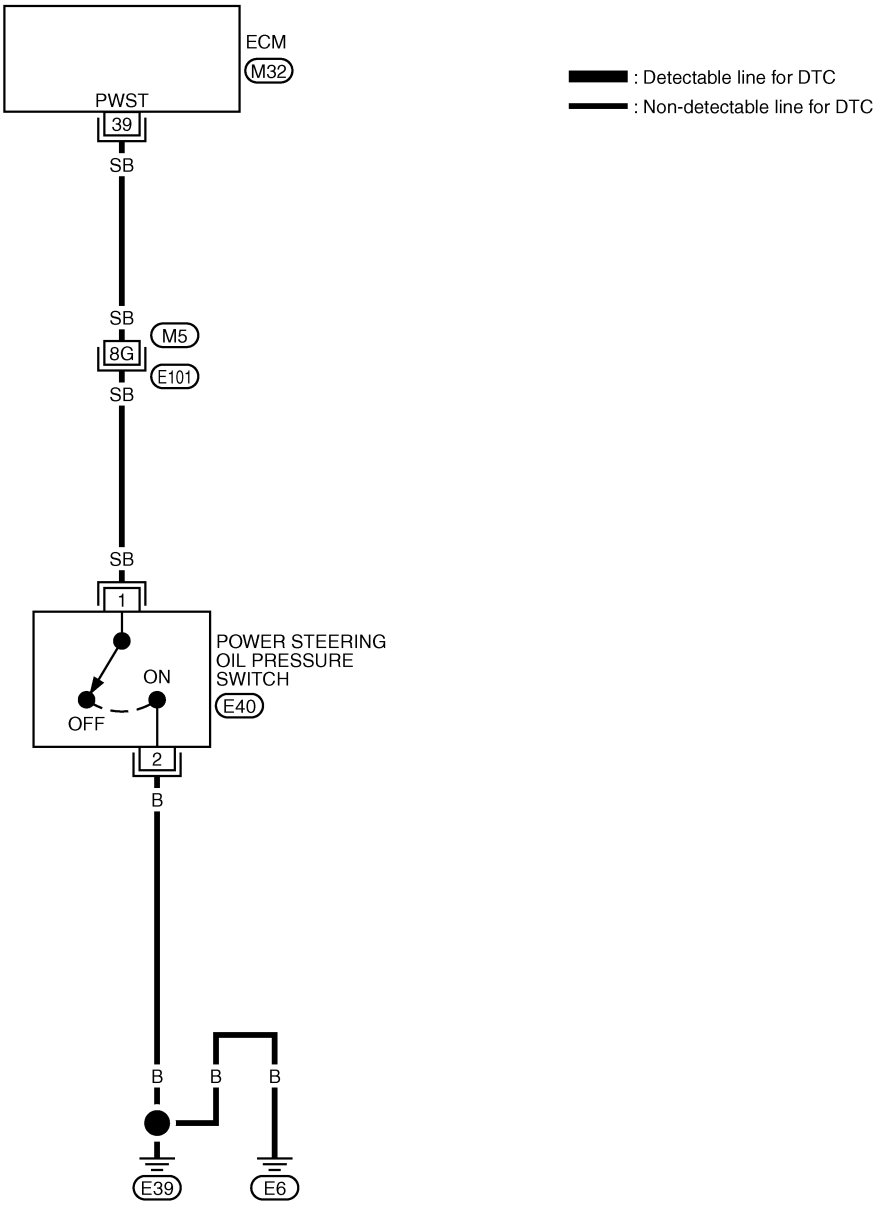
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

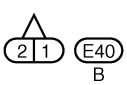
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
39	SB	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is fully turned	Approximately 0V
			[Engine is running] ● Steering wheel is not turned	Approximately 5V

Wiring Diagram

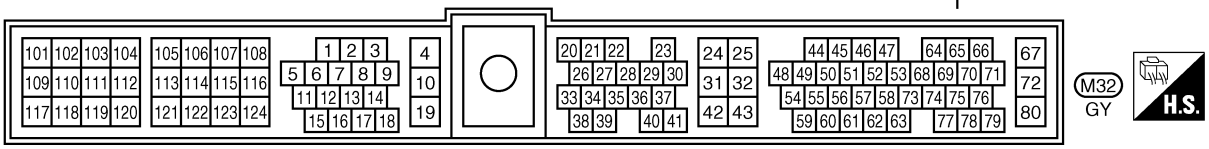
NEEC0450

EC-PST/SW-01





Refer to last page (Foldout page).
M5 , E101



GEC257A

Diagnostic Procedure

=NEEC0454

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 indication
Steering is in neutral position	OFF
Steering is turned	ON

LEC065A

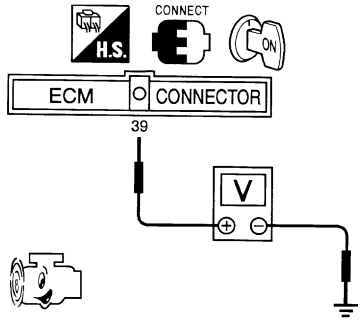
OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 39 and ground under the following conditions.



SEF662P

Condition	Voltage
When steering wheel is turned quickly	Approximately 0V
Except above	Approximately 5V

MTBL0142

OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

4	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 39 and terminal 1. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M5, E101

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.

6	CHECK GROUND CIRCUIT

1. Disconnect power steering oil pressure switch harness connector.
2. Check continuity between power steering oil pressure switch harness connector terminal 2 and ground.
   Continuity should exist.

OK or NG

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

7	CHECK POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals 1 and ground. Refer to wiring diagram.

Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

MTBL0307

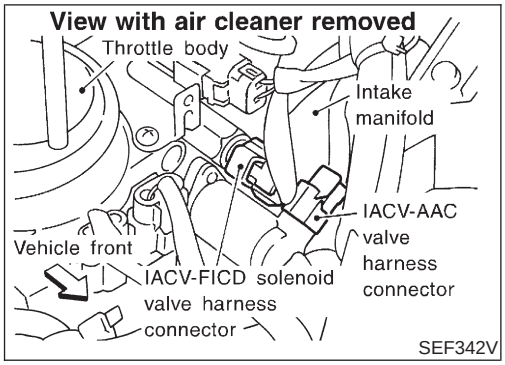
OK or NG

OK	▶	GO TO 8.
NG	▶	Replace power steering oil pressure switch.

8	CHECK INTERMITTENT INCIDENT

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.

	▶	**INSPECTION END**



Component Description

NEEC0462

When the air conditioner is on, the IACV-FICD solenoid valve supplies additional air to adjust to the increased load.

ECM Terminals and Reference Value

NEEC0463

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	G/W	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)

★ Ambient air temperature above 10°C (50°F) and in any mode except OFF.

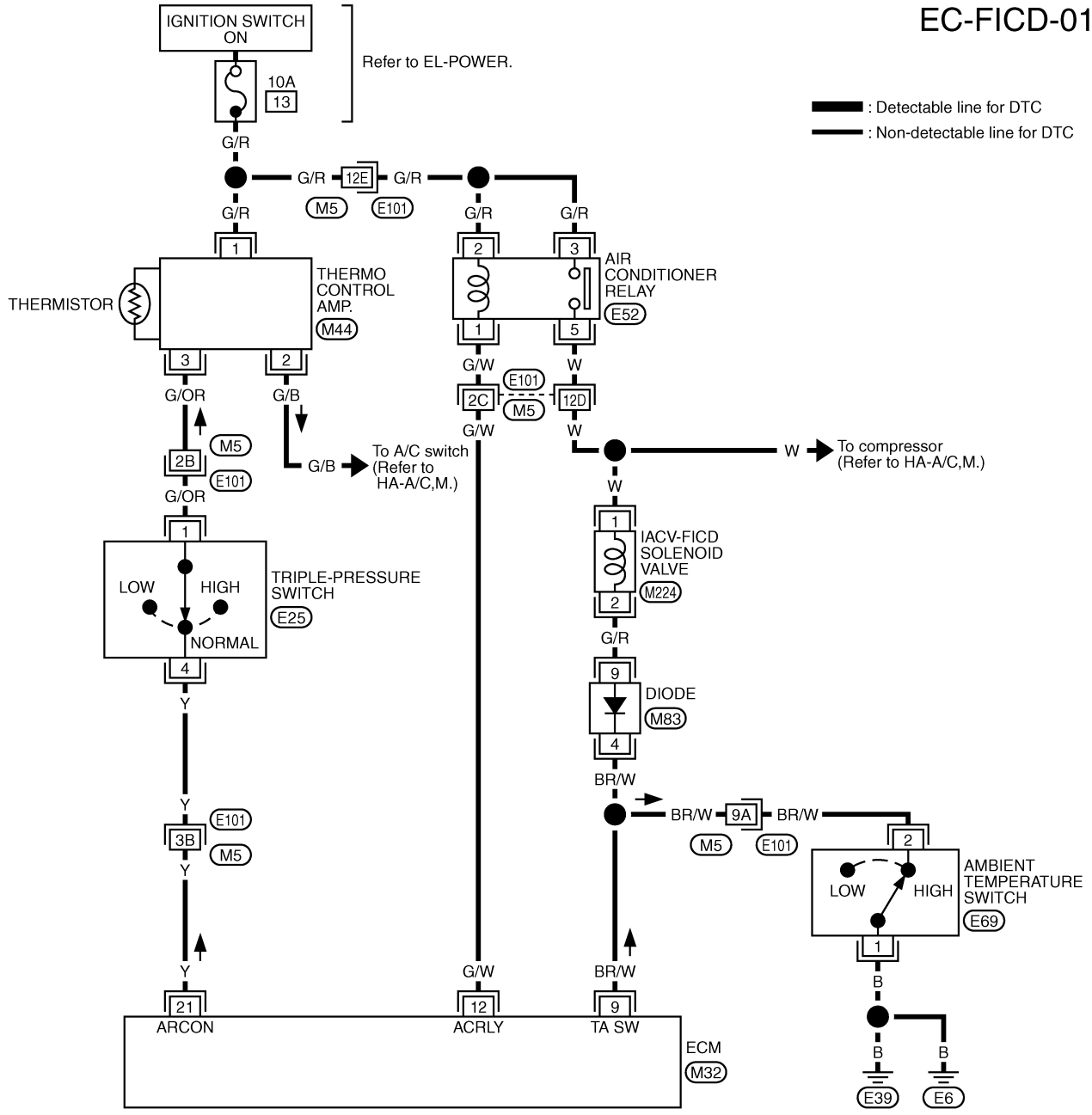
Wiring Diagram

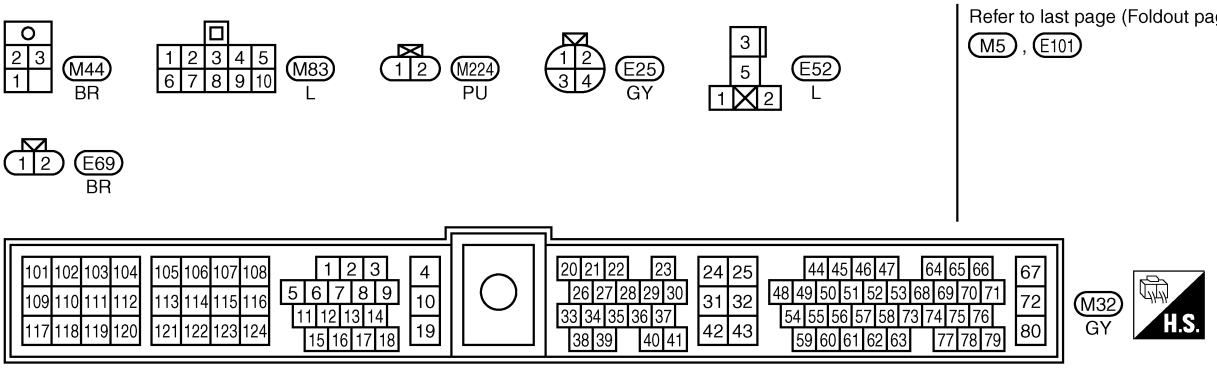
NEEC0461

MODEL WITH MANUAL AIR CONDITIONER

NEEC0461S01

EC-FICD-01





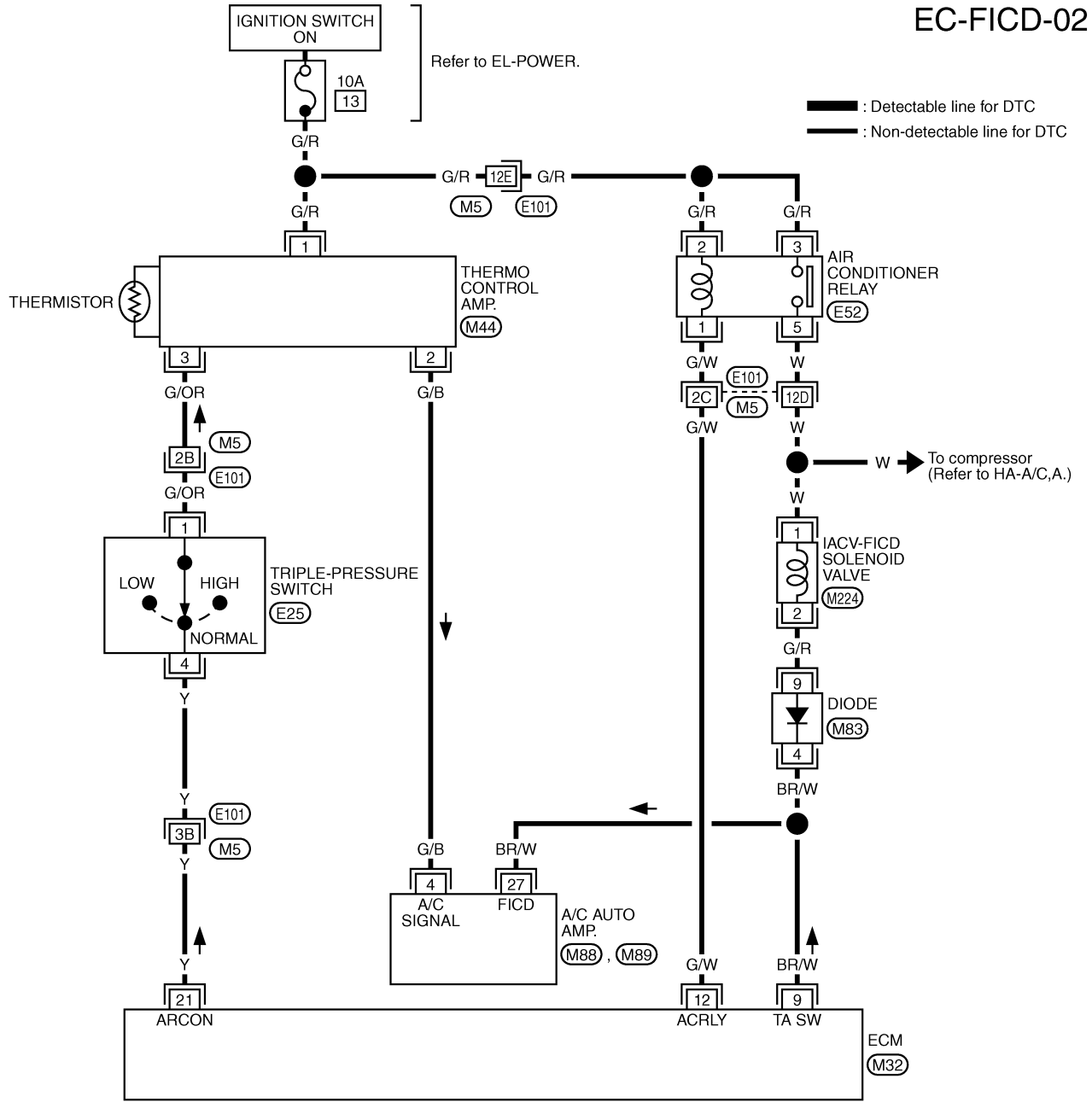
Refer to last page (Foldout page).
M5 , E101

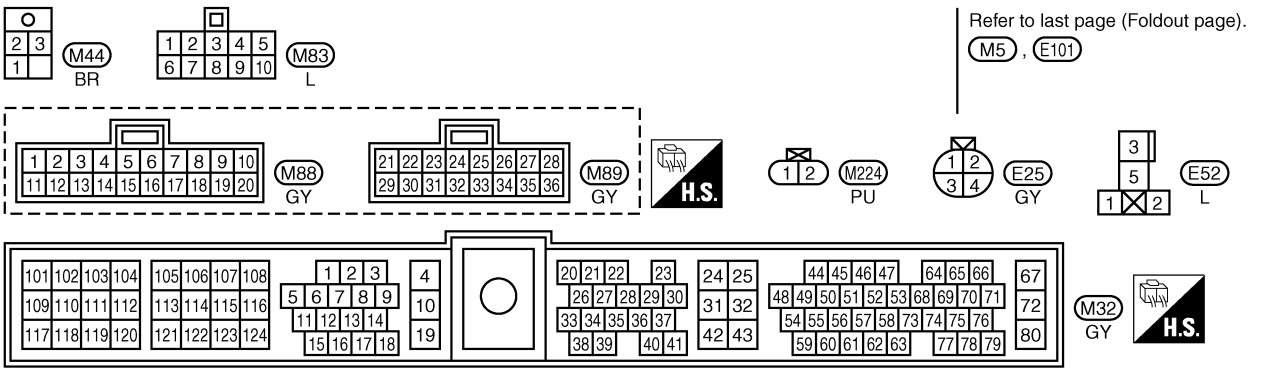
GEC258A

MODEL WITH AUTO AIR CONDITIONER

NEEC0461S02

EC-FICD-02





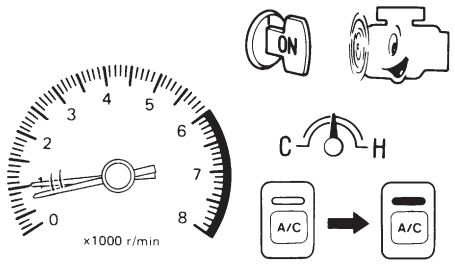
GEC259A

Diagnostic Procedure

=NEEC0464

1	CHECK OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   700±50 rpm
   If NG, adjust idle speed.
3. Push air conditioner switch ON and turn fan switch to 4-speed.
4. Recheck idle speed.



MEF634E

850 rpm or more

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK AIR CONDITIONER FUNCTION

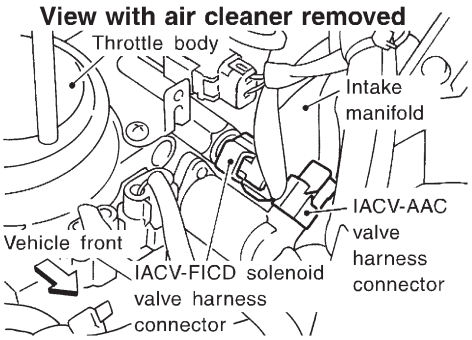
Check if air conditioner compressor functions normally.

OK or NG

OK	▶	GO TO 3.
NG	▶	Refer to “Symptom Table” in “TROUBLE DIAGNOSIS”, HA section.

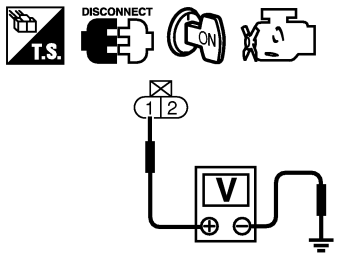
3	CHECK POWER SUPPLY

1. Stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.



SEF342V

3. Start engine, then push A/C switch ON and turn fan switch to 4-speed.
4. Check voltage between terminal 1 and ground with CONSULT-II or tester.



SEC281D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness for open or short between IACV-FICD solenoid valve and air conditioner relay

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

5	CHECK GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check harness continuity as follows.

Type	Terminal name	Condition			
Model with manual air conditioner	Air conditioner relay terminal 5	+	Continuity should not exist.	−	Continuity should exist.
	Ambient temperature switch terminal 2	−		+	
	Diode terminal 4 and ECM terminal 9	Continuity should exist.			
	Ambient temperature switch termial 2 and ECM terminal 9	Continuity should exist.			
	Ambient temperature switch termial 1 and ground	Continuity should exist.			
Model with auto air conditioner	Air conditioner relay terminal 5	+	Continuity should not exist.	−	Continuity should exist.
	ECM terminal 9	−		+	
	Diode terminal 4 and A/C auto amp. terminal 27	Continuity should exist.			
	A/C auto amp. terminal 27 and ECM terminal 9	Continuity should exist.			

MTBL1310

Continuity should exist.

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

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

MANUAL AIR CONDITIONER

Check the following.

- Harness connectors E101, M5
- IACV-FICD solenoid valve
- Ambient temperature switch
- Diode M83
- Harness connectors M5, E101
- Check the harness for open or short between air conditioner relay and ambient temperature switch
- Check the harness for open or short between diode M83 and ECM
- Check the harness for open or short between ambient temperature switch and ECM
- Check the harness for open or short between ambient temperature switch and ground

AUTO AIR CONDITIONER

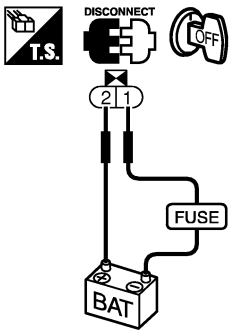
Check the following.

- Harness connectors E101, M5
- IACV-FICD solenoid valve
- Diode M83
- Check the harness for open or short between air conditioner relay and ECM
- Check the harness for open or short between diode and A/C auto amp
- Check the harness for open or short between A/C auto amp and ECM

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

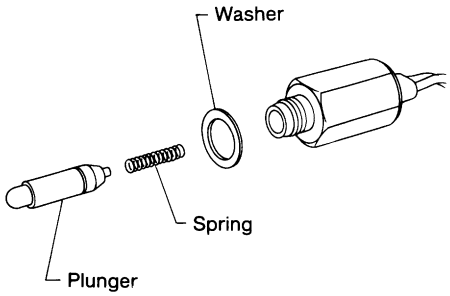
7	CHECK IACV-FICD SOLENOID VALVE

Disconnect IACV-FICD solenoid valve harness connector.



SEC282D

- Check for clicking sound when applying 12V direct current to terminals.
- Check plunger for seizing or sticking.
- Check for broken spring.



SEF097K

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace IACV-FICD solenoid valve.

8	CHECK AMBIENT AIR TEMPERATURE SWITCH

Refer to AC section, “TROUBLE DIAGNOSIS”.

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace ambient air temperature switch.

9	CHECK INTERMITTENT INCIDENT

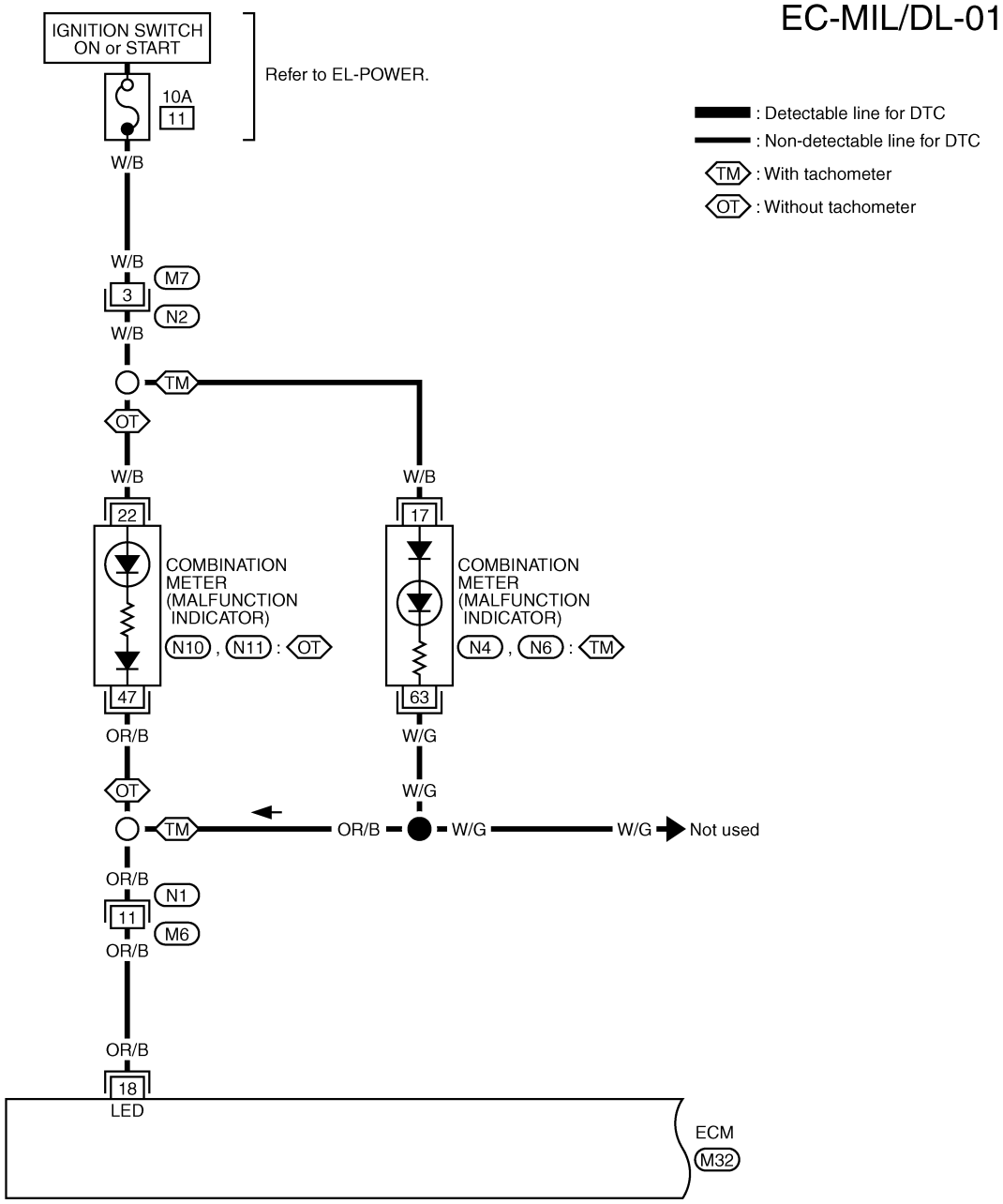
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-3123.

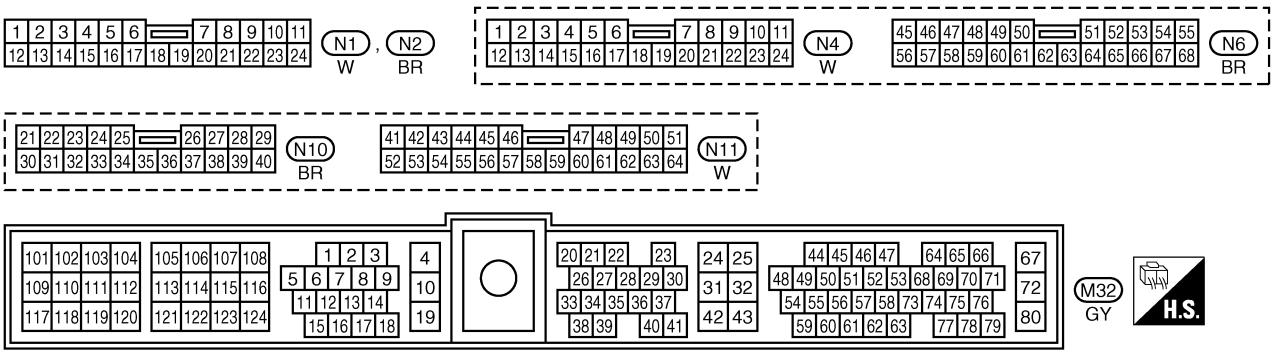
	▶	**INSPECTION END**

Wiring Diagram

NEEC0466

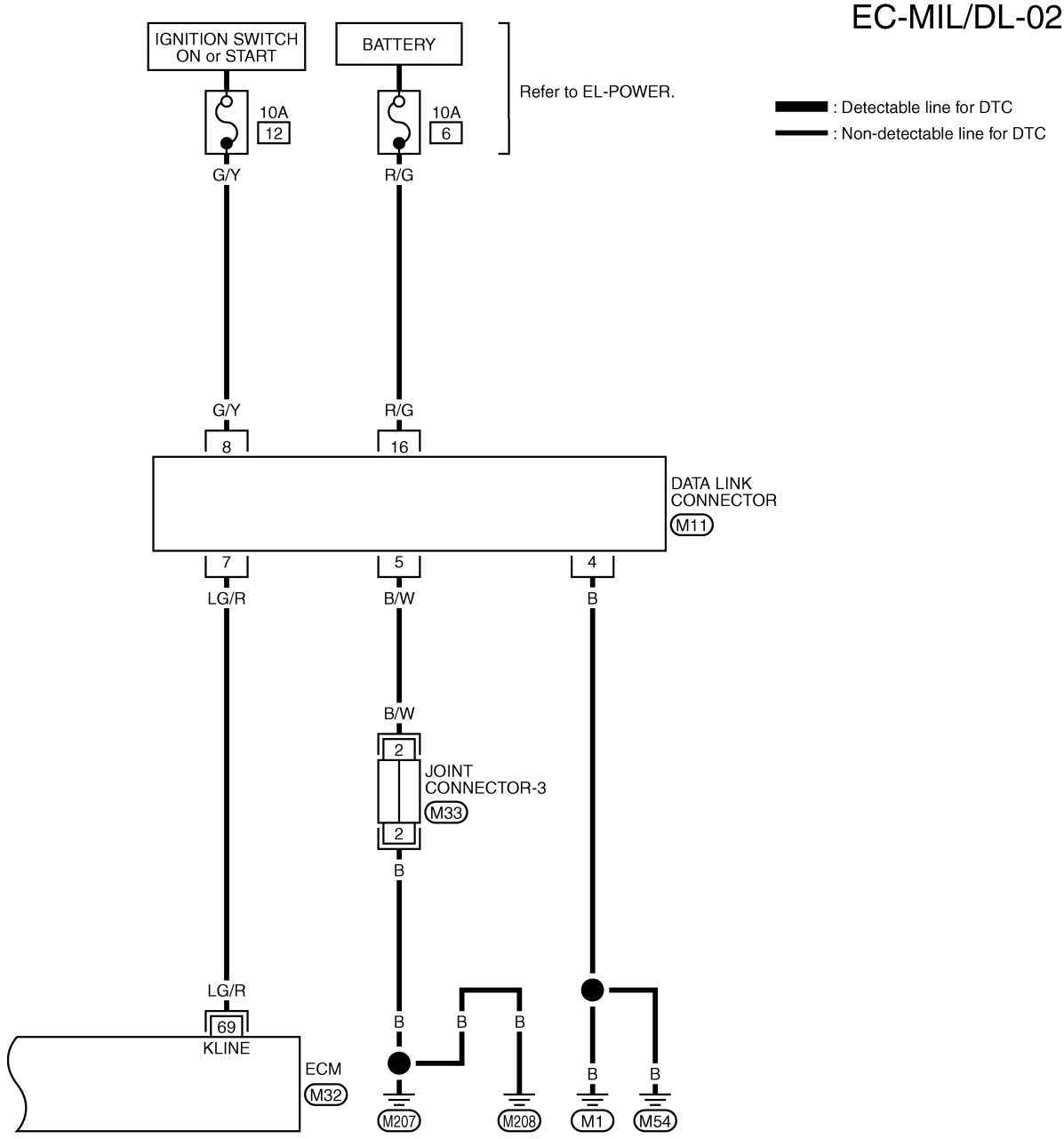
EC-MIL/DL-01

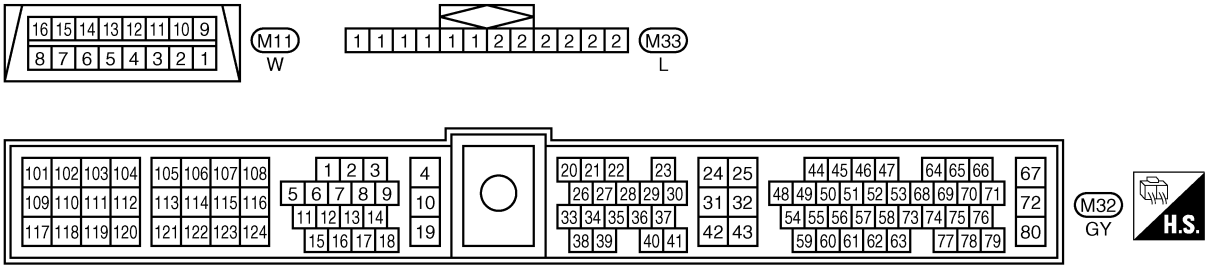




GEC260A

EC-MIL/DL-02





GEC261A

Fuel Pressure Regulator

NEEC0467

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

NEEC0468

Base idle speed*1 rpm	No-load*3 (in “N” position)	650±50
Target idle speed*2 rpm	No-load*3 (in “N” position)	700±50
Air conditioner: ON rpm	In “N” position	850 or more
Ignition timing*1	In “N” position	15°±2° BTDC

*1: Throttle position sensor harness connector disconnected or using CONSULT-II “WORK SUPPORT” mode
*2: Throttle position sensor harness connector connected
*3: Under the following conditions:

- Air conditioner switch: OFF
- Electrical load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Ignition Coil

NEEC0469

Primary voltage V	Battery voltage 12
Primary resistance [at 20°C (68°F)] Ω	Approximately 1.0
Secondary resistance [at 20°C (68°F)] kΩ	Approximately 10

Mass Air Flow Sensor

NEEC0470

Supply voltage V	Battery voltage (11 - 14)
Output voltage V	0.9 - 1.8*
Mass air flow (Using CONSULT-II or GST) g·m/sec	0.9 - 5.8 at idle* 7.5 - 13.2 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and idling under no-load.

Engine Coolant Temperature Sensor

NEEC0471

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

Fuel Pump

NEEC0473

Resistance [at 25°C (77°F)] Ω	0.2 - 5.0

IACV-AAC Valve

NEEC0474

Resistance [at 25°C (77°F)] Ω	Approximately 10.0

Injector

NEEC0475

Resistance [at 25°C (77°F)] Ω	7.3 - 9.9

Throttle Position Sensor

=NEEC0477

Throttle valve conditions	Voltage (at normal operating temp., engine off, ignition switch on)
Completely closed (a)	0.2 - 0.8V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.5V

Heated Oxygen Sensor 1 Heater

NEEC0478

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

Calculated Load Value

NEEC0479

	Calculated load value % (Using CONSULT-II or GST)
At idle	9.5 - 34.0%
At 2,500 rpm	13.9 - 24.9%

Intake Air Temperature Sensor

NEEC0480

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

Heated Oxygen Sensor 2 Heater

NEEC0483

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

Crankshaft Position Sensor (OBD)

NEEC0484

Resistance [at 20°C (68°F)] Ω	512 - 632

Alphabetical & Numerical Index for DTC

ALPHABETICAL INDEX FOR DTC

X: Applicable —: Not applicable

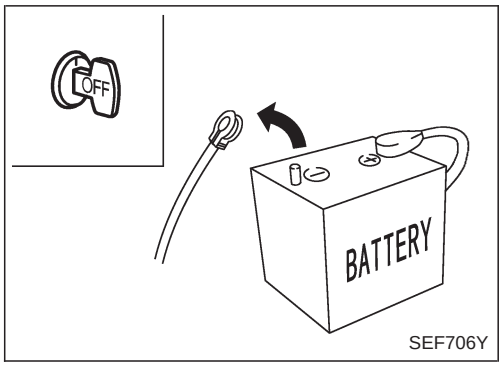
Items (CONSULT-II screen terms)	DTC	MIL illumination	Reference page
ACCEL POS SENSOR	0403	X	EC-3516
BATTERY VOLTAGE	0502	—	EC-3541
COOLANT TEMP SEN	0103	X	EC-3481
CRANK POS SEN (TDC)	0407	X	EC-3535
ECM 10	0802	X	EC-3582
ECM 11	0804	—	EC-3584
ECM 12	0901	X	EC-3502
ECM 14	0807	X	EC-3586
ECM 15	0903	—	EC-3599
ECM 2	0301	X	EC-3502
ECM RLY	0902	X	EC-3594
EGR VOLUME CONT/V	1003	X	EC-3606
FUEL CUT SYSTEM1	1004	X	EC-3615
INT/AIR VOLUME	0406	—	EC-3532
INTAIR TEMP SEN	0401	X	EC-3504
NATS MALFUNCTION	0601 - 0608	—	EL section
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	0505	—	—
OVER HEAT	0208	X	EC-3490
P1·CAM POS SEN	0701	X	EC-3543
P2·TDC PULSE SIG	0702	X	EC-3550
P3·PUMP COMM LINE	0703	X	EC-3557
P4·SPILL/V CIRC	0704	X	EC-3564
P5·PUMP C/MODULE	0705	X	EC-3571
P6·SPILL VALVE	0706	X	EC-3564
P7·F/INJ TIMG FB	0707	X	EC-3574
P9·FUEL TEMP SEN	0402	X	EC-3509
TURBO PRESSURE	0905	X	EC-3601
VEHICLE SPEED SEN	0104	X	EC-3485

Alphabetical & Numerical Index for DTC (Cont'd)

NUMERICAL INDEX FOR DTC

X: Applicable —: Not applicable

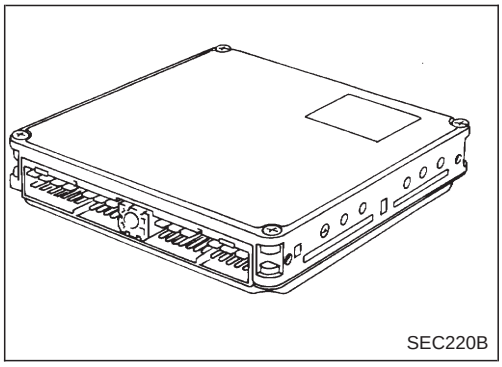
DTC	Items (CONSULT-II screen terms)	MIL illumination	Reference page
0103	COOLANT TEMP SEN	X	EC-3481
0104	VEHICLE SPEED SEN	X	EC-3485
0208	OVER HEAT	X	EC-3490
0301	ECM 2	X	EC-3502
0401	INTAIR TEMP SEN	X	EC-3504
0402	P9·FUEL TEMP SEN	X	EC-3509
0403	ACCEL POS SENSOR	X	EC-3516
0406	INT/AIR VOLUME	—	EC-3532
0407	CRANK POS SEN (TDC)	X	EC-3535
0502	BATTERY VOLTAGE	—	EC-3541
0505	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—
0601 - 0608	NATS MALFUNCTION	—	EL section
0701	P1·CAM POS SEN	X	EC-3543
0702	P2·TDC PULSE SIG	X	EC-3550
0703	P3·PUMP COMM LINE	X	EC-3557
0704	P4·SPILL/V CIRC	X	EC-3564
0705	P5·PUMP C/MODULE	X	EC-3571
0706	P6·SPILL VALVE	X	EC-3564
0707	P7·F/INJ TIMG FB	X	EC-3574
0802	ECM 10	X	EC-3582
0804	ECM 11	—	EC-3584
0807	ECM 14	X	EC-3586
0901	ECM 12	X	EC-3502
0902	ECM RLY	X	EC-3594
0903	ECM 15	—	EC-3599
0905	TURBO PRESSURE	X	EC-3601
1003	EGR VOLUME CONT/V	X	EC-3606
1004	FUEL CUT SYSTEM1	X	EC-3615



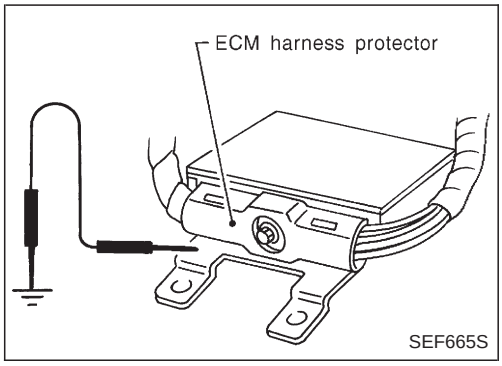
SEF706Y

Precautions

- **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.**

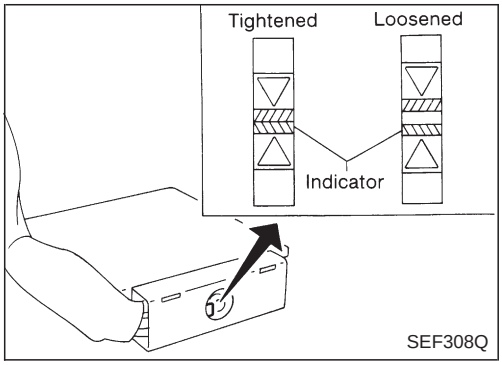

SEC220B

- **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.



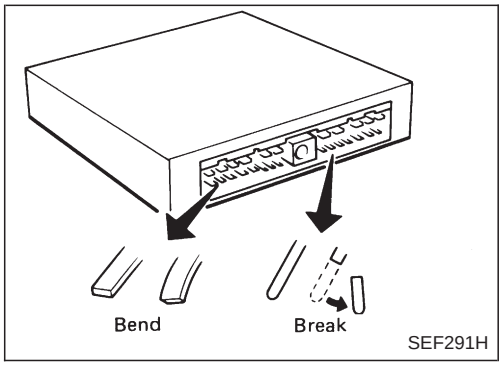
SEF665S

- **When ECM is removed for inspection, make sure to ground the ECM mainframe.**



SEF308Q

- **When connecting engine control system harness connector, tighten securing bolt until the gap between the orange indicators disappears.**
  : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



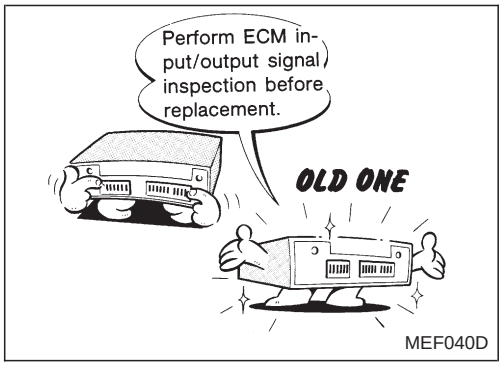
SEF291H

- **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 malfunc-**

Precautions (Cont'd)

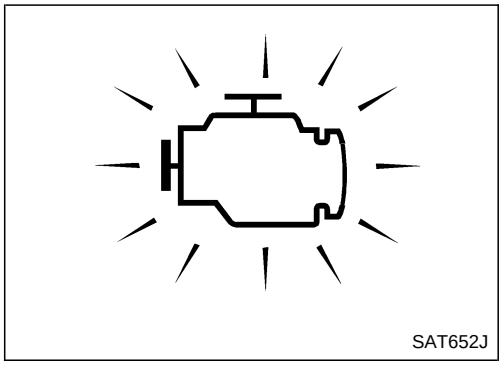
tion due to receiving external noise, degraded operation of ICs, etc.

- Keep engine control system parts and harnesses dry.



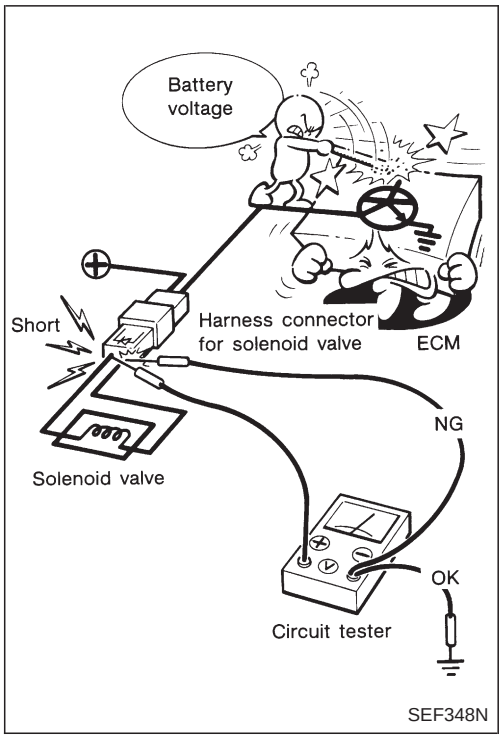
MEF040D

- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-3464.


SAT652J

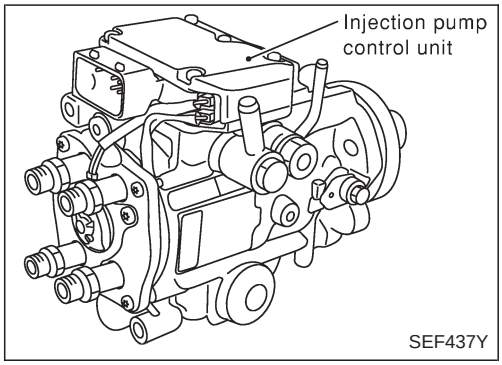
- Fuel filter switch is equipped except for Europe.
  If MIL illuminates or blinks irregularly when engine is running, water may have accumulated in fuel filter. Drain water from fuel filter. Refer to EC-3427. If this does not correct the problem, perform specified trouble diagnostic procedures.
- After 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.

Precautions (Cont'd)



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.**

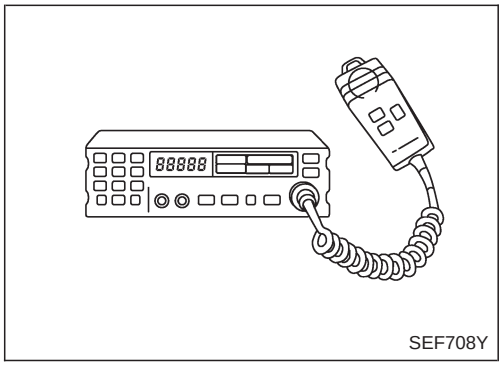


SEF437Y

- **Do not disconnect pump harness connector with engine running.**
- **Do not disassemble electronic fuel injection pump.**
  If NG, take proper action.
- **Do not disassemble injection nozzle.**
  If NG, replace injection nozzle.
- **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.**

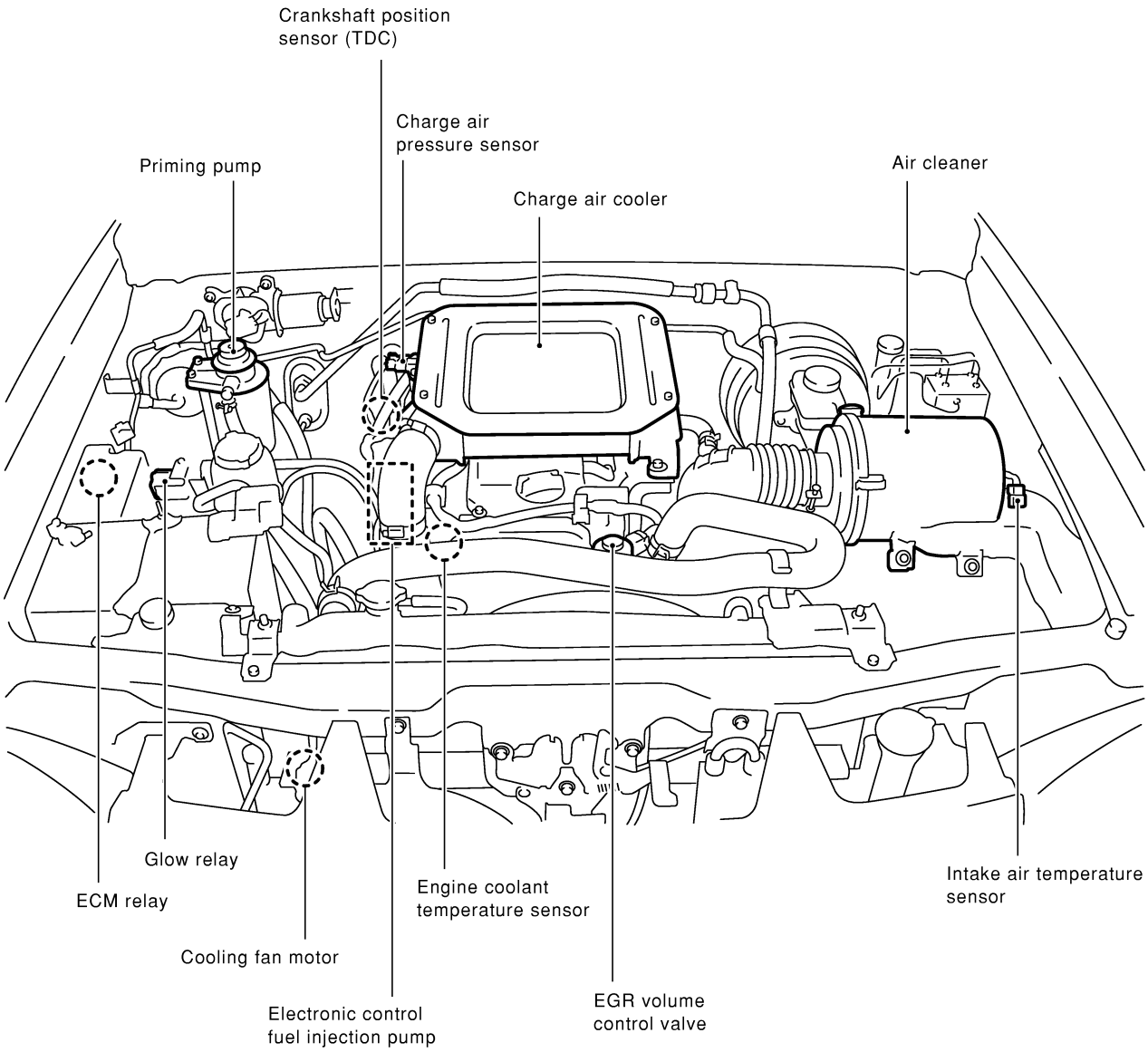


SEF708Y

- **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.**

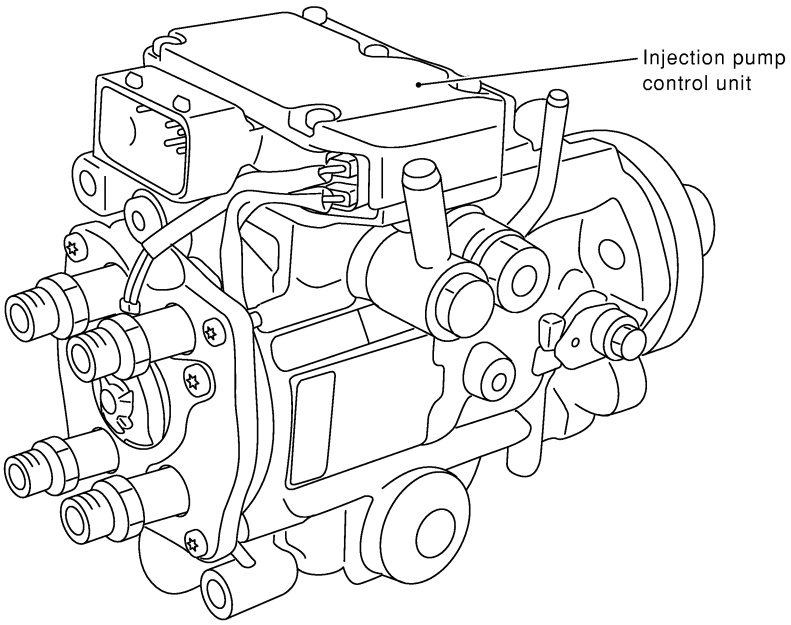
Engine Control Component Parts Location

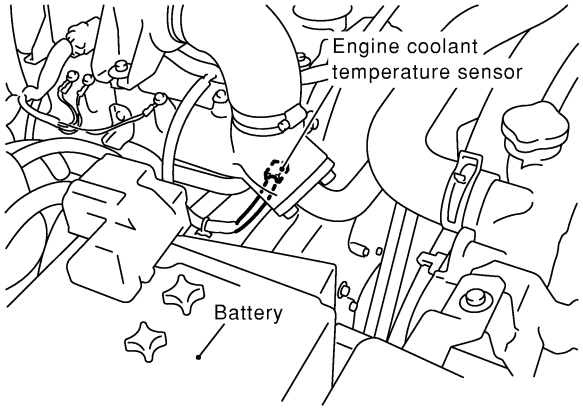


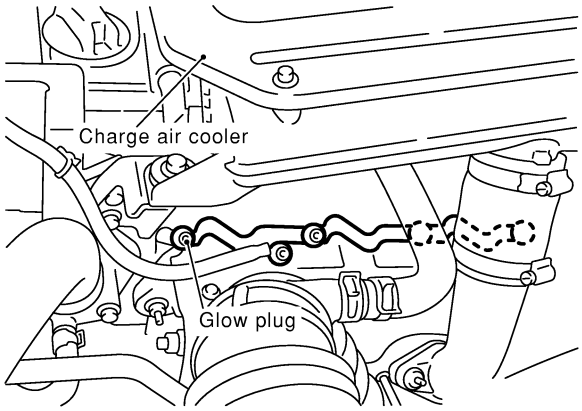
SEC225D

Engine Control Component Parts Location (Cont'd)

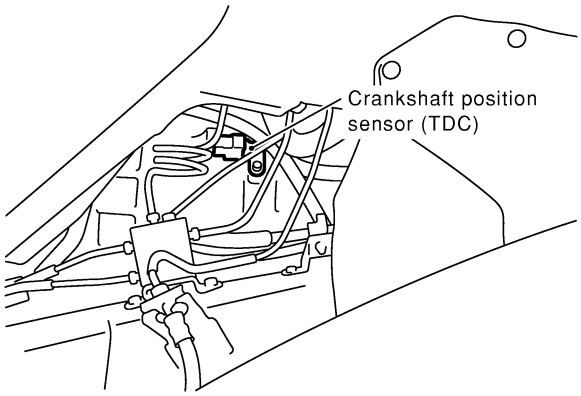
Electronic control fuel injection pump



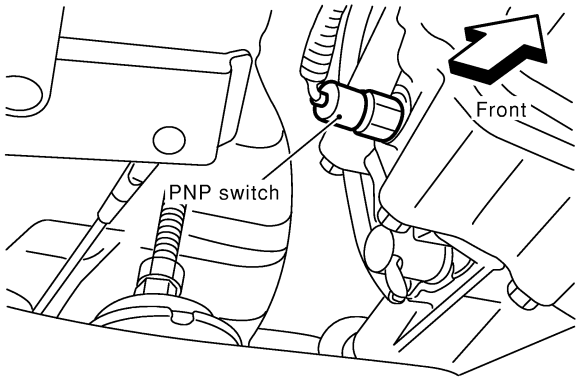




View from front right wheel house

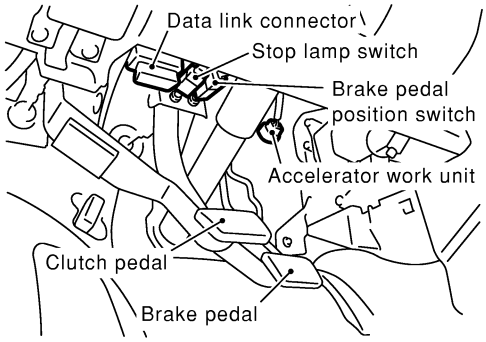


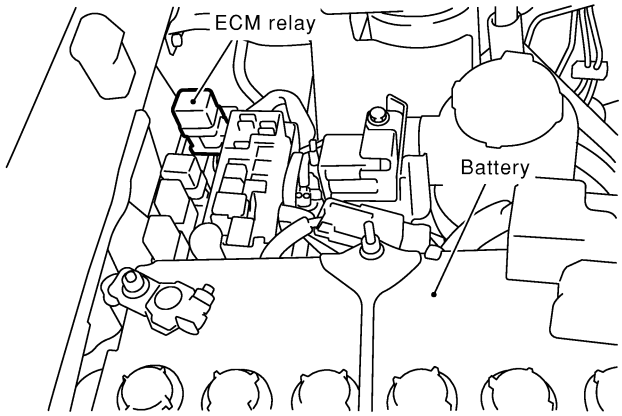
View from under vehicle

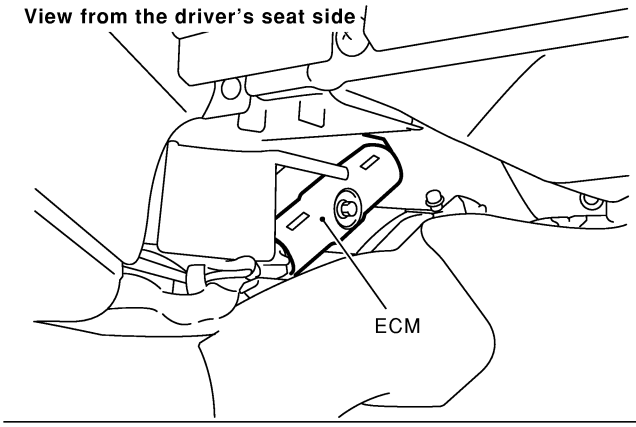


SEC226D

Engine Control Component Parts Location (Cont'd)

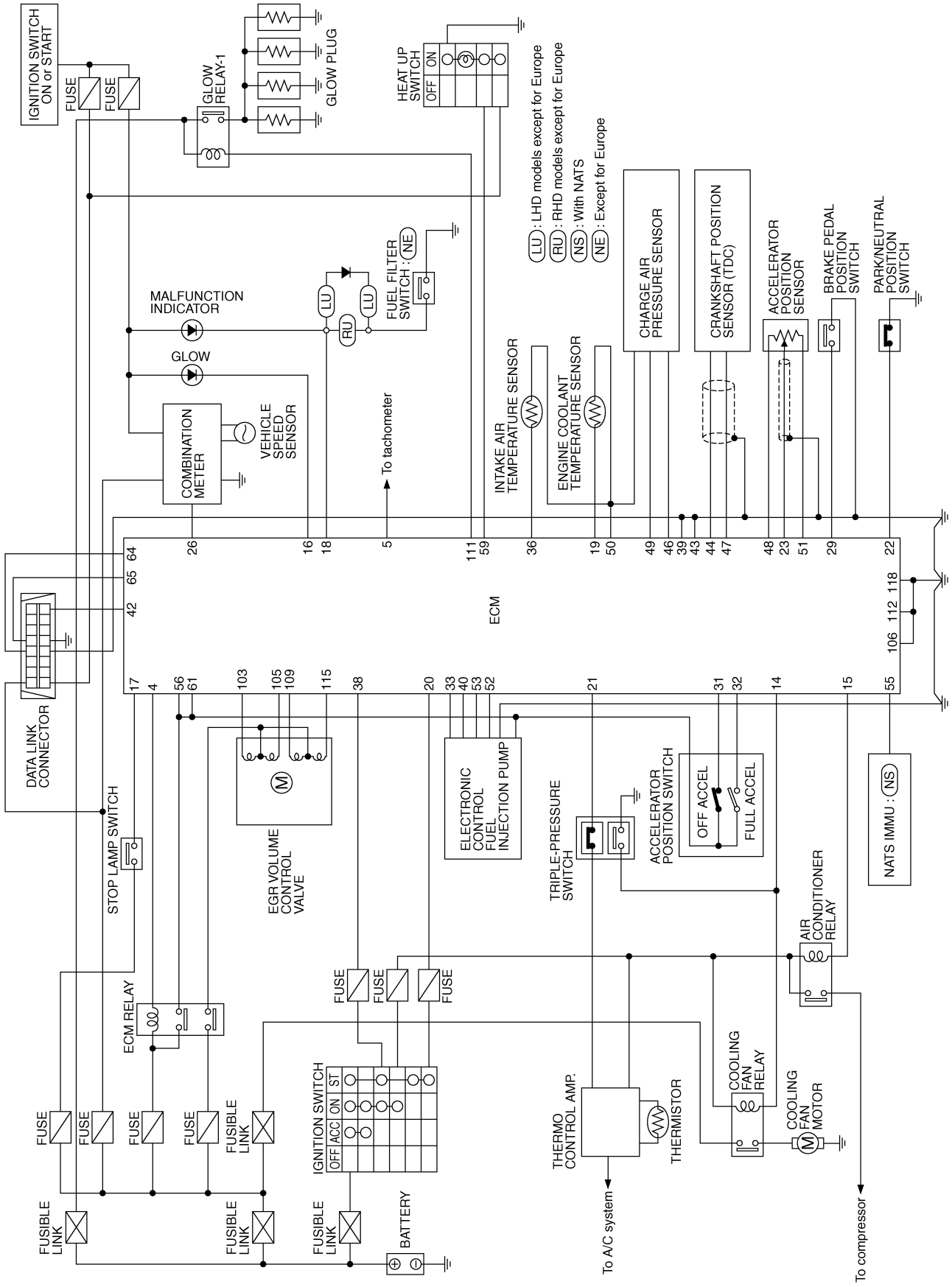






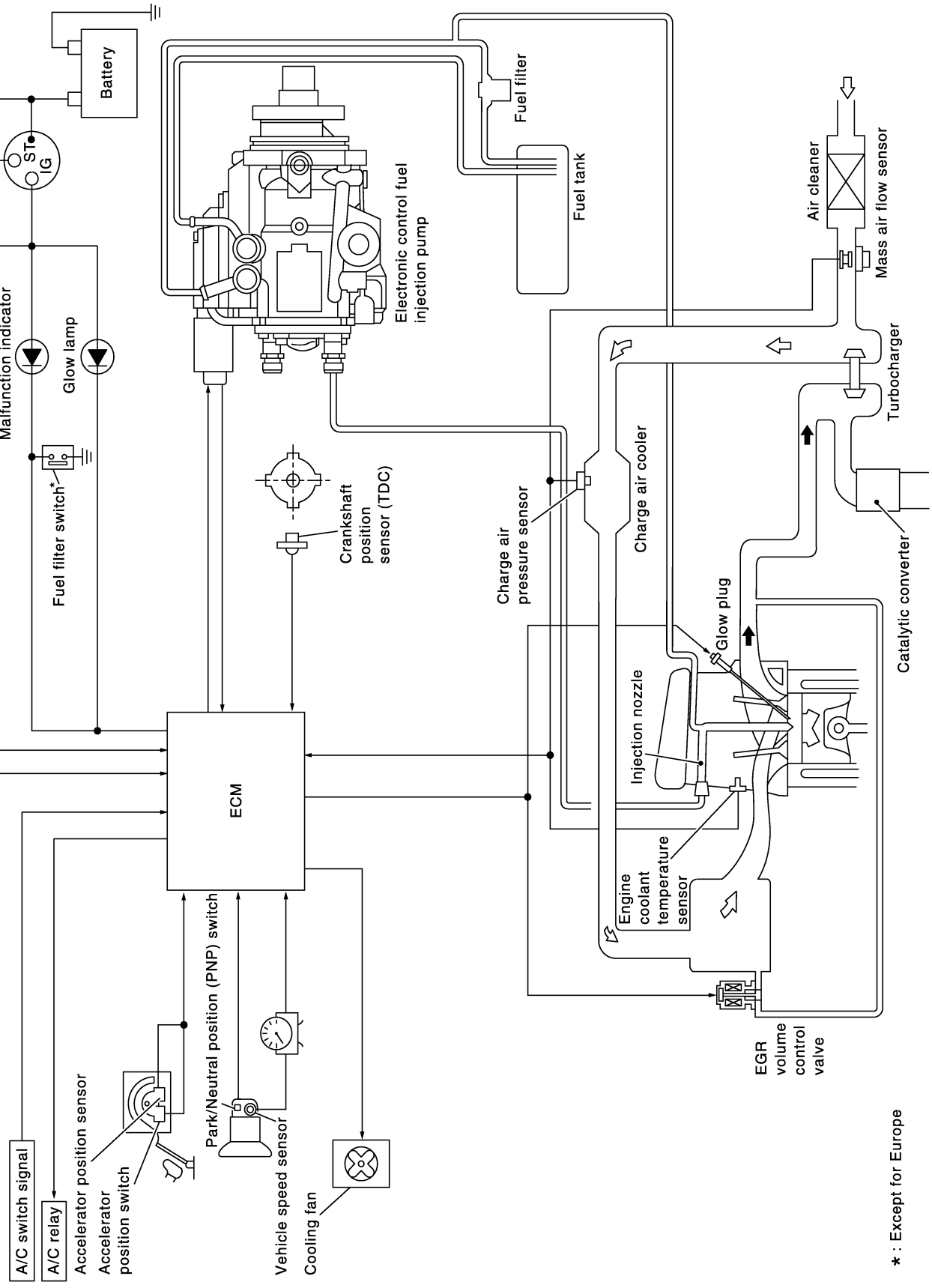
SEC227D

Circuit Diagram



GEC273A

System Diagram



SEC239D

System Chart

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 ● Ignition switch ● Battery voltage ● Vehicle speed sensor ● Air conditioner switch ● Stop lamp switch ● Charge air pressure sensor ● Intake air temperature sensor	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	MIL (On the instrument panel)
	EGR volume control	EGR volume control valve
	Cooling fan control	Cooling fan relay
	Air conditioning cut control	Air conditioner relay

Fuel Injection Control System

DESCRIPTION

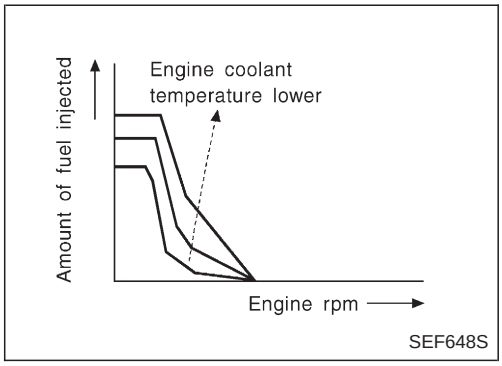
System description

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

Input/output signal chart

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

Input/output signal chart

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		
Park/Neutral position (PNP) switch	Gear position		
Battery	Battery voltage		
Accelerator position switch	Idle position		
Vehicle speed sensor	Vehicle speed		
Air conditioner switch	Air conditioner signal		
Intake air temperature sensor	Intake air temperature		

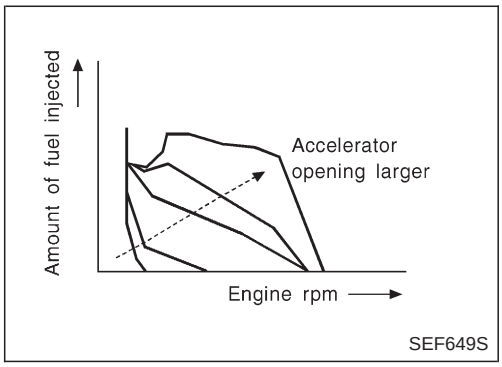
When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. The ECM also provides the system with a fast idle control in response to the engine coolant temperature and heat up switch signal.

Fuel Injection Control System (Cont'd)

Normal control

Input/output signal chart

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		
Vehicle speed sensor	Vehicle speed		



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

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (Maximum amount control)	Electronic control fuel injection pump
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

Input/output signal chart

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

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

Input/output signal chart

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 position		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		

System description

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

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Vehicle speed sensor	Vehicle speed	Fuel cut control	Electronic control fuel injection pump
Park/Neutral position (PNP) switch	Neutral position		
Accelerator position switch	Accelerator position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (TDC)	Engine speed		

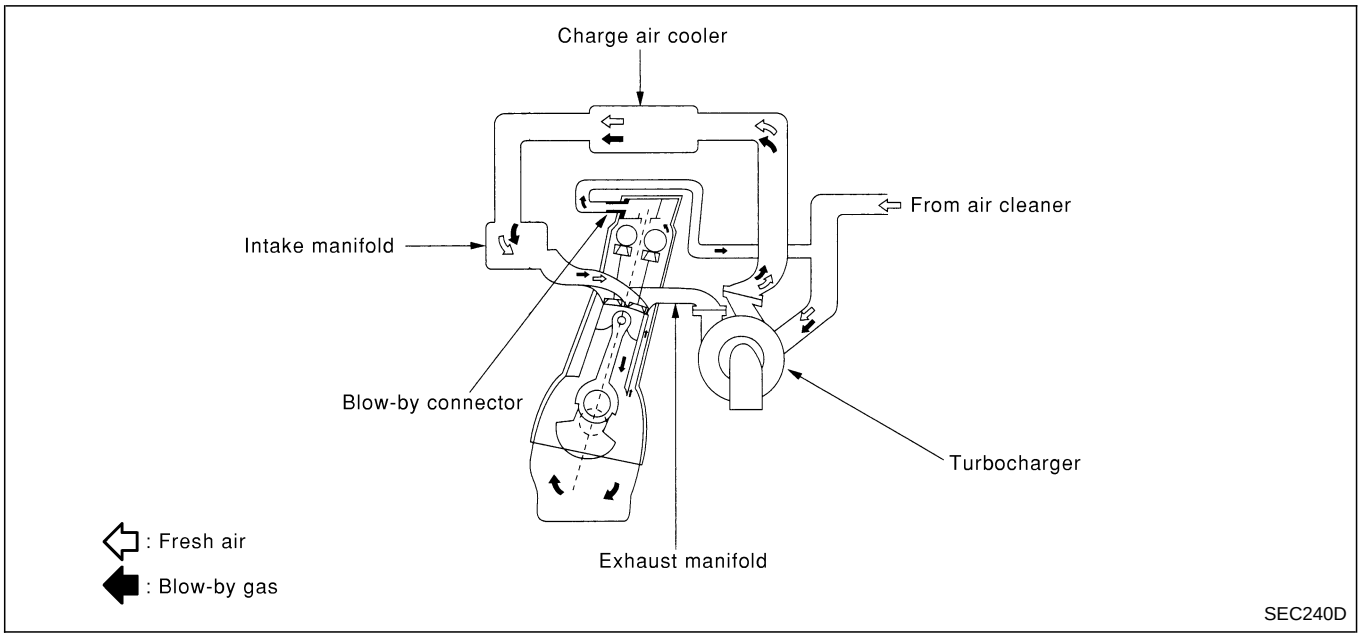
If the engine speed is above 2,700 rpm with no load (for example, in neutral and engine speed over 2,700 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

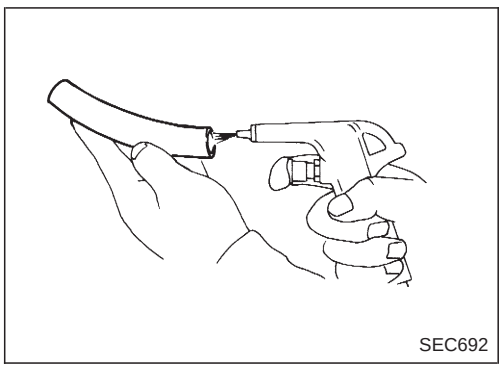
NOTE:
This function is different from deceleration control listed under “Fuel Injection Control System”, EC-3411.

Crankcase Ventilation System

DESCRIPTION

In this system, blow-by gas is sucked into the air inlet pipe after oil separation by oil separator in the rocker cover.





INSPECTION

Ventilation hose

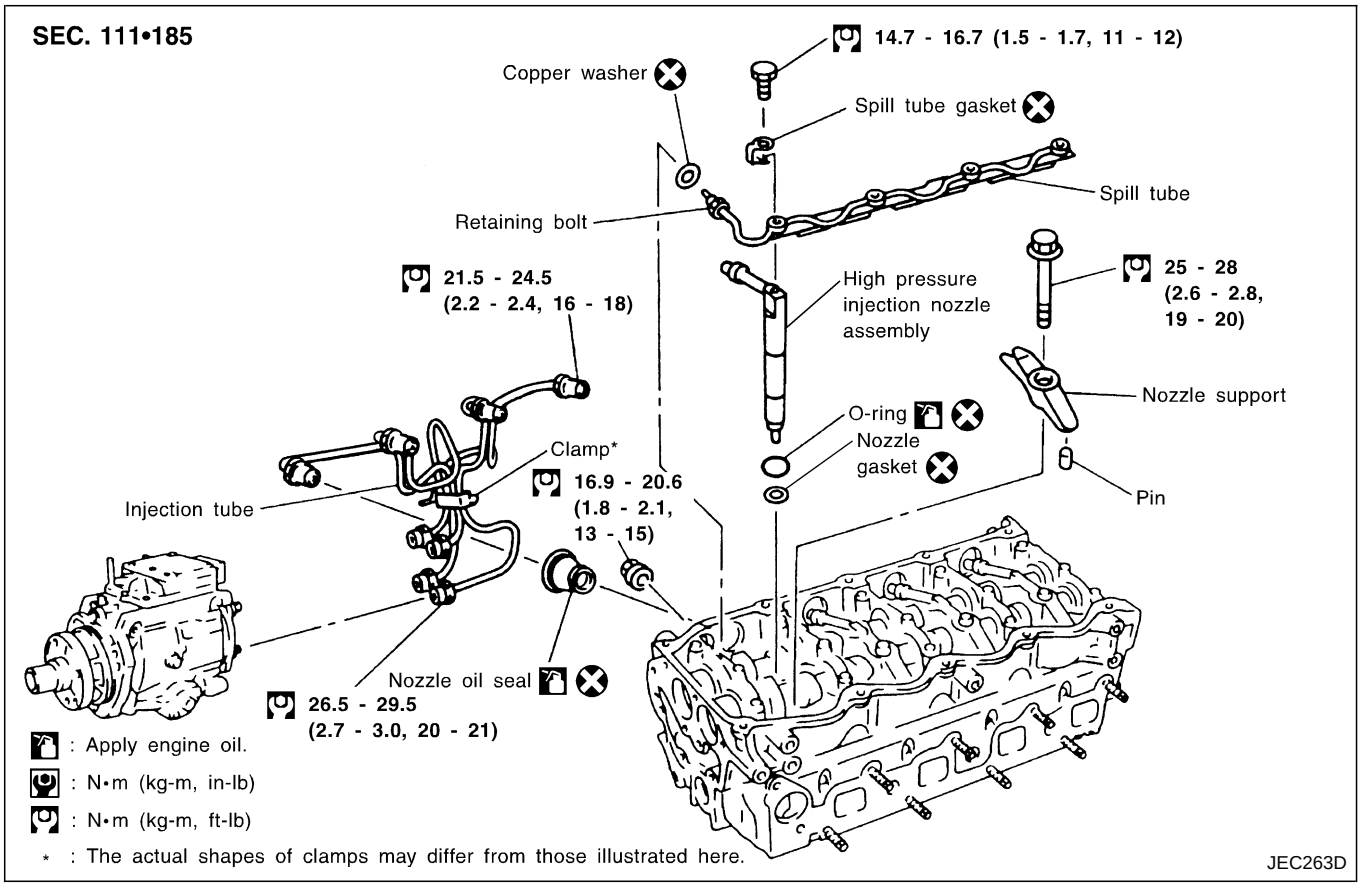
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

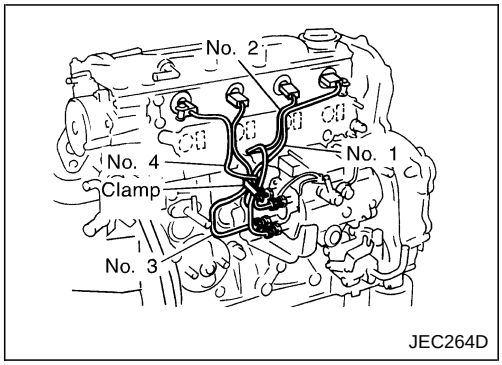
Injection Tube and Injection Nozzle

REMOVAL AND INSTALLATION

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 for protection of needle.**

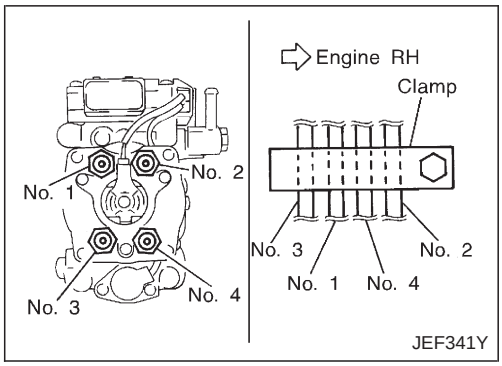




Injection Tube
Removal

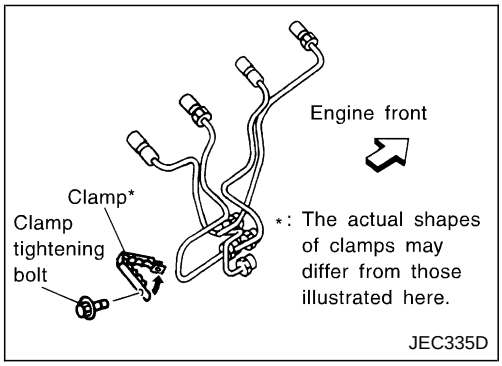
1. Mark the cylinder Nos. to the injection tubes, then disconnect them.
- **Marking should be made at proper locations and by the proper method, so that they are not erased by fuel, etc.**
2. Remove the clamps, then disconnect the tubes one by one.
- The intake manifold is removed for explanation in the figure.

Injection Tube and Injection Nozzle (Cont'd)

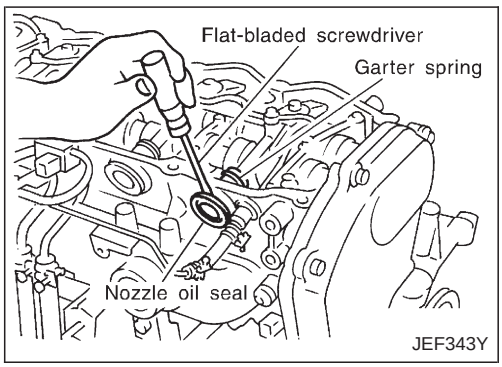


Installation

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 bolt of the clamp (4-tube type) from the rear to the front of the engine.



Injection Nozzle Oil Seal
Removal

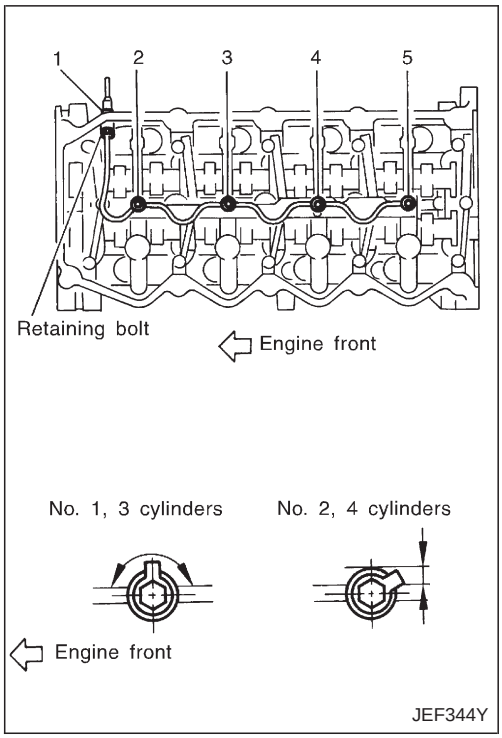
Using a tool such as a flat-bladed screwdriver, pry the flange of the seal, then remove it.

Installation

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.)**

Injection Tube and Injection Nozzle (Cont'd)



Spill Tube

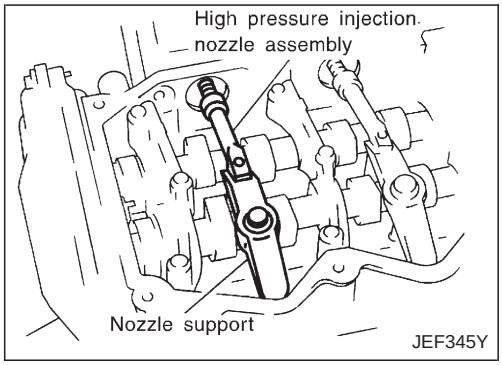
Removal

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

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

Removal

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.

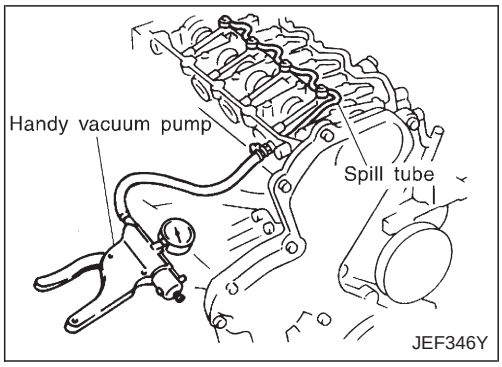
Installation

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

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.

Injection Tube and Injection Nozzle (Cont'd)



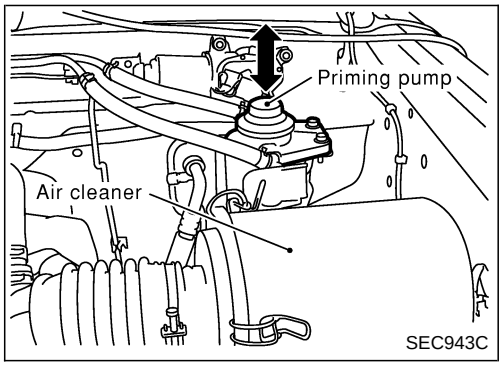
Inspection for Spill Tube Airtightness

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.

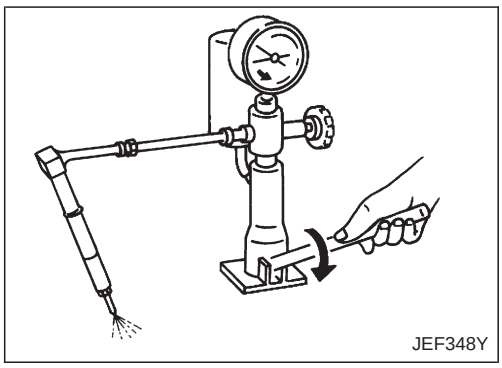
Standard:

−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

After the repair, bleed air in the piping by pumping the priming pump up and down until it becomes heavy. Refer to EC-3427.



Injection Pressure Test

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

18,500 - 20,500 kPa (185 - 205 bar, 189 - 209 kg/cm^2, 2,682 - 2,973 psi)

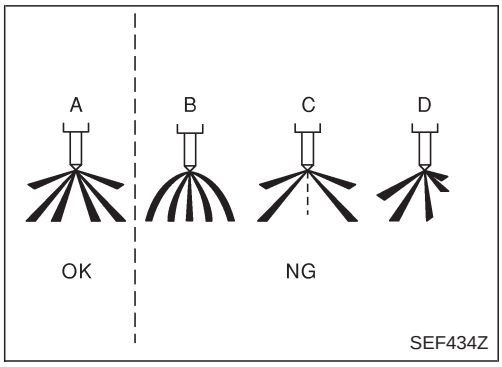
Limit

16,200 kPa (162 bar, 165 kg/cm^2, 2,349 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.

Injection Tube and Injection Nozzle (Cont'd)

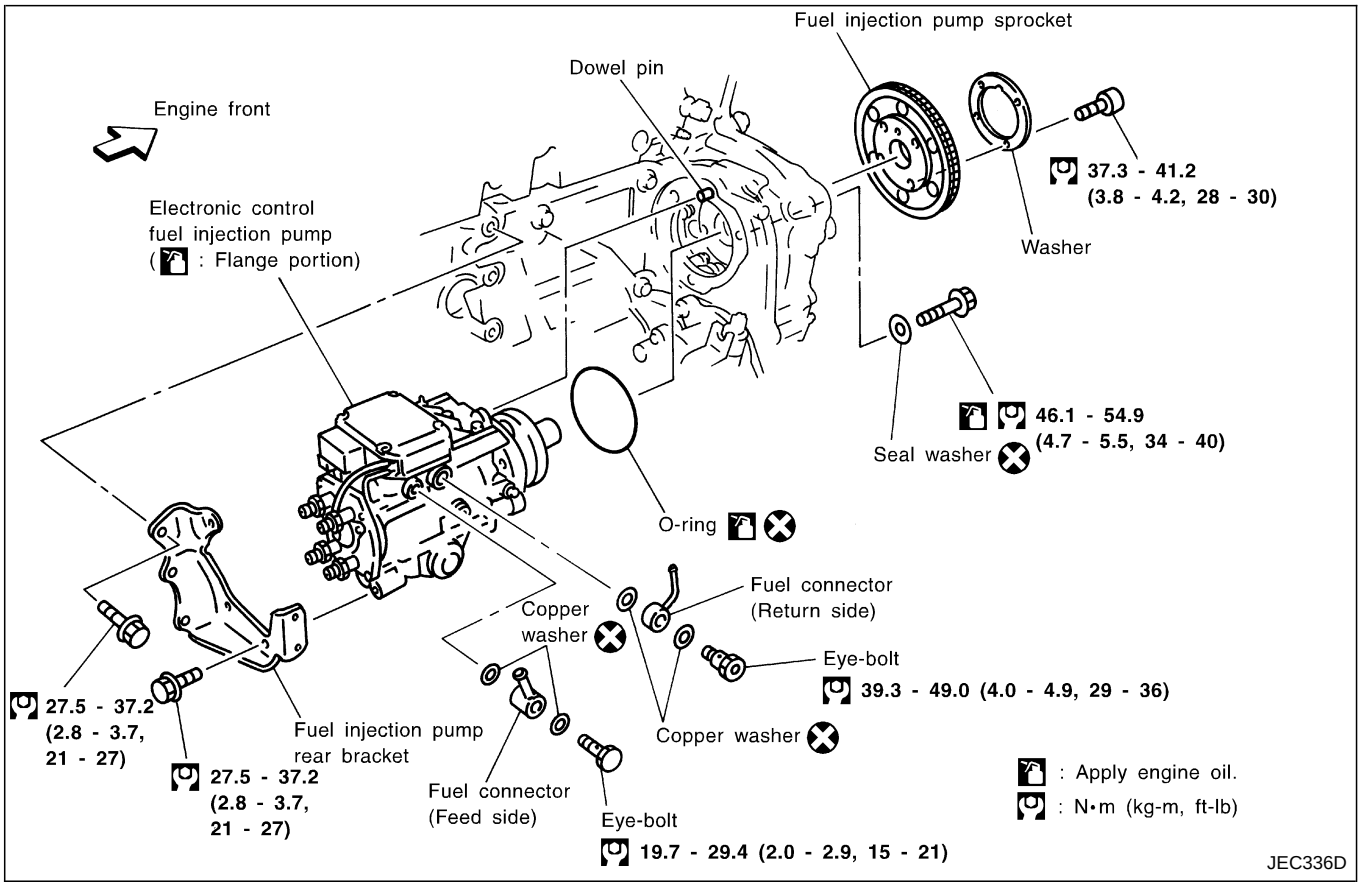


Spray Pattern Test

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

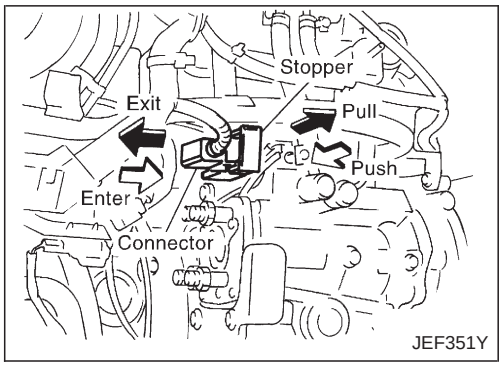
REMOVAL AND INSTALLATION



Removal

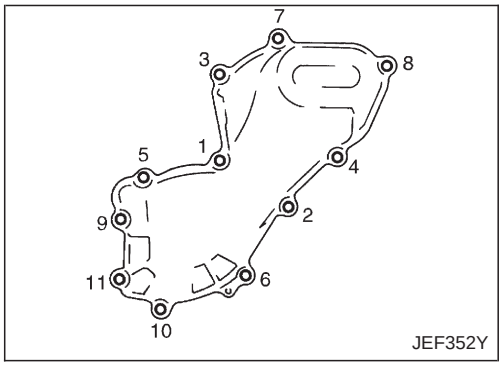
1. Remove the parts shown below.
- Engine hood
- Engine coolant (drain)
- Engine cover
- Heater pipe under intake manifold
- Injection tubes
- Right splash cover (with undercover)
- Right front wheel

Electronic Control Fuel Injection Pump (Cont'd)



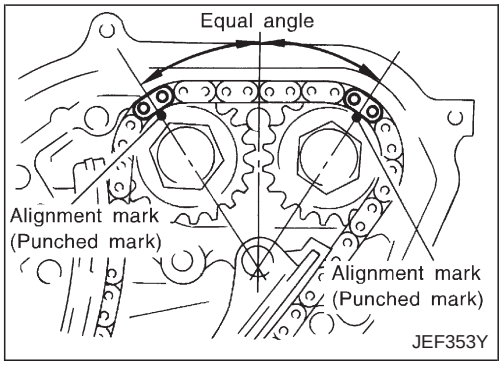
2. Disconnect the fuel hoses from the fuel injection pump.
3. Disconnect the harness connector from the fuel injection pump.
- Disconnect the connector by pulling the connector stopper fully.
- When the stopper is fully pulled, the connector will be disconnected together. For installation, push the connector 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.

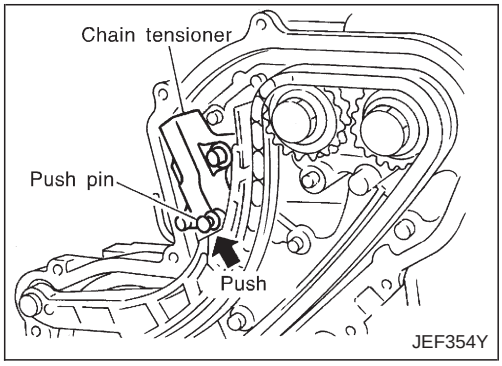


5. Remove the front chain case.
- Move the power steering fluid reservoir tank from the bracket.
- Loosen and remove the mounting bolts in the reverse order of the numbers shown in the figure.
- As for bolts 6, 10, and 11, remove with rubber washer because there is not enough space for removing only the bolts.

CAUTION:
To prevent foreign objects from getting in the engine, cover the opening during the removal of the front chain case.

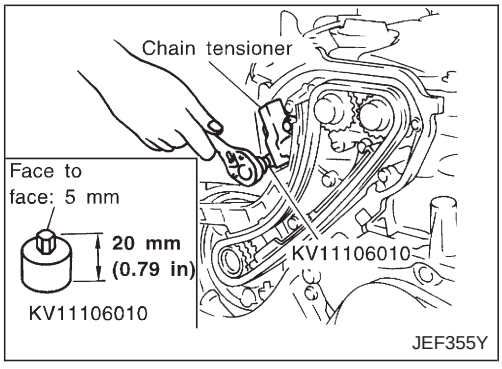


6. Adjust the No. 1 cylinder to the top dead center position.
- Turn the crankshaft pulley clockwise, then align the alignment mark (punched mark) of the camshaft sprocket to the position shown in the figure.
- There is no indicator on the crankshaft pulley.
- It is not necessary to mark the secondary 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.



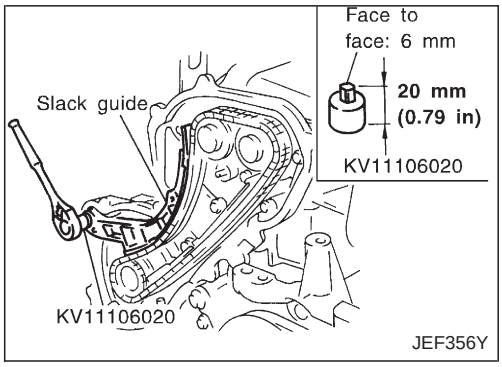
7. Remove the chain tensioner.

a. Push the plunger of the chain tensioner, then fix it with a tool such as a push pin.

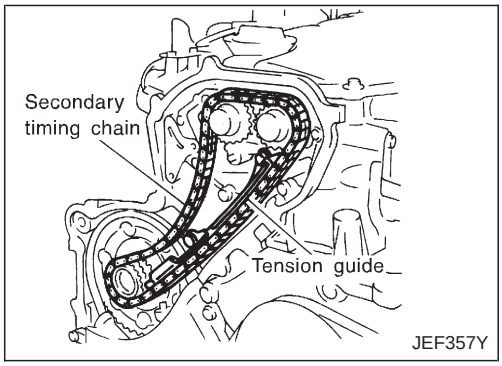


b. Using the hexagon wrench (face to face: 5 mm) (SST), remove the mounting bolts, then remove the chain tensioner.
- A multi-purpose tool may also be used.

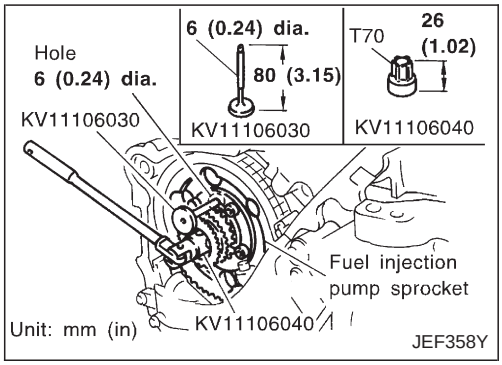
Electronic Control Fuel Injection Pump (Cont'd)



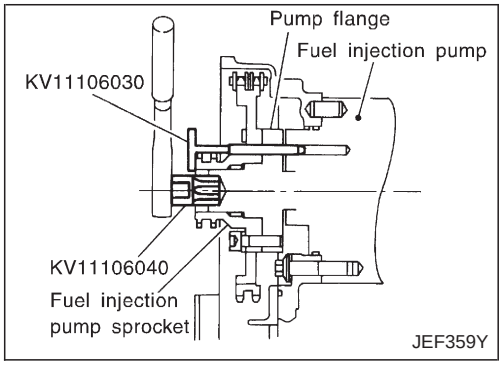
8. Remove the timing chain slack guide.
- Using the hexagon wrench (face to face: 6 mm, short-type) (SST), remove the mounting bolts, then remove the timing chain slack guide.



9. Remove the timing chain tension guide.
10. Remove the secondary timing chain.
- Only the timing chain can be removed without removing the sprockets.

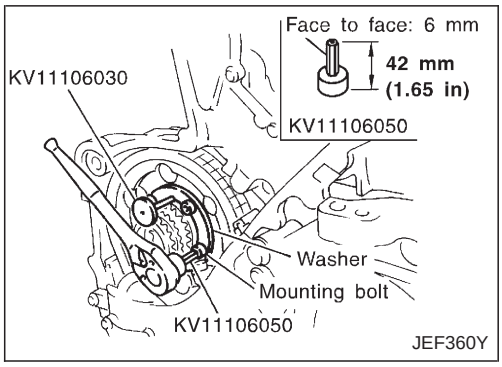


11. Fix the fuel injection pump sprocket.
a. Insert the positioning stopper pin (SST) in the 6 mm (0.24 in) dia. hole of the fuel injection pump sprocket.
b. Using the torx wrench (SST), turn the pump shaft gradually to adjust the hole position of the fuel injection pump sprocket.
c. Insert the positioning stopper pin through the fuel injection pump body to fix the sprocket.

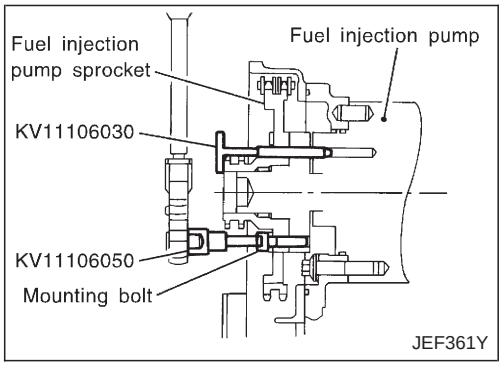


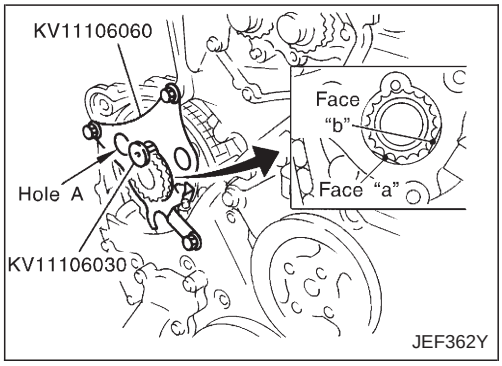
- Insert the positioning stopper pin until its flange contacts the fuel injection pump sprocket.
d. Remove the torx wrench (SST).

Electronic Control Fuel Injection Pump (Cont'd)



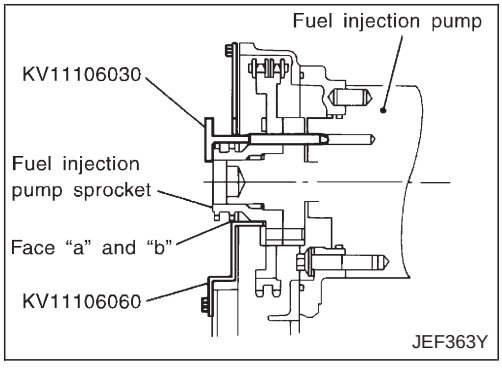
12. Using the hexagon wrench (face to face: 6 mm, long-type) (SST), remove the mounting bolts of the fuel injection pump sprocket.
- It is not necessary to remove the washer of the fuel injection pump sprocket.

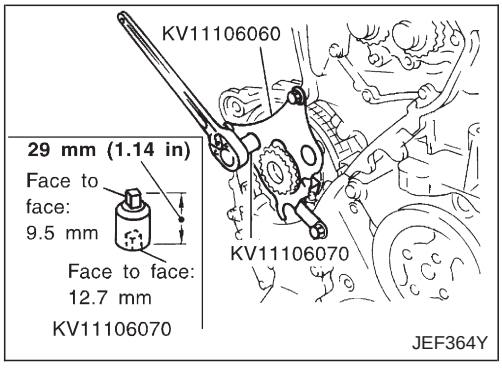




13. Using the sprocket holder (SST), hold the fuel injection pump sprocket to prevent falling.
- When the sprocket holder is installed, if the positioning stopper pin interferes, pull out the stopper pin approximately 10 mm (0.39 in), then install it.
- After the sprocket holder is installed temporarily, 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.

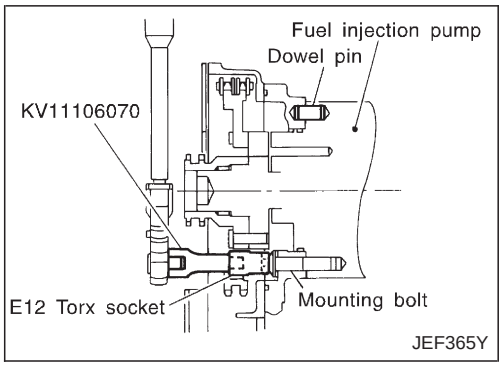




14. Using the extension bar [SST: whole length 43 mm (1.69 in)] and the Torx socket (Q6-E12: commercially available), remove the mounting bolts, them remove the fuel injection pump toward the rear of the engine.
- Even after all the mounting bolts are removed, the fuel injection pump is still held by a dowel pin.

CAUTION:
Do not disassemble or adjust the fuel injection pump.

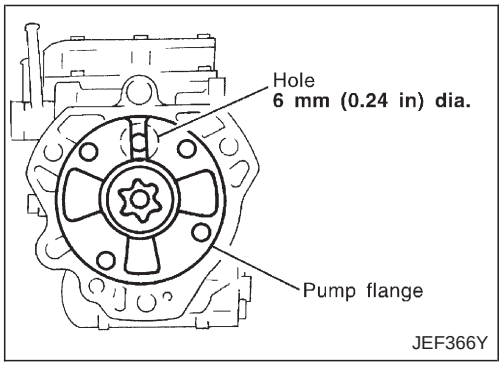
Electronic Control Fuel Injection Pump (Cont'd)



15. Remove the fuel injection pump mounting bolts.
- The seal washer of the mounting bolts cannot be reused.

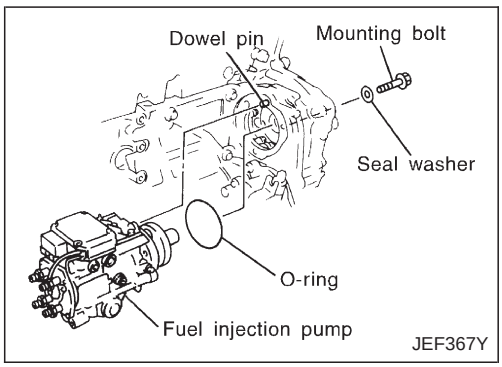
CAUTION:
For removal, be careful not to drop the seal washer into the engine.

Installation

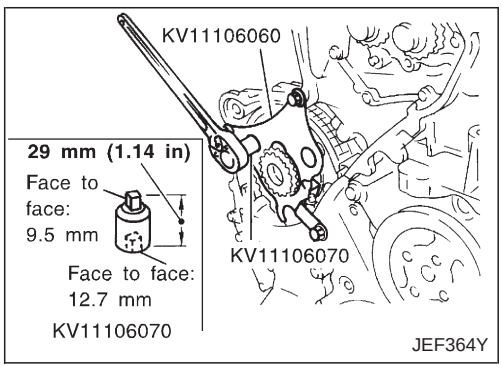


- It is not necessary to adjust the injection timing by changing the installation angle which used to be performed with conventional fuel injection pumps. The installation position can be simply decided by the dowel pin and the mounting bolts.

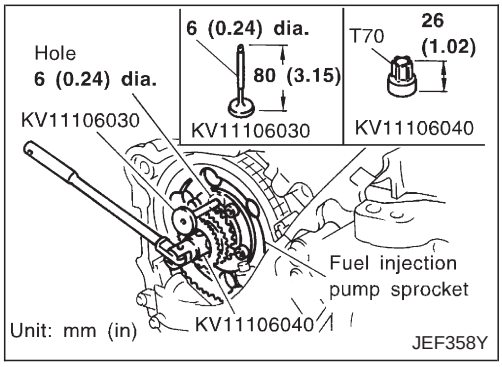
1. Before the fuel injection pump is installed, check that the notch of its flange and the 6 mm (0.24 in) dia. hole on the body are aligned.



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.

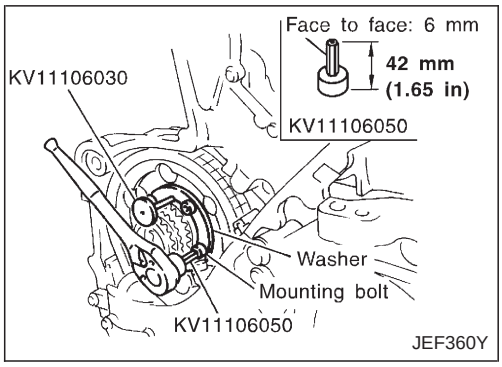


3. Using the extension bar (SST) and the Torx socket, tighten the mounting bolts of the fuel injection pump.
4. Remove the sprocket holder (SST).



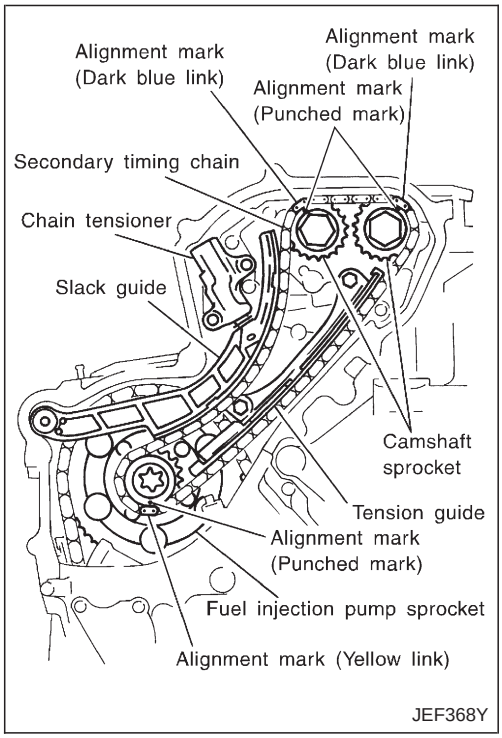
5. Using the torx wrench (SST), turn the pump shaft gradually to adjust the position of the flange. Then, insert the positioning stopper pin (SST) to the 6 mm (0.24 in) dia. hole of the fuel injection pump sprocket through the pump flange and the pump body.
6. Remove the torx wrench (SST).

Electronic Control Fuel Injection Pump (Cont'd)



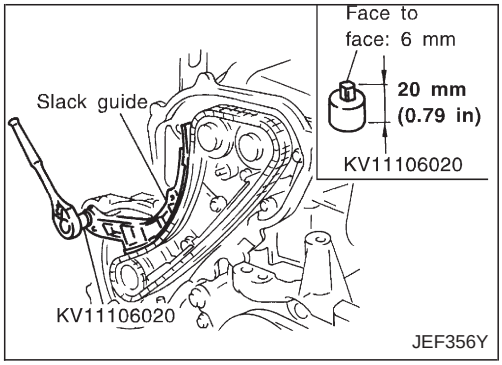
7. Using the hexagon wrench (face to face: 6 mm, long-type) (SST), tighten the sprocket mounting bolt.
- When the washer of the fuel injection pump sprocket is removed, install it with the marking "F" (front) facing the front of the engine.

8. Pull out the positioning stopper pin (SST).

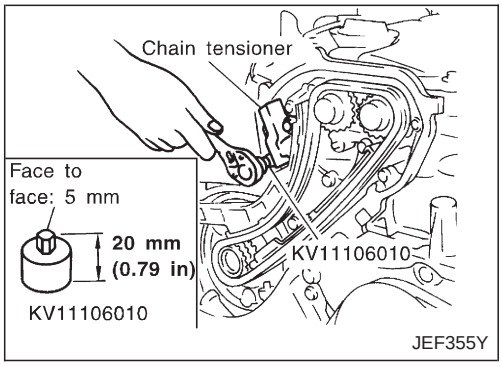


9. Install the secondary timing chain.
- Align the alignment marks of the sprockets and those of the chain, then install it.
- The figure shows the installation state and names of the secondary timing chain and other related parts.

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.

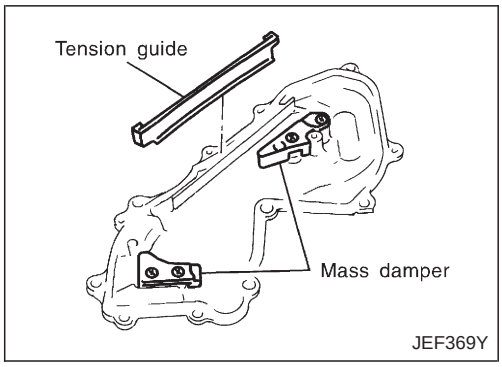


12. Install the chain tensioner.

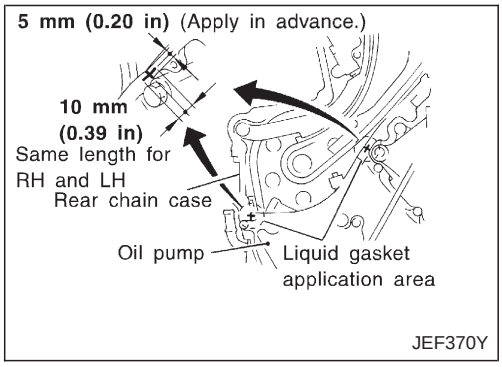
a. Push the plunger of the chain tensioner, then hold it with a tool such as a push pin, and install it.
b. Using a hexagon wrench (face to face: 5 mm) (SST), tighten the mounting bolts.
- Installation is possible by a multi-purpose tool also.

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.**

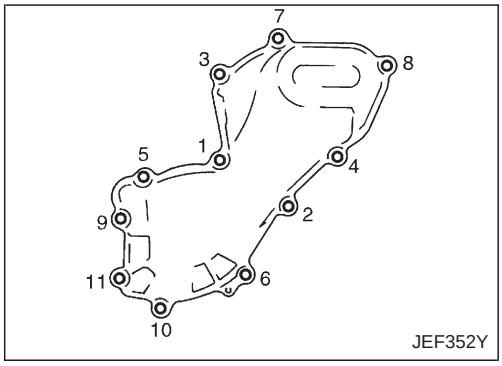
Electronic Control Fuel Injection Pump (Cont'd)



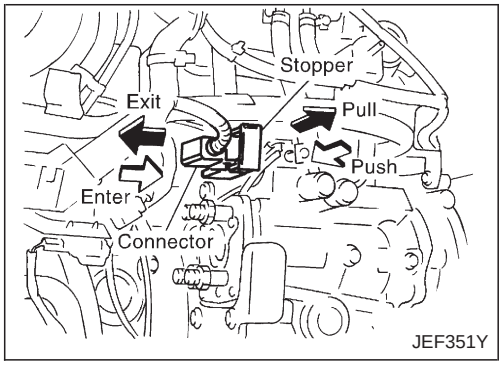
13. Install the front chain case.
a. Install the tension guide to the back side of the front chain case.
- If the front chain case is tilted, the tension guide may fall off. Therefore, when installing the front chain case, hold it vertically.



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.

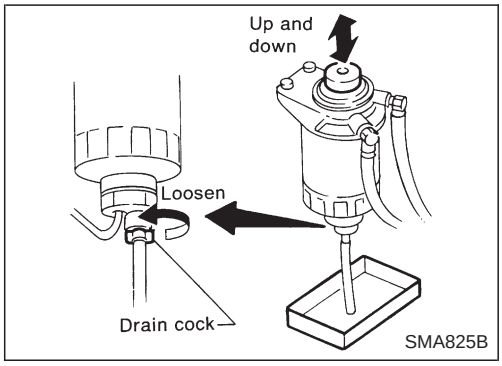
16. Connect the fuel hoses.
- When the hoses are disconnected at the fuel gallery side, insert until the hoses contact the valve, then install the clamp securely.

17. Install other parts in the reverse order of removal.

Air Bleeding

Pump the priming pump to bleed air.

- **When air is bled completely, the pumping of the priming pump suddenly becomes heavy. Stop 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, and then bleed air again.**
- **Start engine and let it idle for at least one minute after performing air bleeding.**



Water Draining

EXCEPT FOR EUROPE

- If the MIL illuminates or blinks during the engine operation, drain the water as follows.

1. Loosen drain cock and drain water.
   Loosening drain cock four to five turns causes water to start draining.
   Do not remove drain cock by loosening it excessively.
   If water does not drain properly, move the priming up and down.
   Water amount when the MIL blinks:
   90 - 150 mℓ (3.2 - 5.3 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.
Do not over-tighten the water draining cock. This will damage the cock thread, resulting in water or fuel leak.

2. Bleed air of the fuel filter. Refer to EC-3426.
3. Start the engine, then check that the MIL goes off.

FOR EUROPE

1. Loosen drain cock and drain water.
   Loosening drain cock four to five turns causes water to start draining.
   Do not remove drain cock by loosening it excessively.
   If water does not drain properly, move the priming handle up and down.

CAUTION:
When the water is drained, the fuel is also drains. Use a pan, etc. to avoid fuel adherence to rubber parts such as the engine mount insulator.
Do not over-tighten the water drain cock. This will damage the cock thread, resulting in water or fuel leak.

2. Bleed air of the fuel filter. Refer to EC-3426.

Accelerator Position Sensor Idle Position Learning

DESCRIPTION

"Accelerator Position Sensor Idle Position Learning" is an operation to clear the self-learning fully closed accelerator position. It must be performed each time harness connector of accelerator position sensor or ECM is disconnected.

OPERATION PROCEDURE

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "CLEAR".

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 10 minutes.

DTC and MIL Detection Logic

When a malfunction is detected, the malfunction (DTC) is stored in the ECM memory.
The MIL will light up each time the ECM detects malfunction. For diagnostic items causing the MIL to light up, refer to “TROUBLE DIAGNOSIS — INDEX”, EC-3400.

Diagnostic Trouble Code (DTC)

HOW TO READ DTC

The DTC can be read by the following methods.

Without CONSULT-II

ECM displays the DTC by a set of four digit numbers with MIL illumination in the diagnostic test mode II (Self-diagnostic results). Example: 0407, 1004, etc.

With CONSULT-II

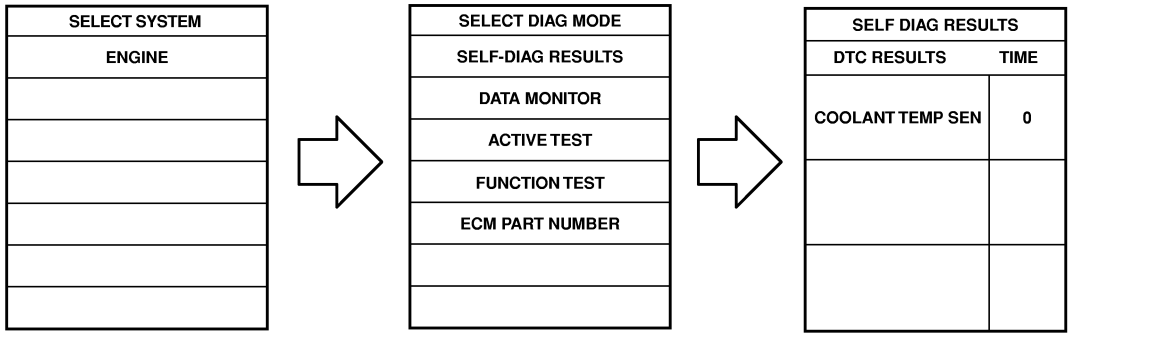
CONSULT-II displays the DTC in “SELF-DIAG RESULTS” mode. Examples: “CRANK POS SEN (TDC)”, etc.

HOW TO ERASE DTC

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” (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.)

SEC944C

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 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-3432.)

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.**

Diagnostic Trouble Code (DTC) (Cont'd)

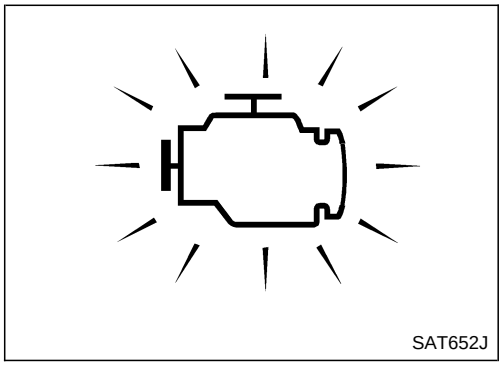
●Erasing the emission-related diagnostic information using CONSULT-II is easier and quicker than switching the diagnostic test mode using the data link connector.

SELF DIAG RESULTS	
DTC RESULTS	TIME
NATS MALFUNCTION	0

SEF252Z

NATS (Nissan Anti-Theft System)

- **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.



SAT652J

Malfunction Indicator Lamp (MIL)

DESCRIPTION

The MIL is located on the instrument panel.

1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   - If the MIL does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-3647.
2. When the engine is started, the MIL should go off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.

Fuel filter switch is equipped except for Europe.
If MIL illuminates or blinks irregularly after starting engine, water may have accumulated in fuel filter. Drain water from fuel filter. Refer to EC-3426.

On board diagnostic system function

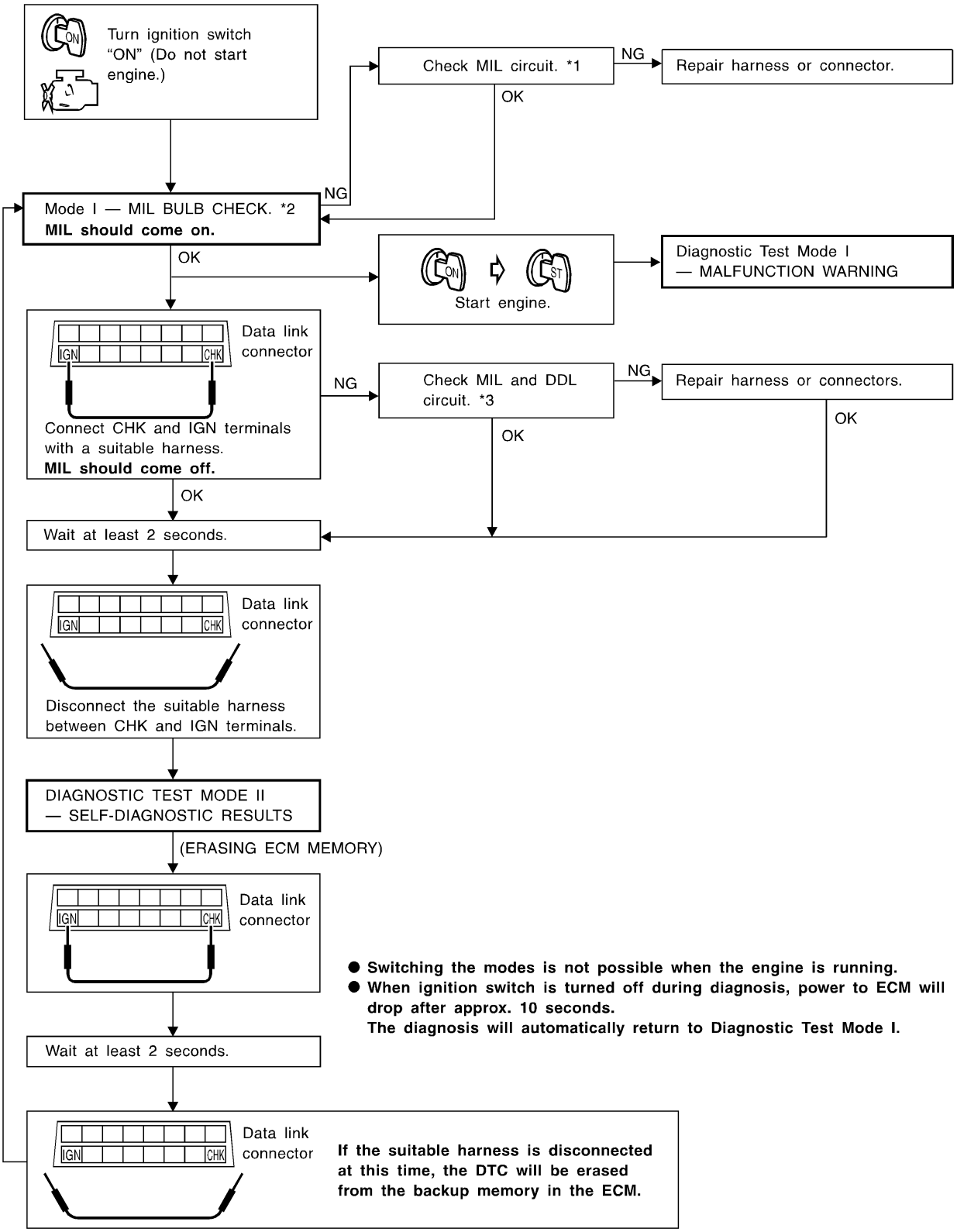
The on board diagnostic system has the following three functions.

Malfunction Indicator Lamp (MIL) (Cont'd)

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 MIL bulb for damage (blown, open circuit, etc.). If the MIL does not come on, check MIL circuit. (See EC-3647.)
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When ECM detects a malfunction, the MIL 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.

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



- **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.

SEC945C

*1: EC-3647 *2: EC-3429 *3: EC-3647

Malfunction Indicator Lamp (MIL) (Cont'd)

Diagnostic test mode I — Bulb check

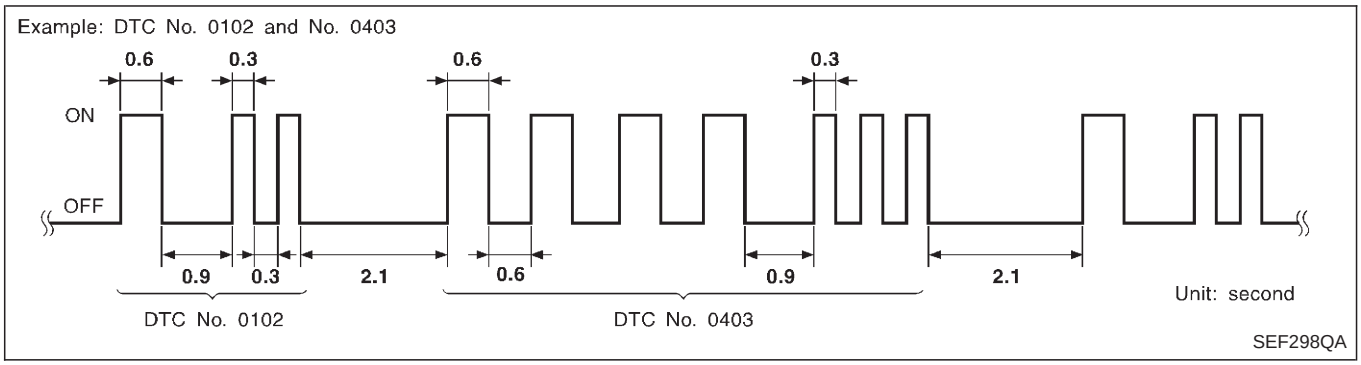
In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section, "WARNING LAMPS AND CHIME" or see EC-3647.

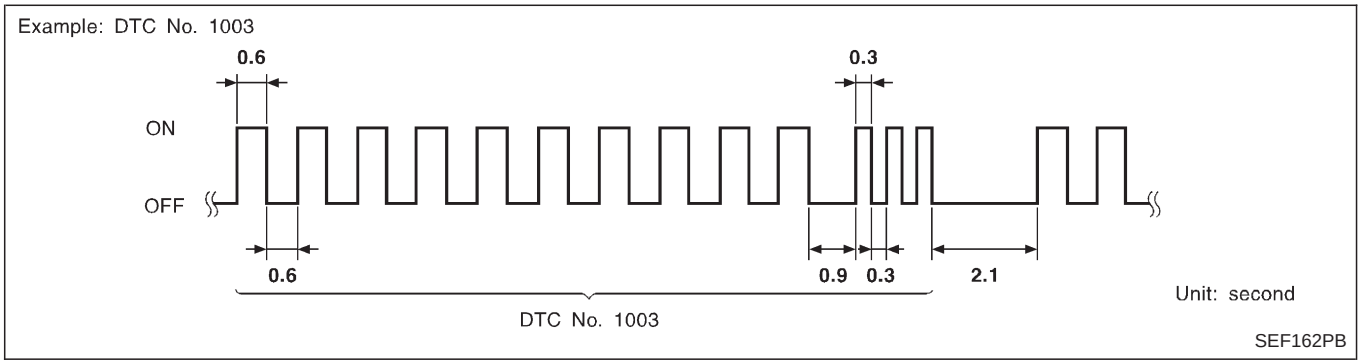
Diagnostic test mode I — Malfunction warning

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

Diagnostic test mode II — Self-diagnostic results

In this mode, DTC is indicated by the number of blinks of the MIL 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 MIL 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-3400.)

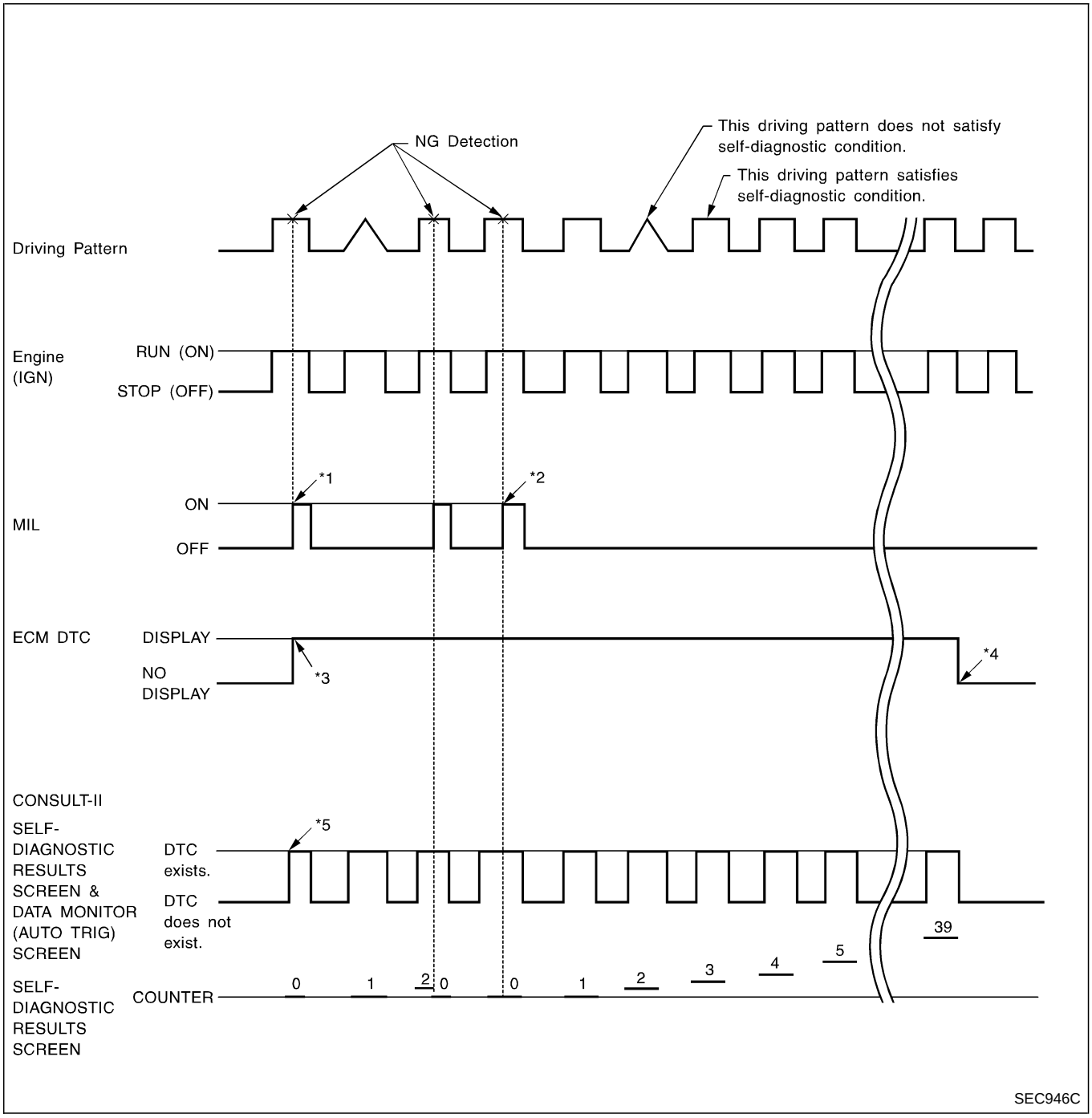
How to erase diagnostic test mode II (Self-diagnostic results)

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-3431.)

- **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.**

Malfunction Indicator Lamp (MIL) (Cont'd)

Relationship between MIL, DTC, CONSULT-II and driving patterns



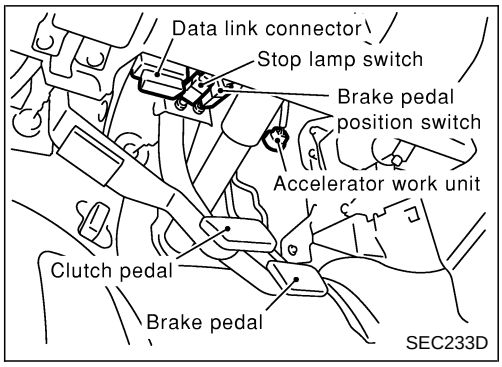
*1: When a malfunction is detected, MIL will light up.

*2: When the same malfunction is detected in two consecutive driving patterns, MIL will stay lit up.

*3: When a malfunction is detected for the first time, the DTC will be stored in ECM.

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

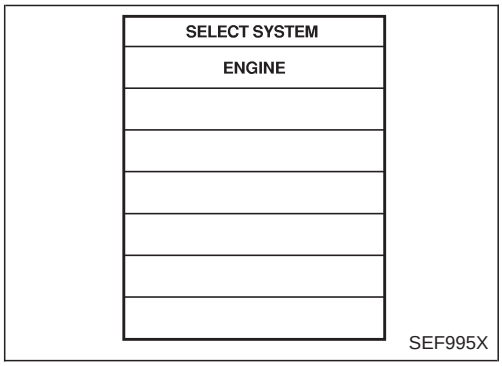
*5: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.



CONSULT-II

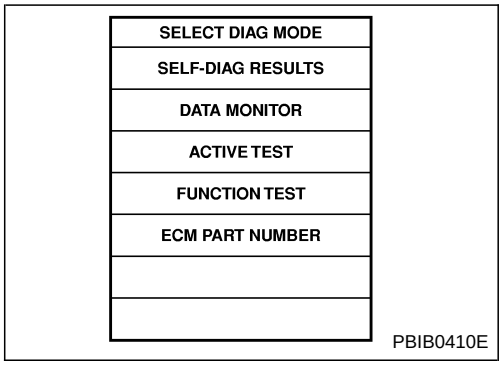
CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which 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.



CONSULT-II (Cont'd)

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE		
			SELF-DIAG RESULTS	DATA MONITOR	ACTIVE TEST
ENGINE CONTROL COMPONENT PARTS	INPUT	Engine coolant temperature sensor	X	X	
		Intake air temperature sensor	X	X	
		Vehicle speed sensor	X	X	
		Accelerator position sensor	X	X	X
		Accelerator position switch	X	X	
		Crankshaft position sensor (TDC)	X	X	
		Ignition switch (start signal)		X	
		Park/Neutral position (PNP) switch		X	
		Battery voltage		X	
		Air conditioner switch		X	
		Brake pedal position switch	X	X	
		Charge air pressure sensor	X	X	
		Heat up switch		X	
		Stop lamp switch	X	X	
	OUTPUT	Glow relay		X	X
		EGR volume control valve	X	X	X
		Cooling fan relay	X	X	X
		Air conditioner relay		X	

X: Applicable

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "TROUBLE DIAGNOSIS — INDEX", EC-3400.

DATA MONITOR MODE

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.	

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ACCEL POS SEN [V]	○	○	● The accelerator position sensor signal voltage is displayed.	
FULL ACCEL SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the accelerator position switch signal.	
OFF ACCEL SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the accelerator position switch signal.	
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.	
I/C INT/A T/S [V]	○	○	● The signal voltage of the intake air temperature sensor is displayed.	
P/N POSI SW [ON/OFF]	○	○	● 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.
AIR COND SIG [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner 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.	
IGN SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from ignition switch signal.	
WARM UP SW [ON/OFF]	○		● Indicates [ON/OFF] condition from the heat up switch signal.	
TURBO BST SEN [kPa]	○		● The charge air pressure (determined by the signal voltage sent to the ECM) is displayed.	
DECELER F/CUT [ON/OFF]		○	● The [ON/OFF] condition from deceleration fuel cut signal (sent from ECM) is displayed.	
INJ TIMG C/V [%]		○	● The duty ratio of fuel injection timing control valve (sent from electronic control fuel injection pump) is displayed.	
AIR COND RLY [ON/OFF]		○	● Indicates the control condition of the air conditioner relay (determined by ECM according to the input signals).	
GLOW RLY [ON/OFF]		○	● The glow relay control condition (determined by ECM according to the input signal) is displayed.	
COOLING FAN [ON/OFF]		○	● Indicates the control condition of the cooling fans (determined by ECM according to the input signal). ● ON ... Operates. OFF ... Stopped.	

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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.	
BARO SEN [kPa]	○		● The barometric pressure (determined by the signal voltage from the barometric pressure sensor built into the ECM) is displayed.	

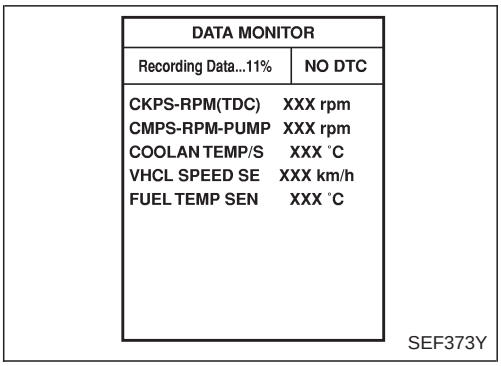
NOTE:
Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
COOLING FAN	● Ignition switch: ON ● Turn cooling fan "ON" and "OFF" using CONSULT-II.	Cooling fan moves and stops.	● Harness and connector ● Cooling fan motor ● Cooling fan relay
OFF ACCEL PO SIG	● Clears the self-learning fully closed accelerator position, detected by accelerator position sensor, from the ECM.		
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
INJ TIMING*1	● Engine: Return to the original trouble condition ● Retard the injection timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Electronic control fuel injection pump
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

*1: When using this item, DTC 0707 "P7·F/INJ TIMG FB" may be detected. If so, erase it because it is not a malfunction.

CONSULT-II (Cont'd)



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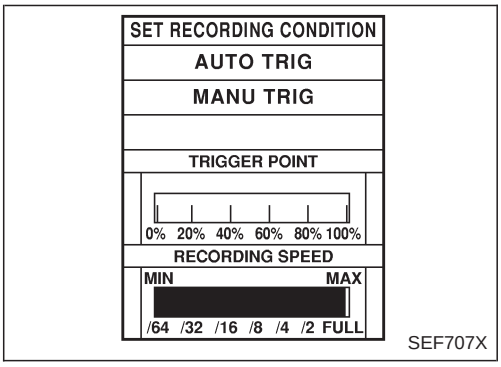

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REAL TIME DIAGNOSIS IN DATA MONITOR MODE

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:

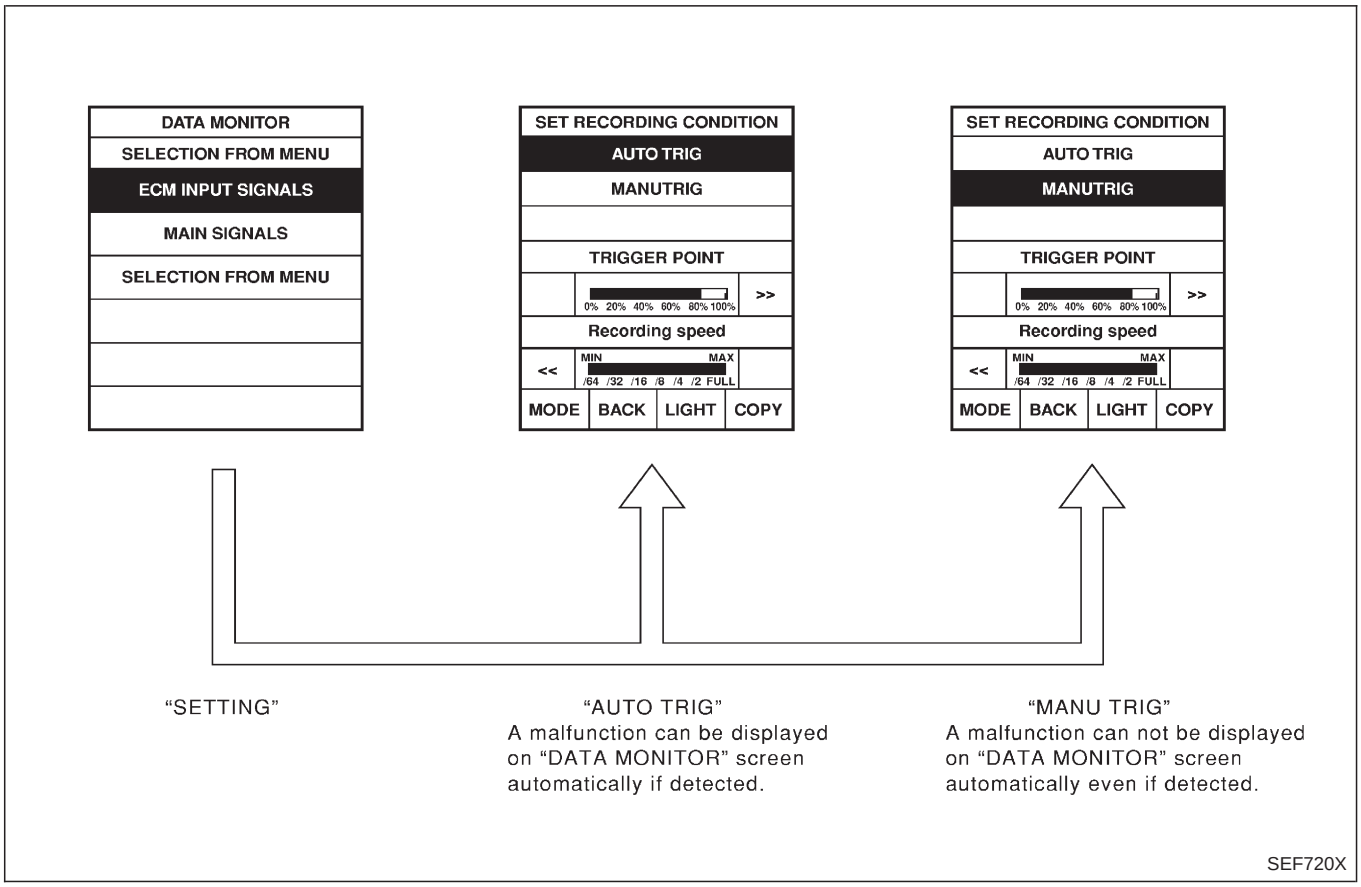
1) "AUTO TRIG"

- 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 section, "Incident Simulation Tests" in "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".)

2) "MANU TRIG"

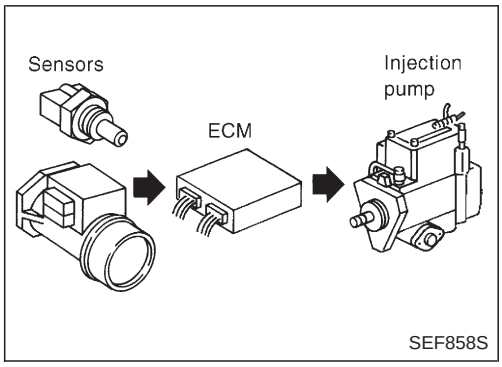
- If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT-II to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

CONSULT-II (Cont'd)



FUNCTION TEST

This mode is used to inform customers of their vehicle condition of periodic maintenance.



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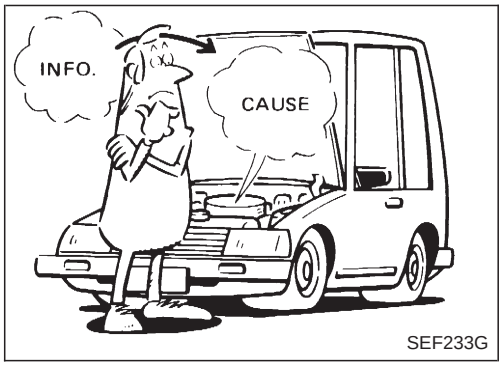

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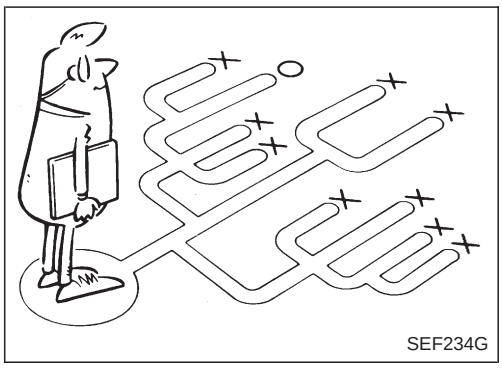
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KEY POINTS

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

SEF907L

Introduction

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-3443.

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

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.

Introduction (Cont'd)

Worksheet sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Symptoms	☐ Startability	☐ Inpossible 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 lamp		☐ Turned on ☐ Not turned on	

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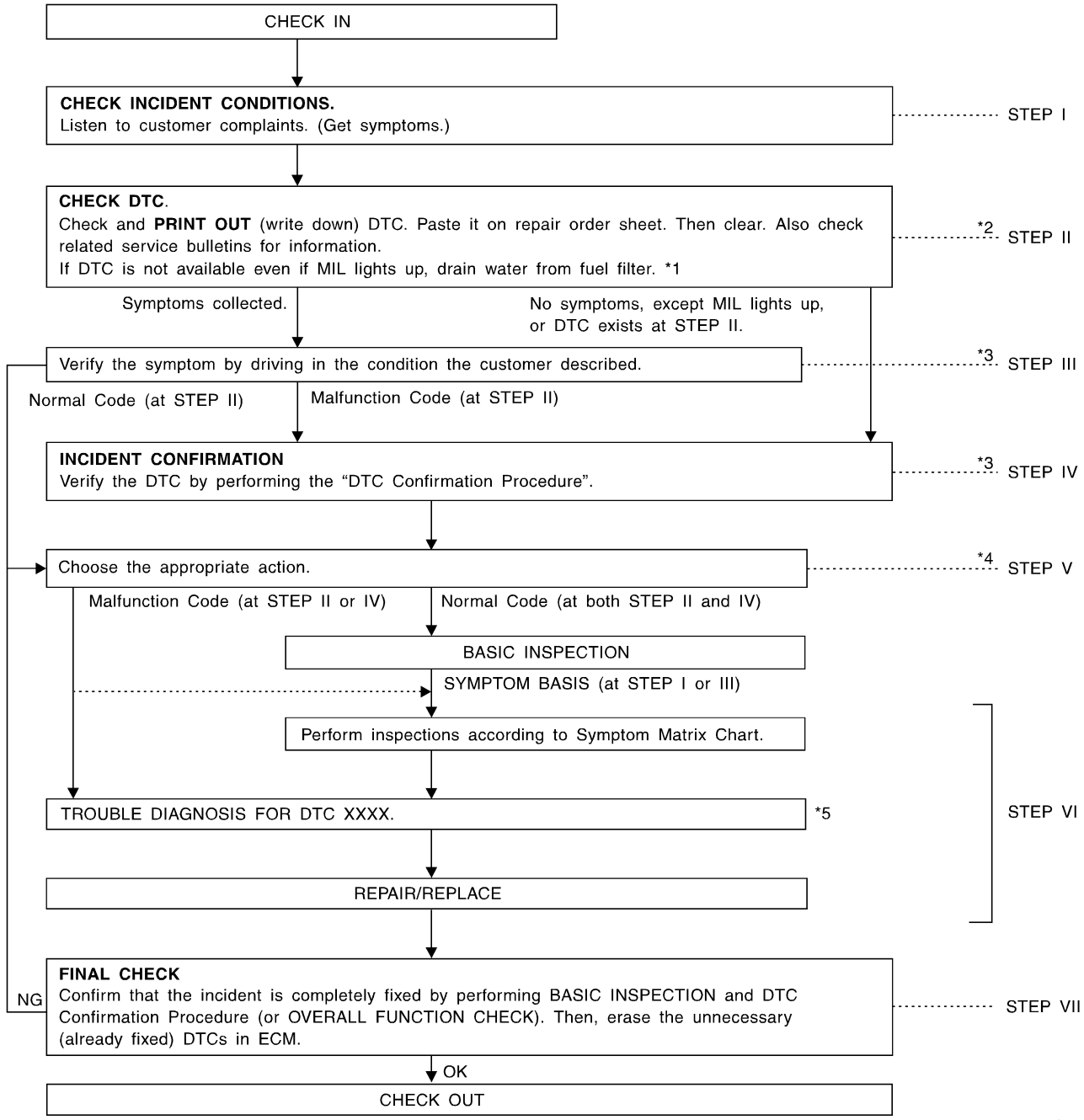
Work Flow



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*1 Refer to MA section ("Checking and Replacing Fuel Filter and Draining Water", "ENGINE MAINTENANCE").

*2 If time data of "SELF-DIAG RESULTS" is other than "0", perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3470.

*3 If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3470.

*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-3471.

*5 If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3470.

Work Flow (Cont'd)

DESCRIPTION FOR WORK FLOW

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET", EC-3440.
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the DTC, then erase the DTC. Refer to EC-3428. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3470. 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-3451.) 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-3470. 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-3470. 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 XXXX. If the normal code is indicated, proceed to the Basic Inspection, EC-3445. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-3451.
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-3464 or EC-3461. 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 ("Circuit Inspection", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"). Repair or replace the malfunction parts. If the malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3470.
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. 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-3428.)

Basic Inspection

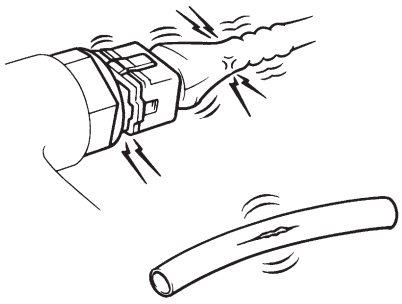
Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

- **Shift lever is in neutral position,**
- **Heat up switch is OFF,**
- **Headlamp switch is OFF,**
- **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 section.
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.

Basic Inspection (Cont'd)

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	BLEED AIR FROM FUEL SYSTEM

1. Stop engine.
2. Using priming pump, bleed air from fuel system. Refer to "Air Bleeding", EC-3426.

	▶	GO TO 5.

Basic Inspection (Cont'd)

5	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 6.

6	DRIN WATER FROM FUEL FILTER

Drain water from fuel filter. Refer to MA section ("Checking and Replacing Fuel Filter and Draining Water", "ENGINE MAINTENANCE").

	►	GO TO 7.

Basic Inspection (Cont'd)

7	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 8.

8	CHECK AIR CLEANER FILTER

Check air cleaner filter for clogging or breaks.

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace air cleaner filter.

9	CHECK FUEL INJECTION NOZZLE

Check fuel injection nozzle opening pressure. Refer to "Injection pressure test", EC-3418.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace fuel injection nozzle assembly.

Basic Inspection (Cont'd)

10	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 11.

11	CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM section, "MEASUREMENT OF COMPRESSION PRESSURE".

OK or NG

OK	►	GO TO 12.
NG	►	Follow the instruction of "MEASUREMENT OF COMPRESSION PRESSURE".

Basic Inspection (Cont'd)

12	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

SYSTEM — Basic engine control system	SYMPTOM													Reference page	Feature of symptom, Check point
	HARD/NO START/RESTART (EXCP. HA)				ENGINE STALL										
	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	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE		
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-3415	*2
Glow system	1	1	1	1					1					EC-3622	
Engine body	3	3	3	3	3	3	3		3	4	4		3	EM section	*3
EGR system										3	3			EC-3606	
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 — 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 lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut		
							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	3	—	*1
Injection nozzle	3	3			3		4	3		1			EC-3415	*2
Glow system								1					EC-3622	
Engine body	3	3		3	3	3		3					EM section	*3
EGR system							3						EC-3606	
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: NO START (with first firing)	HARD/NO START/RESTART (EXCP. HA): NO START (without first firing)	HARD/NO START/RESTART (EXCP. HA): HARD TO START WHEN ENGINE IS COLD	HARD/NO START/RESTART (EXCP. HA): HARD TO START WHEN ENGINE IS HOT	ENGINE STALL: AT IDLE	ENGINE STALL: DURING DRIVING	ENGINE STALL: 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															
	Engine coolant temperature sensor circuit	*a, *b			1		1		1						1	EC-3481	*1
	Vehicle speed sensor circuit	*a, *b											1			EC-3485	

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												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 lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut		
									BLACK SMOKE	WHITE SMOKE						
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	1	—	
		*c, *d							1							
	Engine coolant temperature sensor circuit	*a, *b	1	1		1						1	1		EC-3481	*1
	Vehicle speed sensor circuit	*a, *b											1		EC-3485	

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	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	Fuel cut system line	*a, *c														EC-3615	
		*b	1				1	1	1								*2
	Accelerator position sensor circuit	*a, *b								1		1	1			EC-3516	
	Crankshaft position sensor (TDC) circuit	*a, *b, *d			1	1	1	1	1	1	1	1	1			EC-3535	
	Charge air pressure sensor circuit	*a, *c								1		1	1			EC-3601	
		*b															

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: 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 lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut	Reference page	Feature of symptom, Check point
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
ENGINE CONTROL	Fuel cut system line	*a, *c										1	1		EC-3615	
		*b												1		*2
	Accelerator position sensor circuit	*a, *b										1	1		EC-3516	
	Crankshaft position sensor (TDC) circuit	*a, *b, *d	1	1								1	1		EC-3535	
	Charge air pressure sensor circuit	*a, *c											1		EC-3601	
		*b							1							

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-3631	*3
	PNP switch circuit	*a, *b							1							EC-3634	
		*c															
	Accelerator position switch (Idle) circuit	*a, *c			1	1	1		1						1	EC-3516	
		*b								1		1	1				*4
	Accelerator position switch (Full) circuit	*a, *b								1		1	1			EC-3516	
	Ignition switch circuit	*a		1			1	1	1							EC-3471	
		*b															*5
	Power supply for ECM circuit	*a		1			1	1	1							EC-3471	
		*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: 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 lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut	Reference page	Feature of symptom, Check point
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
ENGINE CONTROL	Start signal circuit	*a, *b													EC-3631	*3
	PNP switch circuit	*a, *b	1	1											EC-3634	
		*c														
	Accelerator position switch (Idle) circuit	*a, *c													EC-3516	
		*b										1	1			*4
	Accelerator position switch (Full) circuit	*a, *b										1	1		EC-3516	
	Ignition switch circuit	*a													EC-3471	
		*b														*5
	Power supply for ECM circuit	*a										1	1	1	EC-3471	
		*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-3606	
		*c															*8
	Glow relay circuit	*a	1	1	1	1										EC-3622	*9
		*b															*10
	ECM relay (Self-shutoff) circuit	*a		1			1	1	1							EC-3471	
		*b															*11
	ECM, Connector circuit	*a, *b	2	2	2	2	2	2	2	2	2	2	2	2	2	EC-3502, 3582, 3599	
	Air conditioner relay circuit	*a														EC-3645	*12
		*b											1				*13
	Air conditioner switch circuit	*a, *c														EC-3645	*13
		*b															*14

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*8: Does not stop operating.
*9: Glow lamp does not turn on.
*10: Glow lamp does not turn off.
*11: Ground short makes engine unable to stop.
*12: Air conditioner does not operate.
*13: Air conditioner does not stop operating.
*14: Air conditioner does not work.

Symptom Matrix Chart (Cont'd)

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 lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut	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-3606	
		*c							1							*8
	Glow relay circuit	*a								1					EC-3622	*9
		*b														*10
	ECM relay (Self-shutoff) circuit	*a										1	1	1	EC-3471	
		*b														*11
	ECM, Connector circuit	*a, *b	2	2	2	2	2	2	2	2	2	2	2	2	EC-3502, 3582, 3599	
	Air conditioner relay circuit	*a													EC-3645	*12
		*b														*13
	Air conditioner switch circuit	*a, *c													EC-3645	*13
		*b														*14

1 - 5: The numbers refer to the order of inspection.
*a: Open
*b: Short
*c: Ground short
*d: Noise
*8: Does not stop operating.
*9: Glow lamp does not turn on.
*10: Glow lamp does not turn off.
*11: Ground short makes engine unable to stop.
*12: Air conditioner does not operate.
*13: Air conditioner does not stop operating.
*14: Air conditioner does not work.

CONSULT-II Reference Value in Data Monitor Mode

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 80°C (176°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	0.29 - 0.79V
		Accelerator pedal: fully depressed	Approx. 3.48 - 4.64V
FULL ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: fully depressed	ON
		Except above	OFF
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 speed	Approx. 13°CA
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
I/C INT/A T/S	• Ignition switch: ON		Intake air temperature Approx. 0°C: Approx. 4.2V Approx. 20°C: Approx. 3.5V
P/N POSI SW	• Ignition switch: ON	Shift lever: Park/Neutral	ON
		Except above	OFF
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
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
IGN SW	• Ignition switch: ON → OFF		ON → OFF
WARM UP SW	• Ignition switch: ON	Heat up switch: ON	ON
		Heat up switch: OFF	OFF
TURBO BST SEN	• Engine: After warming up • Shift lever: Neutral position	Idle speed	Approx. Atmospheric pressure
		Engine speed is 2,000 rpm	Apporx. 106.0 kPa
DECELER F/CUT	• Engine: After warming up	Idle speed	OFF
INJ TIMG C/V	• Engine: After warming up, idle the engine.		Approx. 50 - 70%
AIR COND RLY	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
GLOW RLY	• Refer to EC-3622.		
COOLING FAN	• When cooling fan is stopped.		OFF
	• When cooling fan operates.		ON

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

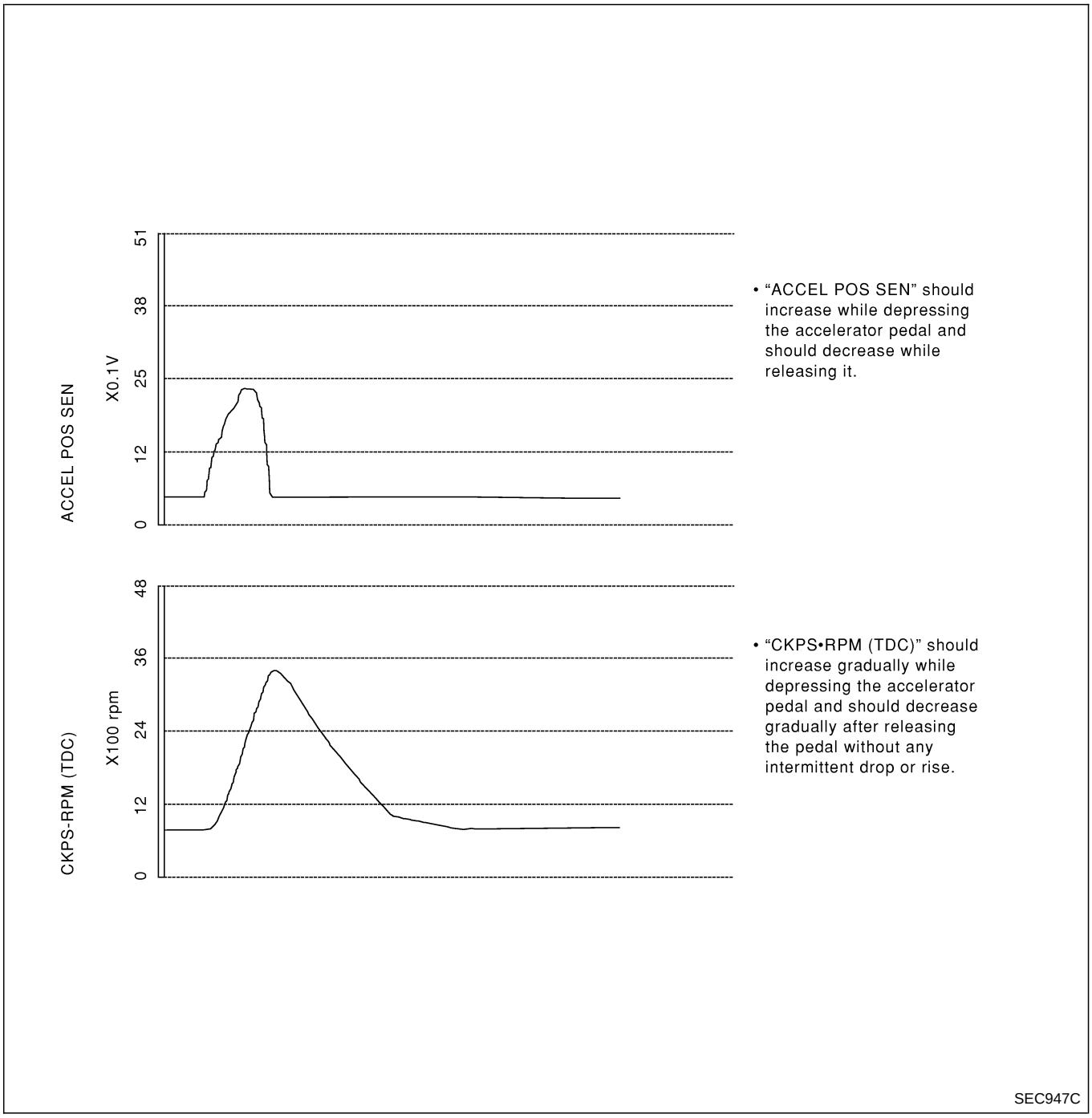
MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: Neutral position ● No-load	After 1 minute of idling	More than 10 steps
		Revving engine from idle to 3,200 rpm	0 step
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): 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)

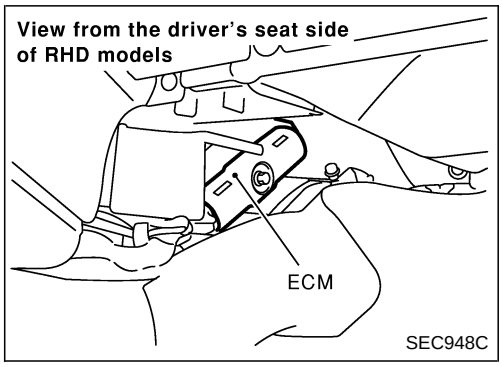
Major Sensor Reference Graph in Data Monitor Mode

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

ACCEL POS SEN, “CKPS·RPM (TDC)”

Below is the data for “ACCEL POS SEN” and “CKPS·RPM (TDC)” 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.

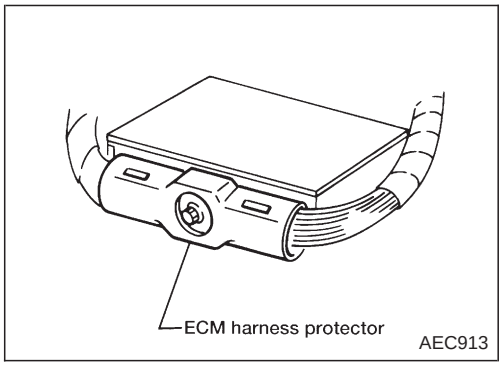




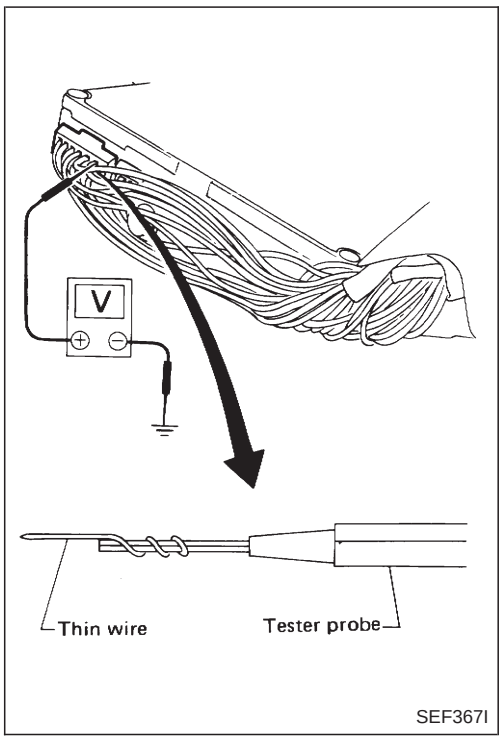
ECM Terminals and Reference Value

PREPARATION

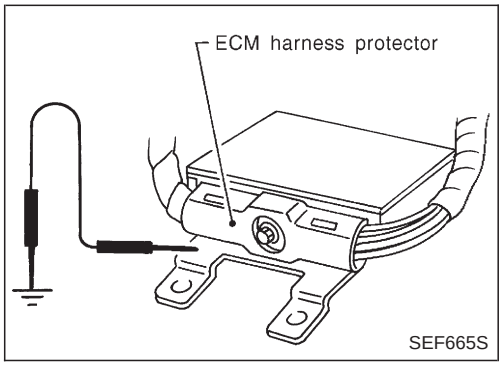
1. ECM is located behind the instrument lower panel. For this inspection, remove the driver's side instrument lower cover.



2. Remove ECM harness protector.



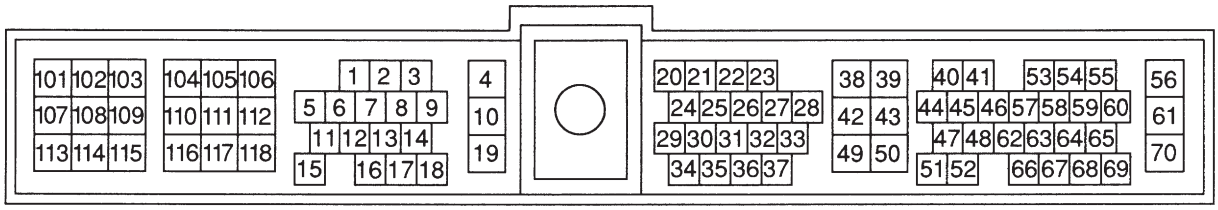
3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
   - Open harness securing clip to make testing easier.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



Be sure ECM unit is properly grounded before checking.

ECM Terminals and Reference Value (Cont'd)

ECM HARNESS CONNECTOR TERMINAL LAYOUT



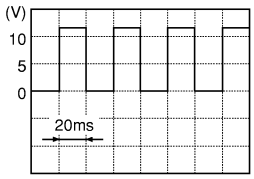
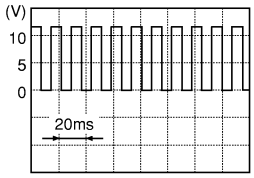
SEF064P

ECM INSPECTION TABLE

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

CAUTION:

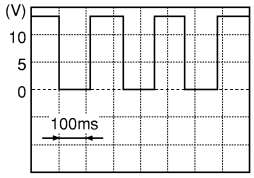
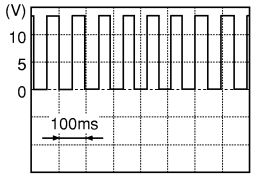
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
4	G	ECM relay (Self-shutoff)	Ignition switch "ON" Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	Approximately 0.9V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
5	W	Tachometer	Engine is running. └ **Warm-up condition** Idle speed	Approximately 4.8V  SEF255Z
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 4.5V  SEF256Z
14	G/B	Cooling fan relay	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating	Approximately 0.1V

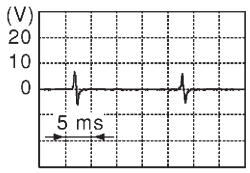
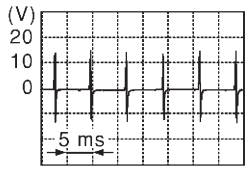
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
15	G/W	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
16	L/W	Glow lamp	Ignition switch "ON" └ Glow lamp is "ON"	Approximately 1V
			Ignition switch "ON" └ Glow lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)
17	G/Y	Stop lamp switch	Ignition switch "ON" └ Brake pedal fully released	Approximately 0V
			Ignition switch "ON" └ Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
18	W/G	Malfunction indicator lamp	Ignition switch "ON"	Approximately 1V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
19	L/OR	Engine coolant temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
20	R	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
21	Y	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 0V
22	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)
23	W	Accelerator position sensor	Ignition switch "ON" └ Accelerator pedal fully released	0.29 - 0.79V
			Ignition switch "ON" └ Accelerator pedal fully depressed	3.48 - 4.64V

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
26	W/L	Vehicle speed sensor	Engine is running. └ Lift up the vehicle In 1st gear position Vehicle speed is 10 km/h (6 MPH)	0 - Approximately 4.6V  SEF257Z
			Engine is running. └ Lift up the vehicle In 2nd gear position Vehicle speed is 30 km/h (19 MPH)	Approximately 2.2V  SEF258Z
29	BR/R	Brake pedal position switch	Ignition switch "ON" └ Brake pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Brake pedal depressed	Approximately 0V
31	Y	Accelerator position switch (Idle)	Ignition switch "ON" └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
32	G	Accelerator position switch (Full)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0V
			Ignition switch "ON" └ Accelerator pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
36	P/B	Intake air temperature sensor	Engine is running. └ Idle speed	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
38	W/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39 43	B/W B/W	ECM ground	Engine is running. └ Idle speed	Approximately 0V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
42	G/R	Data link connector	Engine is running. └ Idle speed (CONSULT-II is connected and turned on)	Approximately 0V
64	G/B			Approximately 0.2V
65	GY/L			Less than 9V
44	Y	Crankshaft position sensor (TDC)	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0.04V  SEF333Y
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 0.04V  SEF334Y
46	P/L	Charge air pressure sensor	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.7V
47	BR	Crankshaft position sensor (TDC) ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V
48	OR/L	Accelerator position sensor power supply	Ignition switch "ON"	Approximately 5V
49	W	Sensor's power supply	Ignition switch "ON"	Approximately 5V
50	B	Sensors' ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V
51	B/W	Accelerator position sensor ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V
56 61	R R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
59	BR/R	Heat up switch	Ignition switch "ON" └ Heat up switch is "ON"	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Heat up switch is "OFF"	Approximately 0V
103 105 109 115	GY OR/B W/L SB	EGR volume control valve	Engine is running. └ **Warm-up condition** Idle speed	0.2 - 14V
106 112 118	B B B	ECM ground	Engine is running. └ Idle speed	Approximately 0V
111	W/R	Glow relay	Refer to "GLOW CONTROL SYSTEM", EC-3622.	

Description

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

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

1	**INSPECTION START**
Erase DTCs. Refer to "HOW TO ERASE DTC", EC-3428.	
►	GO TO 2.

2	**CHECK GROUND TERMINALS**
Check ground terminals for corroding or loose connection. Refer to GI section ("GROUND INSPECTION", "Circuit Inspection").	
OK or NG	
OK ►	GO TO 3.
NG ►	Repair or replace.

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

Main Power Supply and Ground Circuit

ECM TERMINALS AND REFERENCE VALUE

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

CAUTION:

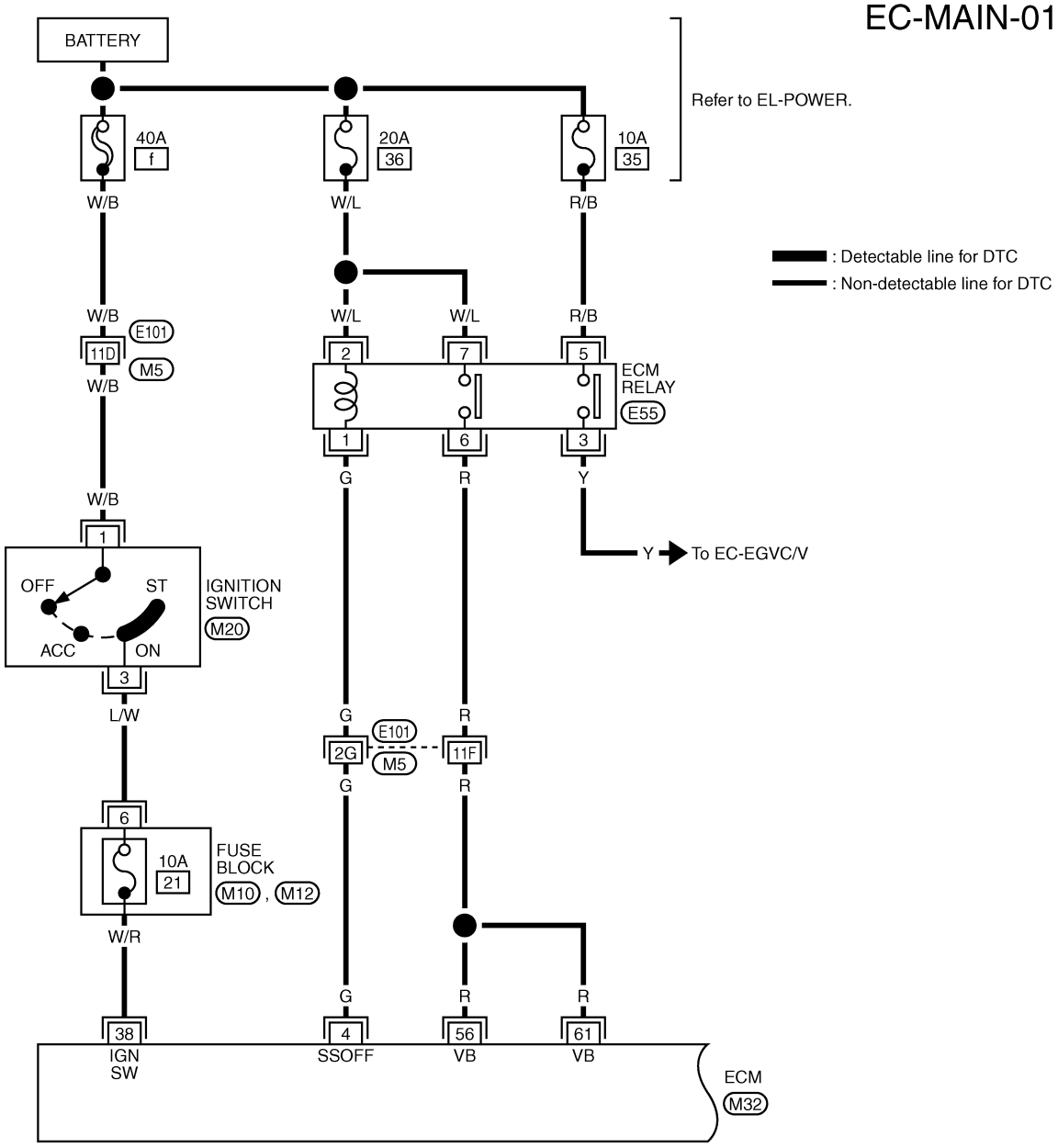
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

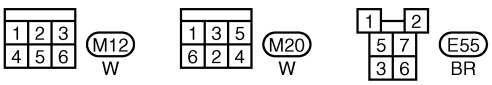
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	G	ECM relay (Self-shutoff)	Ignition switch "ON"	Approximately 0.25V
			Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
38	W/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39 43	B/W B/W	ECM ground	Engine is running. └ Idle speed	Approximately 0V
56 61	R R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
106 112 118	B B B	ECM ground	Engine is running. └ Idle speed	Approximately 0V

Main Power Supply and Ground Circuit (Cont'd)

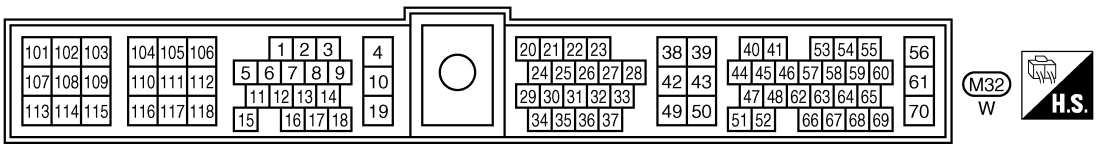
WIRING DIAGRAM - LHD MODELS

EC-MAIN-01





Refer to last page (Foldout page).
M5 , E101
M10

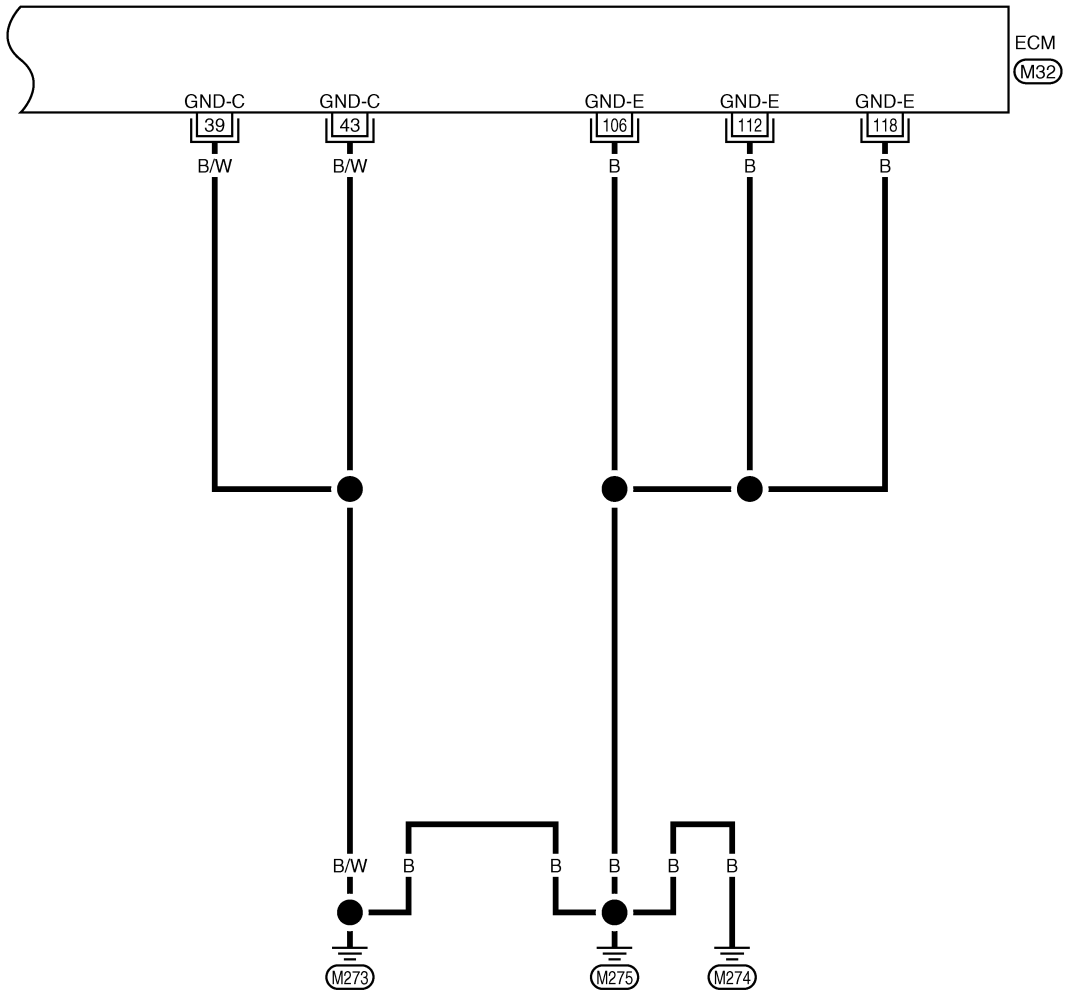


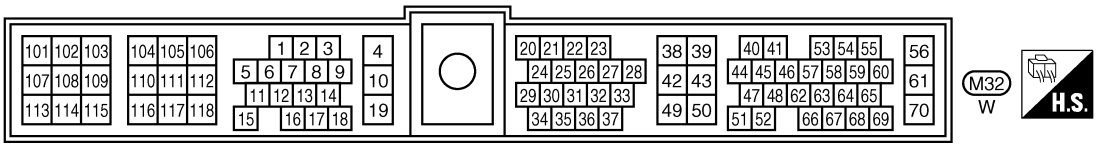
GEC124A

Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-02

: Detectable line for DTC
: Non-detectable line for DTC



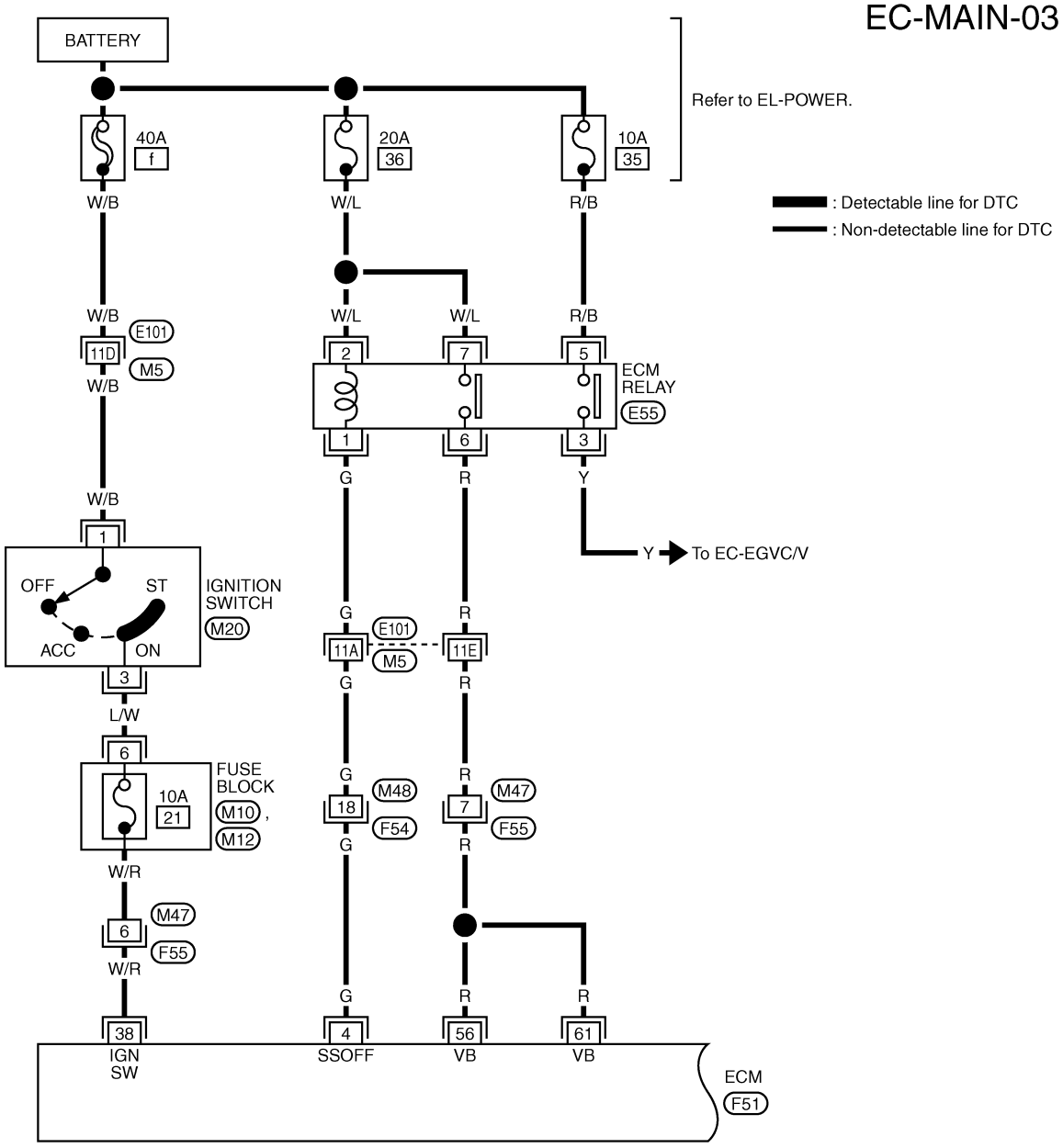


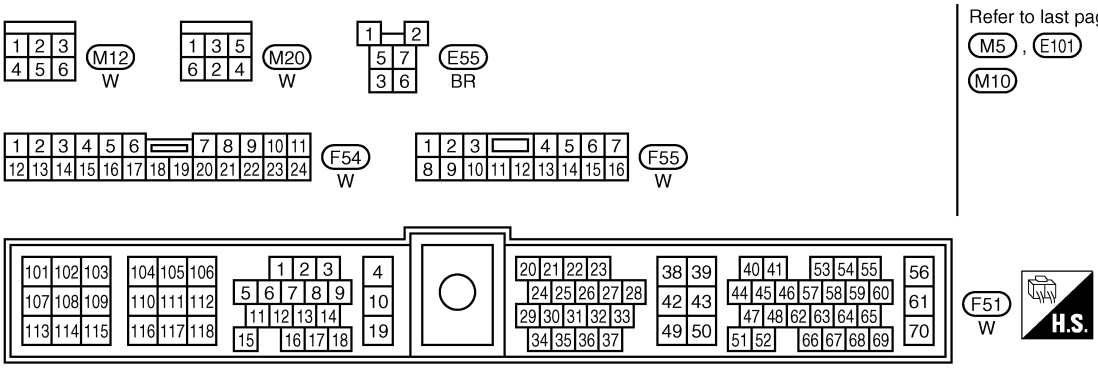
GEC125A

Main Power Supply and Ground Circuit (Cont'd)

WIRING DIAGRAM - RHD MODELS

EC-MAIN-03





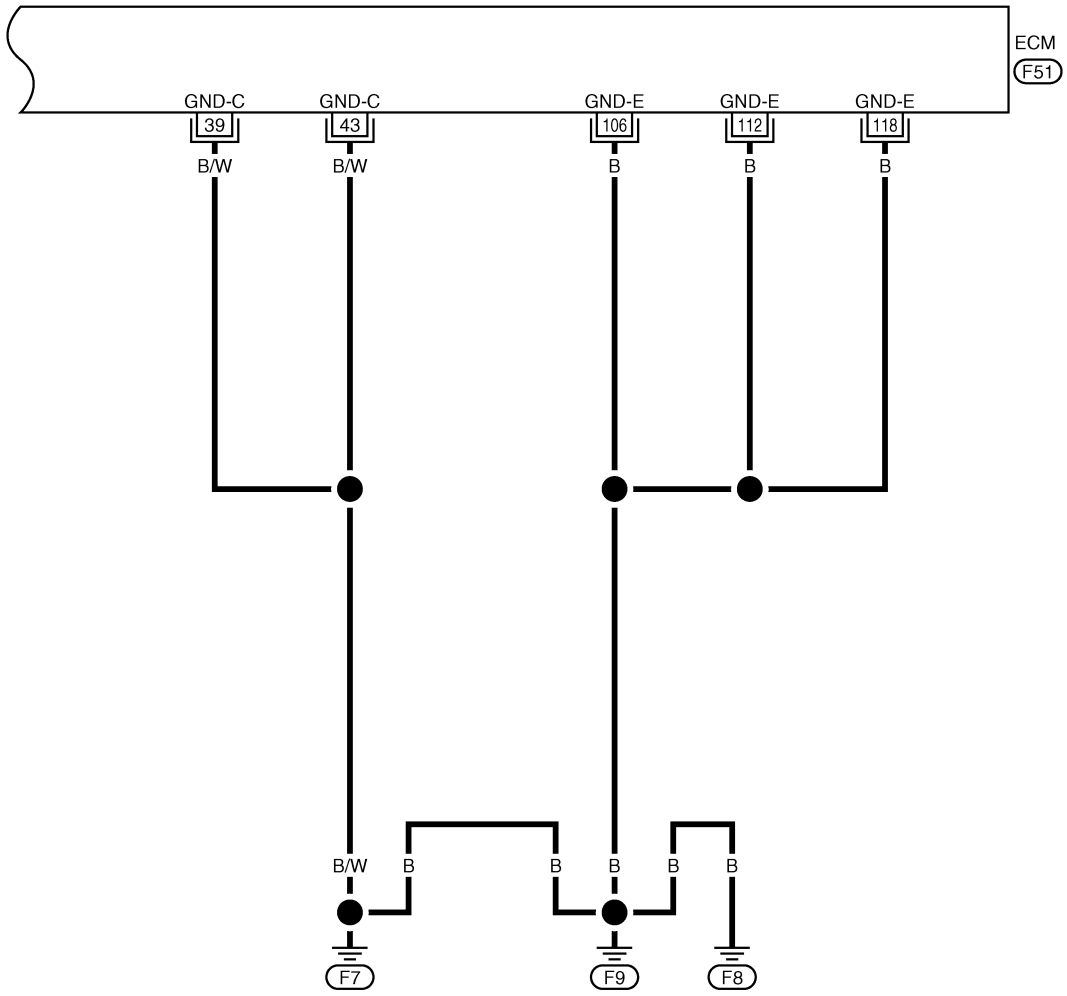
Refer to last page (Foldout page).
M5 , E101
M10

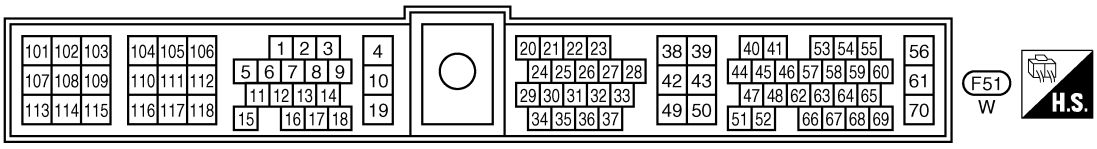
GEC126A

Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-04

: Detectable line for DTC
: Non-detectable line for DTC





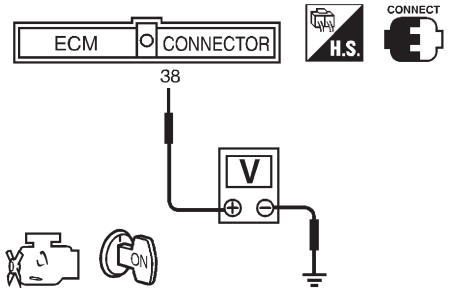
GEC127A

Main Power Supply and Ground Circuit (Cont'd)

DIAGNOSTIC PROCEDURE

1	INSPECTION START
Start engine. Is engine running? **Yes or No**	
Yes ▶	GO TO 14.
No ▶	GO TO 2.

2	CHECK ECM POWER SUPPLY CIRCUIT-I
1. Turn ignition switch "ON". 2. Check voltage between ECM terminal 38 and ground with CONSULT-II or tester.	



Voltage: Battery voltage

SEF397Y

OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M47, F55 (RHD models) ● Fuse block (J/B) connector M10, M12 ● 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.

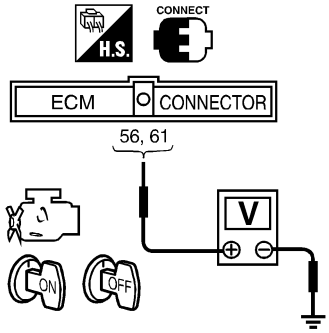
4	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminals 39, 43, 106, 112, 118 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 4. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 6.
NG ▶	GO TO 5.

Main Power Supply and Ground Circuit (Cont'd)

5	DETECT MALFUNCTIONING PART
Check harness for open or short between ECM and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	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 56, 61 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.

SEC949C

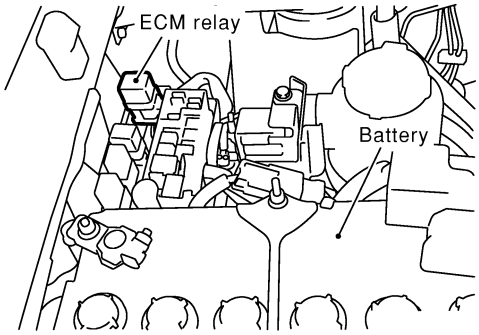
OK or NG

OK ▶	Check electronic control fuel injection pump power supply circuit. Refer to "Diagnostic Procedure", EC-3562.
NG (Battery voltage does not exist.) ▶	GO TO 7.
NG (Battery voltage exists for more than a few seconds.) ▶	GO TO 13.

Main Power Supply and Ground Circuit (Cont'd)

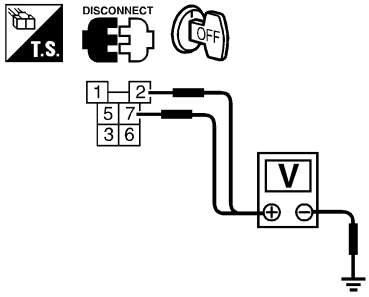
7	CHECK ECM POWER SUPPLY CIRCUIT-III

1. Disconnect ECM relay.



SEC950C

2. Check voltage between relay terminals 2, 7 and ground with CONSULT-II or tester.



Voltage: Battery Voltage

SEC241D

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- 20A fuse
- Harness for open or short between ECM relay and fuse

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

9	CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 4 and ECM relay 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 11.
NG	▶	GO TO 10.

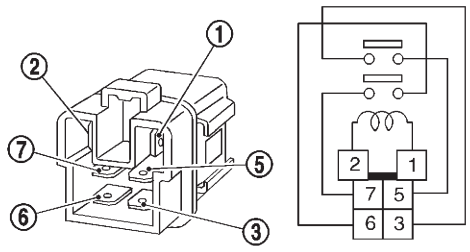
Main Power Supply and Ground Circuit (Cont'd)

10	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E101, M5 ● Harness connectors M48, F54 (RHD models) ● 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.

11	CHECK ECM POWER SUPPLY CIRCUIT-IV
1. Check harness continuity between ECM terminals 56, 61 and ECM relay terminal 6. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power. **OK or NG**	
OK ►	GO TO 13.
NG ►	GO TO 12.

12	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E101, M5 ● Harness connectors M47, F55 (RHD models) ● 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.

13	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

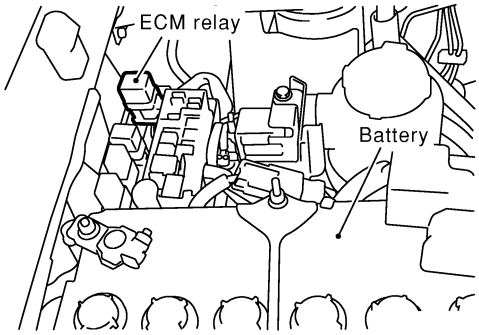
OK or NG

OK ►	GO TO 18.
NG ►	Replace ECM relay.

Main Power Supply and Ground Circuit (Cont'd)

14	CHECK ECM POWER SUPPLY CIRCUIT-V

1. Turn ignition switch "OFF".
2. Disconnect ECM relay.



SEC950C

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminals 56, 61 and ECM relay terminal 6. 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 16.
NG	►	GO TO 15.

15	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M101, M5
- Harness connectors M47, F55 (RHD models)
- 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 GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminals 39, 43, 106, 112, 118 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 18.
NG	►	GO TO 17.

17	DETECT MALFUNCTIONING PART

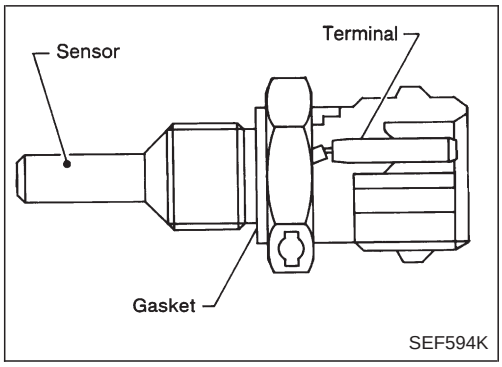
Check harness for open or short between ECM and engine ground

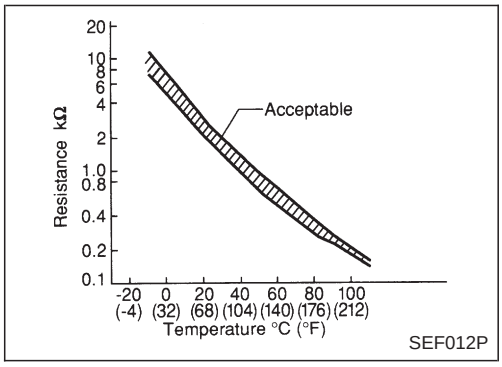
	►	Repair open circuit or short to ground or short to power in harness or connectors.

18	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.

	►	**INSPECTION END**





Description

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>

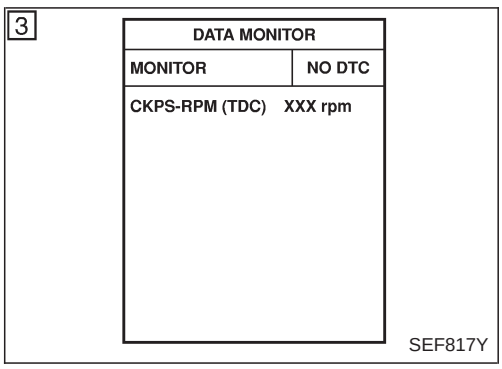
Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
−10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.3	0.68 - 1.0
90 (194)	1.0	0.236 - 0.260

*: These data are reference values and measured between ECM terminal 19 (Engine coolant temperature sensor) 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.

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● 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



DTC Confirmation Procedure

WITH CONSULT-II

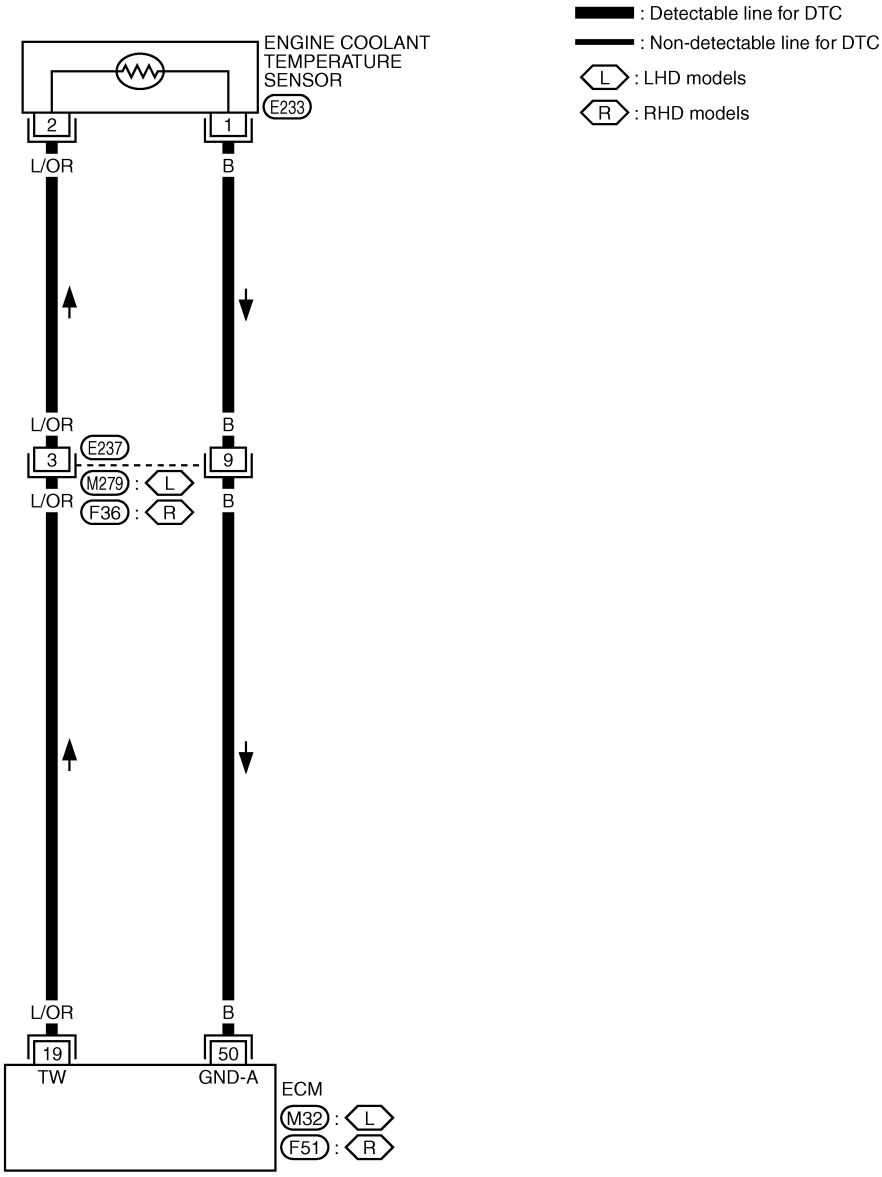
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If DTC is detected, go to "Diagnostic Procedure", EC-3483.

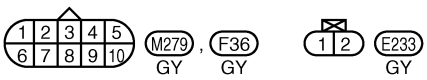
WITHOUT CONSULT-II

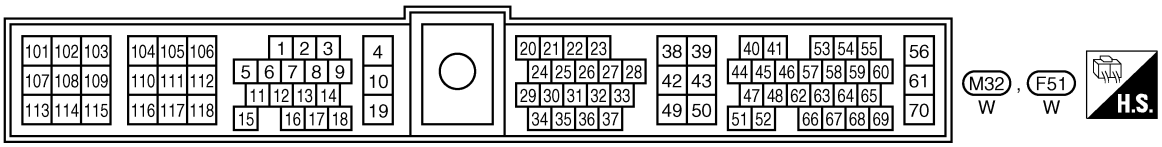
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-3483.

Wiring Diagram

EC-ECTS-01





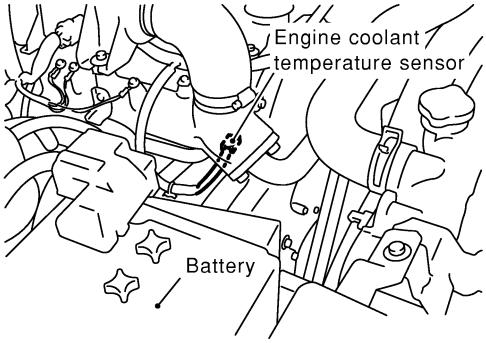


GEC274A

Diagnostic Procedure

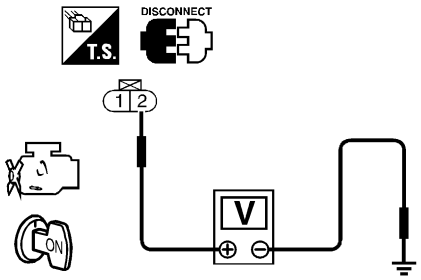
1	CHECK ECTS POWER SUPPLY CIRCUIT

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



SEC230D

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 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E237, M279 (LHD models)
- Harness connectors E237, F36 (RHD models)
- Harness for open or short between engine control temperature sensor and ECM

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

3	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

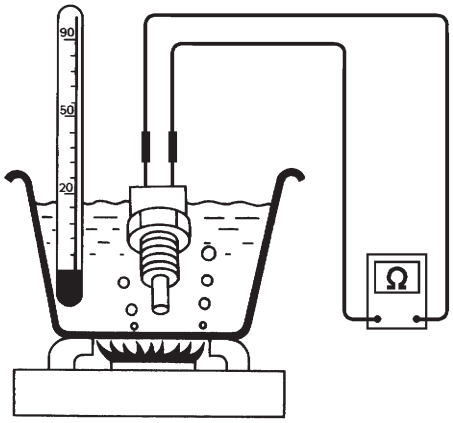
OK	▶	GO TO 5.
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E237, M279 (LHD models) ● Harness connectors E237, F36 (RHD models) ● Harness for open or short between engine coolant temperature sensor and ECM	
►	Repair open circuit or short to ground or short to power in harness or connectors.

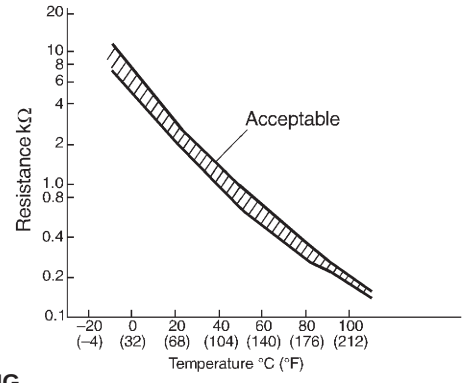
5	CHECK ENGINE COOLANT TEMPERATURE SENSOR

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

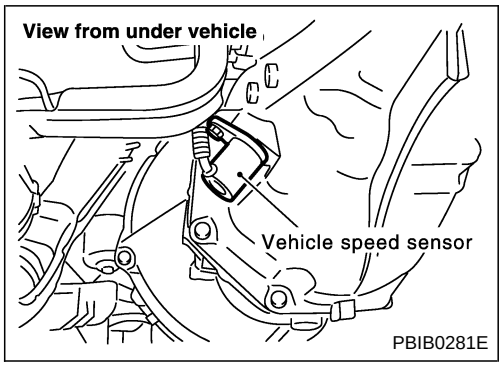


SEF304X

OK or NG

OK	►	GO TO 6.
NG	►	Replace engine coolant temperature sensor.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
►	**INSPECTION END**



Description

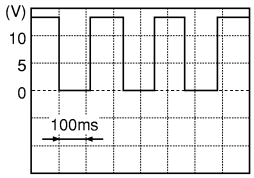
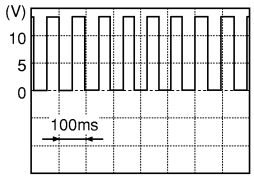
The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

ECM Terminals and Reference Value

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

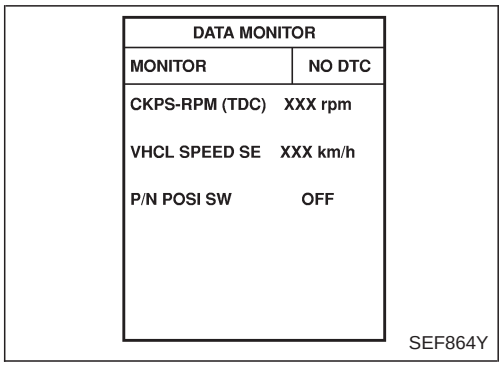
CAUTION:

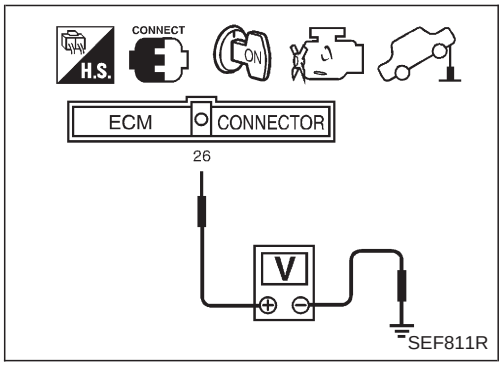
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
26	W/L	Vehicle speed sensor	Engine is running. └ Lift up the vehicle In 1st gear position Vehicle speed is 10 km/h (6 MPH)	Approximately 4.6V  SEF257Z
			Engine is running. └ Lift up the vehicle In 2nd gear position Vehicle speed is 30 km/h (19 MPH)	Approximately 2.2V  SEF258Z

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible Cause)
● 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





Overall Function Check

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

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-3489.

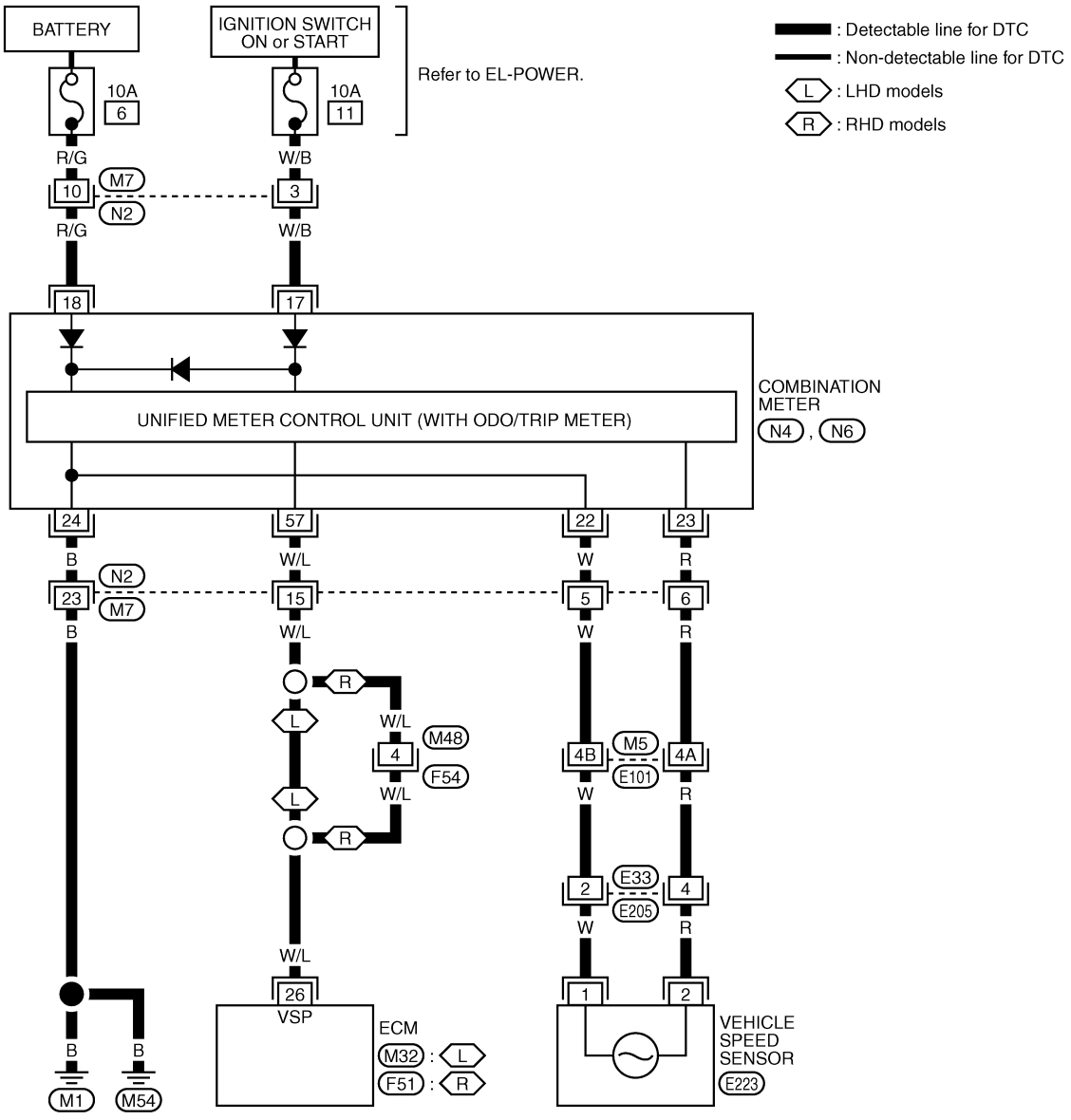
WITHOUT CONSULT-II

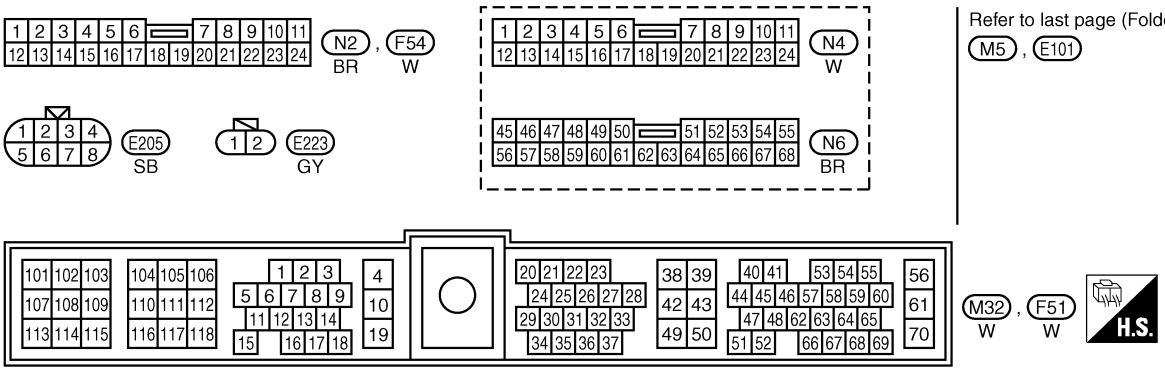
1) Lift up the vehicle.
2) Start engine.
3) Rotate drive wheel by hand.
4) Check voltage between ECM terminal 26 and ground with tester.
   Voltage should vary between 0 - 4.8V.
5) If NG, go to “Diagnostic Procedure”, EC-3489.

Wiring Diagram

MODELS WITH TACHOMETER

EC-VSS-01



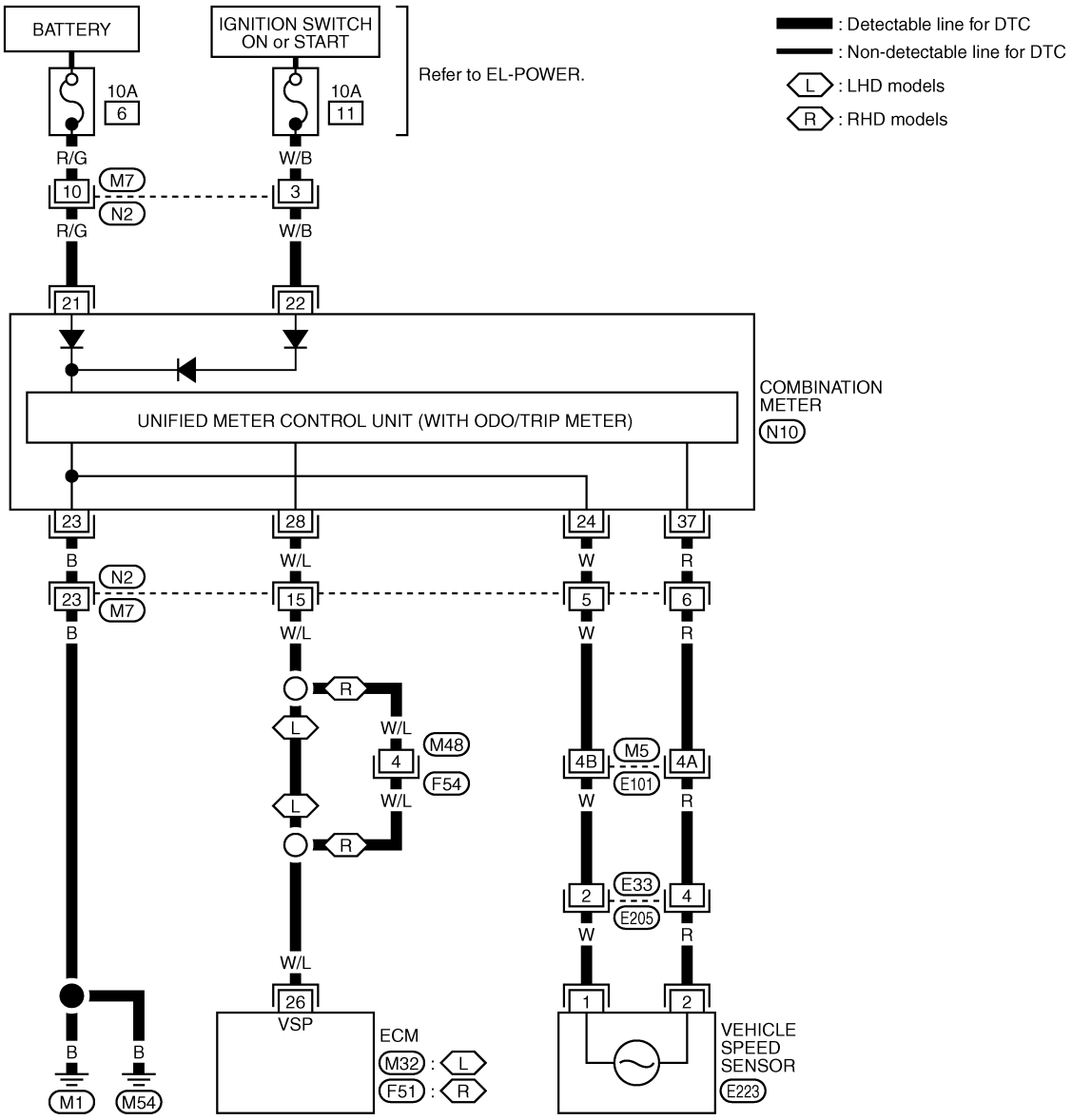


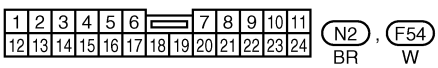
GEC130A

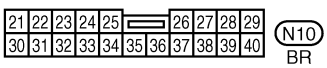
Wiring Diagram (Cont'd)

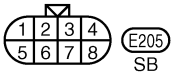
MODELS WITHOUT TACHOMETER

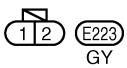
EC-VSS-02

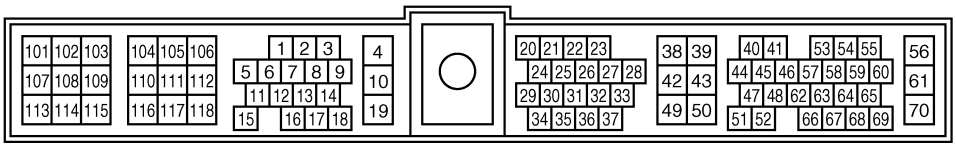












Refer to last page (Foldout page).
M5 , E101

GEC131A

Diagnostic Procedure

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 26 and combination meter terminal 57 (models with tachometer) or 28 (models without tachometer). 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 N2, M7
- Harness connectors M48, F54 (RHD models)
- 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 N2, M7
- Harness connectors M5, E101
- Harness connectors E33, E205
- 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-3469.

	►	**INSPECTION END**

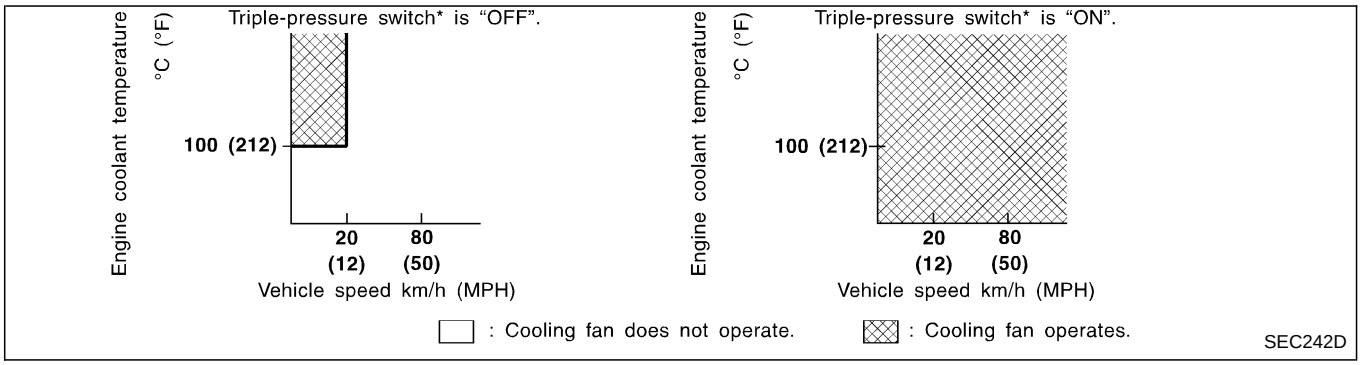
Description

SYSTEM DESCRIPTION

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. The control system has 2-step control [ON/OFF].

OPERATION



*: Refer to HA section.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND RLY	● 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 fan operates.		ON

ECM Terminals and Reference Value

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)
14	G/B	Cooling fan relay	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating	Approximately 0.1V

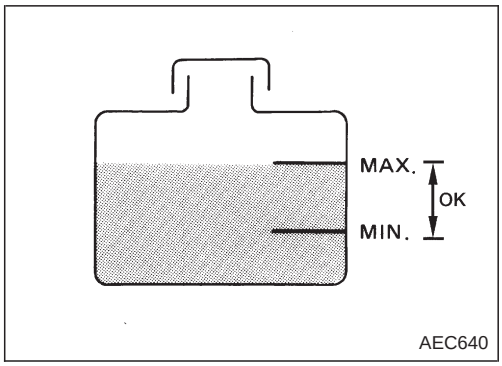
On Board Diagnosis Logic

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.

Malfunction is detected when ...	Check Items (Possible Cause)
● 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 ● Fan belt ● Engine coolant temperature sensor For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-3501.

CAUTION:
When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

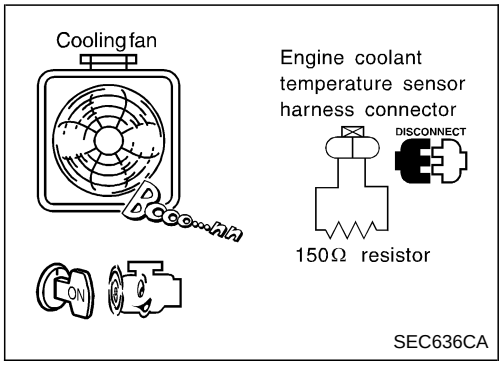
1) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED LUBRICANTS AND FLUIDS").
2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.



AEC640

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF111X



SEC636CA

Overall Function Check

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

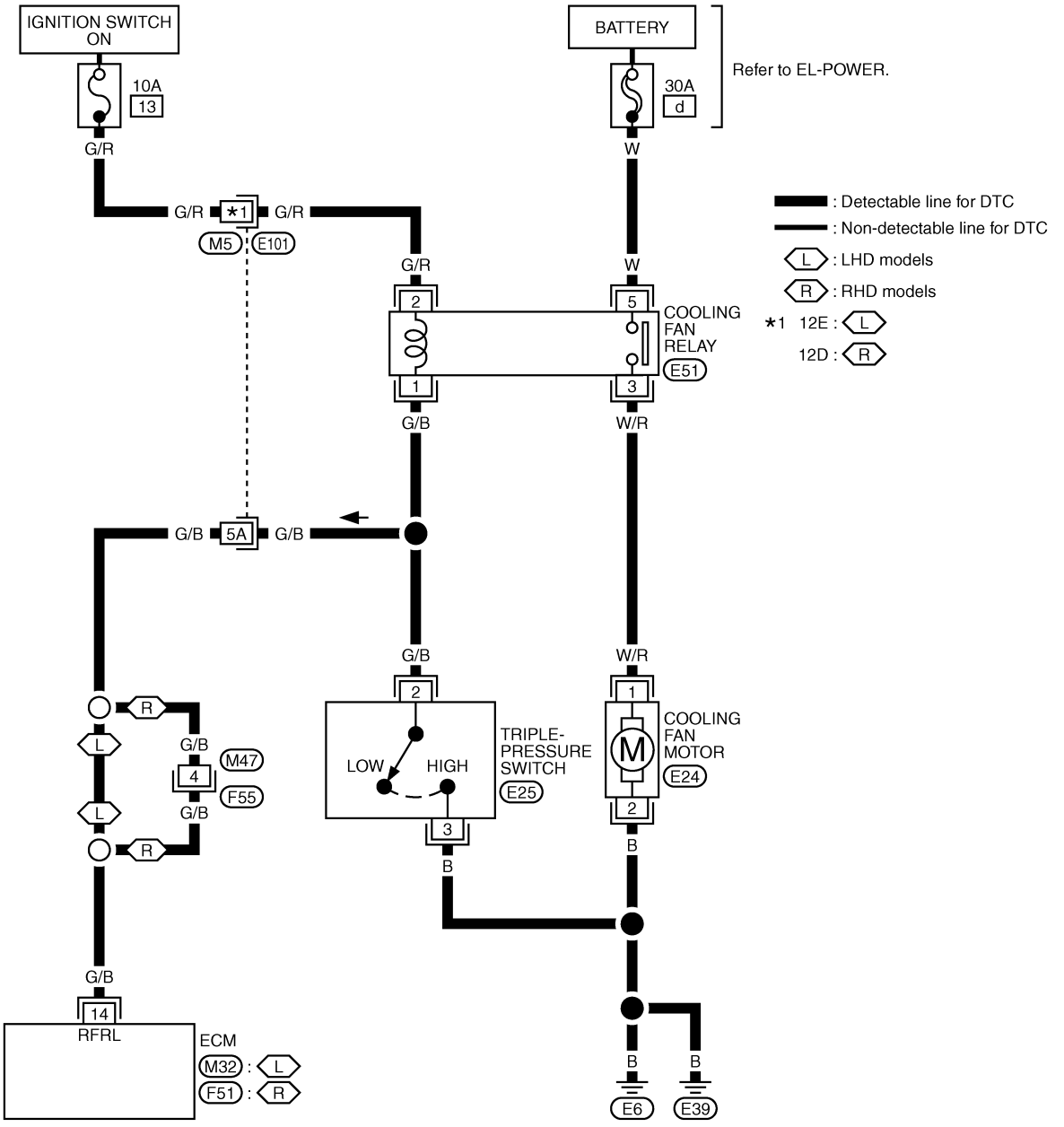
1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to “Diagnostic Procedure”, EC-3494.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-3494.
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 “ON” or “OFF”.
   If NG, go to “Diagnostic Procedure”, EC-3494.

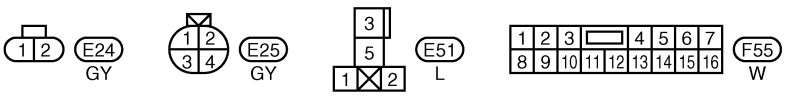
WITHOUT CONSULT-II

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-3494.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-3494.
3) Disconnect engine coolant temperature sensor harness connector.
4) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5) Start engine and make sure that cooling fan operates.
   Be careful not to overheat engine.
6) If NG, go to “Diagnostic Procedure”, EC-3494.

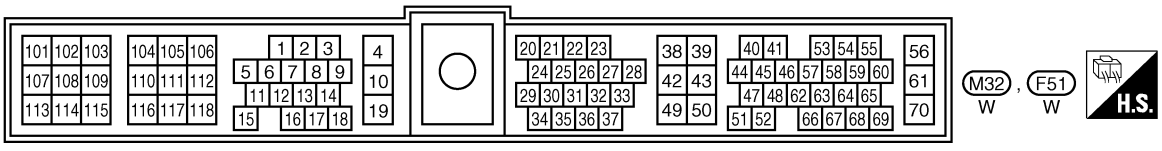
Wiring Diagram

EC-COOL/F-01





Refer to last page (Foldout page).
M5 , E101



M32 , F51
W W

H.S.

GEC133A

Diagnostic Procedure

1	INSPECTION START	
Do you have CONSULT-II?		
Yes or No		
Yes	►	GO TO 2.
No	►	GO TO 3.

2	CHECK COOLING FAN OPERATION	
With CONSULT-II 1. Turn ignition switch “ON”. 2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.		

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF646X

3. Make sure that cooling fan operates.

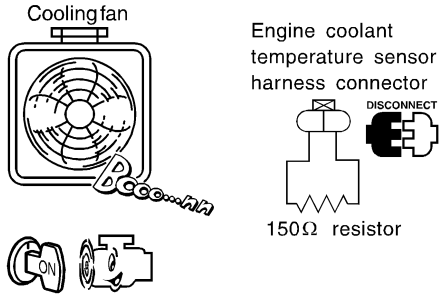
OK or NG		
OK	►	GO TO 13.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

3	CHECK COOLING FAN OPERATION

Without CONSULT-II

1. Turn ignition switch "OFF".
2. Disconnect engine coolant temperature sensor harness connector.
3. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
4. Restart engine and make sure that cooling fan operates.



SEC636CA

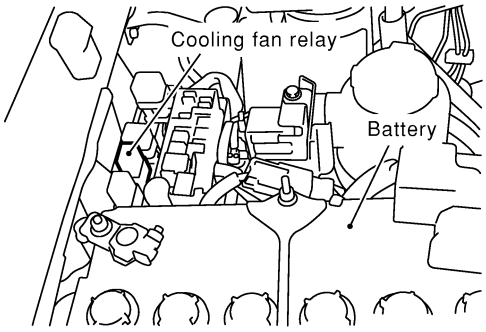
OK or NG

OK	►	GO TO 13.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

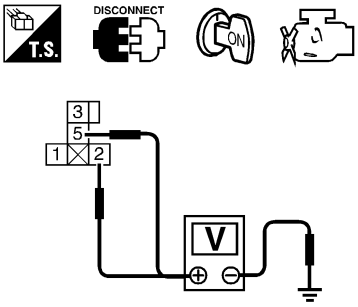
4	CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay.



SEC954C

3. Turn ignition switch "ON".
4. Check voltage between cooling fan relay terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEC161D

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

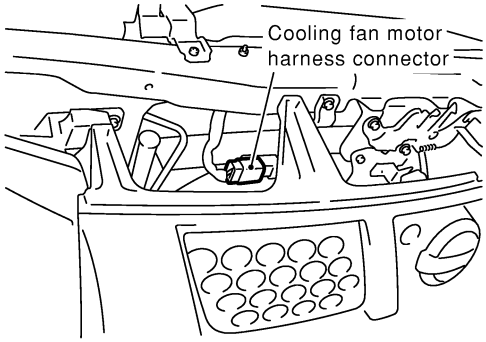
Check the following.
- Harness connectors M5, E101
- 10A fuse
- 30A fusible link
- Harness for open or short between cooling fan relay and fuse
- Harness for open or short between cooling fan relay and battery

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

Diagnostic Procedure (Cont'd)

6	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor harness connector.



SEC232D

3. Check harness continuity between cooling fan relay terminal 3 and cooling fan motor terminals 1, cooling fan motor terminals 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 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Disconnect triple-pressure switch harness connector.
3. Check harness continuity between ECM terminal 14 and cooling fan relay terminal 1, cooling fan relay terminal 1 and triple-pressure switch terminal 2, triple-pressure switch terminal 3 and 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 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

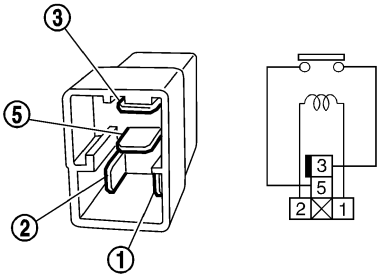
Check the following.
- Harness connectors M5, E101
- Harness connectors M47, F55 (RHD models)
- Harness for open or short between cooling fan relay and ECM
- Harness for open or short between cooling fan relay and triple-pressure switch
- Harness for open or short between triple-pressure switch and ground

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

Diagnostic Procedure (Cont'd)

9	CHECK COOLING FAN RELAY

Check continuity between cooling fan 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

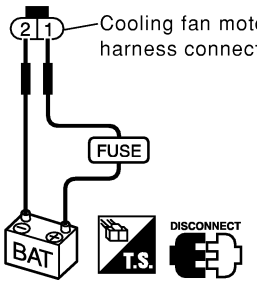
SEC340C

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace cooling fan relay.

10	CHECK COOLING FAN MOTOR

Supply battery voltage between the following terminals and check operation.



Supply battery voltage: Cooling fan operate

SEC162D

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace cooling fan motor.

11	CHECK TRIPLE PRESSURE SWITCH

Refer to HA section.

OK or NG

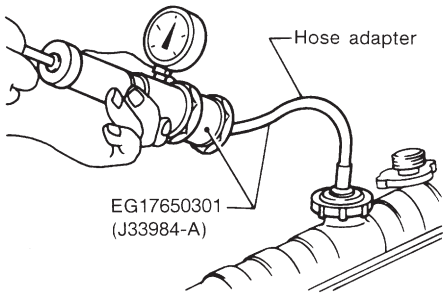
OK	▶	GO TO 12.
NG	▶	Replace triple pressure switch.

12	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
	▶ **INSPECTION END**

Diagnostic Procedure (Cont'd)

13	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 15.
NG	▶	GO TO 14.

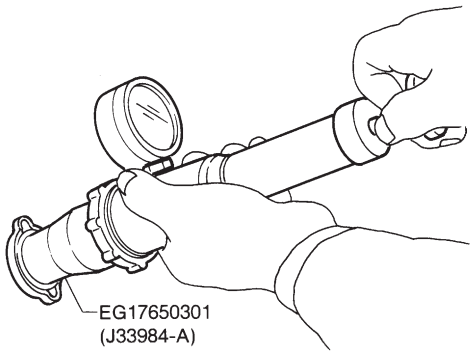
14	DETECT MALFUNCTIONING PART

Check the following for leak.
- Hose
- Radiator
- Water pump (Refer to LC section, "Water Pump".)

	▶	Repair or replace.

15	CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.



SLC755A

Radiator cap relief pressure:
79 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

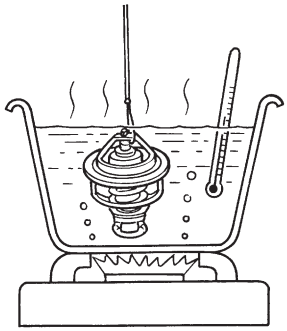
OK or NG

OK	▶	GO TO 16.
NG	▶	Replace radiator cap.

Diagnostic Procedure (Cont'd)

16	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 10 mm/95°C (0.394 in/203°F)

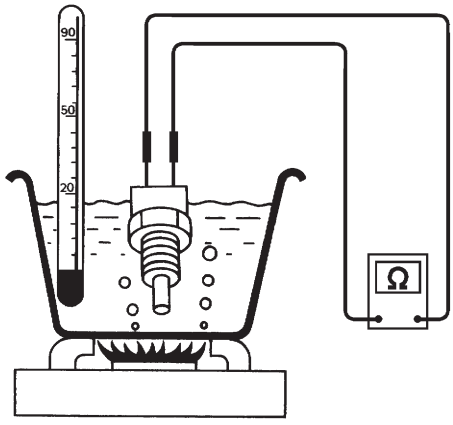
4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC section, "Thermostat".

OK or NG

OK	▶	GO TO 17.
NG	▶	Replace thermostat.

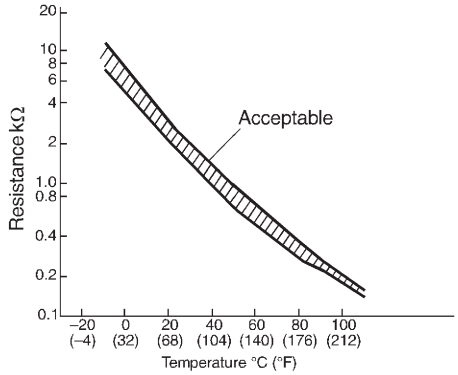
17	CHECK ENGINE COOLANT TEMPERATURE SENSOR

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 18.
NG	▶	Replace engine coolant temperature sensor.

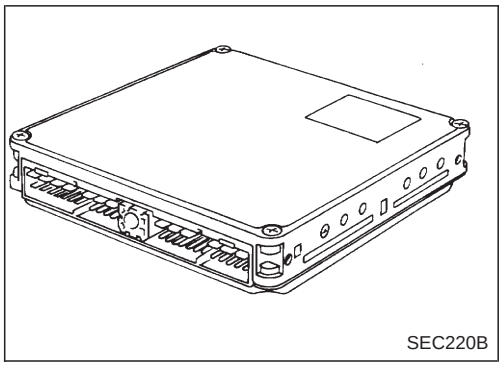
Diagnostic Procedure (Cont'd)

18	**CHECK MAIN 12 CAUSES**
If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-3501.	
►	**INSPECTION END**

Main 12 Causes of Overheating

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	30 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section.
	4	● Radiator cap	● Pressure tester	78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi) 59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See "System Check", "ENGINE COOLING SYSTEM" in LC section.
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check", "ENGINE COOLING SYSTEM" in LC section.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot.	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section.
ON*1	7	● Cooling fan	● Visual	Operating	See "DTC 0208 OVER HEAT", EC-3489.
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 "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See "ENGINE MAINTENANCE" in MA section.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See "Inspection", "CYLINDER HEAD" in EM section.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See "Inspection", "CYLINDER BLOCK" in EM section.

*1: Engine running at idle.
*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 "OVERHEATING CAUSE ANALYSIS" in LC section.

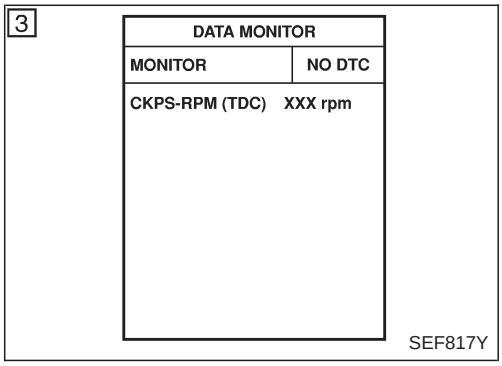

SEC220B

Description

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

Malfunction is detected when ...	Check Items (Possible Cause)
● ECM calculation function is malfunctioning.	● ECM (ECCS-D control module)



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

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-3503.

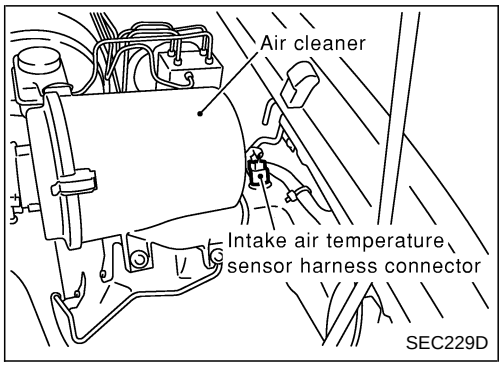
WITHOUT CONSULT-II

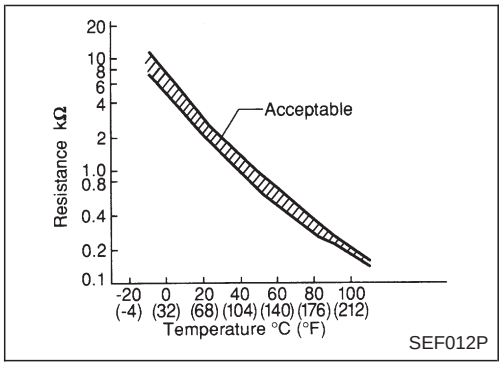
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and wait at least 2 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-3503.

Diagnostic Procedure

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-3501, again. 5. Is the malfunction 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-3501, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0301 or 0901 displayed again?	
Yes or No	
Yes ►	GO TO 2.
No ►	**INSPECTION END**

2	REPLACE ECM
1. Replace ECM. 2. Perform initialization of NATS system and resistration of all NATS ignition key IDs. Refer to EC-3429. (Models with NATS) 3. Perform “Accelerator Position Sensor Idle Position Learning” of “BASIC SERVICE PROCEDURE”. Refer to EC-3427.	
►	**INSPECTION END**





Component Description

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>

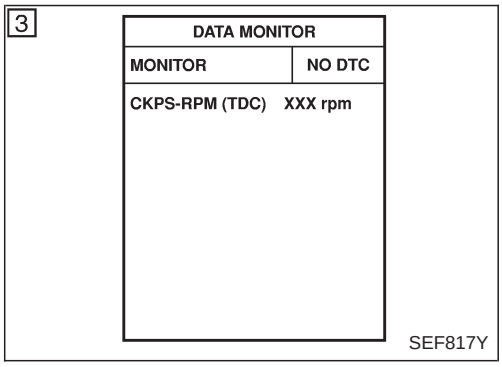
Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.1 - 2.9
80 (176)	1.24	0.27 - 0.38

*: These data are reference values and are measured between ECM terminal 36 (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

Malfunction is detected when ...	Check Items (Possible Cause)
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

WITH CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If DTC is detected, go to "Diagnostic Procedure", EC-3507.

DTC Confirmation Procedure (Cont'd)

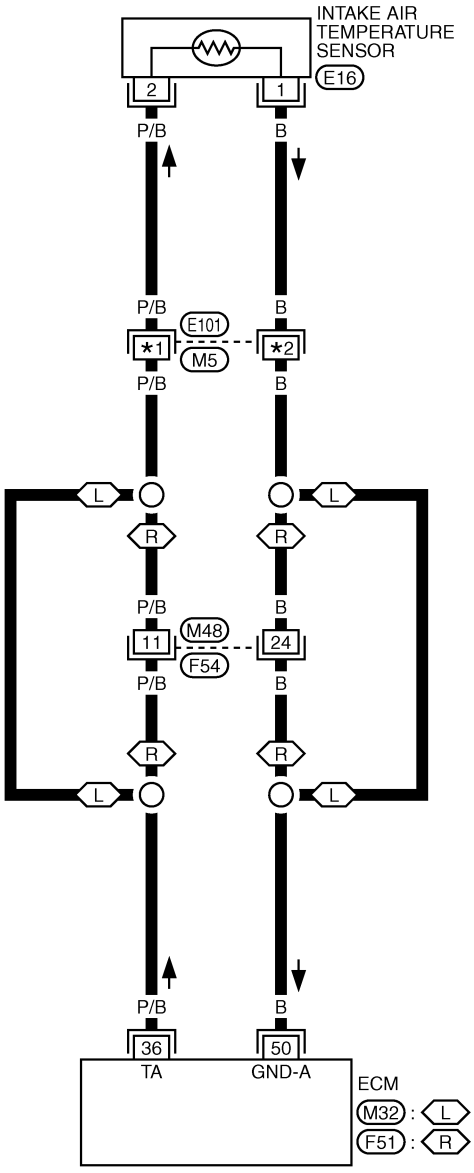
WITHOUT CONSULT-II

WITHOUT CONSULT-II

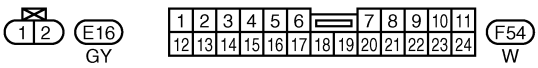
1. Turn ignition switch "ON" and wait at least 5 seconds.
2. Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3. Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4. If DTC is detected, go to EC-3507.

Wiring Diagram

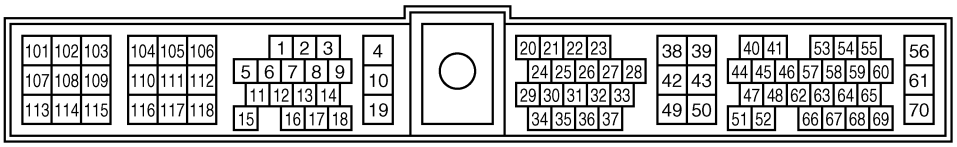
EC-IATS-01



: Detectable line for DTC
: Non-detectable line for DTC
L : LHD models
R : RHD models
*1 7A : L
9J : R
*2 7B : L
10J : R



Refer to last page (Foldout page).
M5 , E101

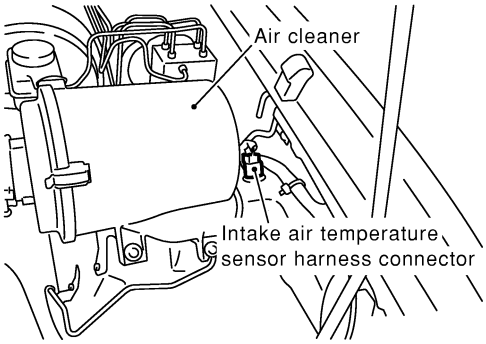


GEC128A

Diagnostic Procedure

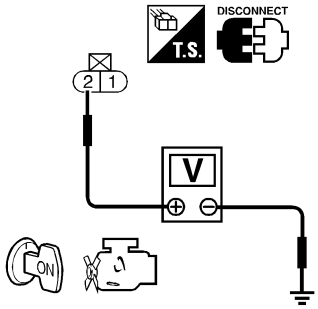
1	CHECK POWER SUPPLY

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



SEC229D

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



Voltage: Approximately 5V

SEC163D

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness connectors M48, F54 (RHD models)
- Harness for open or short between ECM and intake air temperature sensor

	▶	Repair harness or connectors.

Diagnostic Procedure (Cont'd)

3	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 1 and engine ground.
   Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

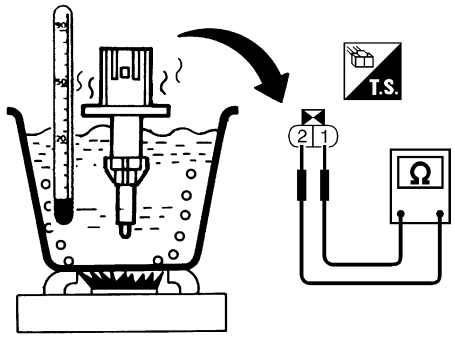
4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness connectors M48, F54 (RHD models)
- Harness for open or short between ECM and intake air temperature sensor

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

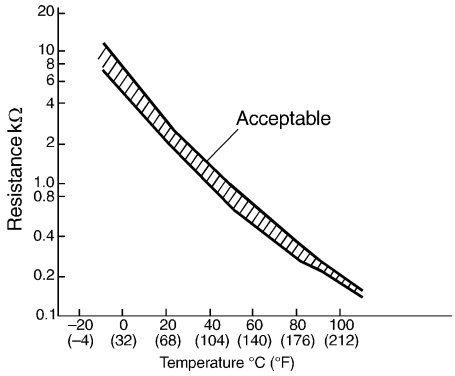
5	CHECK INTAKE AIR TEMPERATURE SENSOR

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



<Reference data>

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



SEC165D

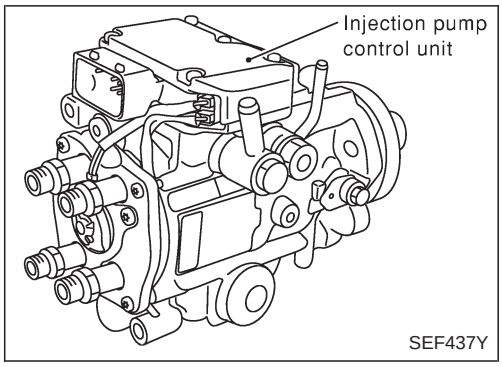
OK or NG

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

6	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.

	▶	**INSPECTION END**



Description

SYSTEM DESCRIPTION

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

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

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

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

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

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	Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
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 (4,992 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

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

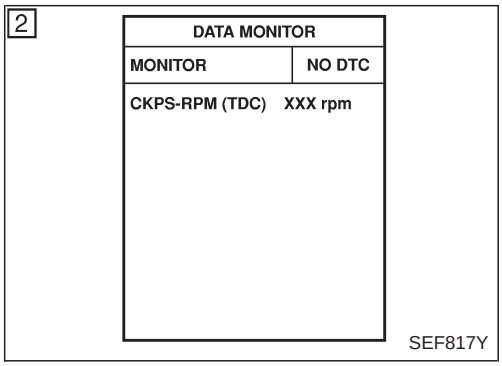
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● 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

WITH CONSULT-II

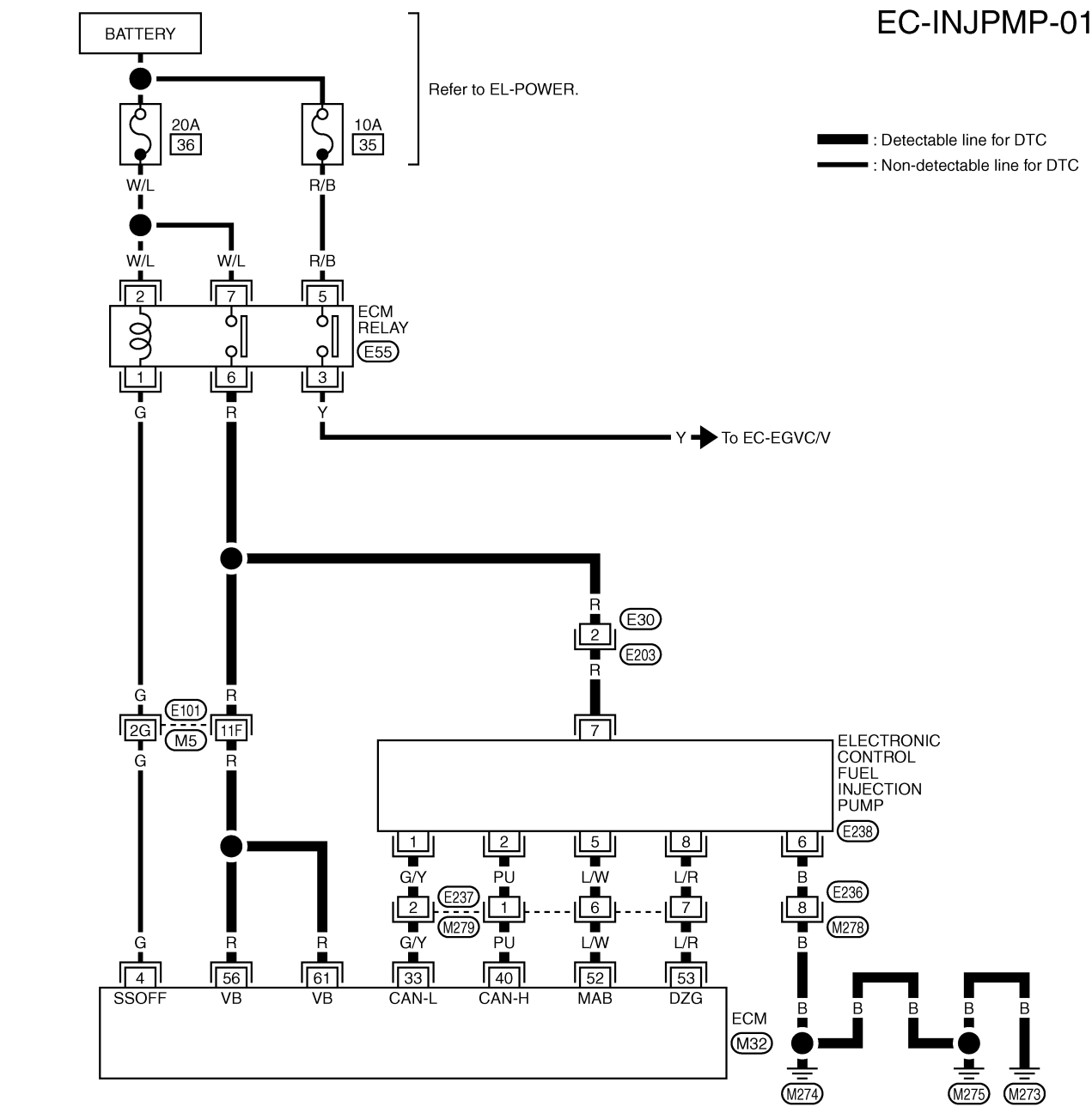
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3514.

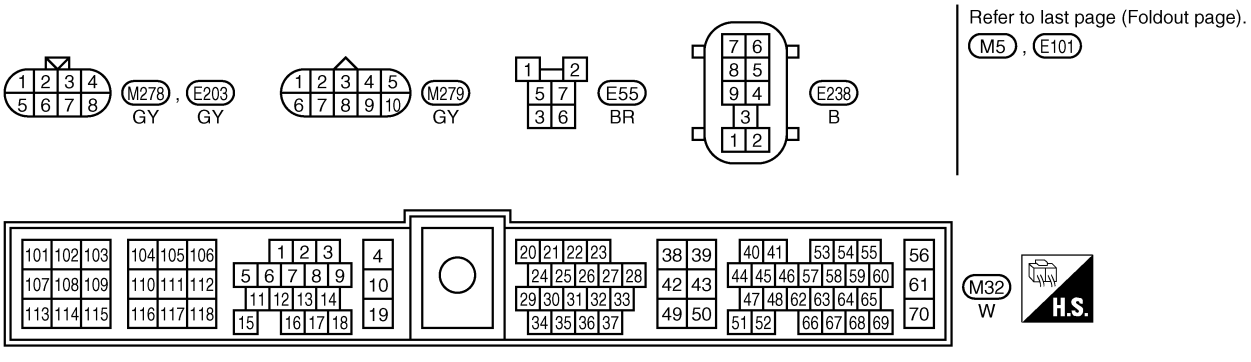
WITHOUT CONSULT-II

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-3514.

Wiring Diagram

LHD MODELS



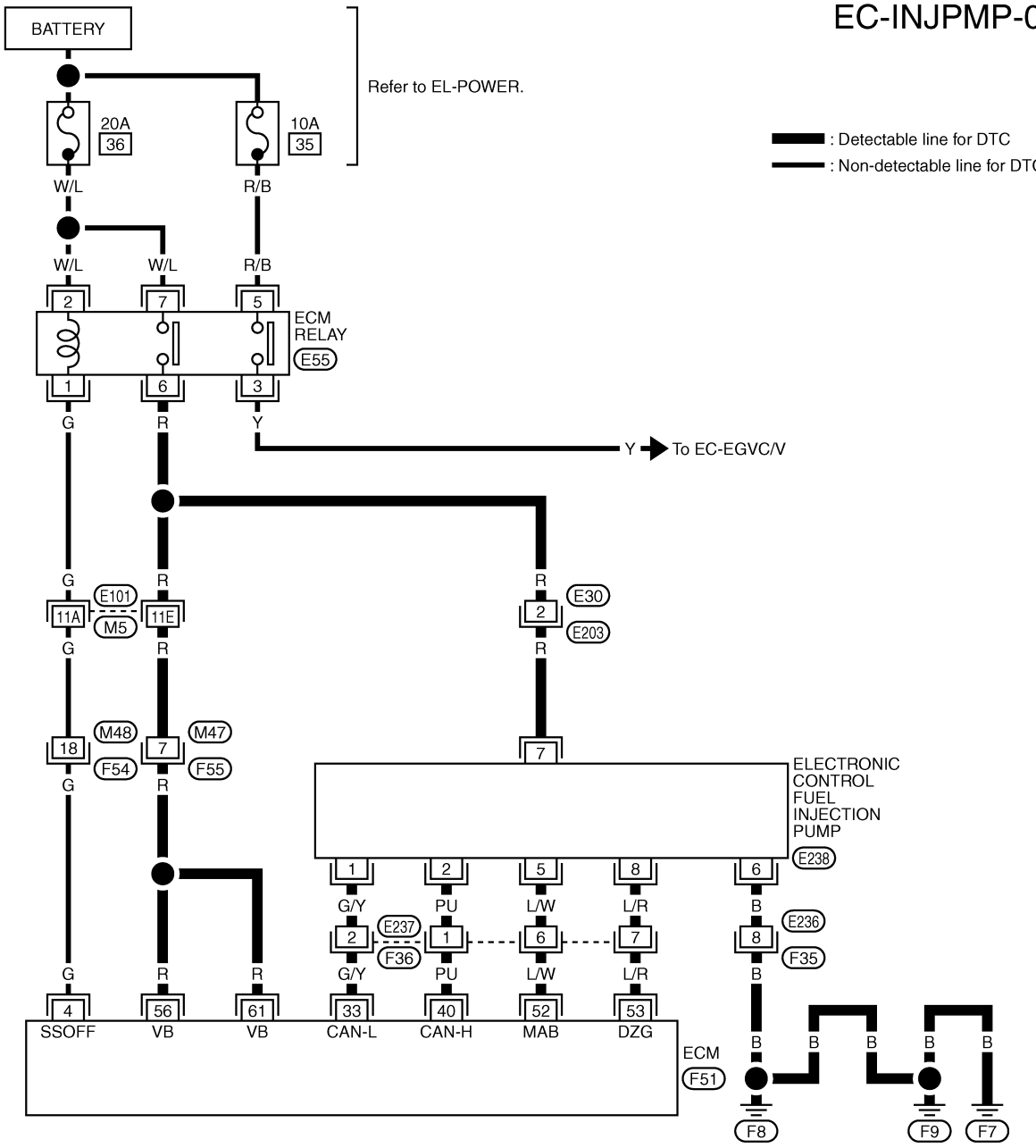


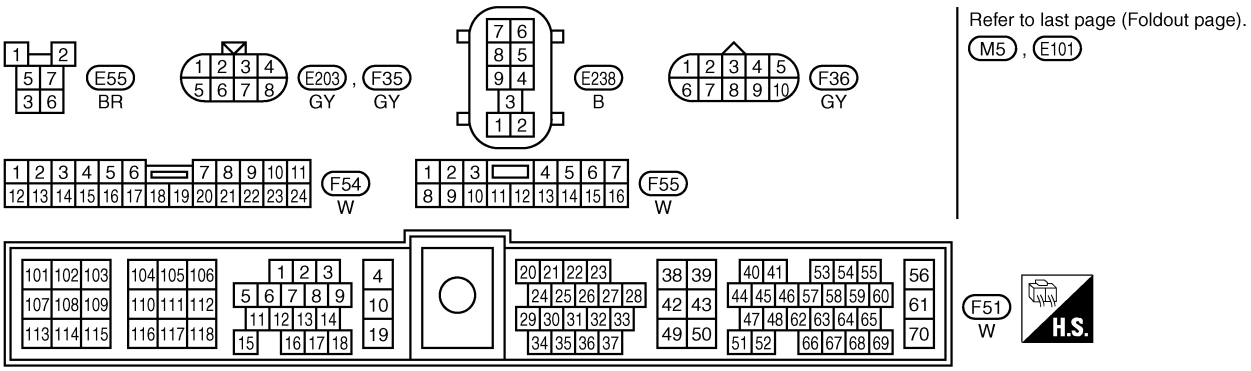
GEC275A

Wiring Diagram (Cont'd)

RHD MODELS

EC-INJPMP-02





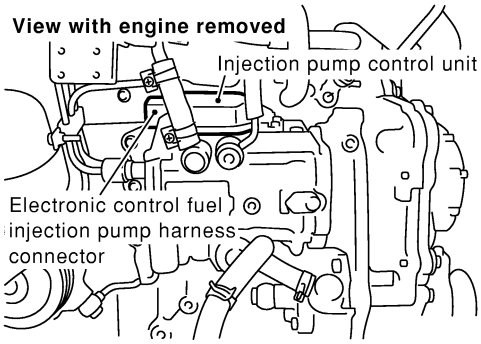
Refer to last page (Foldout page).
M5, E101

GEC276A

Diagnostic Procedure

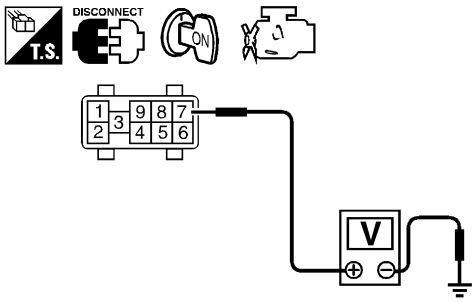
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEC228D

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 E30, E203
- Harness connectors E101, M5
- Harness connectors M47, F55 (RHD models)
- 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 5.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E236, M278 (LHD models) ● Harness connectors E236, F35 (RHD models) ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	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	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

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

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E237, M279 (LHD models) ● Harness connectors E237, F36 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

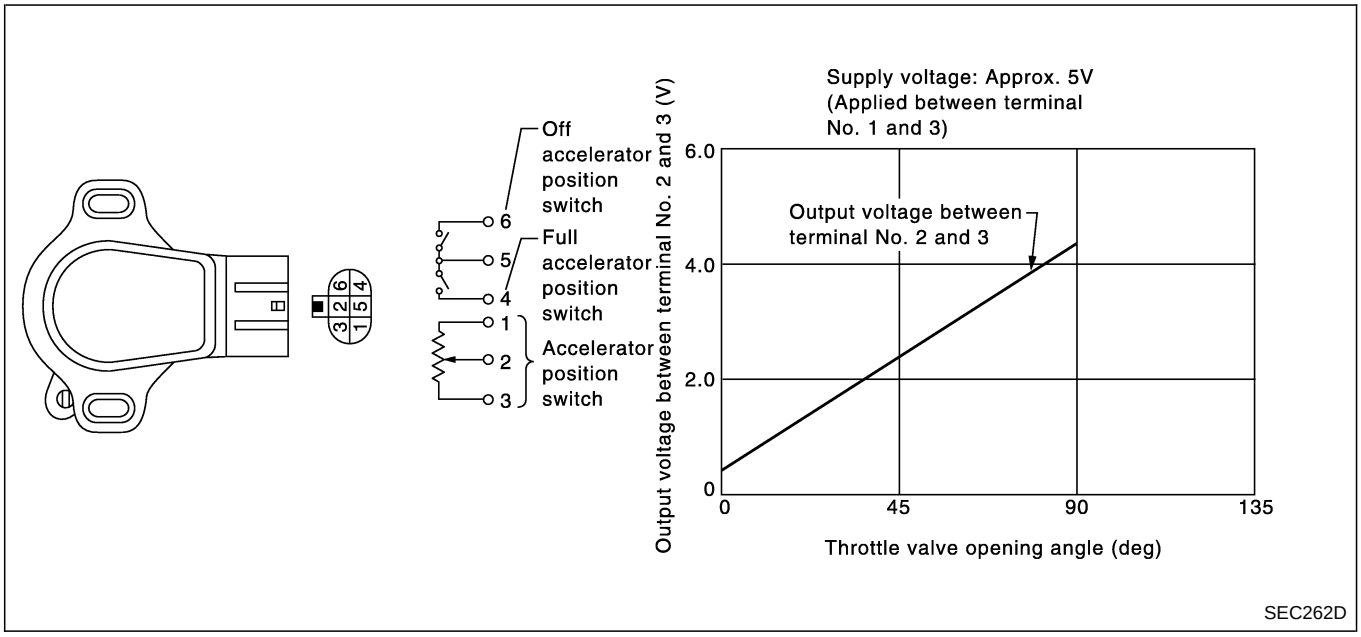
7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	

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

The accelerator work unit is installed on the upper end of the accelerator pedal assembly. 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 Full-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

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL POS SEN	● Ignition switch: ON (Engine stopped)	Accelerator pedal: released	0.29 - 0.79V
		Accelerator pedal: depressed	3.48 - 4.64V
FULL ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully depressed	ON
		Except above	OFF
OFF ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly open	OFF

ECM Terminals and Reference Value

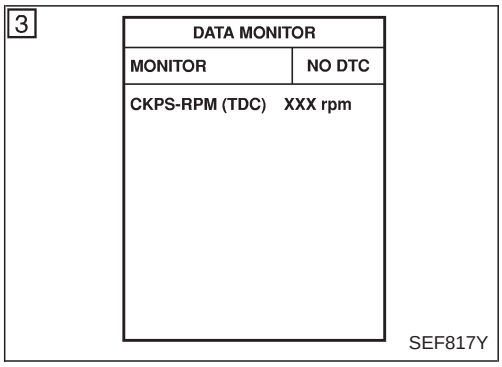
Specification data are reference values and are measured between each terminal and ground.

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23	W	Accelerator position sensor	Ignition switch "ON" └ Accelerator pedal fully released	0.29 - 0.79V
			Ignition switch "ON" └ Accelerator pedal fully depressed	3.48 - 4.64V
31	Y	Accelerator position switch (Idle)	Ignition switch "ON" └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
32	G	Accelerator position switch (Full)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0V
			Ignition switch "ON" └ Accelerator pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
48	OR/L	Accelerator position sensor power supply	Ignition switch "ON"	Approximately 5V
51	B/W	Accelerator position sensor ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● The relation between sensor and switch signal is not in the normal range during the specified accelerator position.	● Harness or connectors (The sensor circuit is open or shorted.) ● Accelerator position sensor ● Accelerator position switch



DTC Confirmation Procedure

WITH CONSULT-II

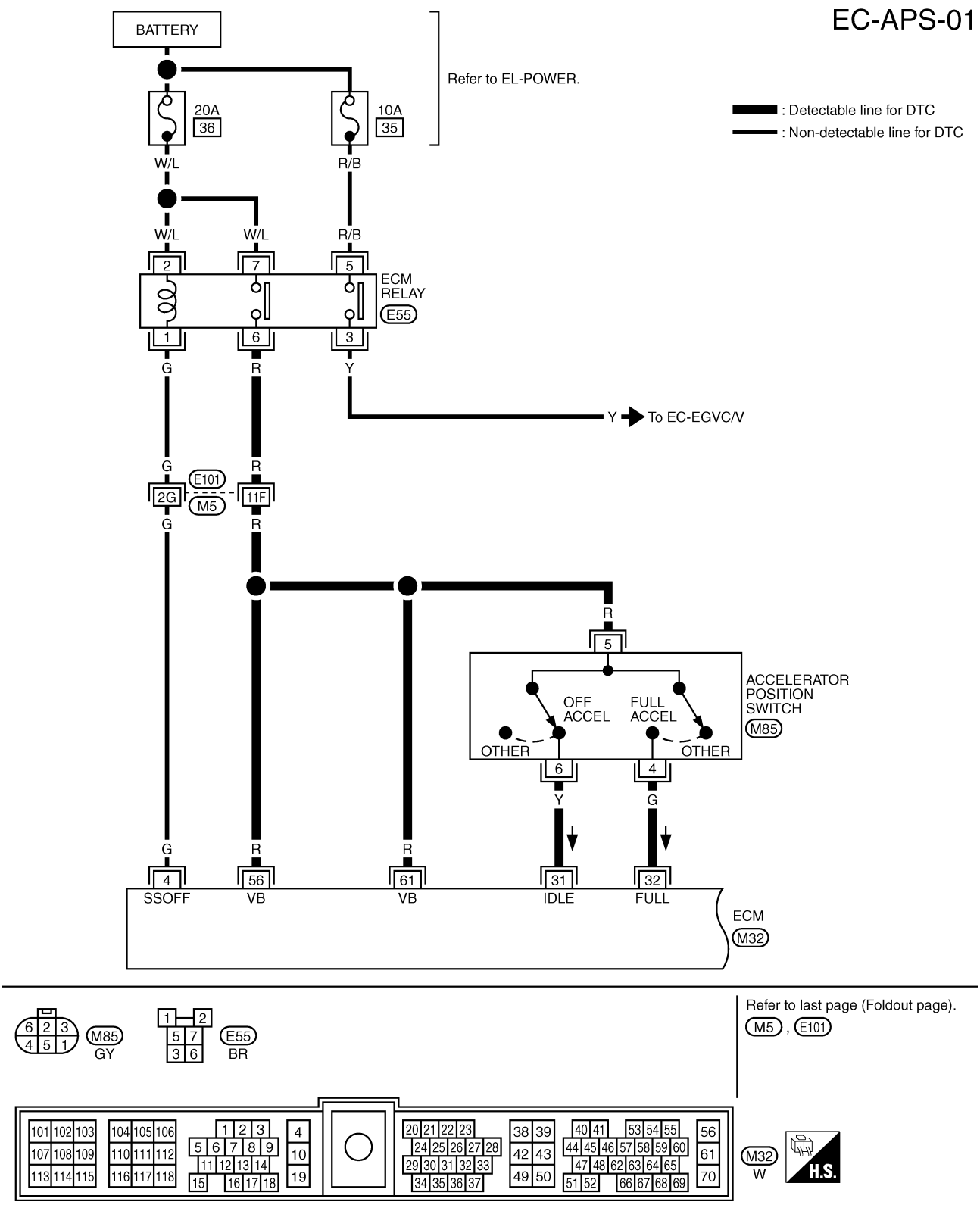
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Depress and release fully accelerator pedal slowly.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3523.

WITHOUT CONSULT-II

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-3523.

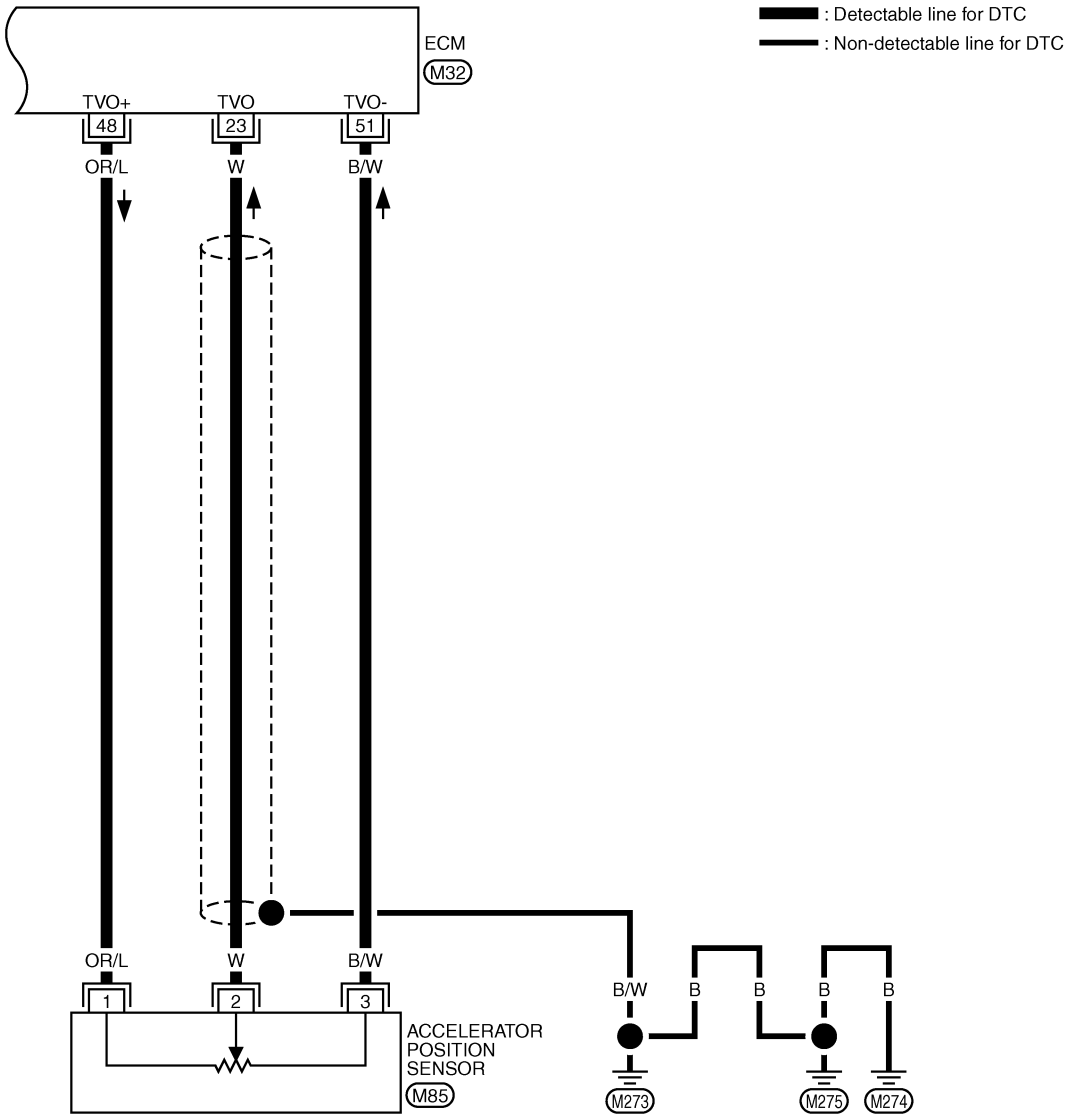
Wiring Diagram

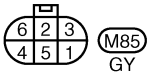
LHD MODELS

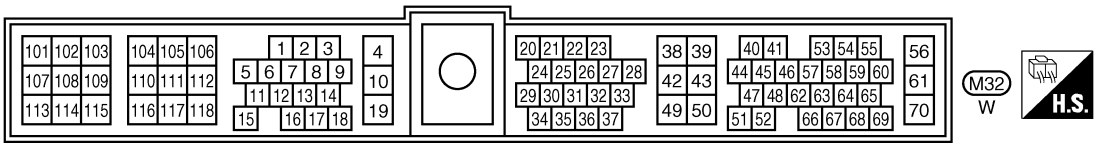


Wiring Diagram (Cont'd)

EC-APS-02





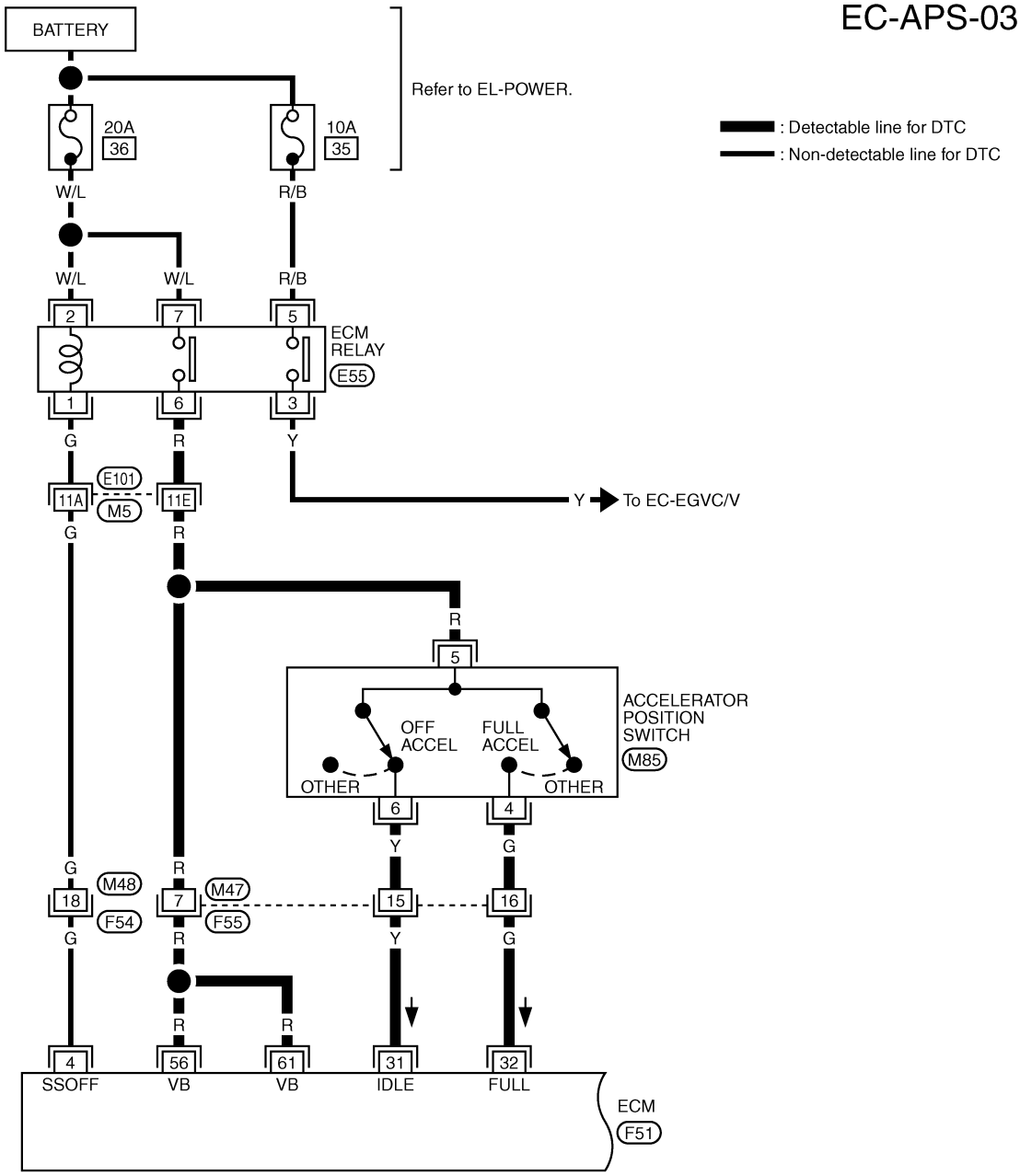


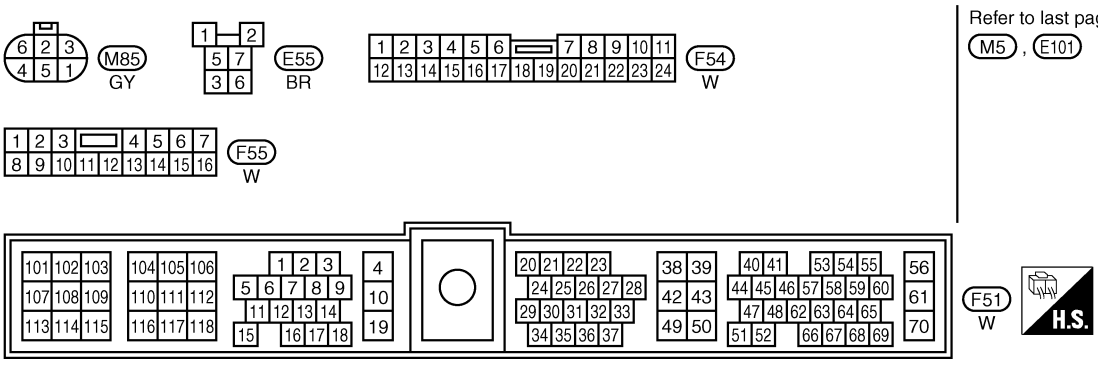
GEC278A

Wiring Diagram (Cont'd)

RHD MODELS

EC-APS-03



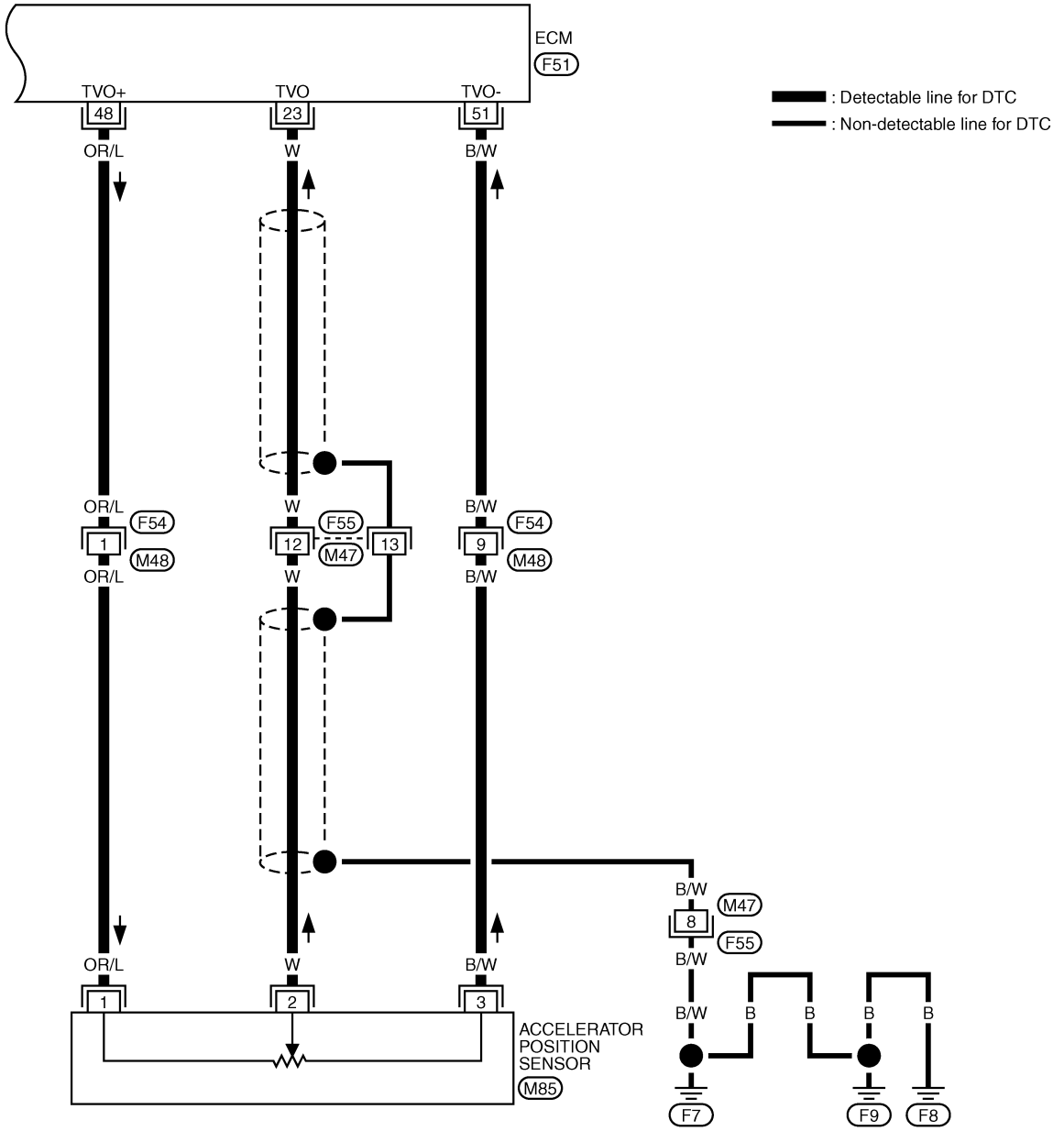


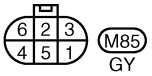
Refer to last page (Foldout page).
M5 , E101

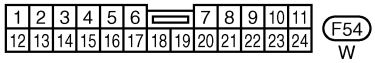
GEC279A

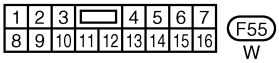
Wiring Diagram (Cont'd)

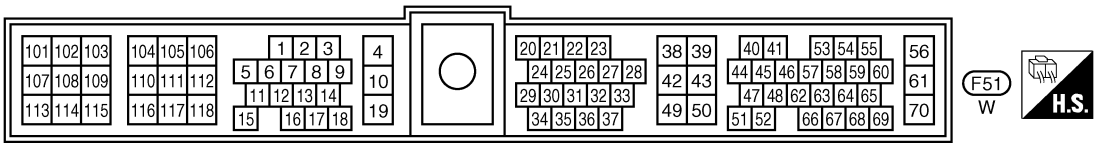
EC-APS-04











GEC280A

Diagnostic Procedure

1	CHECK OVERALL FUNCTION-I

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.

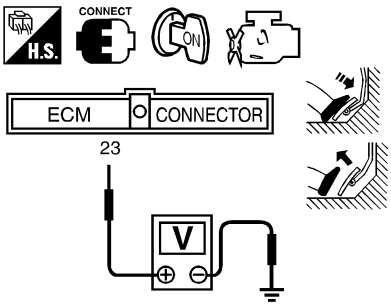
DATA MONITOR	
MONITOR	NO DTC
ACCEL POS SEN	XXX V

Conditions	ACCEL POS SEN
Accelerator pedal fully depressed	3.48 - 4.64V
Accelerator pedal fully released	0.29 - 0.79V

SEF278ZB

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 23 and ground under the following conditions.



Conditions	Voltage
Accelerator pedal fully depressed	3.48 - 4.64V
Accelerator pedal fully released	0.29 - 0.79V

SEF279ZB

OK or NG

OK	►	GO TO 2.
NG	►	GO TO 3.

Diagnostic Procedure (Cont'd)

2	CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "FULL ACCEL SW" and "OFF ACCEL SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check "FULL ACCEL SW" and "OFF ACCEL SW" signal under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
FULL ACCEL SW	OFF
OFF ACCEL SW	ON

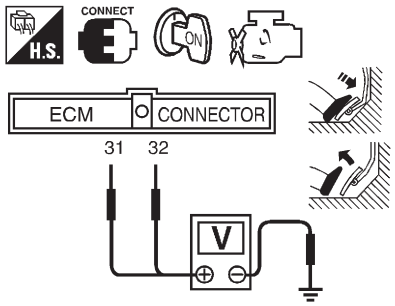
Conditions	FULL ACCEL SW
Accelerator pedal fully depressed	ON
Except above	OFF

Conditions	OFF ACCEL SW
Accelerator pedal fully released	ON
Accelerator pedal depressed	OFF

SEF416Y

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminals 31, 32 and ground under the following conditions.



Conditions	Voltage (ECM terminal 32)
Accelerator pedal fully depressed	Battery voltage
Except above	Approx. 0V

Conditions	Voltage (ECM terminal 31)
Accelerator pedal fully released	Battery voltage
Accelerator pedal depressed	Approx. 0V

SEF417Y

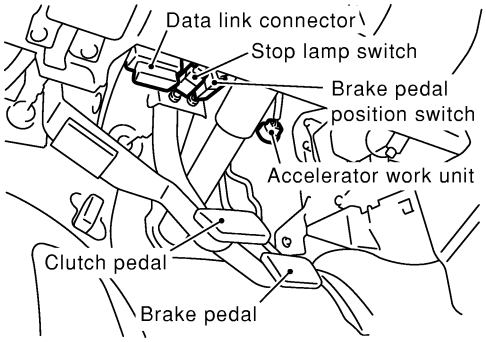
OK or NG

OK	►	GO TO 24.
NG	►	GO TO 15.

Diagnostic Procedure (Cont'd)

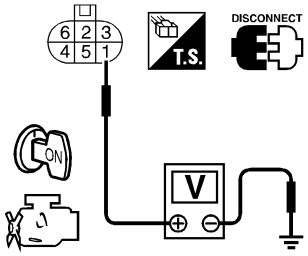
3	CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect accelerator work unit harness connector.



SEC233D

3. Turn ignition switch "ON".
4. Check voltage between accelerator work unit terminal 1 and ground with CONSULT-II or tester.



Approximately 5V

SEC244D

OK or NG

OK	►	GO TO 5.
NG	►	GO TO 4.

4	DETECT MALFUNCTIONING PART

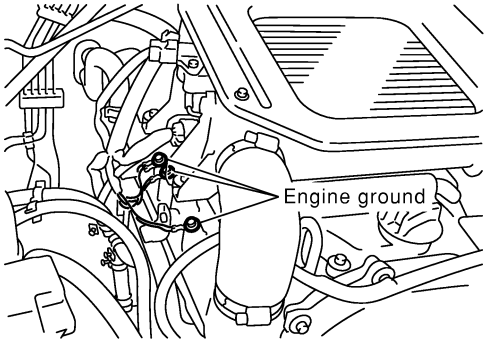
Check the following.
- Harness connectors F54, M48 (RHD models)
- Harness for open or short between ECM and accelerator work unit

	►	Repair harness or connectors.

Diagnostic Procedure (Cont'd)

5	CHECK ACCELERATOR POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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



SEC245D

3. Check harness continuity between accelerator work unit 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 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F54, M48 (RHD models)
- 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 23 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 (With CONSULT-II)	▶	GO TO 9.
OK (Without CONSULT-II)	▶	GO TO 10.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F55, M47 (RHD models)
- 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.

Diagnostic Procedure (Cont'd)

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
CKPS-RPM (TDC)	XXX rpm
ACCEL POS SEN	XXX V

Throttle valve conditions	ACCEL POS SEN
Completely closed (a)	0.29 - 0.79V
Partially open	Between (a) and (b)
Completely open (b)	3.48 - 4.64V

SEF818YB

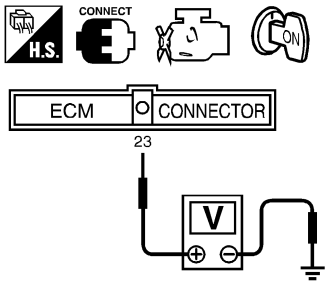
OK or NG

OK (LHD models)	▶	GO TO 13.
OK (RHD models)	▶	GO TO 11.
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 23 and ground under the following conditions.



Throttle valve conditions	Voltage
Completely closed (a)	0.29 - 0.79V
Partially open	Between (a) and (b)
Completely open (b)	3.48 - 4.64V

SEF407YB

OK or NG

OK (LHD models)	▶	GO TO 14.
OK (RHD models)	▶	GO TO 11.
NG	▶	Replace accelerator pedal assembly.

Diagnostic Procedure (Cont'd)

11	CHECK ACCELERATOR POSITION SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check harness continuity between harness connector F55 terminal 13 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to power. **OK or NG**	
OK (With CONSULT-II) ▶	GO TO 13.
OK (Without CONSULT-II) ▶	GO TO 14.
NG ▶	GO TO 12.

12	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M47, F55 ● Harness for open or short between harness connector F55 and engine ground	
▶	Repair harness or connectors.

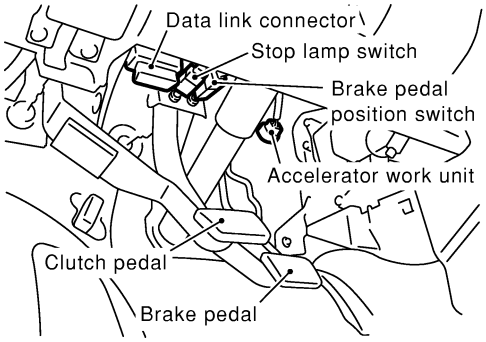
13	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY
With CONSULT-II 1. Turn ignition switch "ON". 2. Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode with CONSULT-II. 3. Touch "CLEAR".	
▶	GO TO 24.

14	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY
Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Let engine idle for 10 minutes.	
▶	GO TO 24.

Diagnostic Procedure (Cont'd)

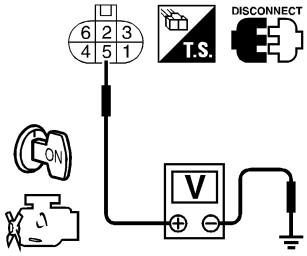
15	CHECK ACCELERATOR POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect accelerator work unit harness connector.



SEC233D

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



Voltage: Battery voltage

SEC243D

OK or NG

OK	►	GO TO 17.
NG	►	GO TO 16.

16	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness connectors M47, F55 (RHD models)
- Harness for open or short between accelerator work unit and ECM relay
- Harness for open or short between accelerator work unit and ECM

	►	Repair harness or connectors.

Diagnostic Procedure (Cont'd)

17	CHECK ACCELERATOR POSITION SWITCH INPUT SIGNAL CIRCUIT-I FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between accelerator work unit terminal 6 and ECM terminal 31. 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 19.
NG	▶	GO TO 18.

18	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M47, F55 (RHD models)
- 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.

19	CHECK ACCELERATOR POSITION SWITCH INPUT SIGNAL CIRCUIT-II FOR OPEN AND SHORT

1. Check harness continuity between accelerator work unit terminal 4 and ECM terminal 32. 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 21.
NG	▶	GO TO 20.

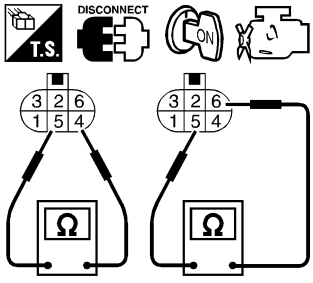
20	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M47, F55 (RHD models)
- 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.

21	CHECK ACCELERATOR POSITION SWITCH

Check continuity between accelerator work unit terminals 4 and 5, 5 and 6 under the following conditions.



Between terminals 4 and 5

Conditions	Continuity
Accelerator pedal fully depressed	Should exist.
Except above	Should not exist.

Between terminals 5 and 6

Conditions	Continuity
Accelerator pedal fully released	Should exist.
Accelerator pedal depressed	Should not exist.

SEC246D

OK or NG

OK (With CONSULT-II)	▶	GO TO 22.
OK (Without CONSULT-II)	▶	GO TO 23.
NG	▶	Replace accelerator pedal assembly.

Diagnostic Procedure (Cont'd)

22	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY
With CONSULT-II 1. Reconnect all connectors disconnected. 2. Turn ignition switch "ON". 3. Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode with CONSULT-II. 4. Touch "CLEAR".	
►	GO TO 24.

23	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY
Without CONSULT-II 1. Reconnect all connectors disconnected. 2. Start engine and warm it up to normal operating temperature. 3. Let engine idle for 10 minutes.	
►	GO TO 24.

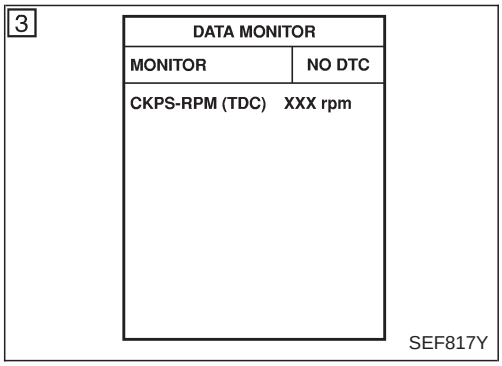
24	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
►	**INSPECTION END**

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● An excessively high voltage from the charge air pressure sensor is sent to ECM when engine is running.	● Intake air system ● Turbocharger system ● Charge air pressure sensor ● Harness or connectors (The charge air pressure sensor circuit is shorted.)

DTC Confirmation Procedure

NOTE:
If DTC 0406 “INT AIR VOL” displayed with DTC 0905 “TURBO PRESSURE”, perform trouble diagnosis for DTC 0905 “TURBO PRESSURE” first. (See EC-3601.)



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) Drive vehicle.
5) Maintain the engine speed more than 4,000 rpm for at least 10 seconds.
6) If DTC is detected, go to “Diagnostic Procedure”, EC-3533.

WITHOUT CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Drive vehicle.
3) Maintain the engine speed more than 4,000 rpm for at least 10 seconds.
4) Stop vehicle.
5) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
6) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
7) If DTC is detected, go to “Diagnostic Procedure”, EC-3533.

Diagnostic Procedure

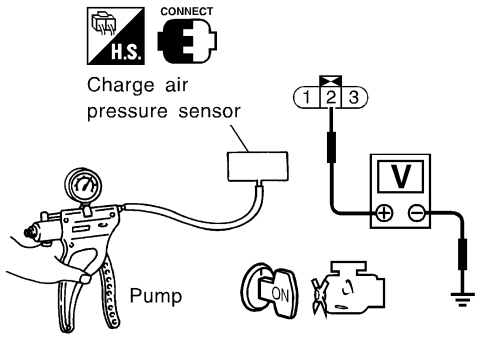
1	CHECK INTAKE AIR SYSTEM
Listen for an intake air leak and clogging after the intake air temperature sensor.	
OK or NG	
OK ►	GO TO 2.
NG ►	Repair or replace.

2	CHECK CHARGE AIR PRESSURE SENSOR

1. Remove charge air pressure sensor with its harness connector connected.
2. Turn ignition switch “ON”.
3. Use pump to apply pressure to charge air pressure sensor as shown in the figure.

CAUTION:
- **Always calibrate the pressure pump gauge when using it.**
- **Inspection should be done at room temperature [10 - 30°C (50 - 86°F)].**

4. Check the output voltage between charge air pressure sensor terminal 2 and engine ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mbar, 0 mmHg, 0 inHg)	1.9 - 3.0
+40 kPa (400 mbar, 300 mmHg, 11.81 inHg)	The voltage should be 0.6 to 1.0V higher than the value measured above.

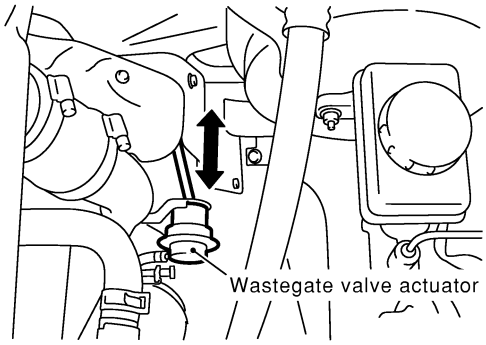
SEF449Z

OK or NG

OK ►	GO TO 3.
NG ►	Replace charge air pressure sensor.

3	CHECK TURBOCHARGER OVERALL FUNCTION

1. Start engine and let it idle.
2. Make sure that turbocharger wastegate valve control actuator rod moves when revving engine up to 3,000 rpm and returning to idle.



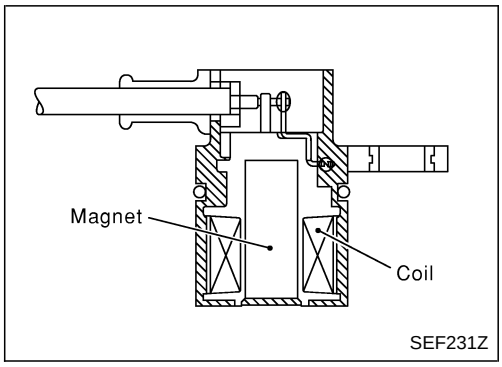
SEC255D

OK or NG

OK ►	GO TO 4.
NG ►	Refer to EM section, “Turbocharger inspection”.

Diagnostic Procedure (Cont'd)

4	CHECK INTERMIT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
►	INSPECTION END



Description

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 data signal output is detected at ATDC 70° 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

Specification data are reference values.

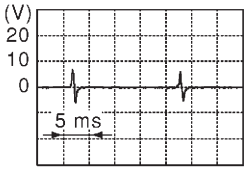
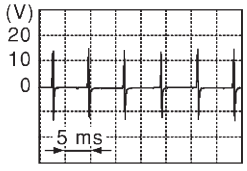
MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (TDC)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

ECM Terminals and Reference Value

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

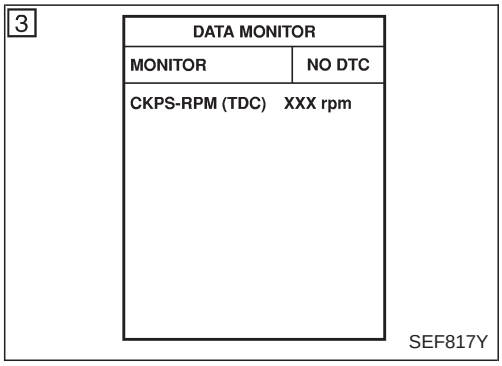
CAUTION:

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 and Pulse Signal)
44	Y	Crankshaft position sensor (TDC)	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0.04V  SEF333Y
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 0.04V  SEF334Y
47	BR	Crankshaft position sensor (TDC) ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● 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)



DTC Confirmation Procedure

Before performing the following procedure, confirm that battery voltage is more than 10V.

WITH CONSULT-II

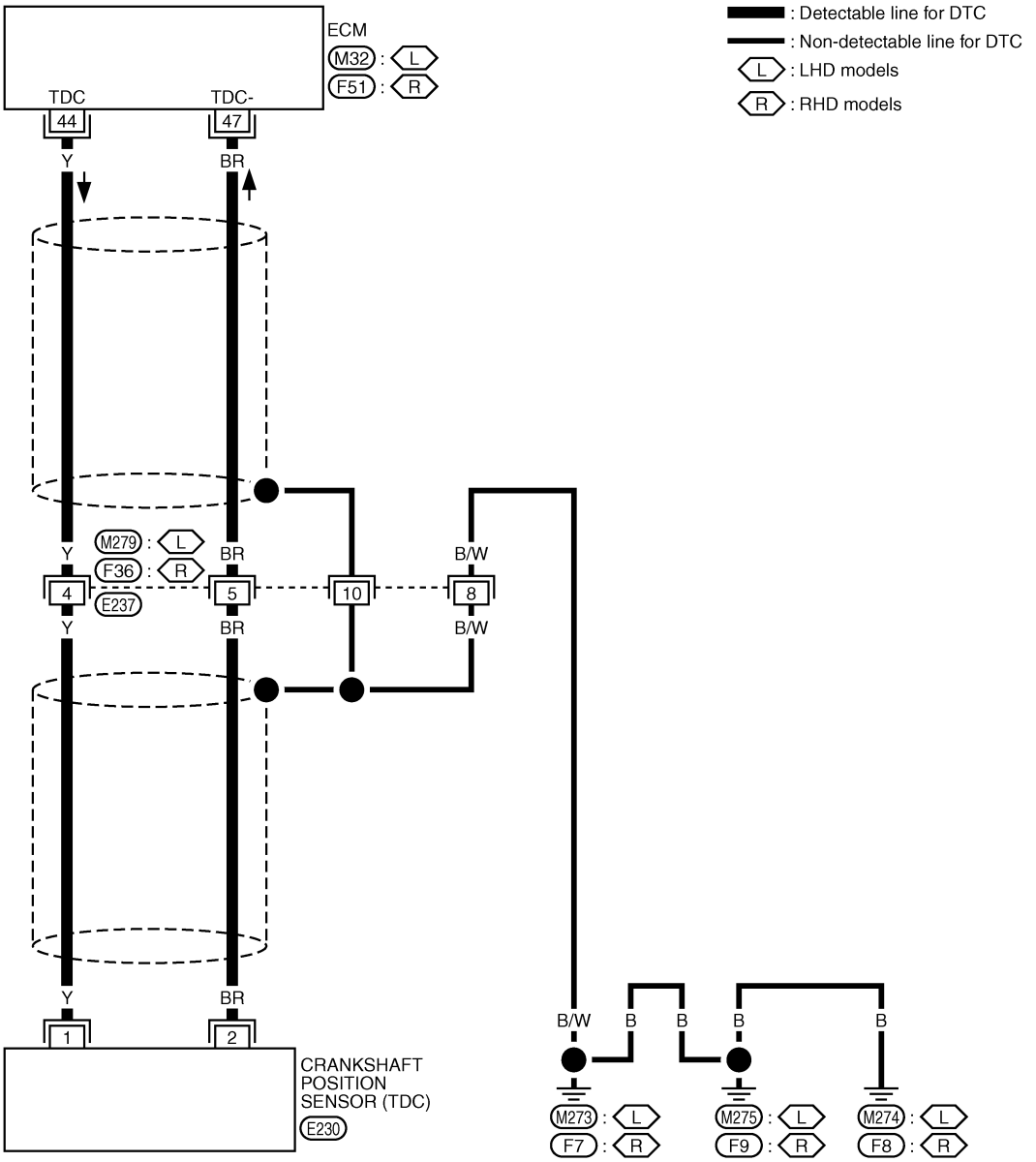
1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Crank engine for at least 1 second.
3) Start engine and run it for at least 2 seconds at idle speed.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3538.

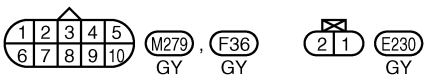
WITHOUT CONSULT-II

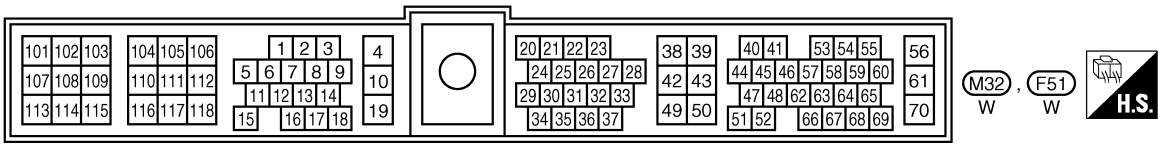
1) Crank engine for at least 1 second.
2) Start engine and run it for at least 2 seconds at idle speed.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-3538.

Wiring Diagram

EC-CKPS-01





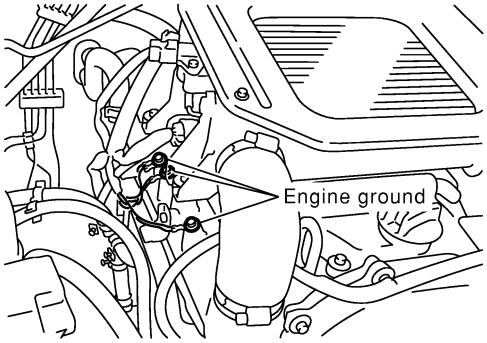


GEC281A

Diagnostic Procedure

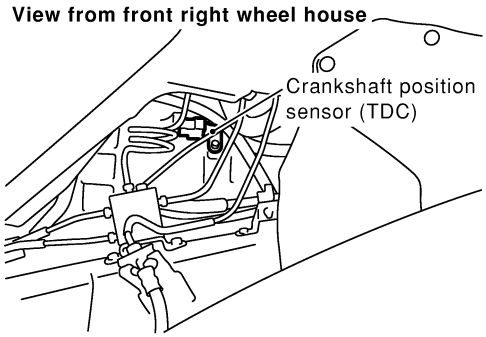
1	CHECK CRANKSHAFT POSITION SENSOR (TDC) GROUND CIRCUIT FOR OPEN AND SHORT

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



SEC245D

3. Disconnect crankshaft position sensor (TDC) harness connector and ECM harness connector.



SEC238D

4. Check harness continuity between ECM terminal 47 and crankshaft position sensor (TDC) 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 2.
NG	►	GO TO 3.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M279, E237 (LHD models)
- Harness connectors F36, E237 (RHD models)
- Harness for open and short between crankshaft position sensor (TDC) and ECM

	►	Repair harness or connectors.

3	CHECK CRANKSHAFT POSITION SENSOR (TDC) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between terminal 1 and ECM terminal 44. Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

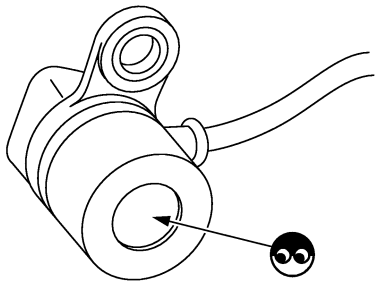
OK or NG

OK	►	GO TO 5.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M279, E237 (LHD models) ● Harness connectors F36, E237 (RHD models) ● Harness for open and short between crankshaft position sensor (TDC) and ECM	
►	Repair harness or connectors.

5	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.	

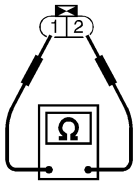


SEF232Z

OK or NG

OK	►	GO TO 6.
NG	►	Replace crankshaft position sensor (TDC).

6	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)]

SEC248D

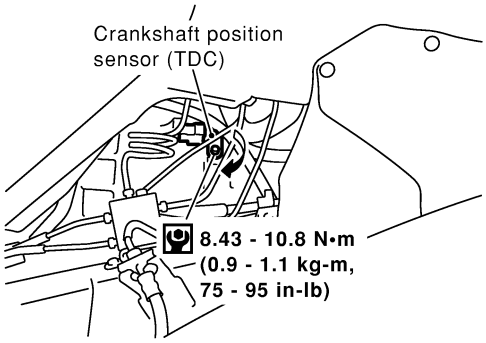
OK or NG

OK	►	GO TO 7.
NG	►	Replace crankshaft position sensor (TDC).

Diagnostic Procedure (Cont'd)

7	INSTALL CRANKSHAFT POSITION SENSOR

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.



SEC247D

►	GO TO 8.

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
►	INSPECTION END

On Board Diagnosis Logic

The ECM checks if battery voltage is within the tolerance range for the engine control system.

Malfunction is detected when ...	Check Items (Possible Cause)
● An abnormally high voltage from the battery is sent to ECM.	● Incorrect jump starting ● Battery ● Alternator ● ECM

DTC Confirmation Procedure

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-3541.

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 EL section (“CHARGING SYSTEM”).
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-3541.
   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-3541.

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-3541.

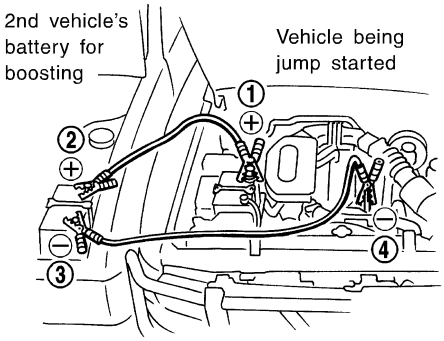
2) Check that the positive battery terminal is connected to battery properly. If NG, reconnect it properly.
3) Check that the alternator functions properly. Refer to EL section (“CHARGING SYSTEM”).
4) Turn ignition switch “ON” and wait one minute.
5) Turn ignition switch “OFF”, wait 5 seconds and then turn “ON”.
6) Perform “Diagnostic Test Mode II (Self-diagnostic result)” with ECM.
7) If DTC is detected, go to “Diagnostic Procedure”, EC-3541.
   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-3541.

Diagnostic Procedure

1	**INSPECTION START**	
Are jumper cables connected for the jump starting? **Yes or No**		
Yes	►	GO TO 3.
No	►	GO TO 2.

Diagnostic Procedure (Cont'd)

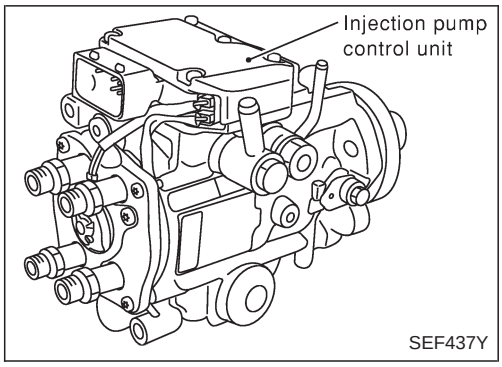
2	CHECK BATTERY AND ALTERNATOR	
Check that the proper type of battery and alternator is installed. Refer to EL section ("BATTERY" and "CHARGING SYSTEM").		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace with a proper one.

3	CHECK JUMPER CABLES INSTALLATION	
Check that the jumper cables are connected in the correct sequence.		
 SEF488Z		
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-3540, 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

SYSTEM DESCRIPTION

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

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

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

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

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

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	Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
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 (4,992 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

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

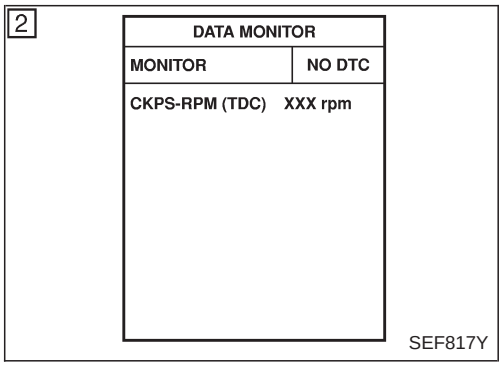
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● 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

WITH CONSULT-II

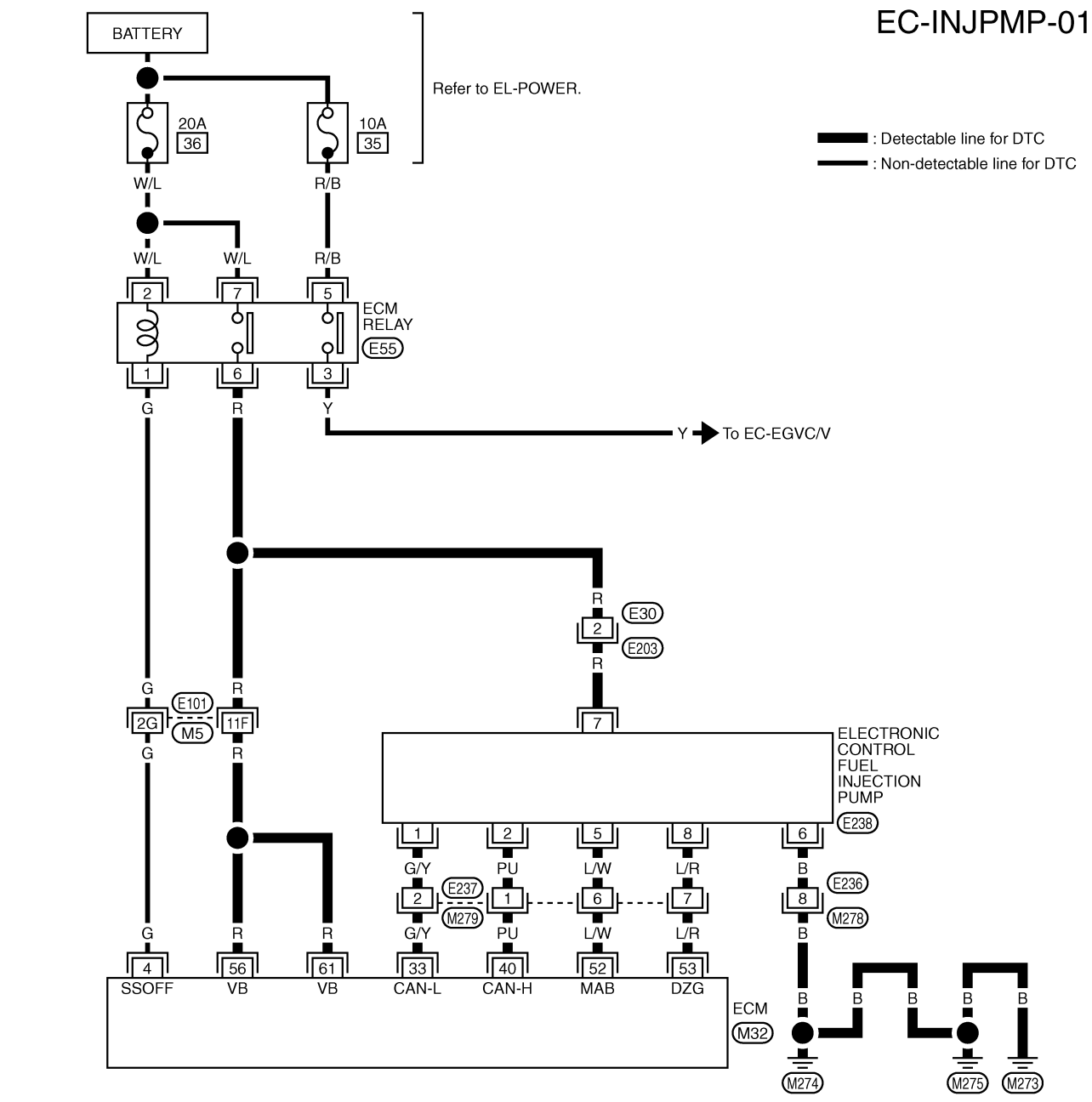
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3548.

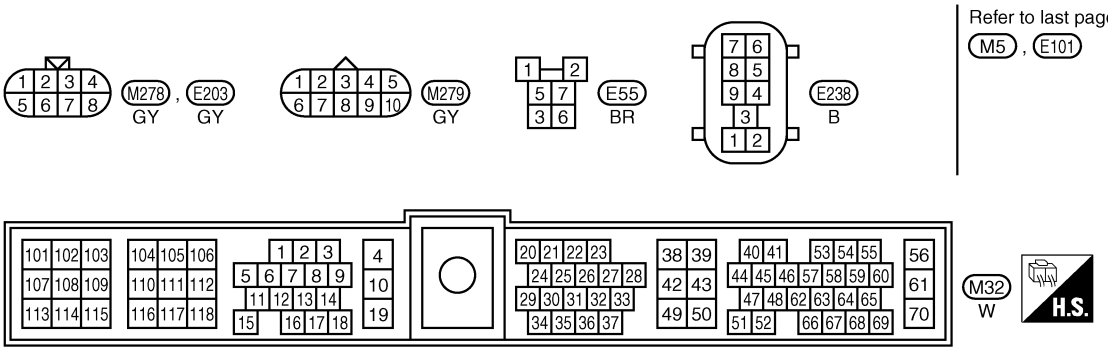
WITHOUT CONSULT-II

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-3548.

Wiring Diagram

LHD MODELS



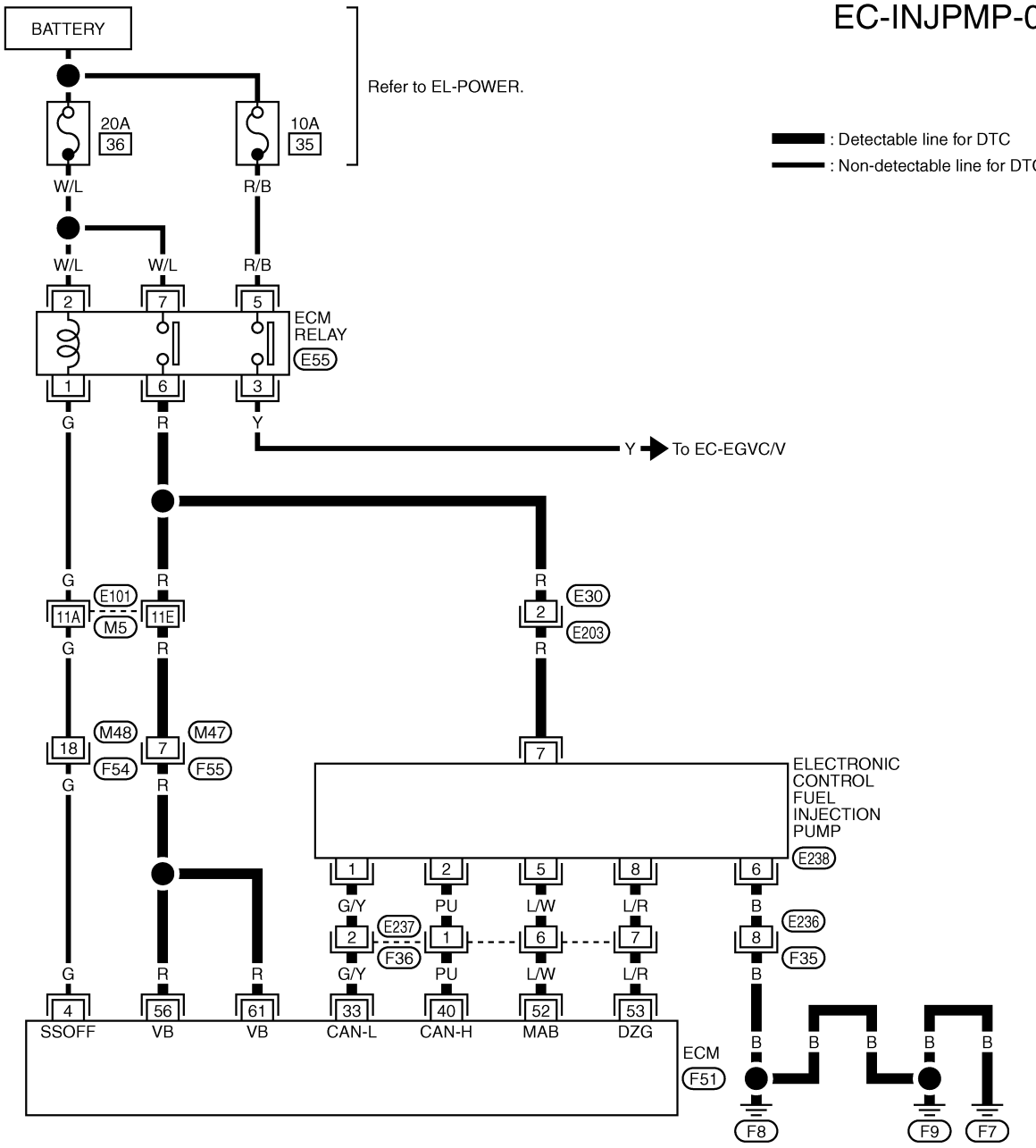


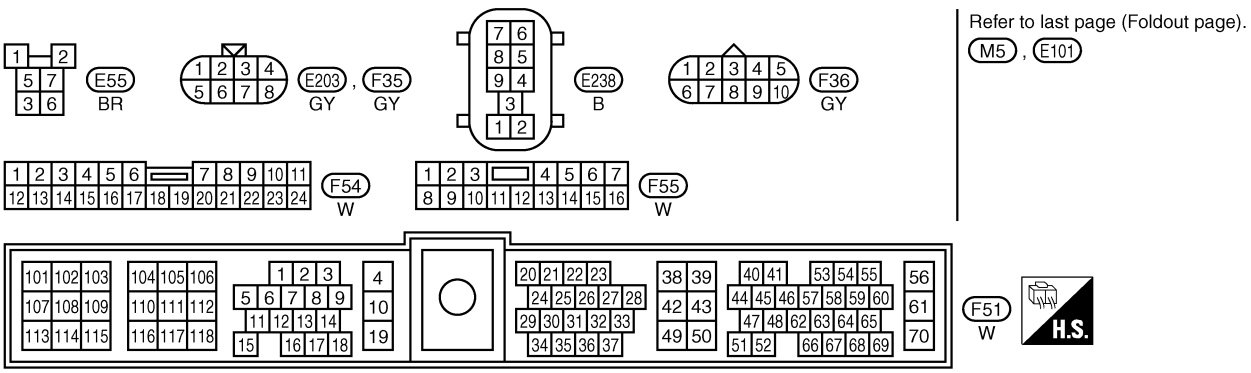
GEC275A

Wiring Diagram (Cont'd)

RHD MODELS

EC-INJPMP-02





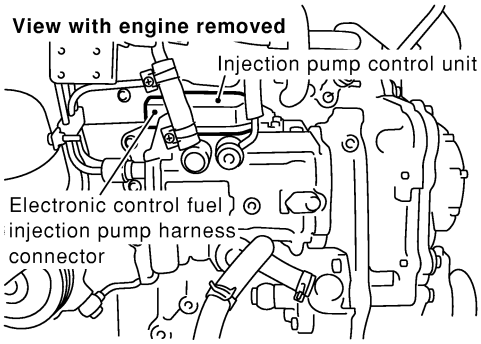
Refer to last page (Foldout page).
M5, E101

GEC276A

Diagnostic Procedure

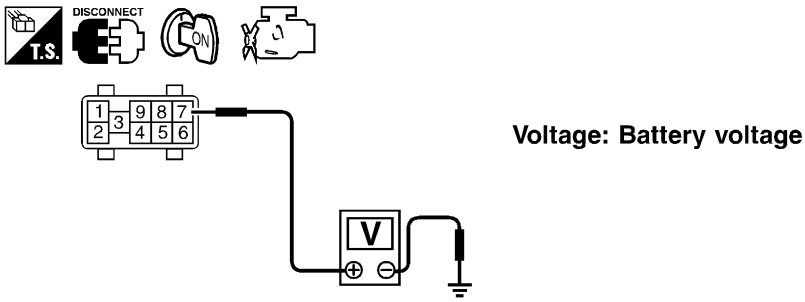
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEC228D

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 E30, E203
- Harness connectors E101, M5
- Harness connectors M47, F55 (RHD models)
- 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 5.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E236, M278 (LHD models) ● Harness connectors E236, F35 (RHD models) ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	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	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

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

OK or NG

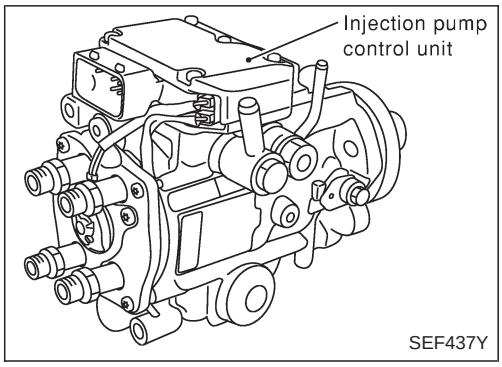
OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E237, M279 (LHD models) ● Harness connectors E237, F36 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	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-3469.	

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

SYSTEM DESCRIPTION

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

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

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

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

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

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	Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
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 (4,992 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

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

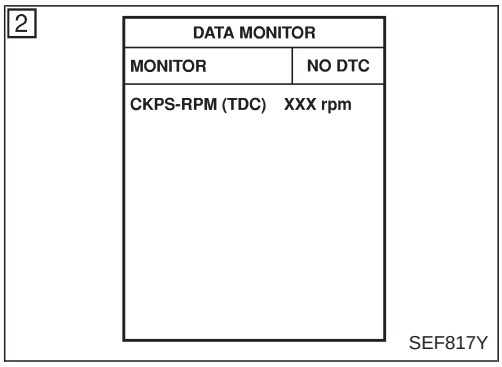
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● 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

WITH CONSULT-II

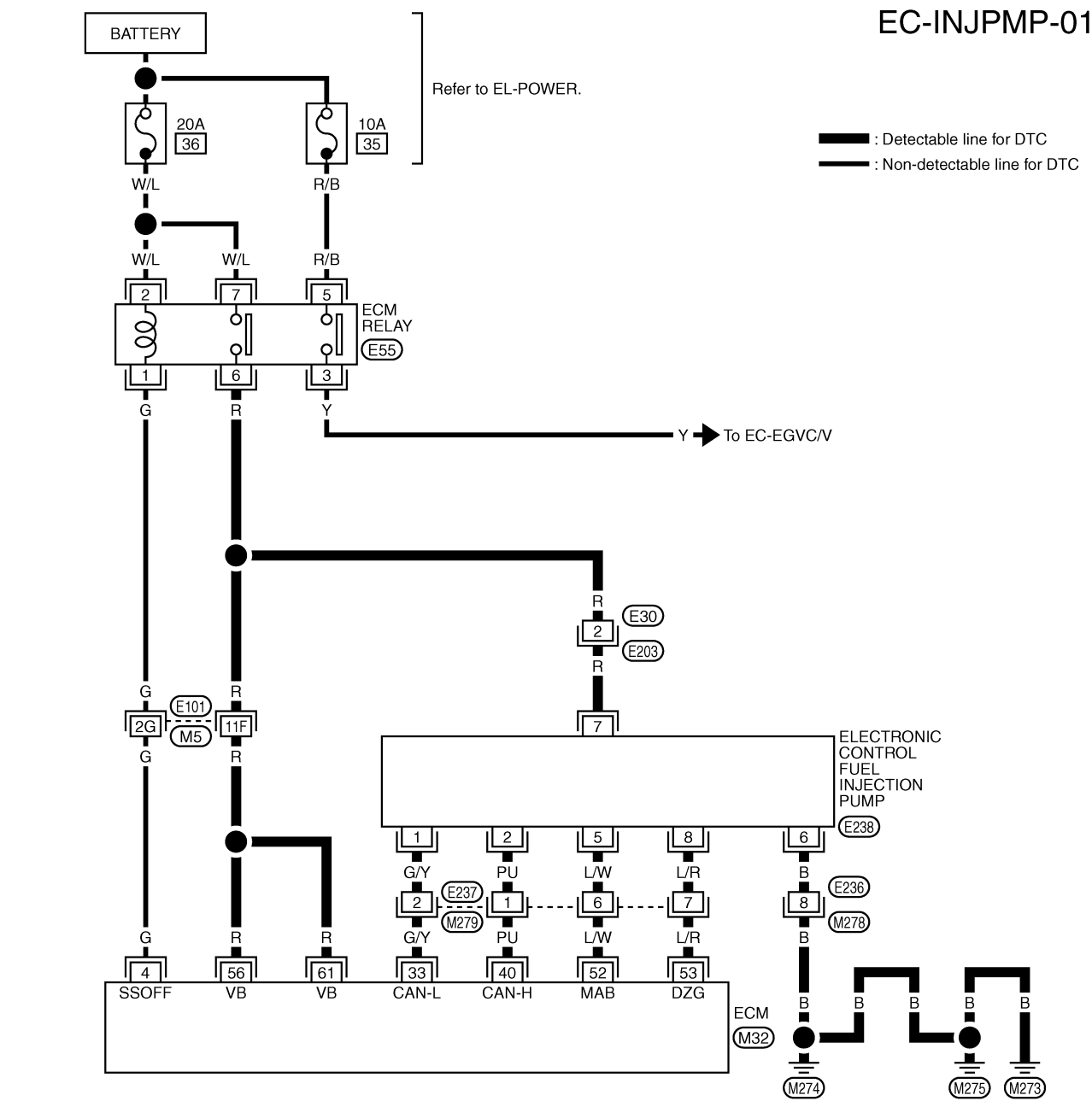
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC 0407 is detected, go to “Diagnostic procedure”, EC-3537.
   If DTC 0702 is detected, go to “Diagnostic Procedure”, EC-3555.

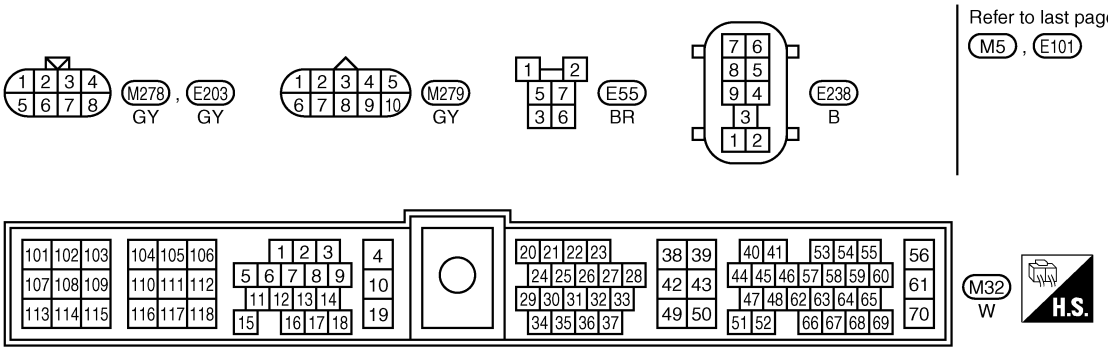
WITHOUT CONSULT-II

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 0407 is detected, go to “Diagnostic Procedure”, EC-3537.
   If DTC 0702 is detected, go to “Diagnostic Procedure”, EC-3555.

Wiring Diagram

LHD MODELS



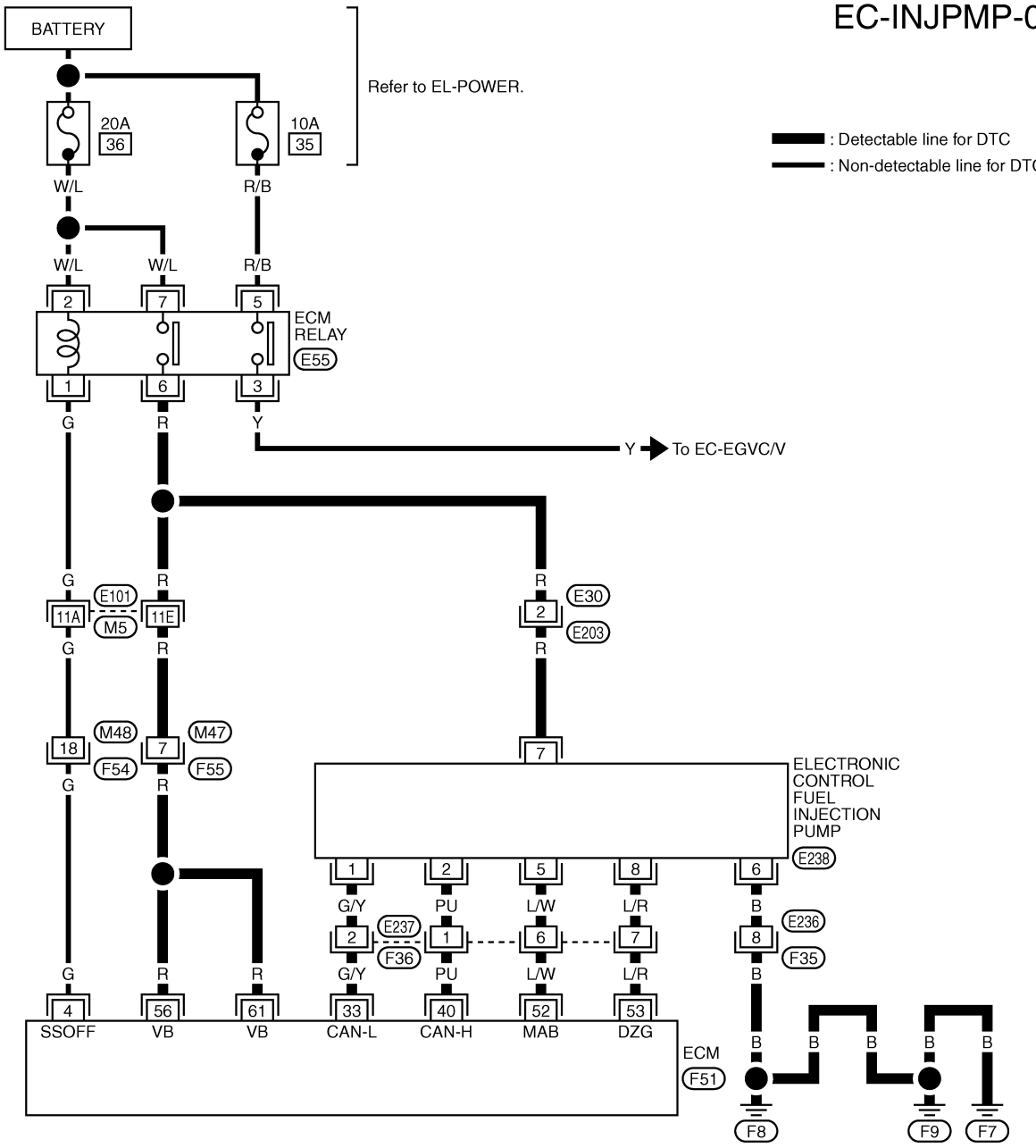


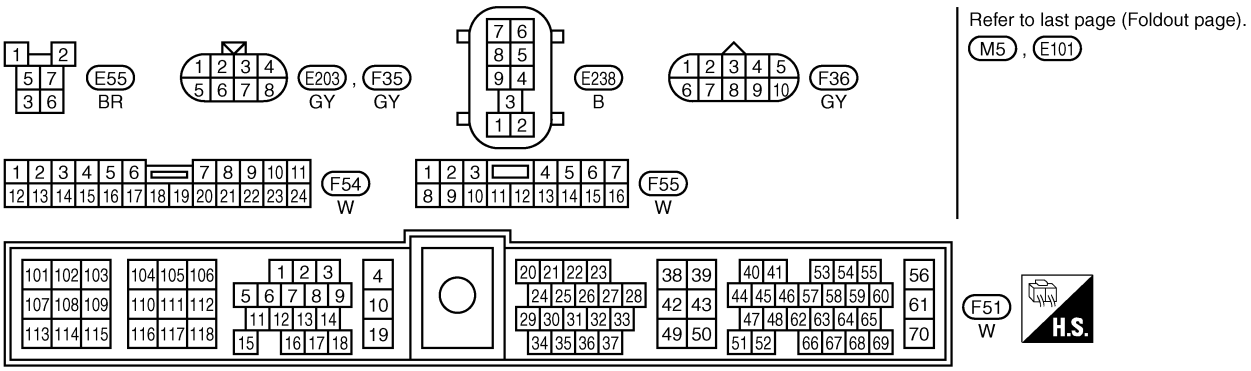
GEC275A

Wiring Diagram (Cont'd)

RHD MODELS

EC-INJPMP-02





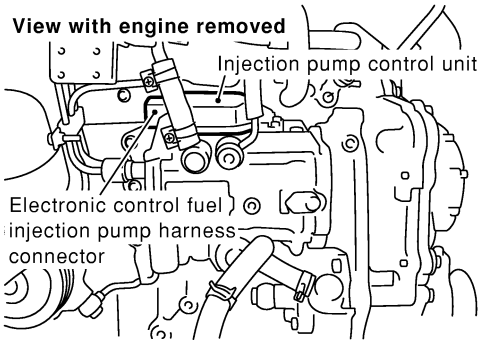
Refer to last page (Foldout page).
M5, E101

GEC276A

Diagnostic Procedure

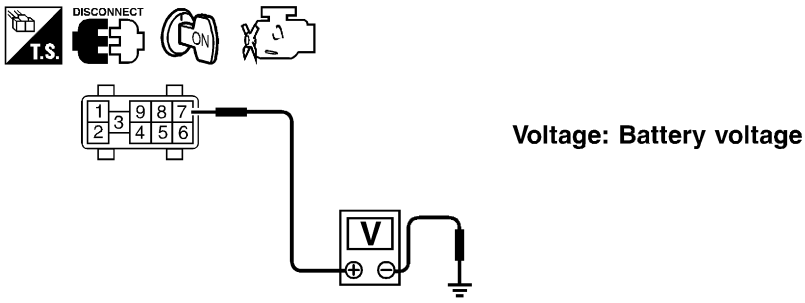
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEC228D

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 E30, E203
- Harness connectors E101, M5
- Harness connectors M47, F55 (RHD models)
- 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 5.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E236, M278 (LHD models) ● Harness connectors E236, F35 (RHD models) ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	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	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

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

OK or NG

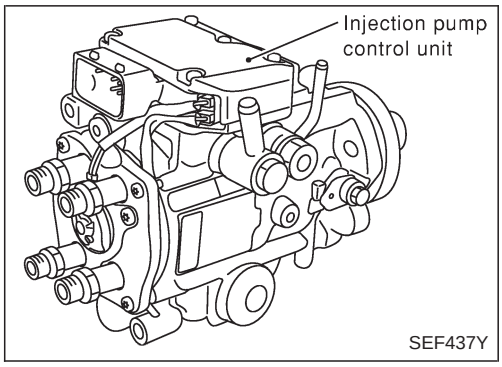
OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E237, M279 (LHD models) ● Harness connectors E237, F36 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	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-3469.	

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

SYSTEM DESCRIPTION

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

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

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

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

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

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	Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
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 (4,992 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

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

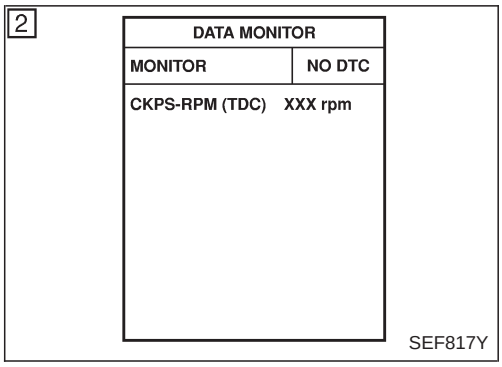
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● 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

WITH CONSULT-II

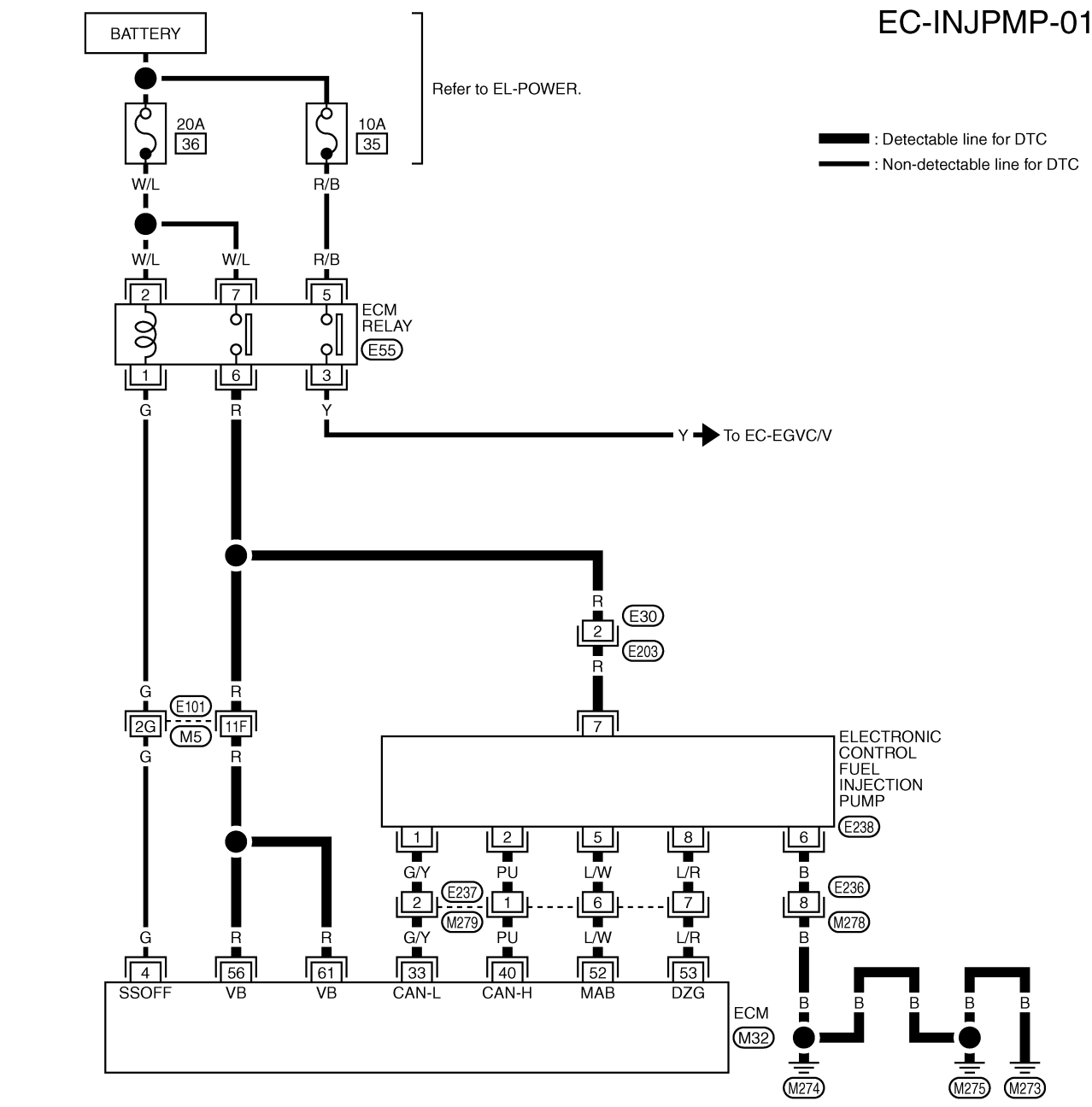
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3562.

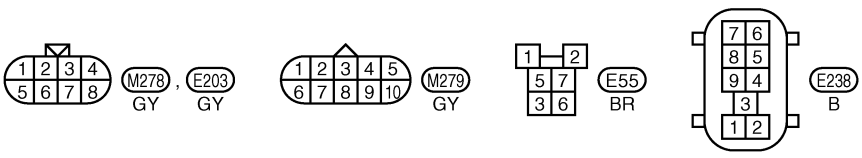
WITHOUT CONSULT-II

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-3562.

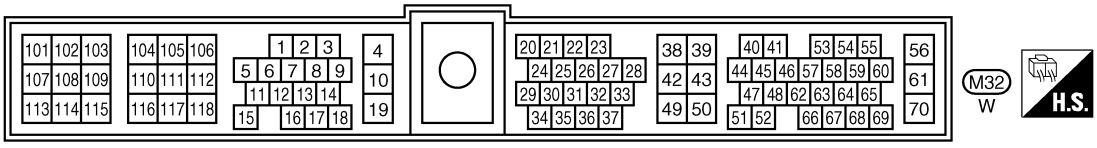
Wiring Diagram

LHD MODELS





Refer to last page (Foldout page).
M5 , E101

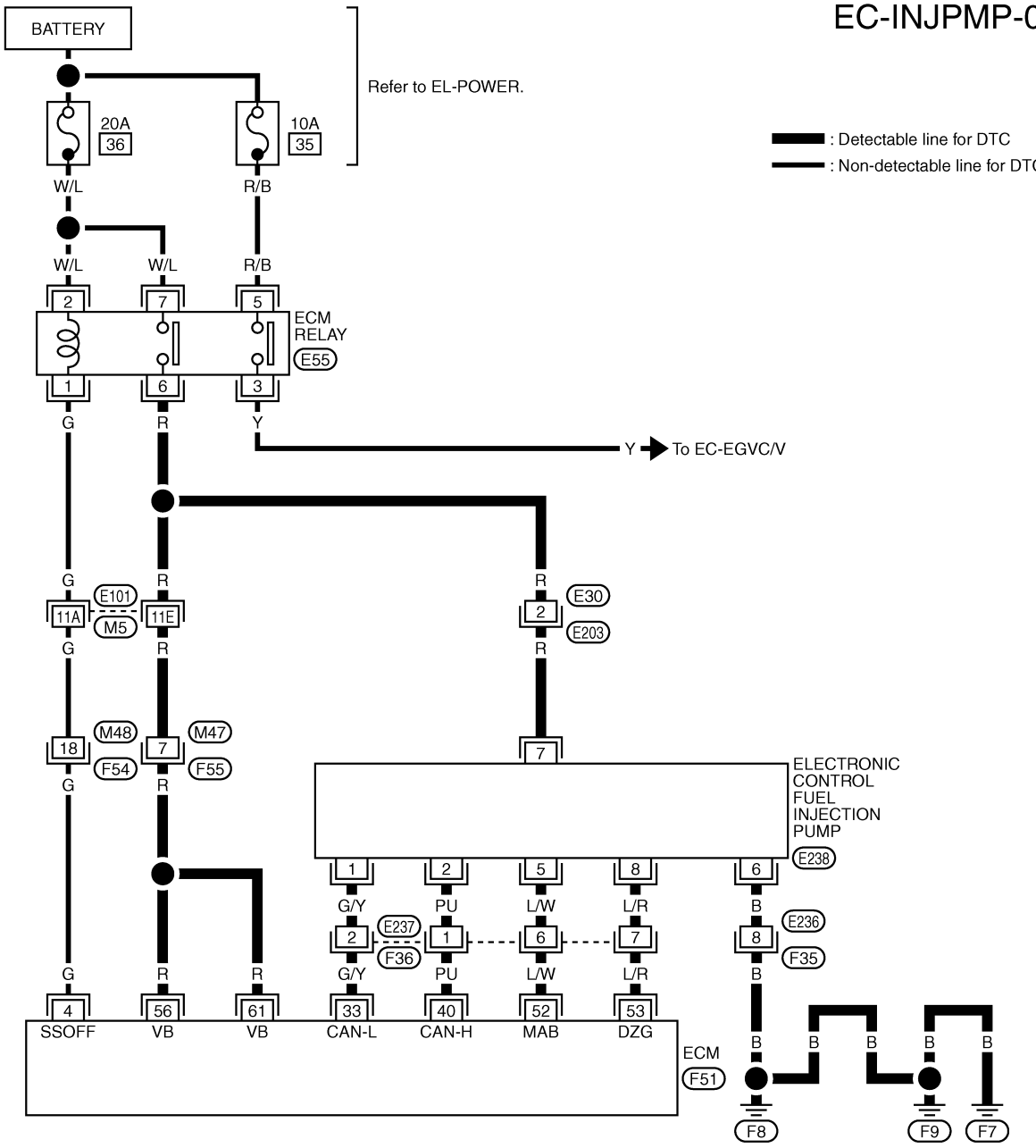


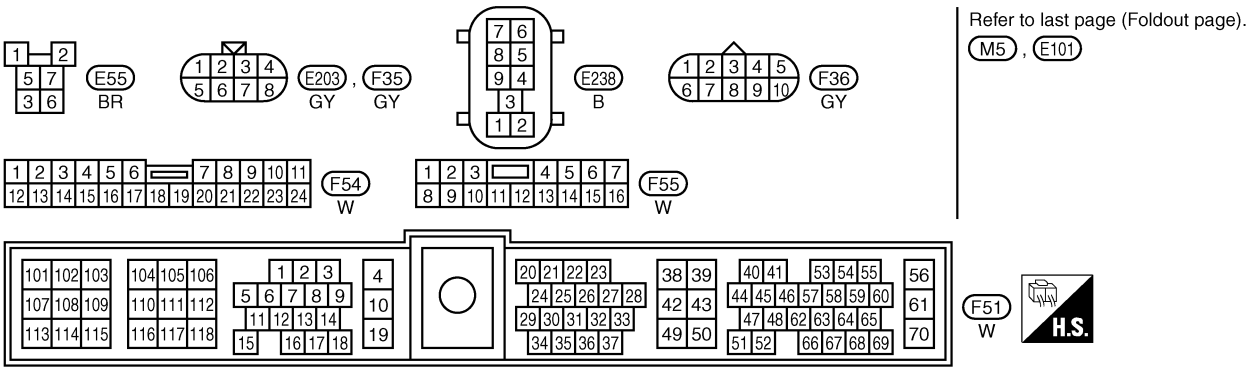
GEC275A

Wiring Diagram (Cont'd)

RHD MODELS

EC-INJPMP-02





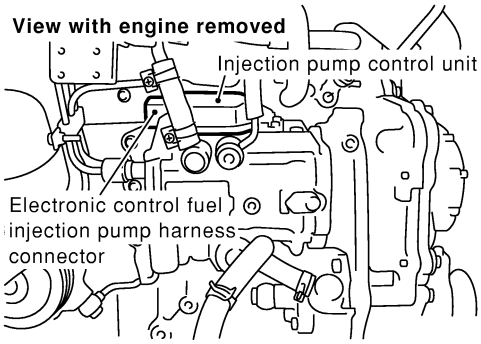
Refer to last page (Foldout page).
M5, E101

GEC276A

Diagnostic Procedure

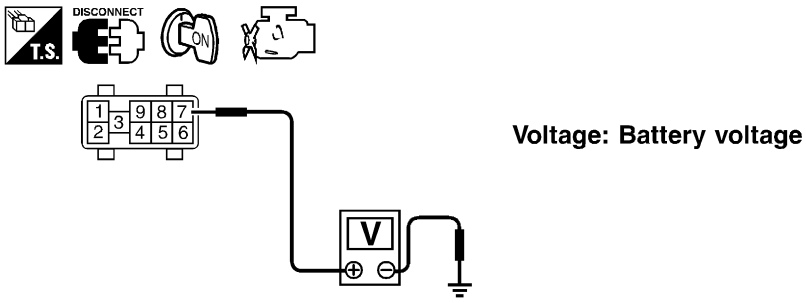
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEC228D

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 E30, E203
- Harness connectors E101, M5
- Harness connectors M47, F55 (RHD models)
- 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 5.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E236, M278 (LHD models) ● Harness connectors E236, F35 (RHD models) ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	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	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

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

OK or NG

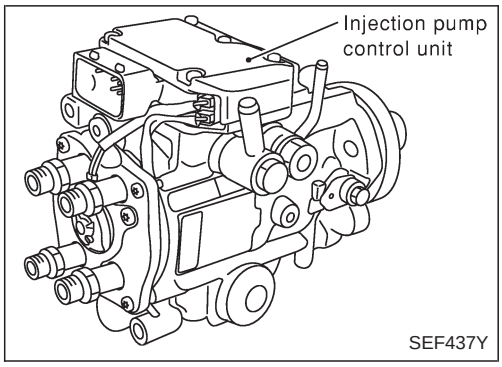
OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E237, M279 (LHD models) ● Harness connectors E237, F36 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	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-3469.	

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

SYSTEM DESCRIPTION

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

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

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

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

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

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	Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
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 (4,992 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

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

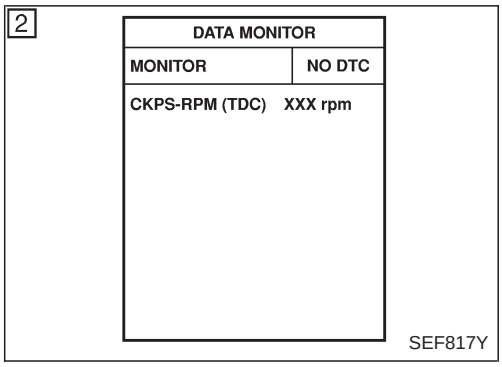
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● 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

WITH CONSULT-II

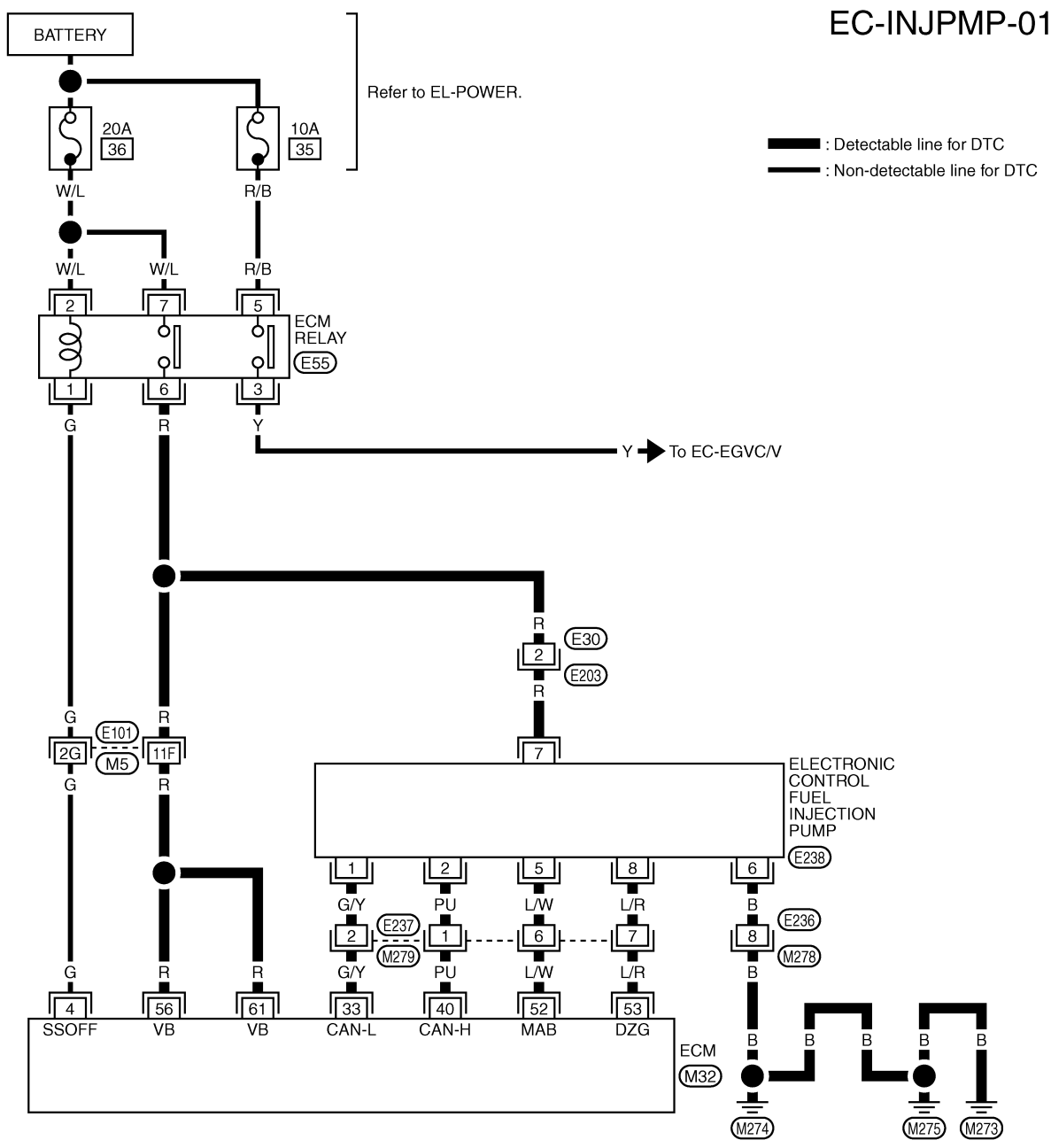
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3569.

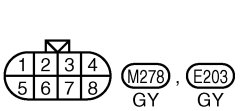
WITHOUT CONSULT-II

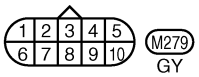
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-3569.

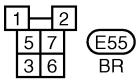
Wiring Diagram

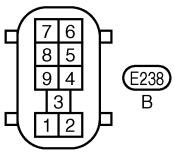
LHD MODELS



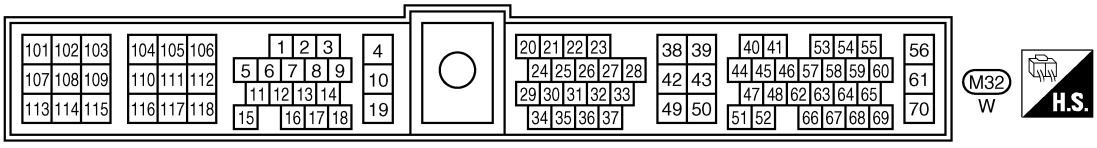








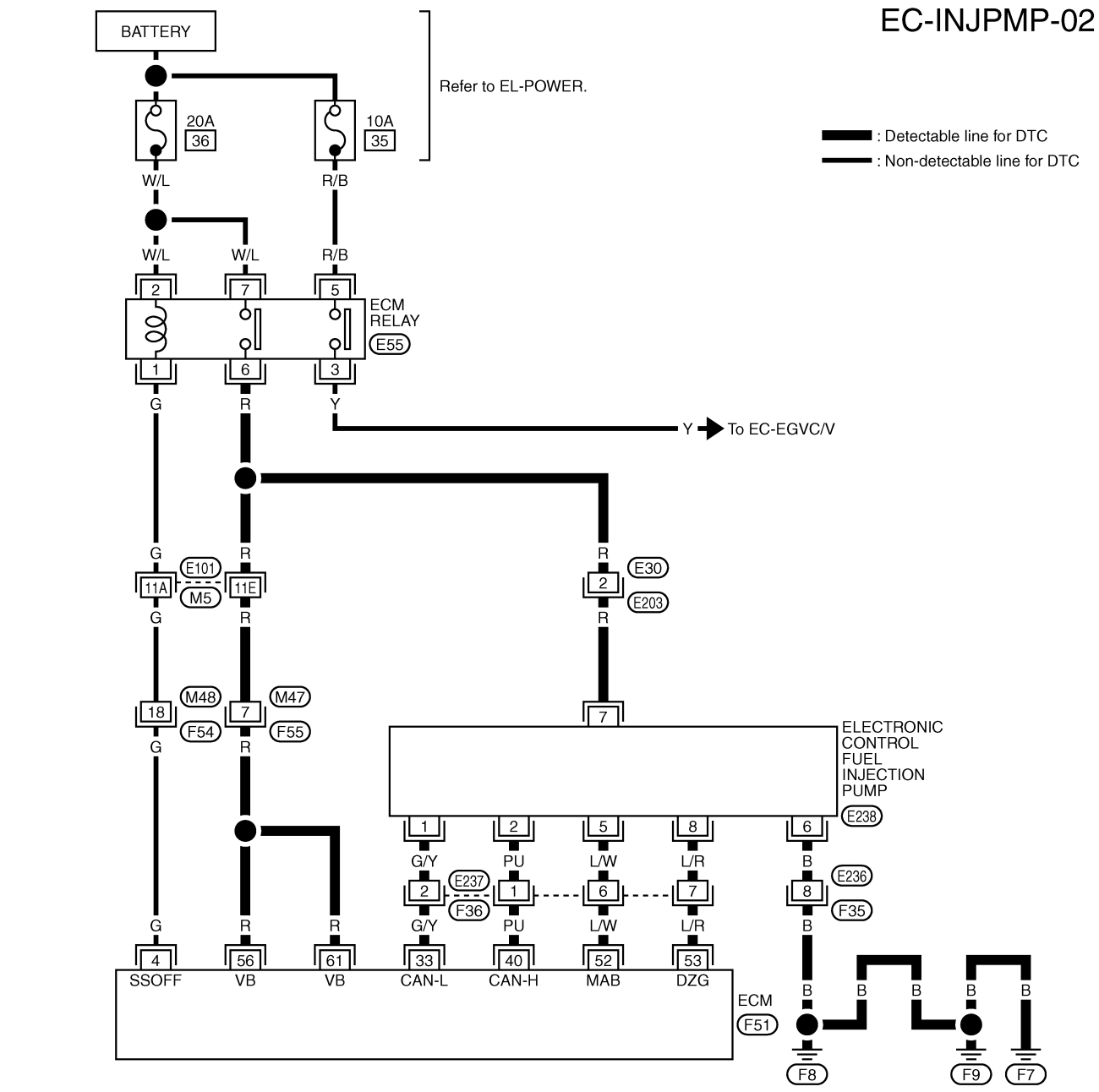
Refer to last page (Foldout page).
M5 , E101

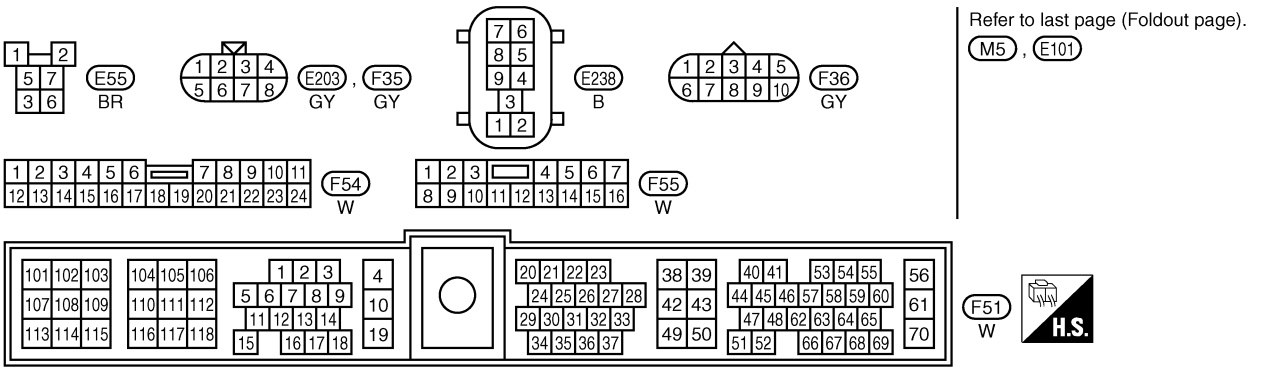


GEC275A

Wiring Diagram (Cont'd)

RHD MODELS





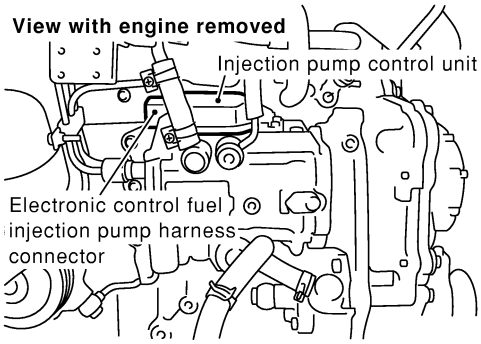
Refer to last page (Foldout page).
M5, E101

GEC276A

Diagnostic Procedure

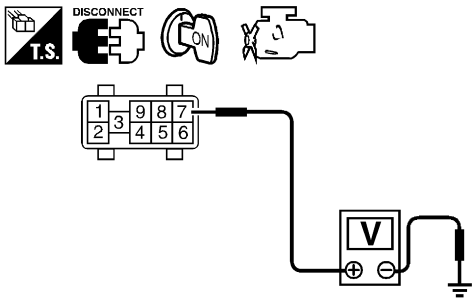
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEC228D

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 E30, E203
- Harness connectors E101, M5
- Harness connectors M47, F55 (RHD models)
- 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 5.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E236, M278 (LHD models) ● Harness connectors E236, F35 (RHD models) ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	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	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

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

OK or NG

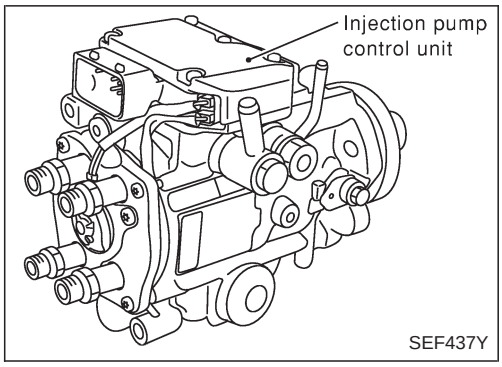
OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E237, M279 (LHD models) ● Harness connectors E237, F36 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	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-3469.	

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

SYSTEM DESCRIPTION

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

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

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

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

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

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	Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
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 (4,992 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

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

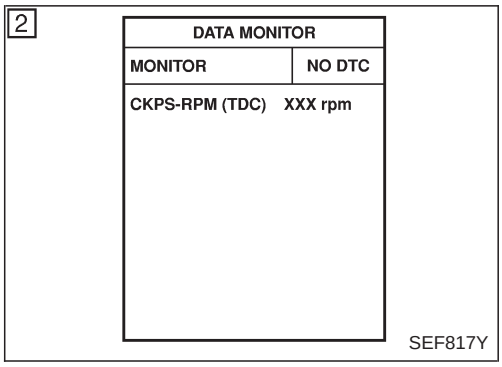
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● Injection pump control unit does not function properly.	● Electronic control fuel injection pump



DTC Confirmation Procedure

WITH CONSULT-II

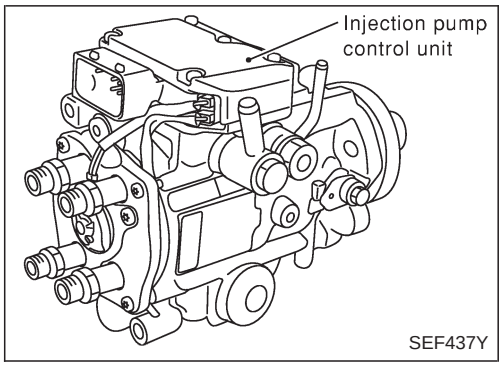
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3573.

WITHOUT CONSULT-II

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-3573.

Diagnostic Procedure

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-3572, again. 5. Is the malfunction 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-3572, 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

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

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

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

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

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

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	Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
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 (4,992 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

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

CAUTION:

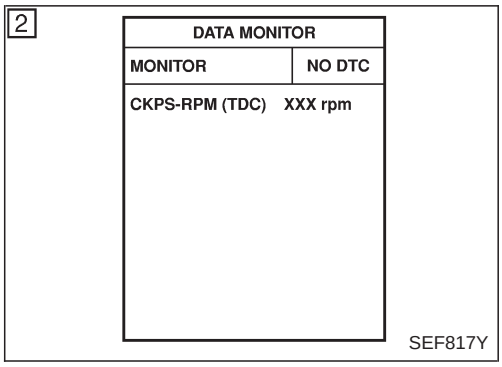
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● 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 ● "INJ TIMING" in "ACTIVE TEST" mode with CONSULT-II.*

*: When using this item, DTC may be detected. If so, erase it because it is not a malfunction.



DTC Confirmation Procedure

WITH CONSULT-II

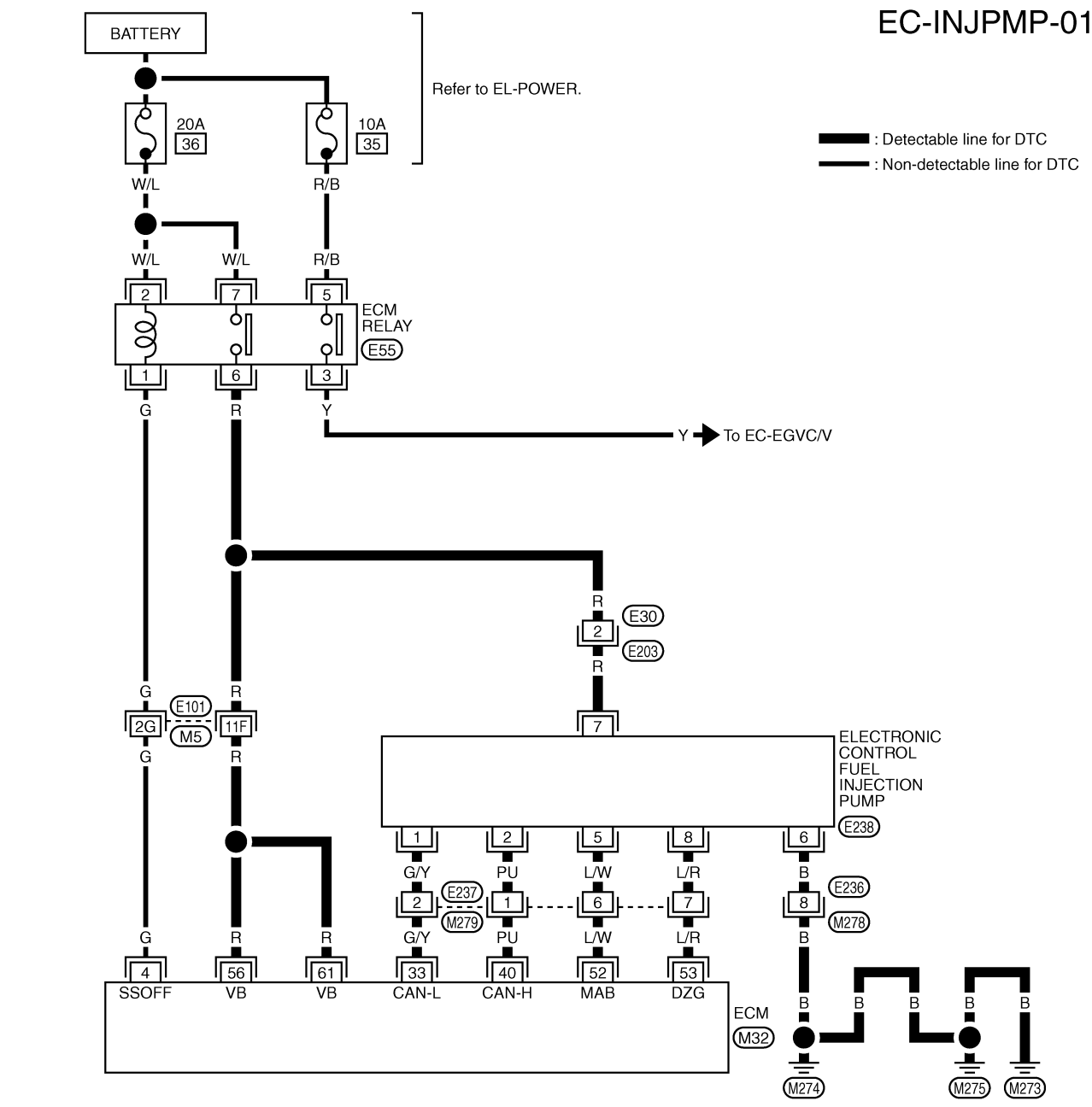
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) Keep engine speed at more than 2,000 rpm for at least 10 seconds.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-3579.

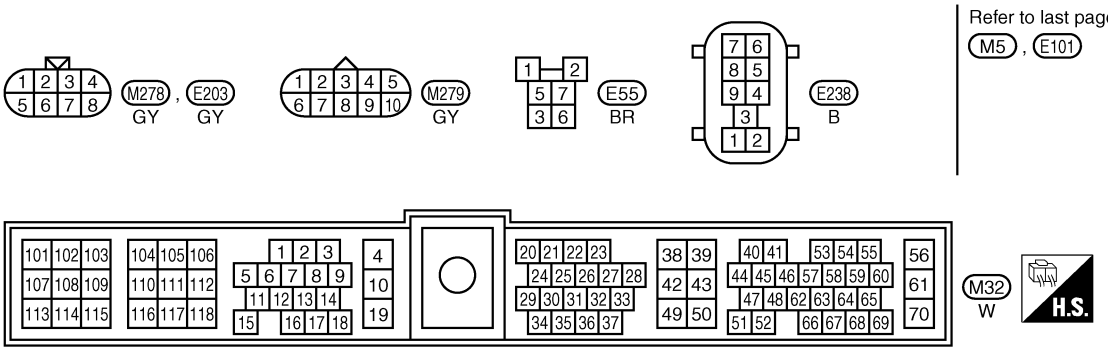
WITHOUT CONSULT-II

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-3579.

Wiring Diagram

LHD MODELS

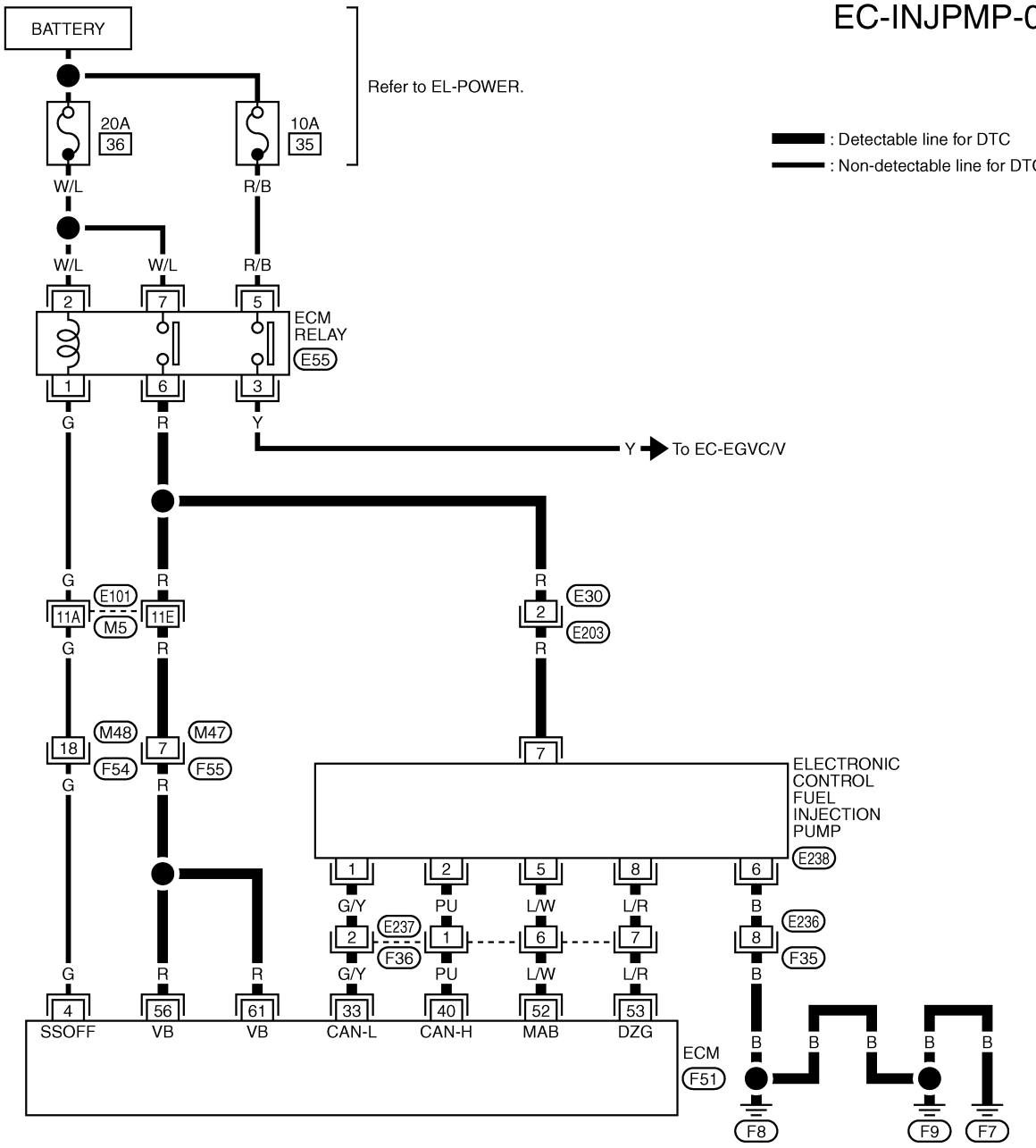


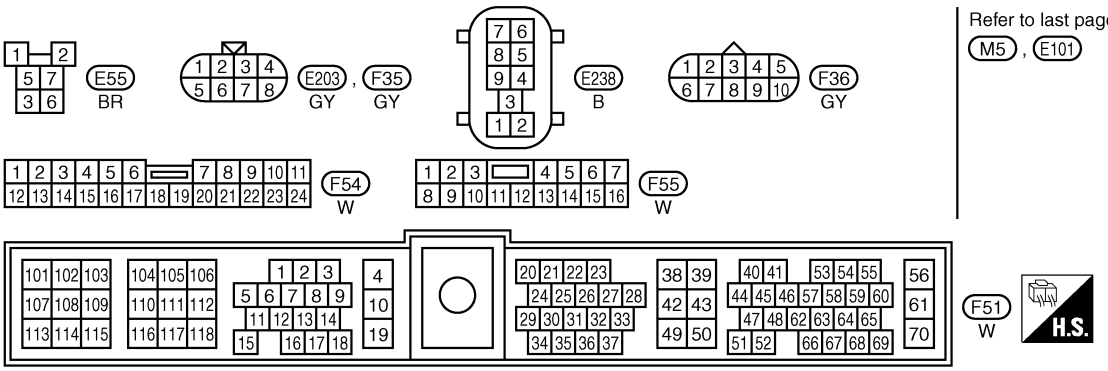


Wiring Diagram (Cont'd)

RHD MODELS

EC-INJPMP-02





Refer to last page (Foldout page).
M5, E101

GEC276A

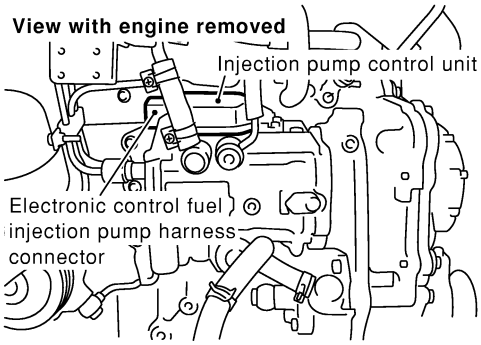
Diagnostic Procedure

1	INSPECTION START
1. Turn ignition switch “OFF”. 2. Perform “Air Bleeding”, EC-3426, and “Water Draining” in EC-3426.	
►	GO TO 2.

2	PERFORM DTC CONFIRMATION PROCEDURE AGAIN
Perform “DTC Confirmation Procedure”, EC-3575 again.	
OK or NG	
OK ►	**INSPECTION END**
NG ►	GO TO 3.

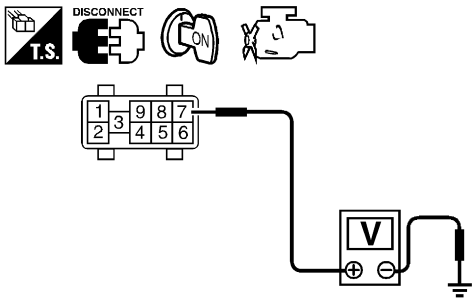
3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEC228D

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.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E30, E203 ● Harness connectors E101, M5 ● Harness connectors M47, F55 (RHD models) ● 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 7.
NG ►	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E236, M278 (LHD models) ● Harness connectors E236, F35 (RHD models) ● Harness for open or short between electronic control fuel injection pump and engine ground	
►	Repair open circuit or short to ground or short to power in harness or connectors.

7	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	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

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

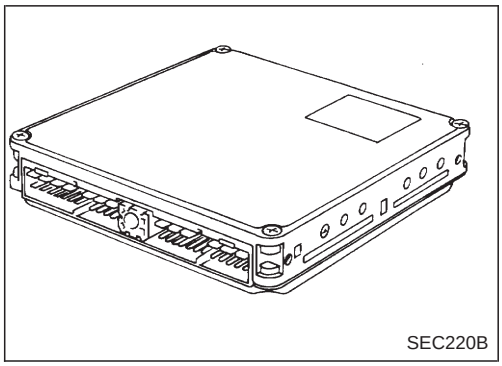
OK or NG

OK ►	GO TO 9.
NG ►	GO TO 8.

8	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E237, M279 (LHD models) ● Harness connectors E237, F36 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
►	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

9	**CHECK INTERMITTENT INCIDENT**	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.		
	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.

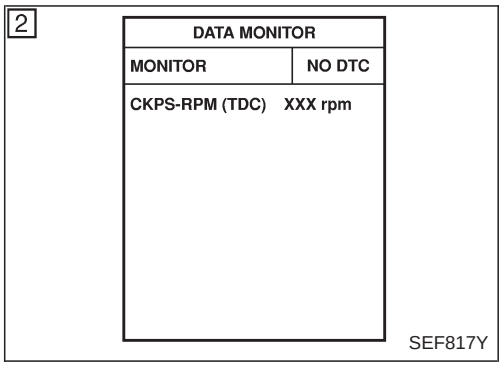

SEC220B

Description

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

Malfunction is detected when ...	Check Items (Possible Cause)
● 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

WITH CONSULT-II

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-3583.

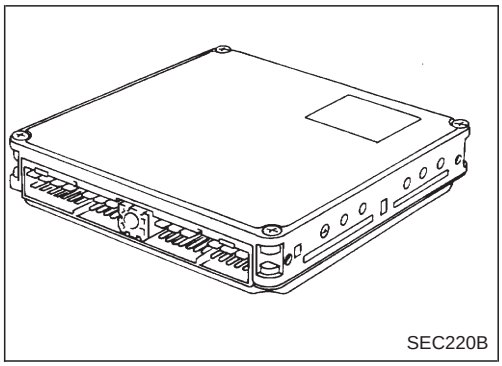
WITHOUT CONSULT-II

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-3583.

Diagnostic Procedure

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-3581, again. 5. Is the malfunction 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-3581, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0802 displayed again?	
Yes or No	
Yes ►	GO TO 2.
No ►	**INSPECTION END**

2	REPLACE ECM
1. Replace ECM. 2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-3429. (Models with NATS) 3. Perform “Accelerator Position Sensor Idle Position Learning” of “BASIC SERVICE PROCEDURE”. Refer to EC-3427.	
►	**INSPECTION END**

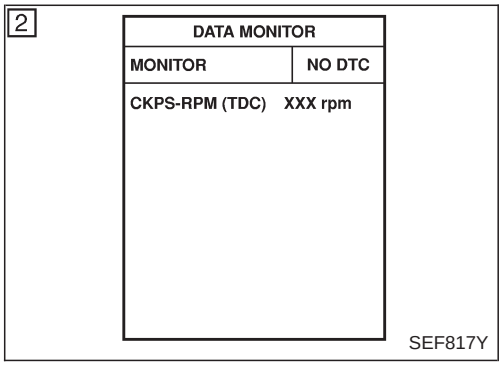

SEC220B

Description

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

Malfunction is detected when ...	Check Items (Possible Cause)
● ECM input signal processing function is malfunctioning.	● ECM (ECCS-D control module)



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 1 second.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3585.

WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 1 second.
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-3585.

Diagnostic Procedure

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-3583, again. 5. Is the malfunction 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-3583, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0802 displayed again?	
Yes or No	
Yes ►	GO TO 2.
No ►	**INSPECTION END**

2	REPLACE ECM
1. Replace ECM. 2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-3429. (Models with NATS) 3. Perform “Accelerator Position Sensor Idle Position Learning” of “BASIC SERVICE PROCEDURE”. Refer to EC-3427.	
►	**INSPECTION END**

Description

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

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

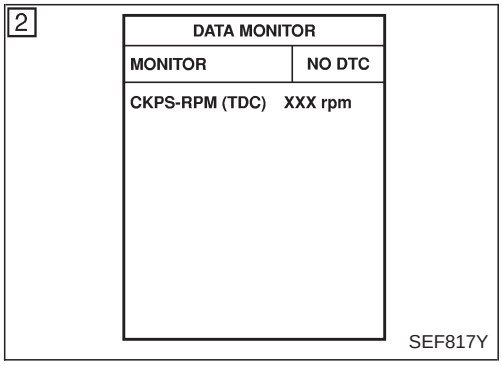
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17	G/Y	Stop lamp switch	Ignition switch "ON" └ Brake pedal fully released	Approximately 0V
			Ignition switch "ON" └ Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
29	BR/R	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

Malfunction is detected when ...	Check Items (Possible Cause)
● The relation between stop lamp switch signal and brake pedal position switch signal is not in normal range during the specified brake pedal position.	● Harness or connectors (The stop lamp switch circuit or brake pedal position switch circuit is open or shorted.) ● Stop lamp switch ● Brake pedal position switch



DTC Confirmation Procedure

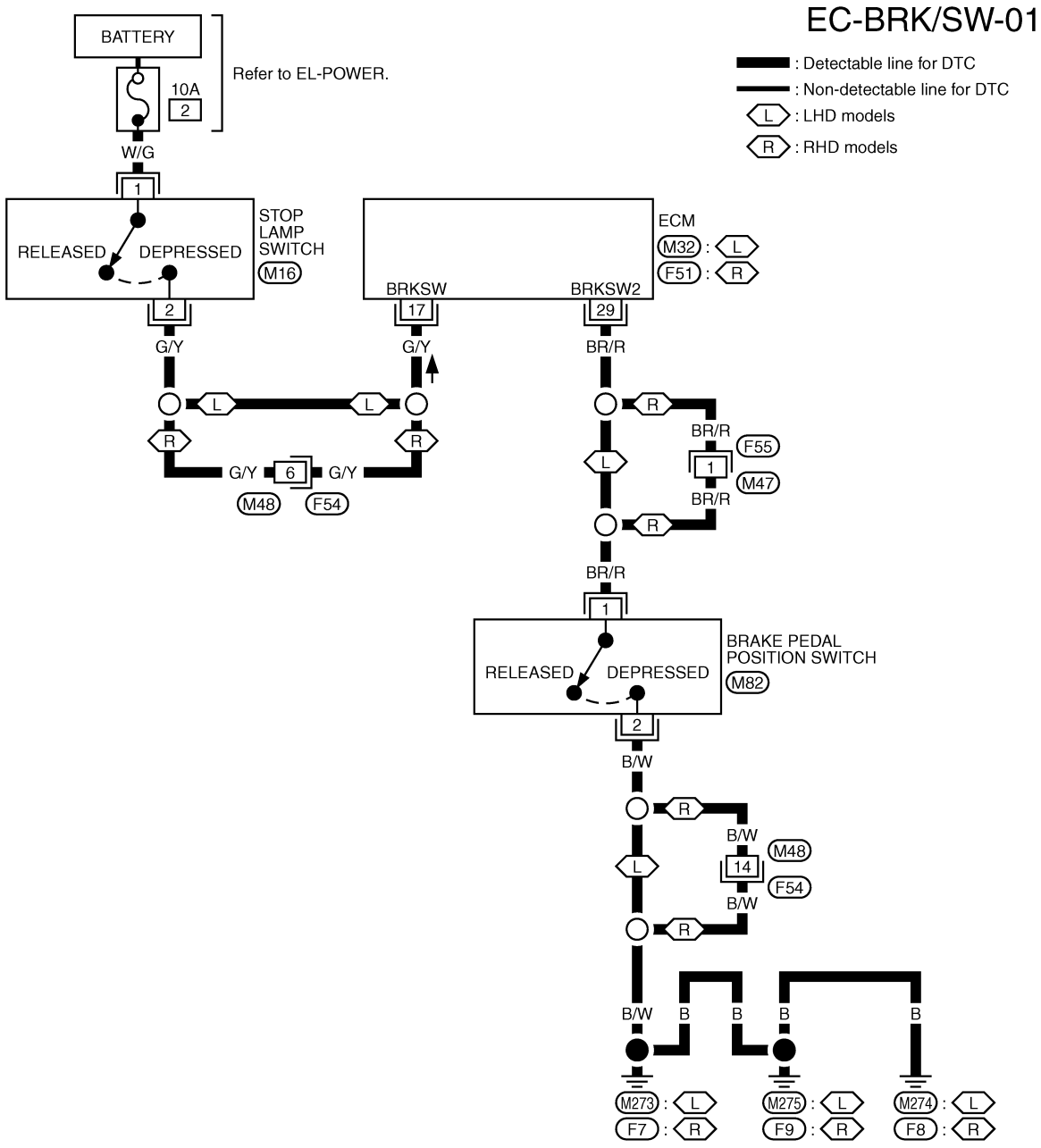
WITH CONSULT-II

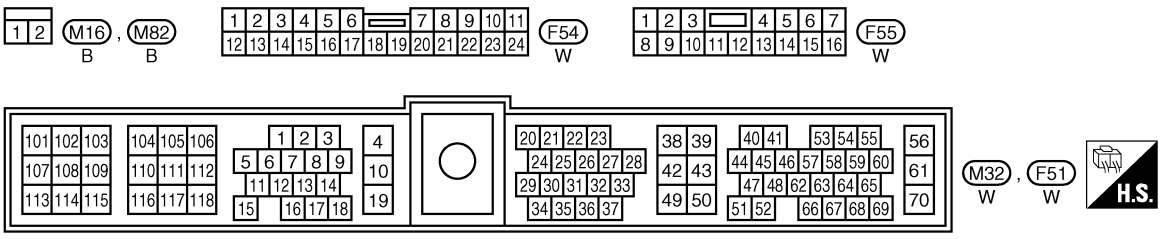
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Depress and release brake pedal more than 10 times.
4) If DTC is detected, go to "Diagnostic Procedure", EC-3588.

WITHOUT CONSULT-II

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-3588.

Wiring Diagram





GEC282A

Diagnostic Procedure

1	CHECK STOP LAMP SWITCH FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “BRAKE SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check “BRAKE SW” signal under the following conditions.

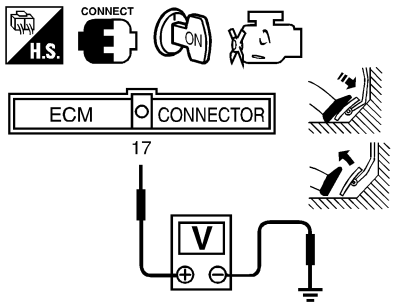
DATA MONITOR	
MONITOR	NO DTC
BRAKE SW	ON

Conditions	BRAKE SW
Brake pedal released	OFF
Brake pedal depressed	ON

SEC256D

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 17 and ground under the following conditions.



Conditions	Voltage
Brake pedal released	Approximately 0V
Brake pedal depressed	Battery voltage

SEC257D

OK or NG

OK	►	GO TO 2.
NG	►	GO TO 3.

2	CHECK BRAKE PEDAL POSITION SWITCH FUNCTION

With CONSULT-II

1. Select "BRAKE SW2" in "DATA MONITOR" mode with CONSULT-II.
2. Check "BRAKE SW2" signal under the following conditions.

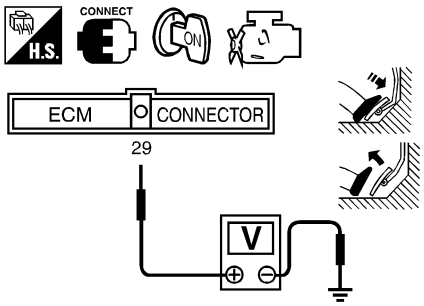
DATA MONITOR	
MONITOR	NO DTC
BRAKE SW 2	ON

Conditions	OFF ACCEL SW
Brake pedal released	OFF
Brake pedal depressed	ON

SEC258D

Without CONSULT-II

Check voltage between ECM terminal 29 and ground under the following conditions.



Conditions	Voltage (ECM terminal 435)
Brake pedal released	Battery voltage
Brake pedal depressed	Approximately 0V

SEC259D

OK or NG

OK	►	GO TO 14.
NG	►	GO TO 9.

3	CHECK STOP LAMP SWITCH CIRCUIT

Check the stop lamp when depressing and releasing the stop lamp switch.

Stop lamp switch	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

MTBL0443

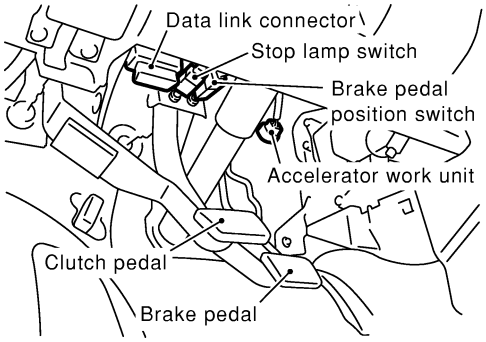
OK or NG

OK	►	GO TO 6.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

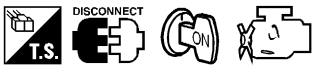
4	CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

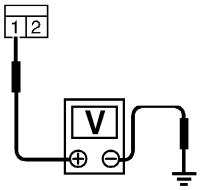
1. Turn ignition switch "OFF".
2. Disconnect stop lamp switch harness connector.



SEC233D

3. Turn ignition switch "ON".
4. 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 6.
NG	►	GO TO 5.

5	DETECT MALFUNCTIONING PART

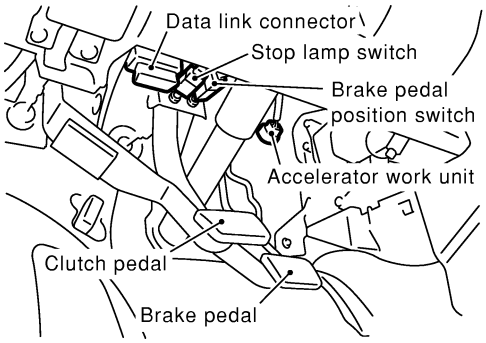
Check the following.
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

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

Diagnostic Procedure (Cont'd)

6	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.



SEC233D

4. Check harness continuity between ECM terminal 17 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 8.
NG	►	GO TO 7.

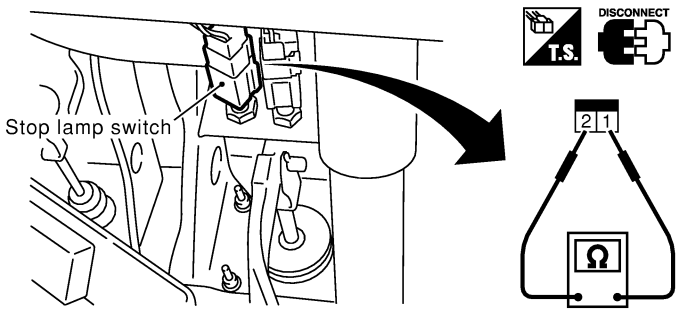
7	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M48, F54 (RHD models)
- Harness for open or short between stop lamp switch and ECM

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

8	CHECK STOP LAMP SWITCH

Check continuity between stop lamp switch terminal 1 and 2 under the following conditions.



Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

SEC260D

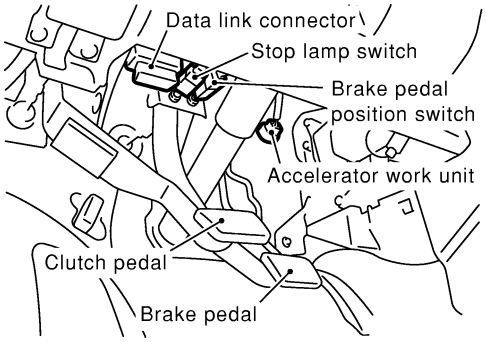
OK or NG

OK	►	GO TO 14.
NG	►	Replace stop lamp switch.

Diagnostic Procedure (Cont'd)

9	CHECK BRAKE PEDAL POSITION SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect brake pedal position switch harness connector.



SEC233D

3. Check harness continuity between brake pedal position switch terminal 2 and 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 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M48, F54 (RHD models)
- Harness for open or short between brake pedal position switch and ground

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

11	CHECK BRAKE PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 29 and brake pedal position 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 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART

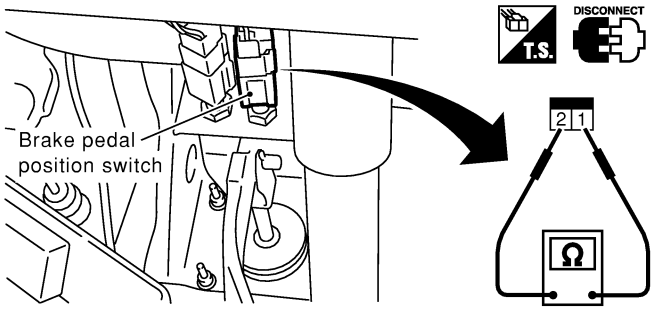
Check the following.
- Harness connectors F55, M47 (RHD models)
- Harness for open or short between brake pedal position switch and ECM

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

Diagnostic Procedure (Cont'd)

13	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 not exist.
Brake pedal depressed	Should exist.

SEC261D

OK or NG

OK	►	GO TO 14.
NG	►	Replace brake pedal position switch.

14	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
	► **INSPECTION END**

ECM Terminals and Reference Value

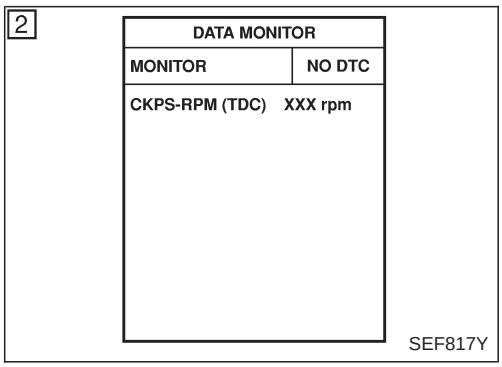
Specification data are reference values and are measured between each terminal and ground.

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)
4	G	ECM relay (Self-shutoff)	Ignition switch "ON"	Approximately 0.9V
			Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
38	W/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
56 61	R R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible Cause)
● 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

WITH CONSULT-II

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-3597.

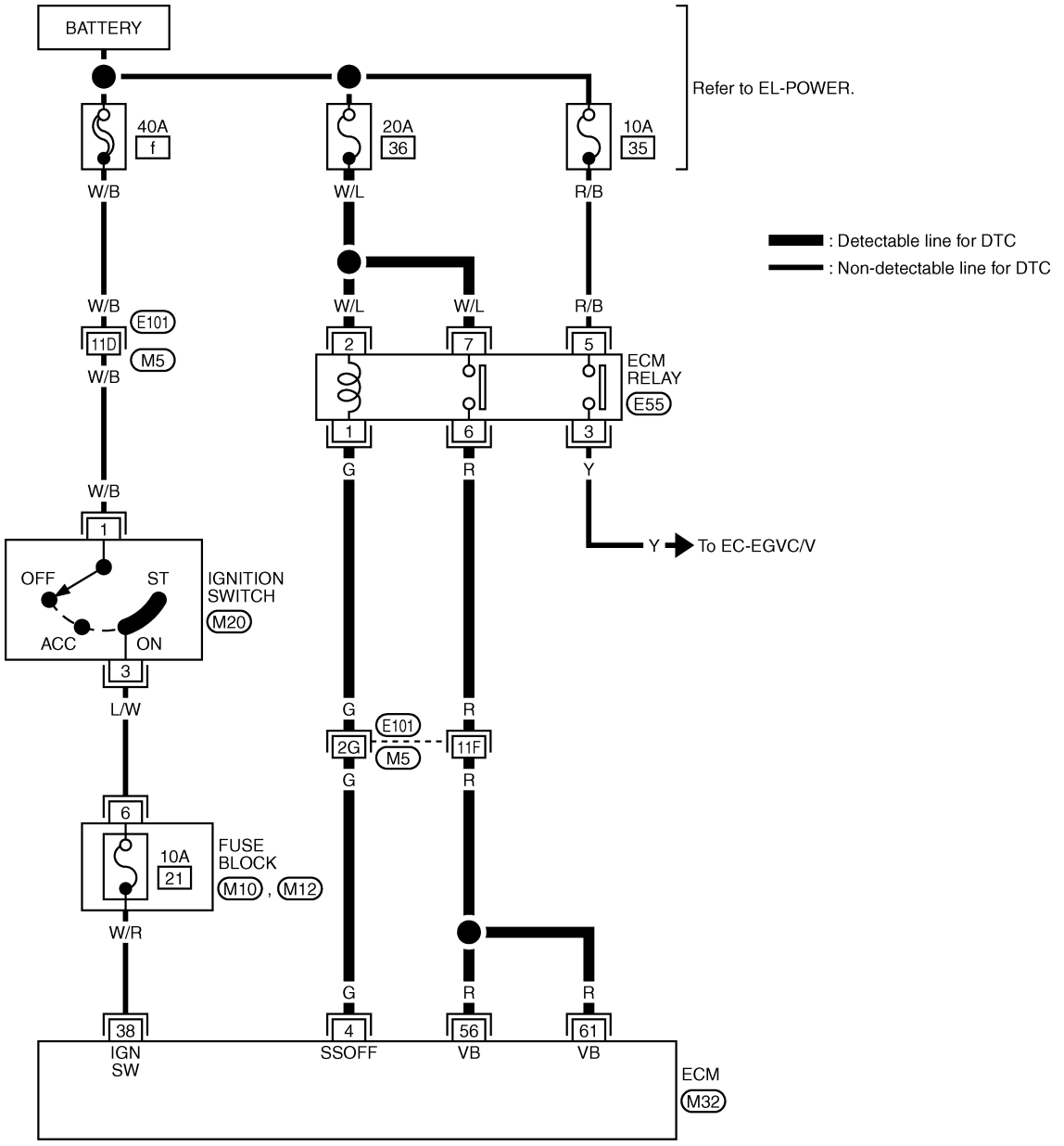
WITHOUT CONSULT-II

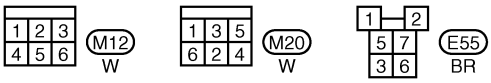
1) Turn ignition switch "ON".
2) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-3597.

Wiring Diagram

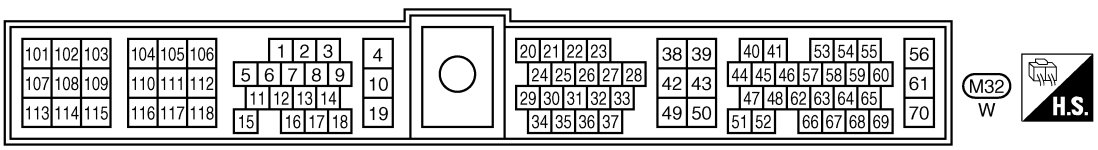
LHD MODELS

EC-ECMRLY-01





Refer to last page (Foldout page).
M5 , E101
M10

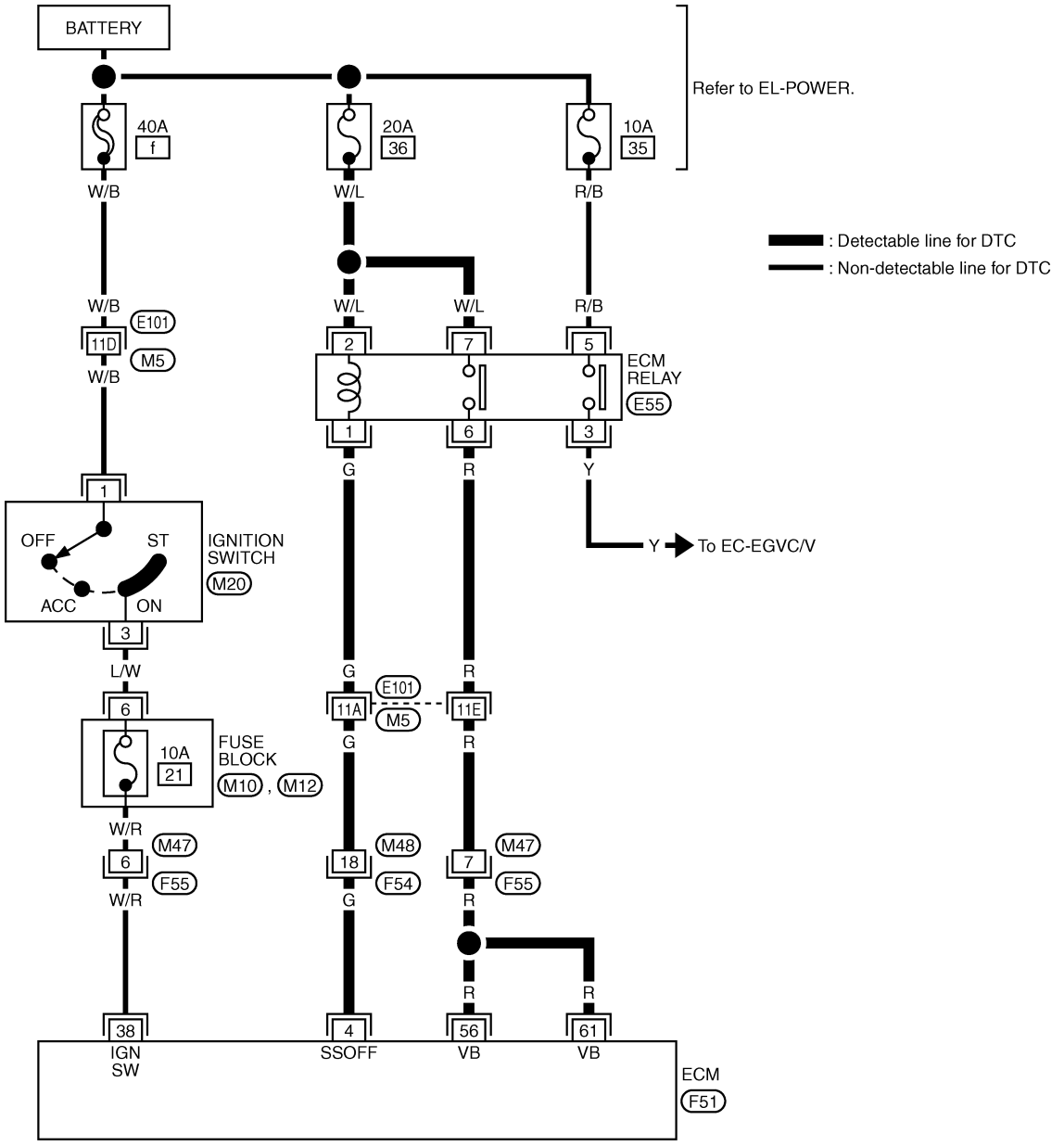


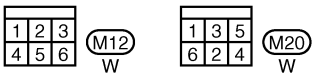
GEC142A

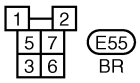
Wiring Diagram (Cont'd)

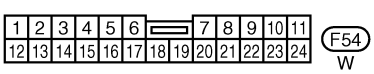
RHD MODELS

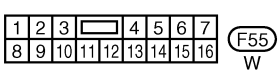
EC-ECMRLY-02



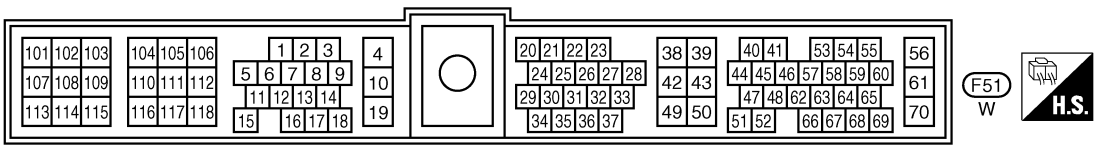








Refer to last page (Foldout page).
M5 , E101
M10

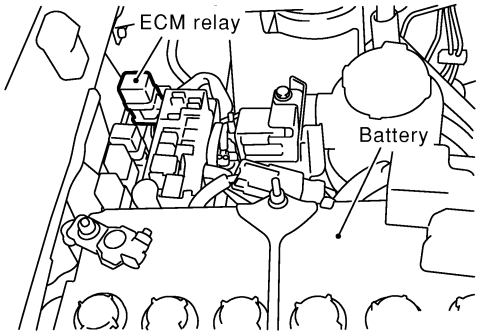


GEC143A

Diagnostic Procedure

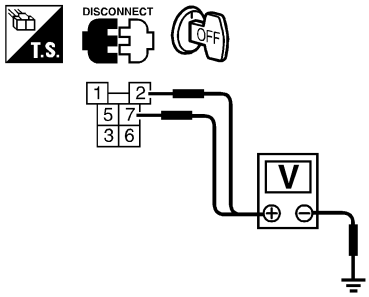
1	CHECK ECM POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.



SEC950C

3. Check voltage between ECM terminals 2, 7 and ground with CONSULT-II or tester.



Voltage: Battery Voltage

SEC241D

OK or NG

OK	►	GO TO 3.
NG	►	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- 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 56, 61 and ECM relay 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	►	GO TO 4.

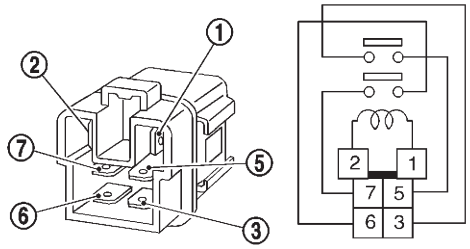
Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E101, M5 ● Harness connectors M47, F55 (RHD models) ● 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.

5	CHECK ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Check harness continuity between ECM terminal 4 and ECM relay terminal 1. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power. **OK or NG**	
OK ►	GO TO 7.
NG ►	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E101, M5 ● Harness connectors M48, F54 (RHD models) ● 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.

7	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.	



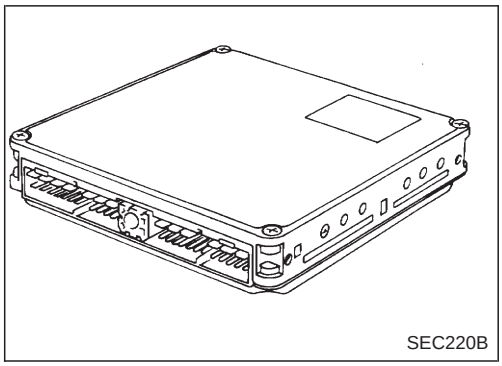
Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

SEF296X

OK or NG

OK ►	GO TO 8.
NG ►	Replace ECM relay.

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
►	**INSPECTION END**

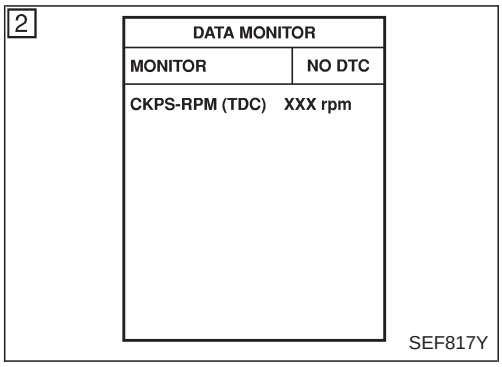

SEC220B

Description

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

Malfunction is detected when ...	Check Items (Possible Cause)
● ECM input signal processing function is malfunctioning.	● ECM (ECCS-D control module)



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

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-3600.

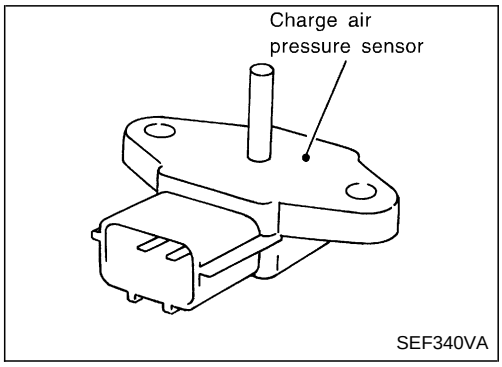
WITHOUT CONSULT-II

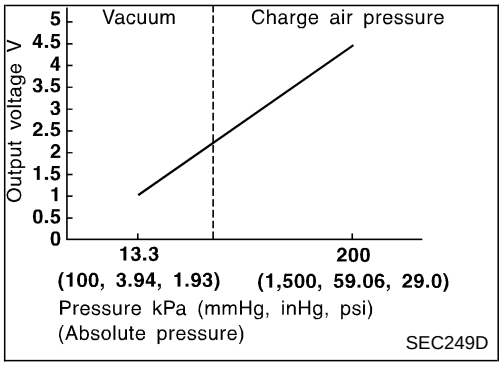
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Turn ignition switch “OFF”, wait at least 20 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3600.

Diagnostic Procedure

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-3598, again. 5. Is the malfunction 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-3598, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0903 displayed again?	
Yes or No	
Yes ►	GO TO 2.
No ►	**INSPECTION END**

2	REPLACE ECM
1. Replace ECM. 2. Perform intialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-3429. (Models with NATS) 3. Perform “Accelerator Position Sensor Idle Position Learning” of “BASIC SERVICE PROCEDURE”. Refer to EC-3427.	
►	**INSPECTION END**





Component Description

The charge air pressure sensor detects pressure of the turbocharger air. The sensor output voltage to the ECM increases as pressure increases. The charge air pressure sensor is not used to control the engine system under normal conditions.

ECM Terminals and Reference Value

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

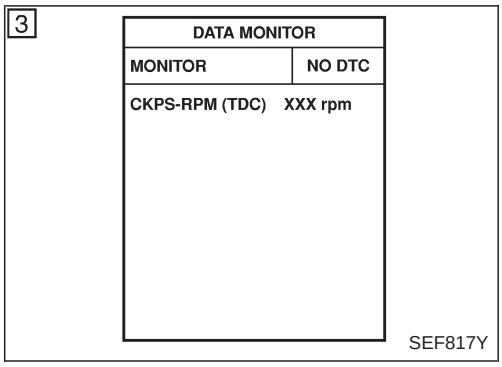
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	P/L	Charge air pressure sensor	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.7V

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● An excessively high or low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Charge air pressure sensor



DTC Confirmation Procedure

WITH CONSULT-II

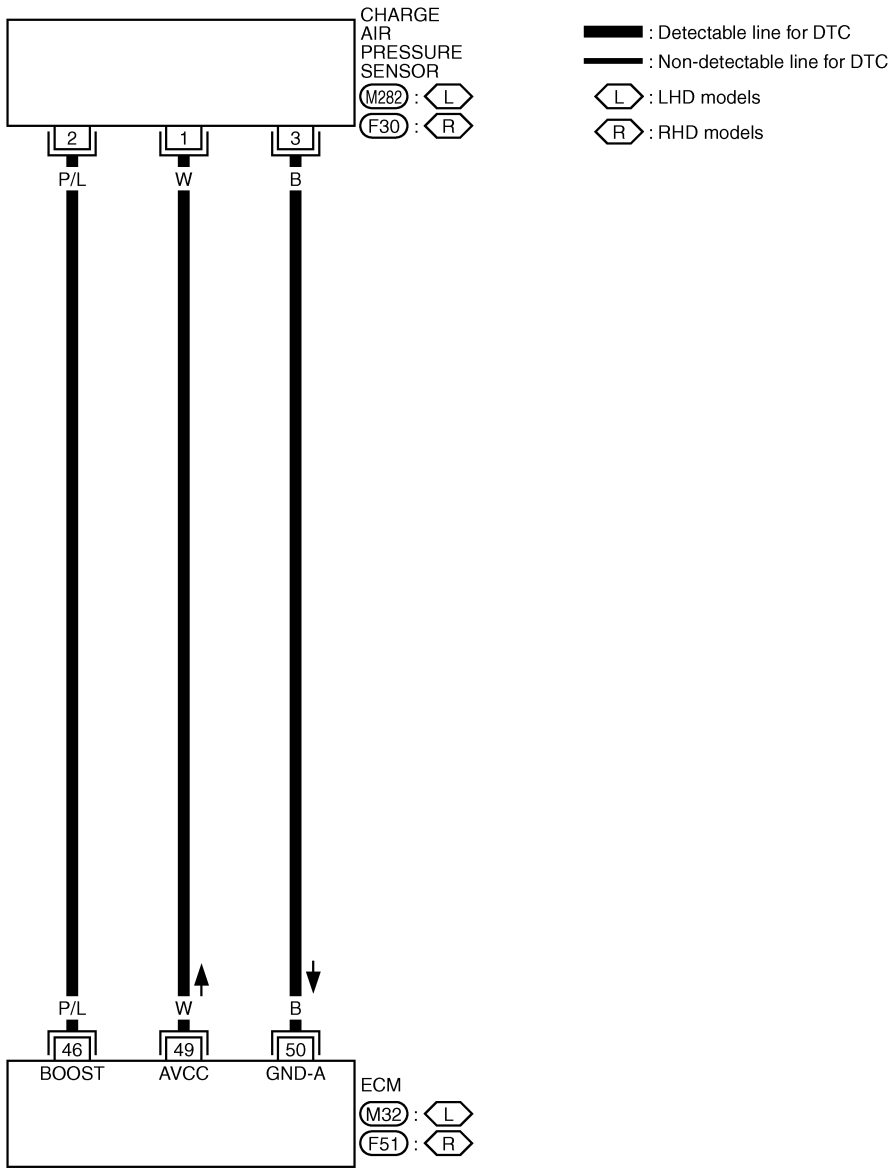
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 1 second.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3604.

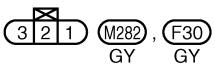
WITHOUT CONSULT-II

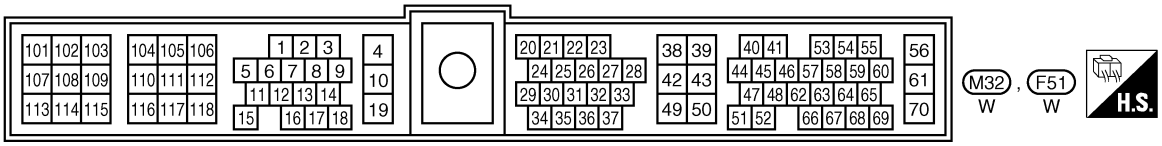
1) Turn ignition switch “ON” and wait at least 1 second.
2) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-3604.

Wiring Diagram

EC-BOOST-01





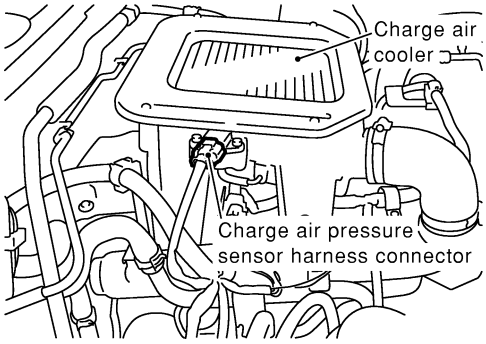


GEC283A

Diagnostic Procedure

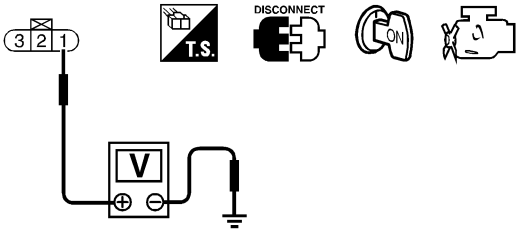
1	CHECK CHARGE AIR PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Stop engine.
2. Disconnect charge air pressure sensor harness connector.



SEC234D

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



Voltage: Approximately 5V

SEF306Z

OK or NG

OK	►	GO TO 2.
NG	►	Repair harness or connectors.

2	CHECK CHARGE AIR PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

OK or NG

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

3	CHECK CHARGE AIR PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 46 and charge air 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 4.
NG	►	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

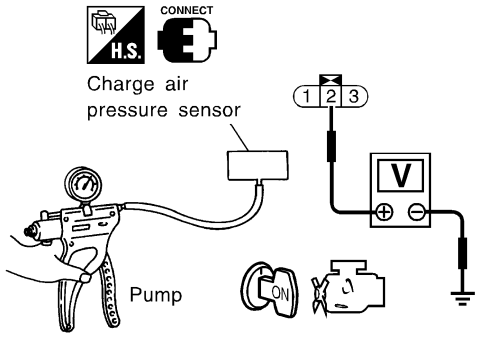
4	CHECK CHARGE AIR PRESSURE SENSOR

1. Remove charge air pressure sensor with its harness connector connected.
2. Turn ignition switch "ON".
3. Use pump to apply pressure to charge air pressure sensor as shown in the figure.

CAUTION:

- **Always calibrate the pressure pump gauge when using it.**
- **Inspection should be done at room temperature [10 - 30°C (50 - 86°F)].**

4. Check the output voltage between charge air pressure sensor terminal 2 and engine ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mbar, 0 mmHg, 0 inHg)	1.9 - 3.0
+40 kPa (400 mbar, 300 mmHg, 11.81 inHg)	The voltage should be 0.6 to 1.0V higher than the value measured above.

SEF449Z

OK or NG

OK	►	GO TO 5.
NG	►	Replace charge air pressure sensor.

5	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
►	**INSPECTION END**

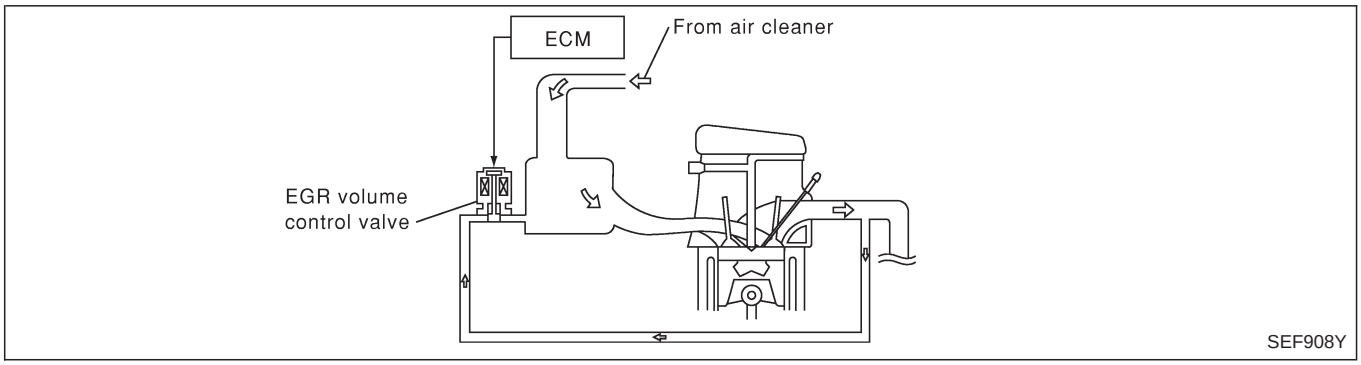
Description

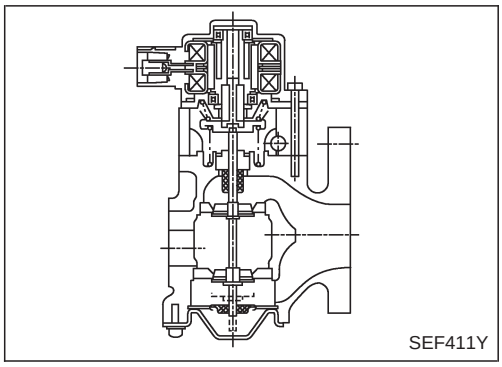
SYSTEM DESCRIPTION

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		
Battery	Battery voltage		
Air conditioner switch	Air conditioner operation		
PNP switch	Park/Neutral position signal		
Barometric pressure sensor (Built into ECM)	Barometric pressure		

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
- Low battery voltage
- Low barometric pressure




SEF411Y

Description (Cont'd)

COMPONENT DESCRIPTION

EGR volume control valve

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

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 1 minute at idle	More than 10 steps
		Revving engine up to 3,200 rpm quickly	0 step

ECM Terminals and Reference Value

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
103 105 109 115	GY OR/B W/L SB	EGR volume control valve	Engine is running. └ **Warm-up condition** Idle speed	0.1 - 14V

2

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

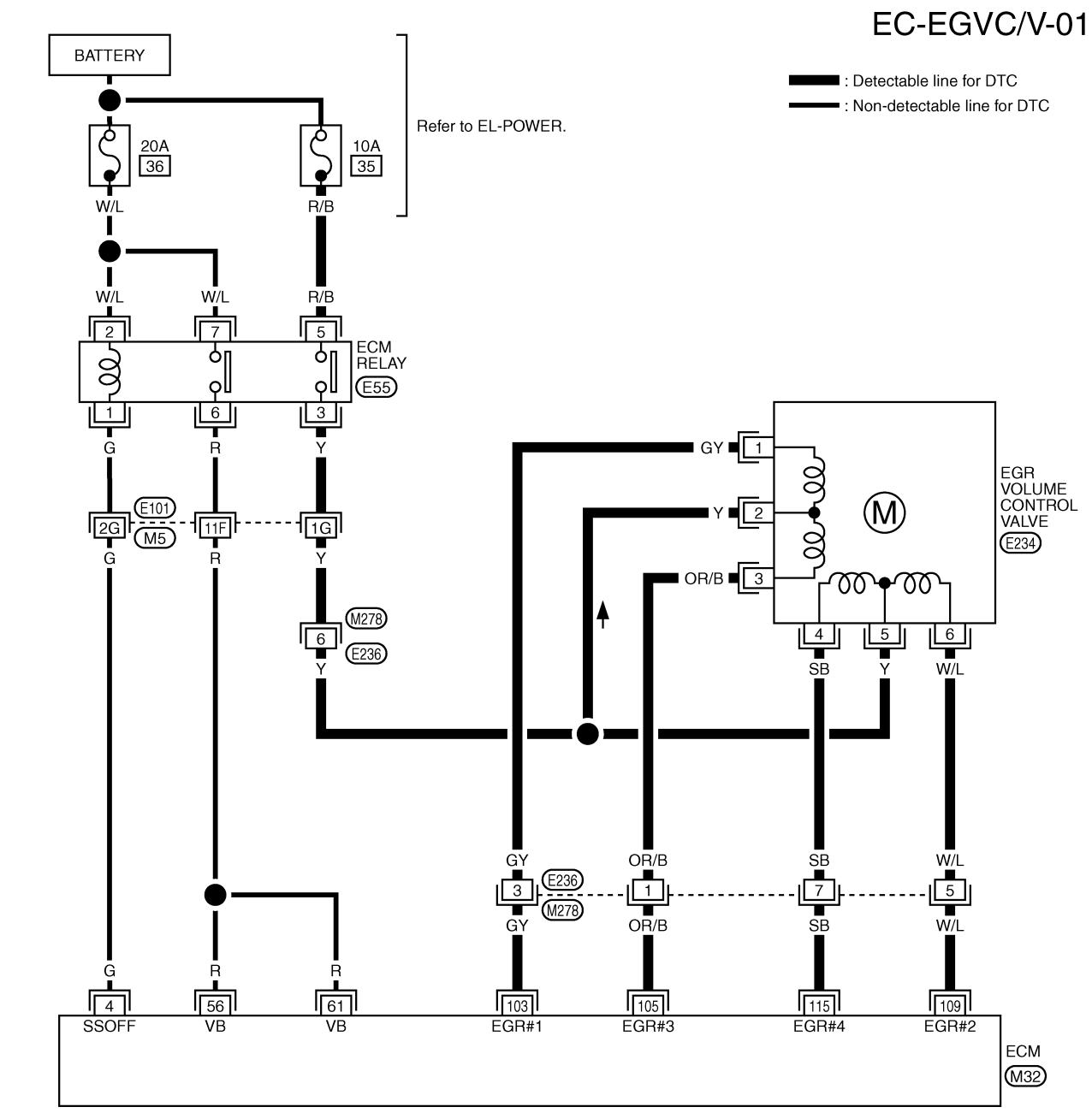
1) Start engine and warm it up to normal operating temperature.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Turn ignition switch "OFF", and immediately turn "ON" within 1 second.
4) Start engine and let it idle.
5) If DTC is detected, go to "Diagnostic Procedure", EC-3610.

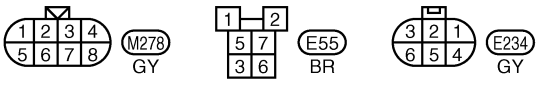
WITHOUT CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF", and immediately turn "ON" within 1 second.
3) Start engine and let it idle.
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-3610.

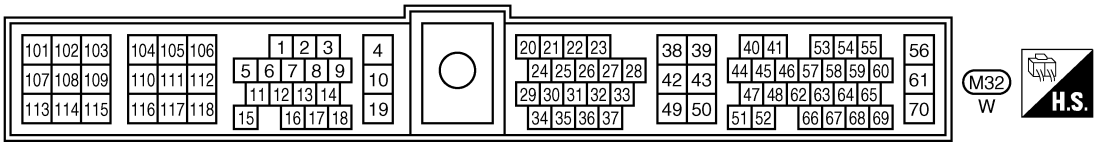
Wiring Diagram

LHD MODELS





Refer to last page (Foldout page).
M5 , E101

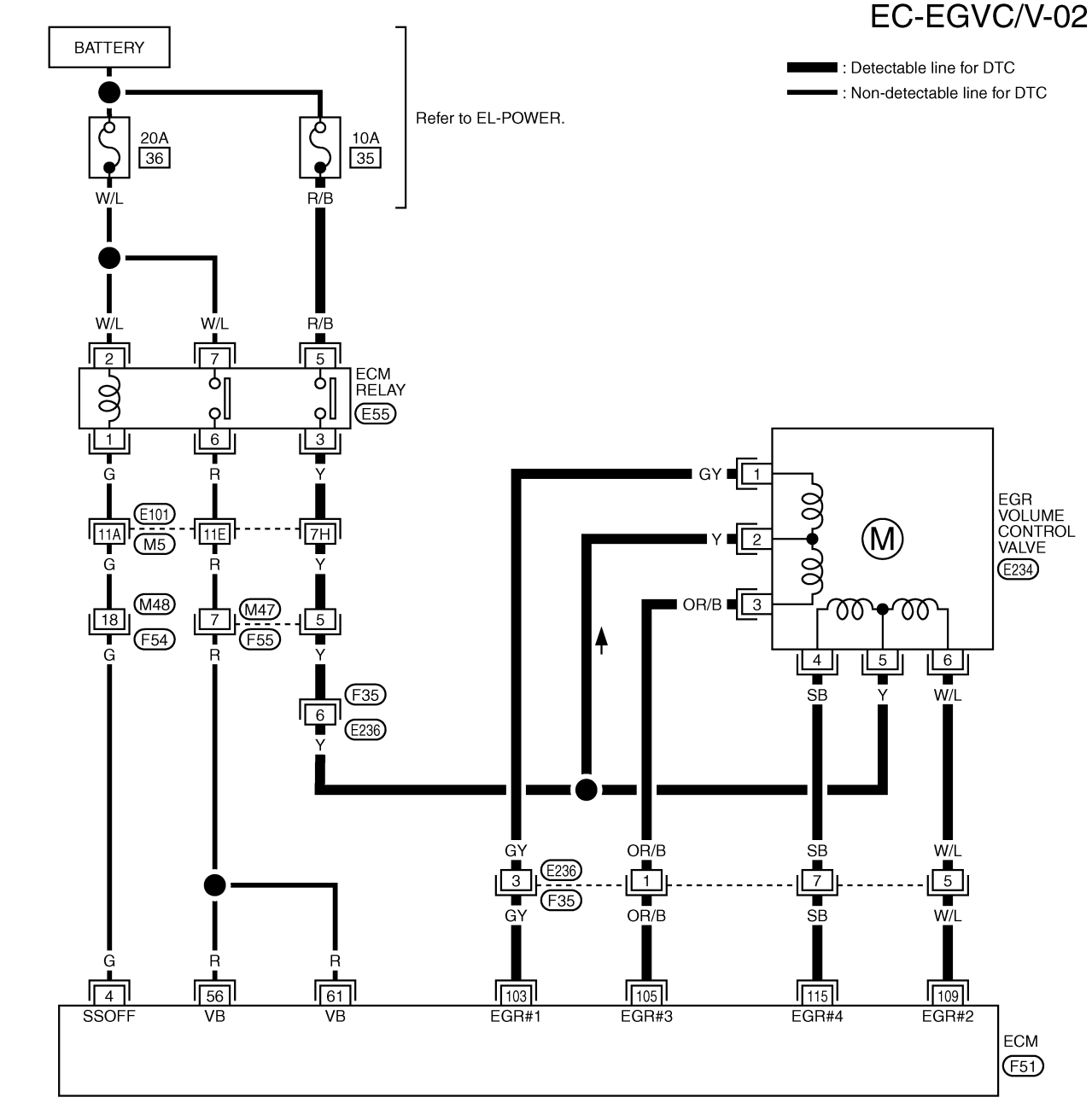


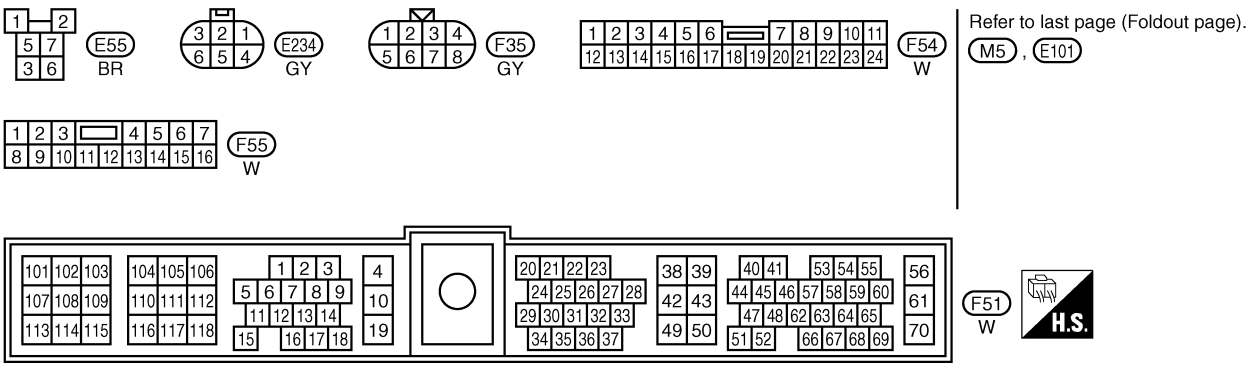
GEC284A

Wiring Diagram (Cont'd)

RHD MODELS

EC-EGVC/V-02



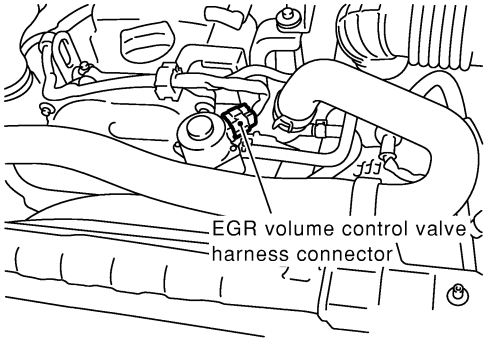


GEC285A

Diagnostic Procedure

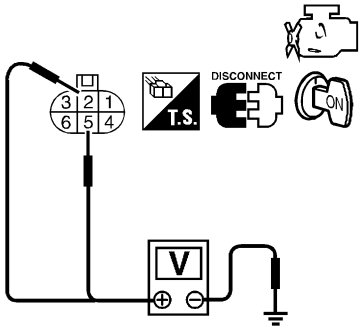
1	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect EGR volume control valve harness connector.



SEC231D

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

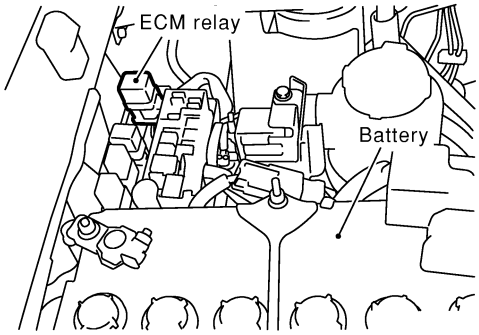
OK or NG

OK	►	GO TO 7.
NG	►	GO TO 2.

Diagnostic Procedure (Cont'd)

2	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM relay.



SEC950C

3. Check harness continuity between ECM relay terminal 3 and EGR volume control valve terminals 2 and 5. Refer to Wiring Diagram.
   Continuity should exist.

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

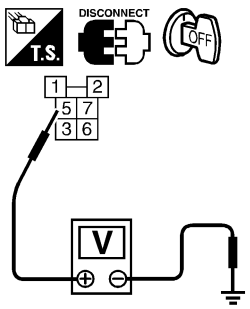
3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E101, M5
- Harness connectors M278, E236 (LHD models)
- Harness connectors M47, F55 (RHD models)
- Harness connectors F35, E236 (RHD models)
- Harness for open or short between EGR volume control valve and ECM relay

	▶	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 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEC167D

OK or NG

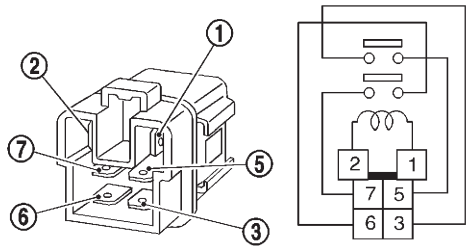
OK	▶	GO TO 6.
NG	▶	GO TO 5.

Diagnostic Procedure (Cont'd)

5	DETECT MALFUNCTIONING PART
Check the following. ● 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
103	1
105	3
109	6
115	4

MTBL0442

Continuity should exist.

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

OK or NG

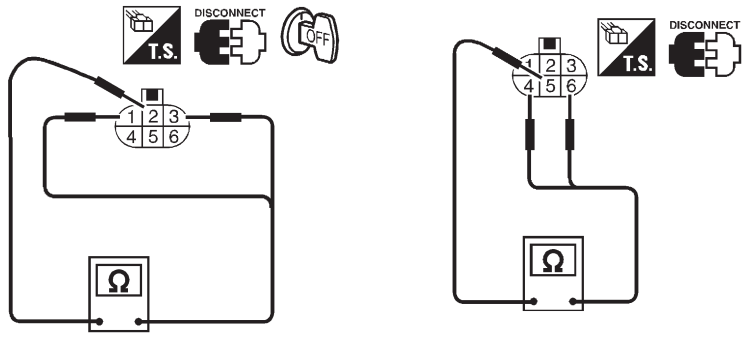
OK	►	GO TO 9.
NG	►	GO TO 8.

8	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E236, M278 (LHD models) ● Harness connectors E236, F35 (RHD models) ● Harness for open or short between ECM and EGR volume control valve	
►	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

9	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

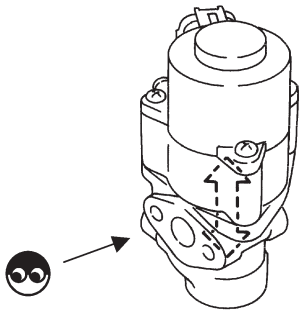
OK (With CONSULT-II)	▶	GO TO 10.
OK (Without CONSULT-II)	▶	GO TO 11.
NG	▶	Replace EGR volume control valve.

10	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 smoothly 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

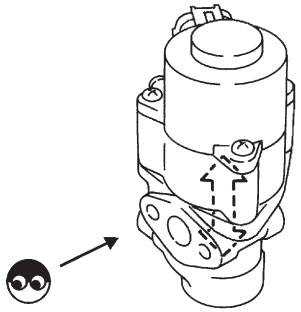
OK	▶	GO TO 12.
NG	▶	Replace EGR volume control valve.

Diagnostic Procedure (Cont'd)

11	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.

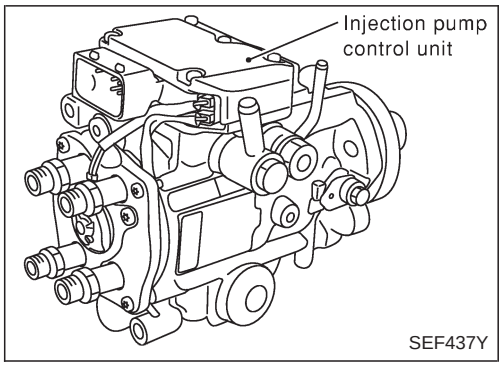


SEF560W

OK or NG

OK	►	GO TO 12.
NG	►	Replace EGR volume control valve.

12	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
	► **INSPECTION END**



Description

SYSTEM DESCRIPTION

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

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

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

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

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

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	Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
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 (4,992 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

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

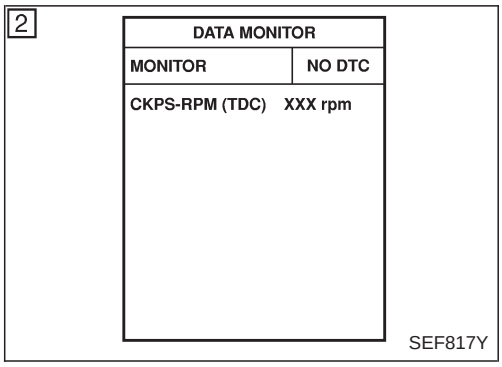
CAUTION:

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.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G/Y	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
40	PU	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.4V
52	L/W	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	L/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.45V
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● 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

WITH CONSULT-II

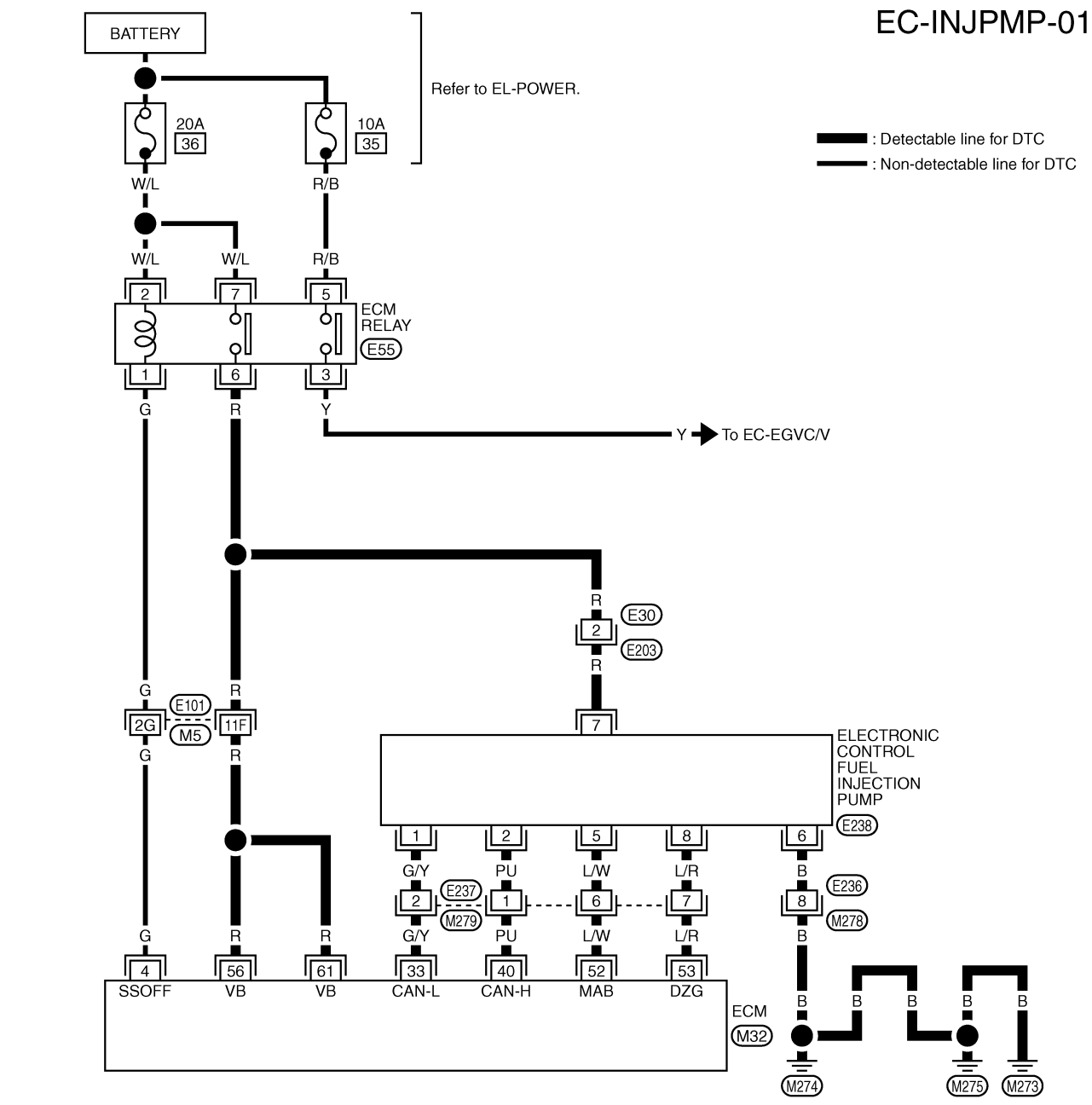
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-3620.

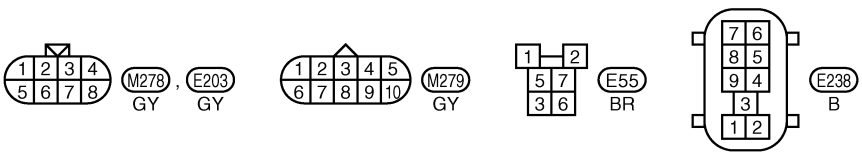
WITHOUT CONSULT-II

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-3620.

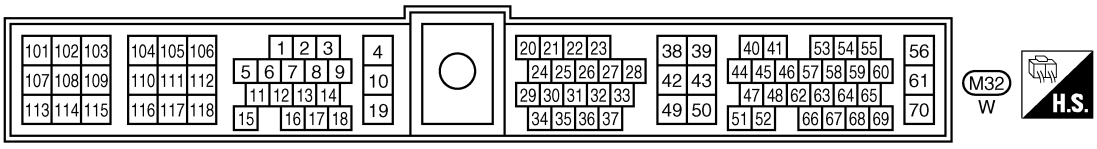
Wiring Diagram

LHD MODELS





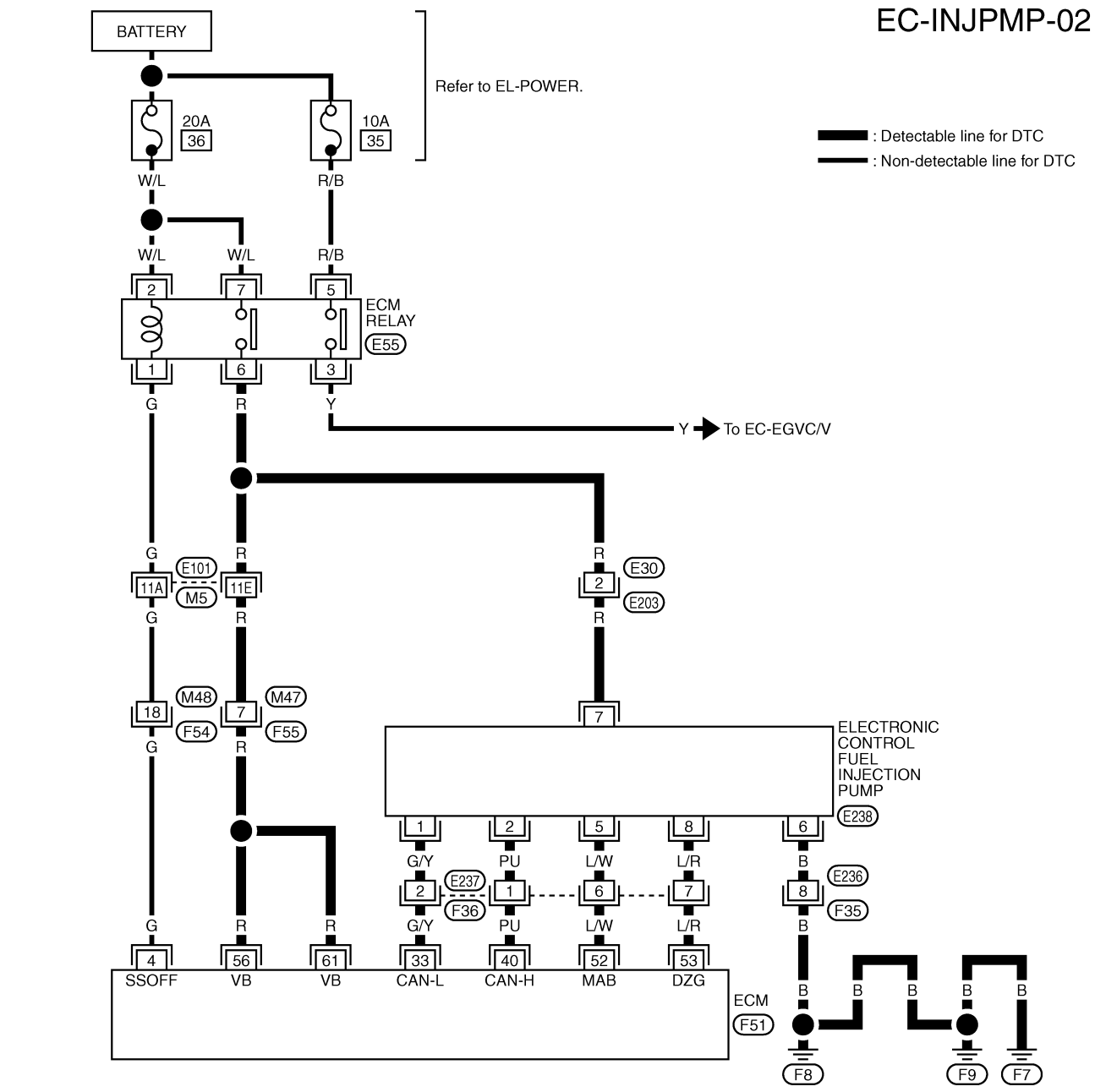
Refer to last page (Foldout page).
M5 , E101

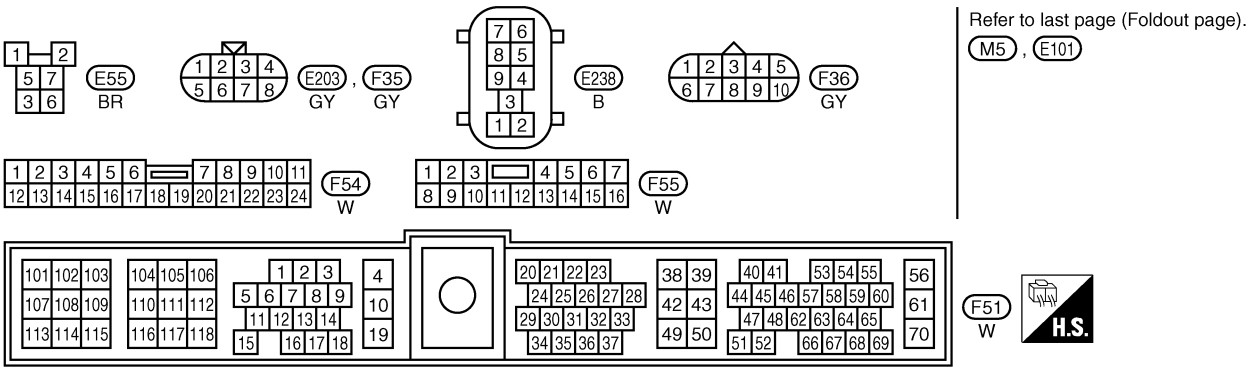


GEC275A

Wiring Diagram (Cont'd)

RHD MODELS





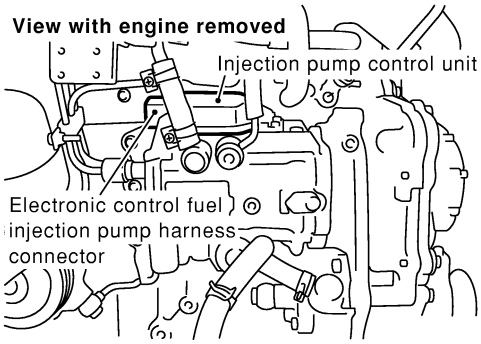
Refer to last page (Foldout page).
M5 , E101

GEC276A

Diagnostic Procedure

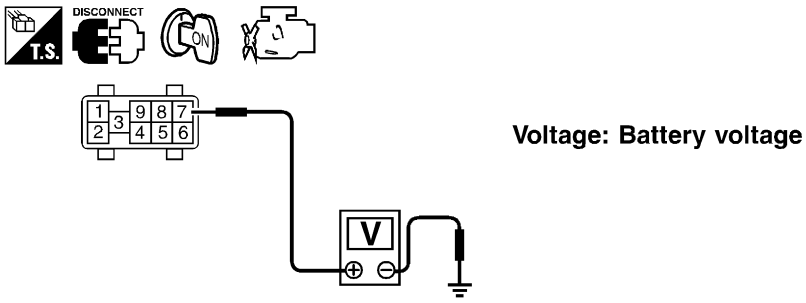
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



SEC228D

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 E30, E203
- Harness connectors E101, M5
- Harness connectors M47, F55 (RHD models)
- 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 5.
NG	►	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E236, M278 (LHD models) ● Harness connectors E236, F35 (RHD models) ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	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	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

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

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E237, M279 (LHD models) ● Harness connectors E237, F36 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	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-3469.	

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

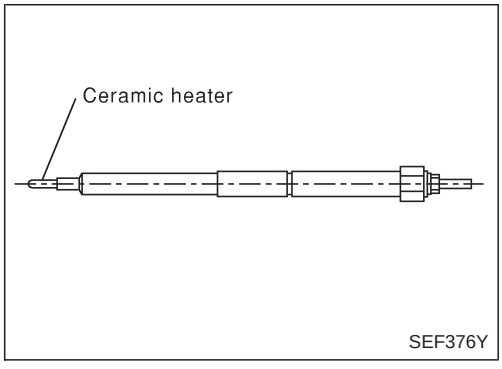
SYSTEM DESCRIPTION

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, inactivating the quick-glow control until coolant temperature drops below approximately 55°C (131°F).
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.
  When engine speed exceeds approximately 4,800 rpm, current flow through glow plug is interrupted.

The glow indicator lamp turns ON for a certain period of time in relation to engine coolant temperature at the time glow relay is turned ON.



COMPONENT DESCRIPTION

Glow plug

- 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.

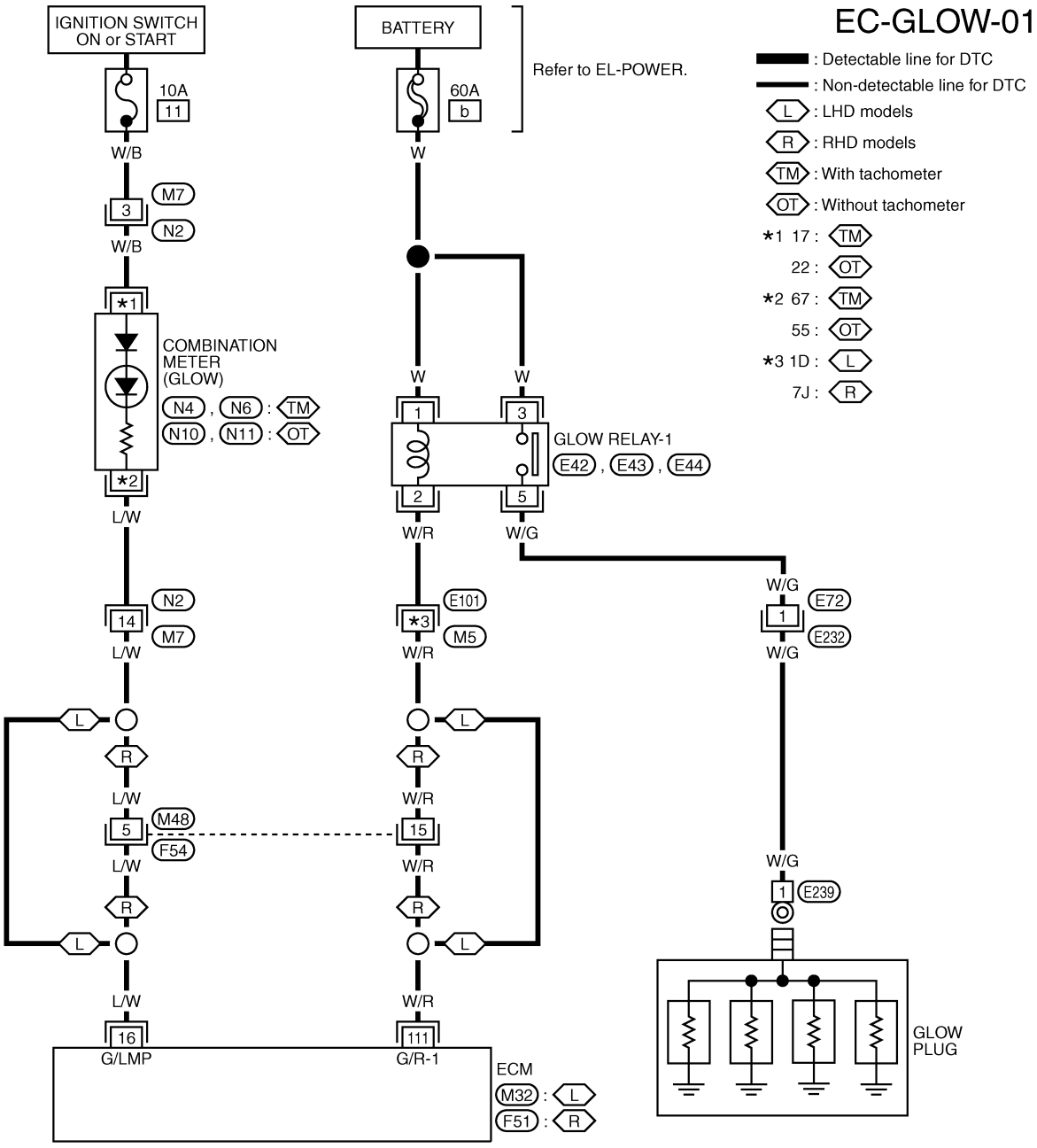
ECM Terminals and Reference Value

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)
16	L/W	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)
111	W/R	Glow relay	Refer to "SYSTEM DESCRIPTION", EC-3621.	

Wiring Diagram

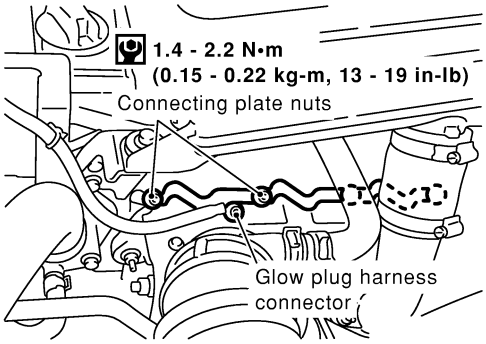


GEC286A

Diagnostic Procedure

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 all glow plug connecting plate nuts are installed properly.	



SEC250D

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”.

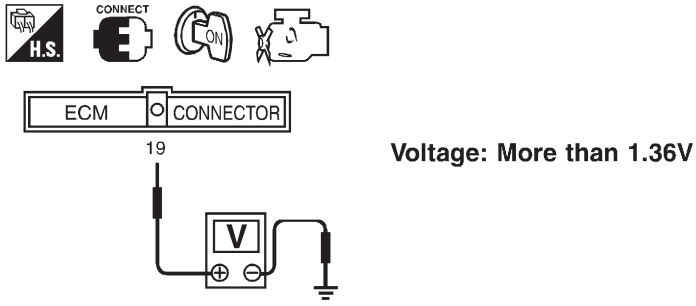
OK or NG	
OK ►	GO TO 5.
NG ►	GO TO 6.

4	CHECK GLOW INDICATOR LAMP OPERATION

Diagnostic Procedure (Cont'd)

Without CONSULT-II

1. Turn ignition switch "ON".
2. Confirm that the voltage between ECM terminal 19 and ground is above 1.36V. If it is below 1.36V, cool down engine.



Voltage: More than 1.36V

SEF430Y

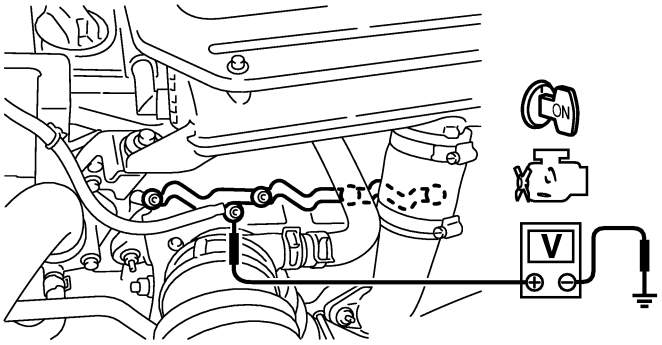
3. Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4. Make sure that glow indicator lamp is turned "ON" for 1.5 seconds or more after turning ignition switch "ON", and then turned "OFF".

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

SEC251D

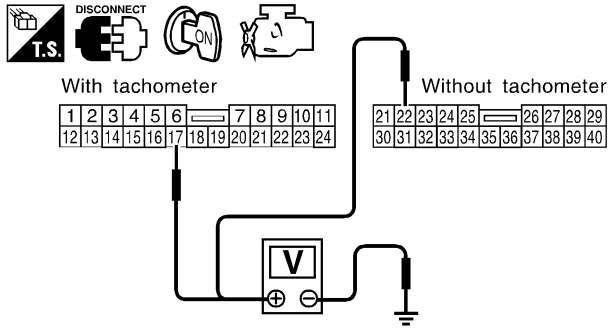
OK or NG

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

Diagnostic Procedure (Cont'd)

6	CHECK GLOW INDICATOR LAMP POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector N4 (With tachometer) or N10 (Without tachometer).
3. Turn ignition switch "ON".
4. Check voltage between combination meter terminal 17 (N4) or 22 (N10) and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEC252D

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
1. Harness connectors M7, N2
2. 10A fuse
3. 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. Disconnect combination meter harness connector N6 or N11.
4. Check harness continuity between ECM terminal 16 and combination meter terminal 67 (N6) or 55 (N11). 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 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors N2, M7
- Harness connector M48, F54 (RHD models)
- Harness for open or short between combination meter and ECM

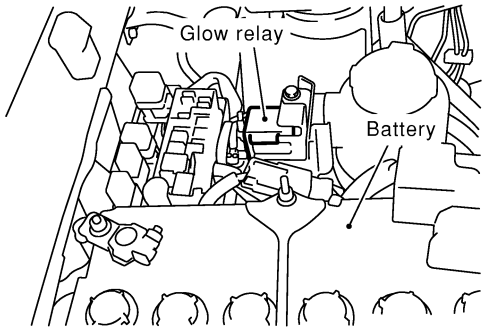
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

10	CHECK COMBINATION METER
Check combination meter and glow indicator lamp. Refer to EL section ("METER AND GAUGES").	
OK or NG	
OK ▶	GO TO 19.
NG ▶	Repair or replace combination meter or glow indicator lamp.

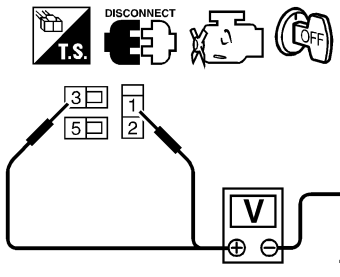
11	CHECK GLOW RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect glow relay.



SEC965C

3. Check voltage between glow relay terminals 1, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF451Z

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.

Diagnostic Procedure (Cont'd)

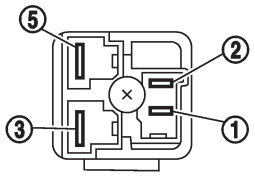
13	CHECK GLOW RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 111 and glow relay terminal 2. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 15.
NG ▶	GO TO 14.

14	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E101, M5 ● Harness connectors M48, F54 (RHD models) ● 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 5 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	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E72, E232 ● Harness for open or short between glow relay and glow plug	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

17	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

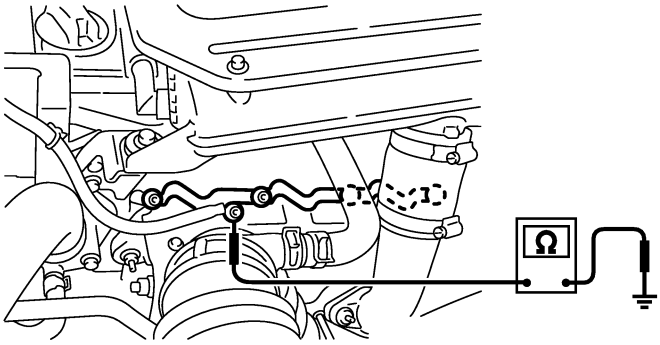
OK or NG

OK ▶	GO TO 18.
NG ▶	Replace glow relay.

Diagnostic Procedure (Cont'd)

18	CHECK GLOW PLUG

1. Remove glow plug connecting plate.
2. Check glow plug resistance.



Resistance:
Approximately 0.8 Ω
[at 20°C(68°F)]

SEC253D

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 0.1 m (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.**
  : 1.4 - 2.2 N·m (0.15 - 0.22 kg-m, 13 - 19 in-lb)

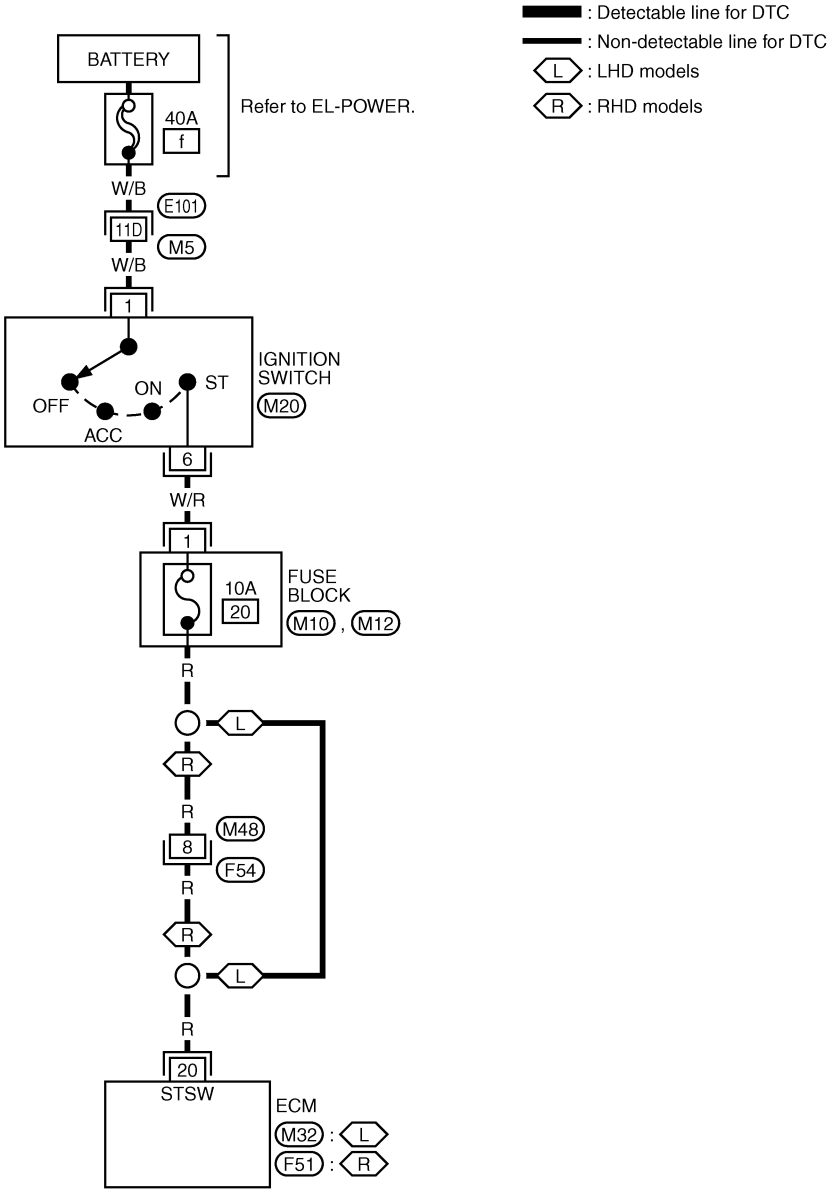
OK or NG

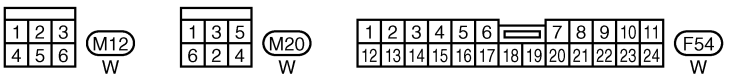
OK	►	GO TO 19.
NG	►	Replace glow plug.

19	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
	► **INSPECTION END**

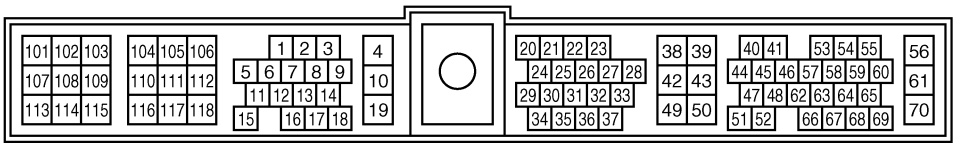
Wiring Diagram

EC-S/SIG-01





Refer to last page (Foldout page).
M5 , E101
M10



GEC148A

Diagnostic Procedure

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.

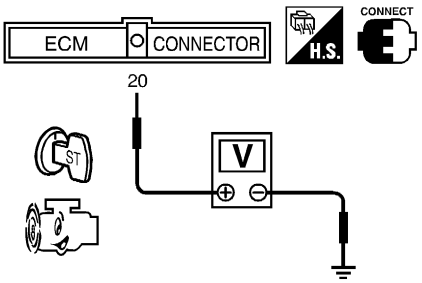
DATA MONITOR	
MONITORING	NO DTC
START SIGNAL	OFF

Condition	“START SIGNAL”
Ignition switch “ON”	OFF
Ignition switch “START”	ON

SEC254D

Without CONSULT-II

Check voltage between ECM terminal 20 and ground under the following conditions.



Condition	Voltage
Ignition switch “START”	Battery voltage
Other positions	Approximately 0V

SEF415Y

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 20 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.

Diagnostic Procedure (Cont'd)

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M48, F54 (RHD models) ● 10A fuse ● Fuse block (J/B) connectors M10, M12 ● 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.

4	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
▶	**INSPECTION END**

Description

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

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: Park/Neutral	ON
		Except above	OFF

ECM Terminals and Reference Value

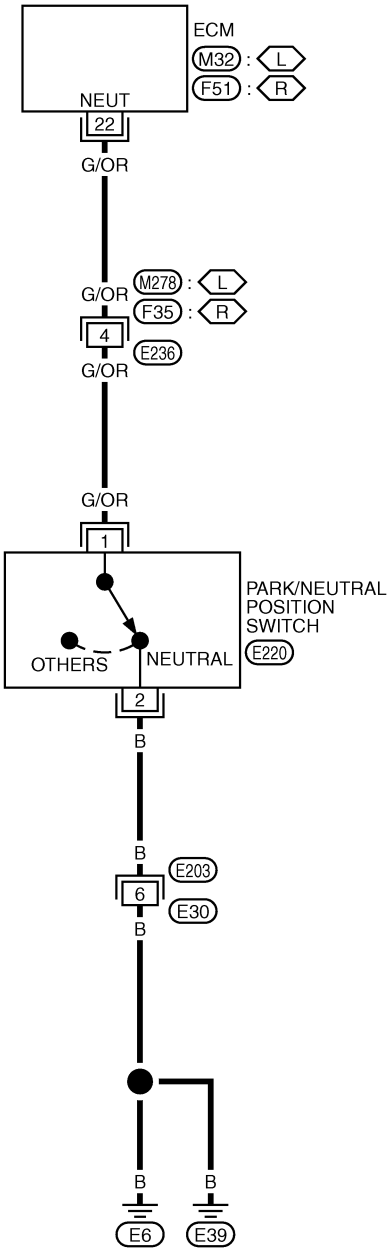
Specification data are reference values and are measured between each terminal and ground.

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.

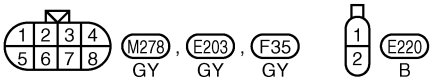
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22	G/OR	Park/Neutral position switch	Ignition switch “ON” └ Gear position is “Neutral” (M/T models)	Approximately 0V
			Ignition switch “ON” └ Except the above gear position	BATTERY VOLTAGE (11 - 14V)

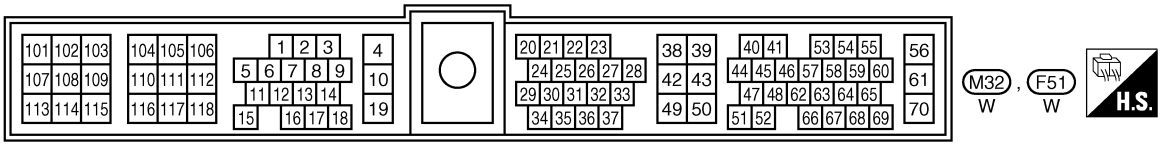
Wiring Diagram

EC-PNP/SW-01



: Detectable line for DTC
: Non-detectable line for DTC
L : LHD models
R : RHD models





GEC287A

Diagnostic Procedure

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.

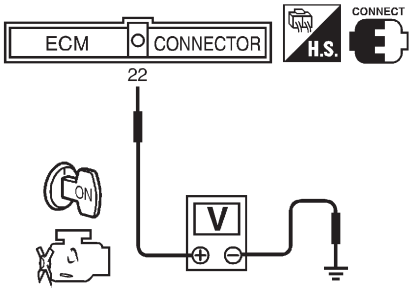
DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

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 22 and ground under the following conditions.



Condition (Gear position)	Voltage V
Neutral position	Approx. 0V
Except the above position	Battery voltage

SEF419Y

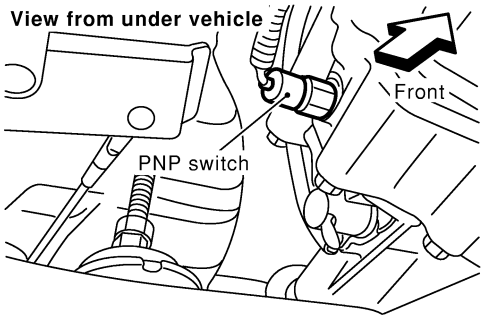
OK or NG

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.



SEC170D

3. Check harness continuity between PNP switch terminal 2 and body ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to 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 E203, E30
- Harness for open or short between PNP switch and body ground

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

4	CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 22 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 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M278, E236 (LHD models)
- Harness connectors F35, E236 (RHD models)
- Harness for open or short between PNP switch and ECM

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

6	CHECK PARK/NEUTRAL POSITION SWITCH

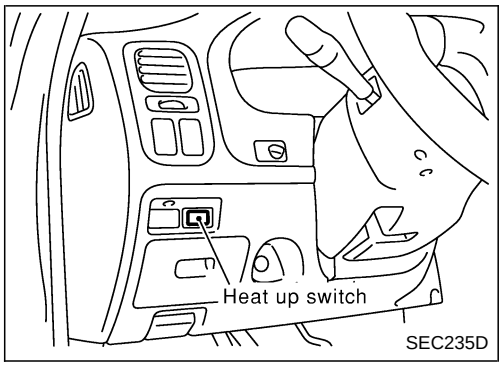
Refer to MT section ("POSITION SWITCH CHECK").

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace park/neutral position switch.

Diagnostic Procedure (Cont'd)

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
►	INSPECTION END



Component Description

The heat up switch is located on the lower side of the instrument panel. This switch is used to speed up the heater's operation when the engine is cold.
When the ECM received the heat up switch "ON" signal, the ECM increases the engine idle speed to 1,100 to 1,200 rpm to warm up engine quickly.
This system works when all conditions listed below are met.

Heat up switch	ON
Engine coolant temperature	Below 105°C (221°F)
Shift lever	"P" or "N"
Accelerator pedal	Fully released

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
WARM UP SW	● Ignition switch: ON	Heat up switch: ON	ON
		Heat up switch: OFF	OFF

ECM Terminals and Reference Value

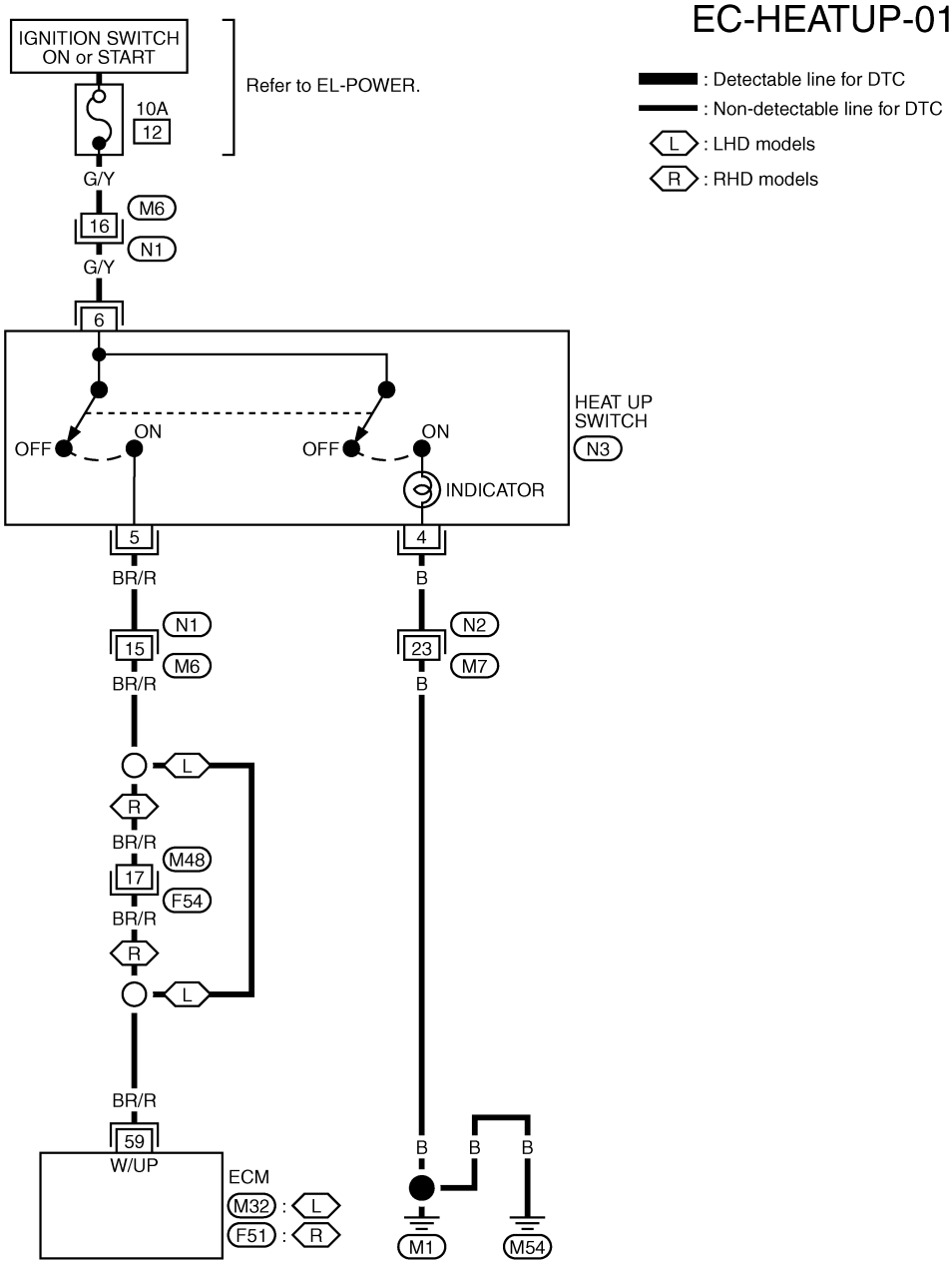
Specification data are reference values and are measured between each terminal and ground.

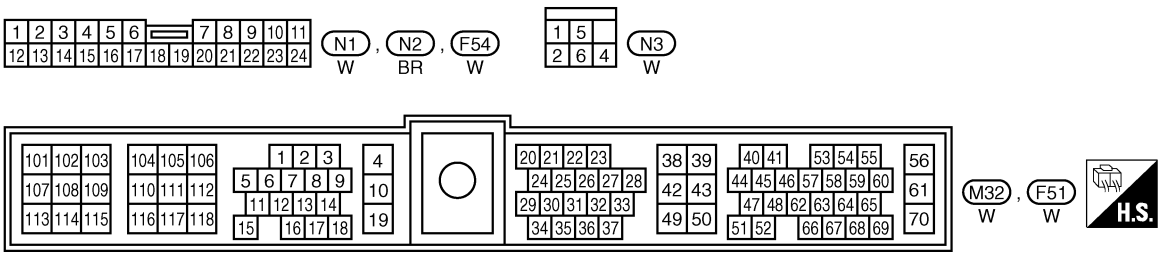
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
59	BR/R	Heat up switch	Ignition switch "ON" └ Heat up switch is "OFF".	0V
			Ignition switch "ON" └ Heat up switch is "ON".	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

EC-HEATUP-01





GEC150A

Diagnostic Procedure

1	INSPECTION START
Do you have CONSULT-II? **Yes or No**	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “WARM UP SW” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
WARM UP SW	OFF

Conditions	WARM UP SW
Heat-up switch is "OFF"	OFF
Heat-up switch is "ON"	ON

SEF302Z

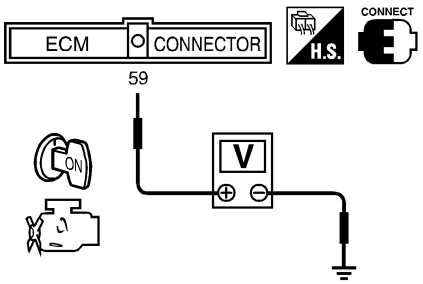
OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 5.

3	CHECK OVERALL FUNCTION-I

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 59 and ground under the following conditions.



Conditions	Voltage
Heat-up switch is “OFF”.	Approximately 0V
Heat-up switch is “ON”.	Battery voltage

SEF303Z

OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 5.

Diagnostic Procedure (Cont'd)

4	CHECK OVERALL FUNCTION-II

Check the indicator when turning "ON" and "OFF" the heat up switch.

Heat up switch	Indicator
ON	Illuminated
OFF	Not illuminated

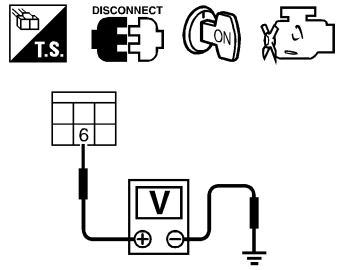
MTBL1314

OK or NG

OK	►	**INSPECTION END**
NG	►	GO TO 10.

5	CHECK HEAT UP SWITCH POWER SUPPLY CIRCUIT

1. Turn heat up switch "OFF".
2. Turn ignition switch "OFF".
3. Disconnect heat up switch harness connector.
4. Turn ignition switch "ON".
5. Check voltage between heat up switch terminal 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF304Z

OK or NG

OK	►	GO TO 7.
NG	►	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors N1, M6
- 10A fuse
- Harness for open or short between heat up switch and fuse

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

7	CHECK HEAT UP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 59 and heat up switch terminal 5. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

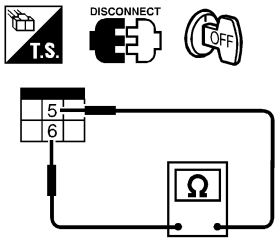
OK	►	GO TO 9.
NG	►	GO TO 8.

Diagnostic Procedure (Cont'd)

8	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors N1, M6 ● Harness connectors M48, F54 (RHD models) ● Harness for open or short between heat up switch and ECM	
►	Repair open circuit or short to ground or short to power in harness or connectors.

9	CHECK HEAT UP SWITCH

Check continuity between heat up switch terminals 5 and 6 under the following conditions.



Conditions	Continuity
Heat-up switch is "OFF".	Should not exist.
Heat-up switch is "ON".	Should exist.

SEF305Z

OK or NG

OK	►	GO TO 13.
NG	►	Replace heat up switch.

10	CHECK HEAT UP SWITCH INDICATOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn heat up switch "OFF".
2. Turn ignition switch "OFF".
3. Disconnect heat up switch harness connector.
4. Check harness continuity between heat up switch terminal 4 and ground.
   Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to power.

OK or NG

OK	►	GO TO 12.
NG	►	GO TO 11.

11	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors N2, M7 ● Harness for open or short between heat up switch and ground	
►	Repair open circuit or short to power in harness or connectors.

12	CHECK HEAT UP SWITCH INDICATOR

Apply 12V current supply between heat up switch terminal 4 and 6.
Indicator should illuminates.

OK or NG

OK	►	GO TO 13.
NG	►	Replace heat up switch.

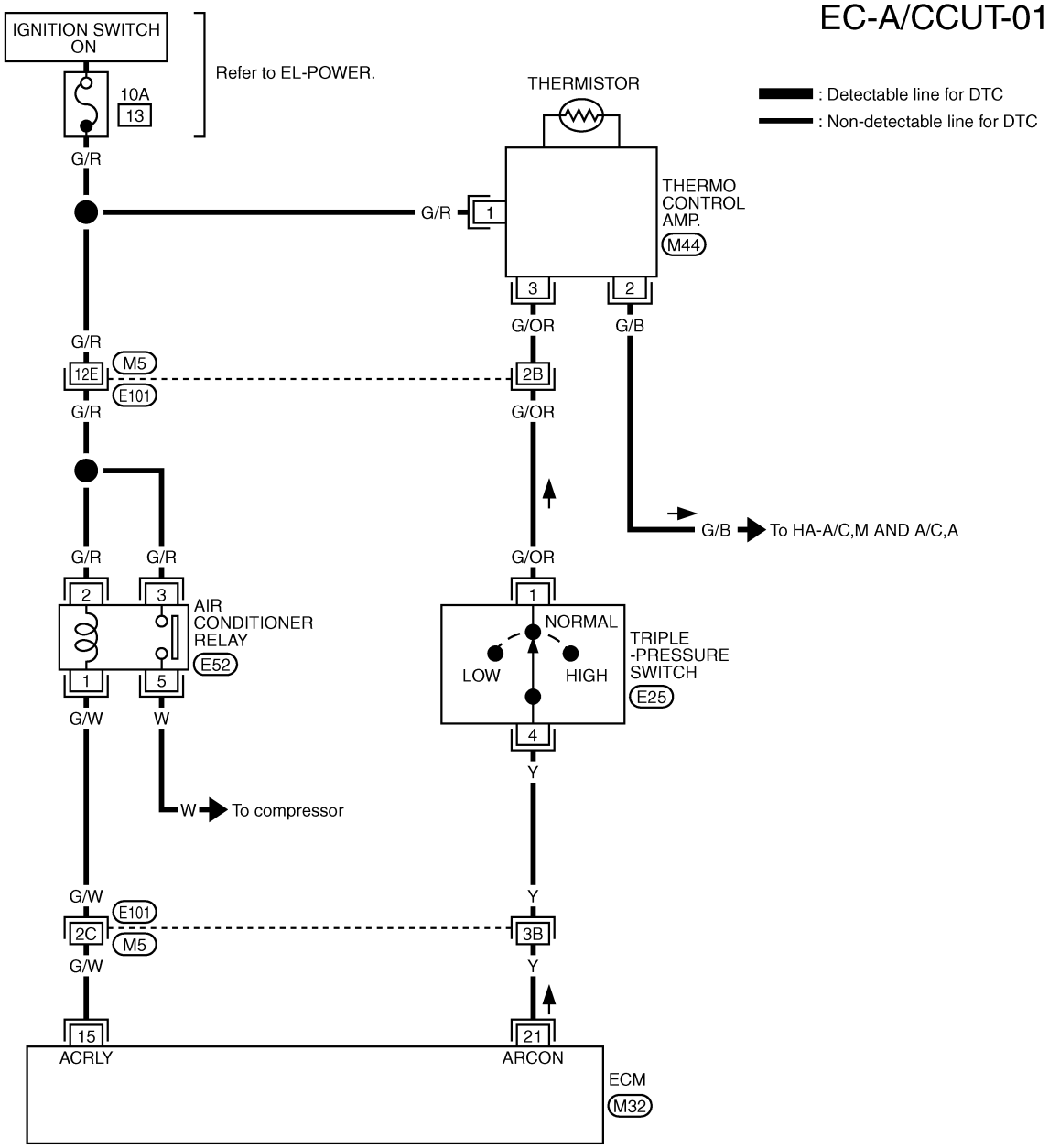
Diagnostic Procedure (Cont'd)

13	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-3469.	
►	**INSPECTION END**

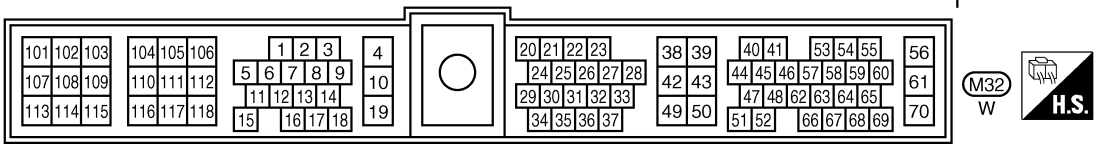
Wiring Diagram

LHD MODELS

EC-A/CCUT-01



Refer to last page (foldout page).
M5 , E101

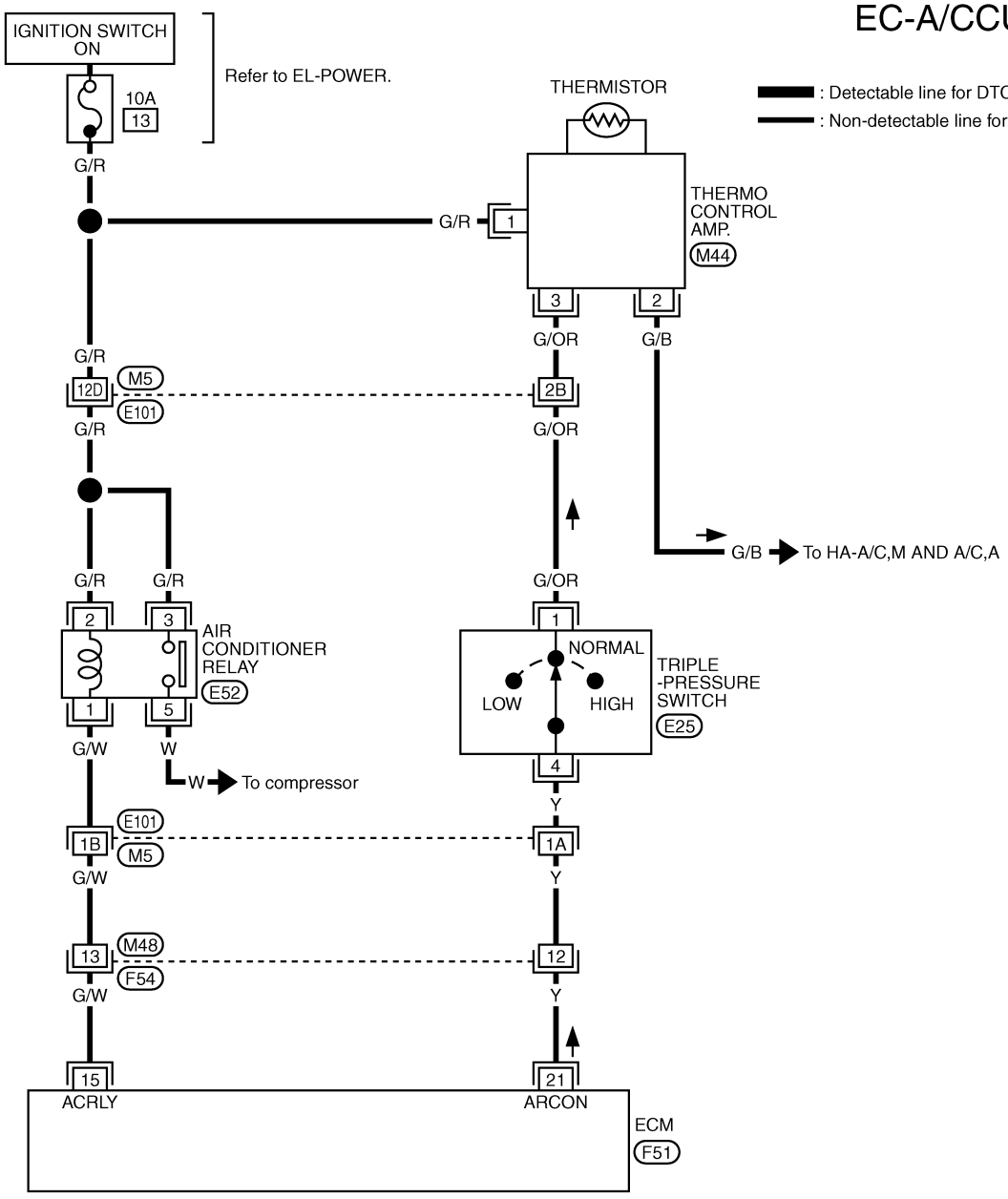


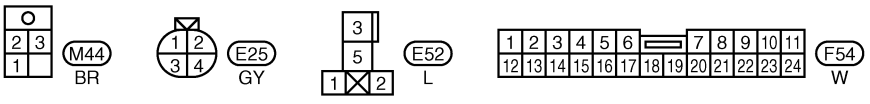
GEC288A

Wiring Diagram (Cont'd)

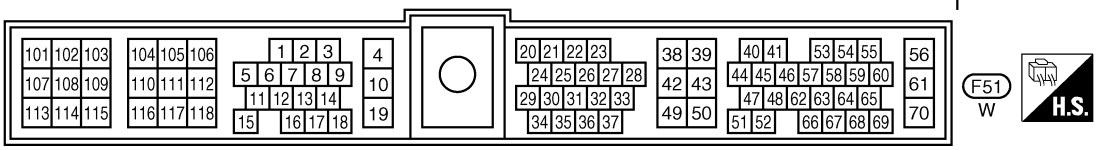
RHD MODELS

EC-A/CCUT-02





Refer to last page (foldout page).
M5 , E101

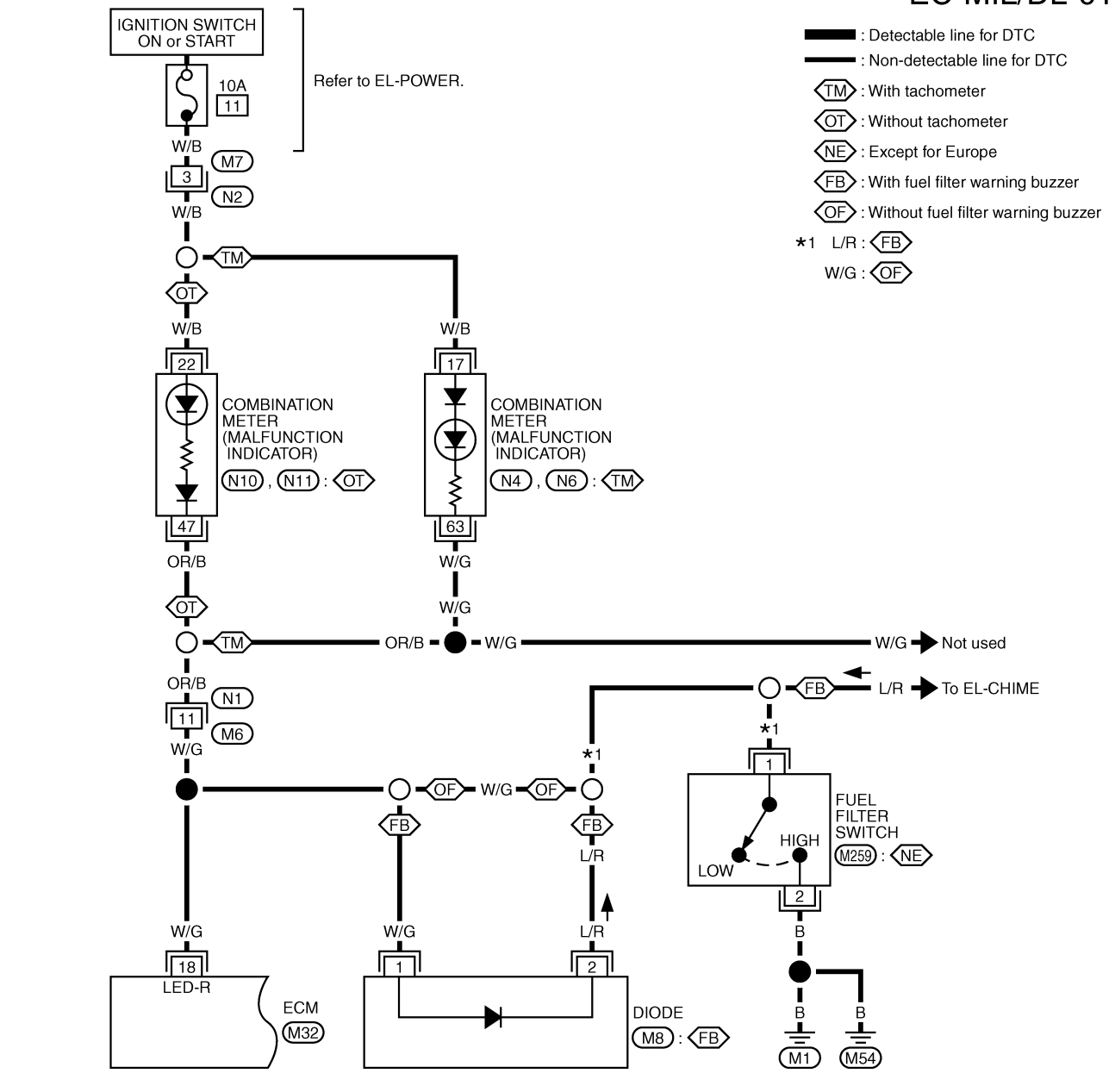


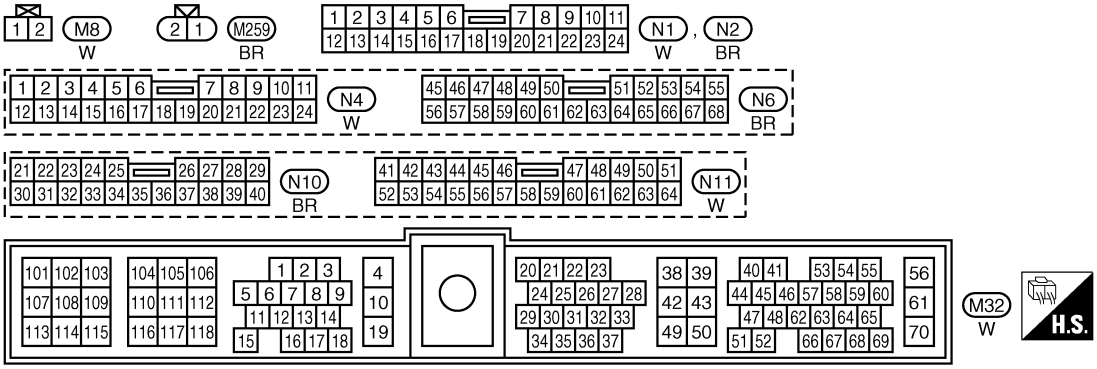
GEC289A

Wiring Diagram

LHD MODELS

EC-MIL/DL-01

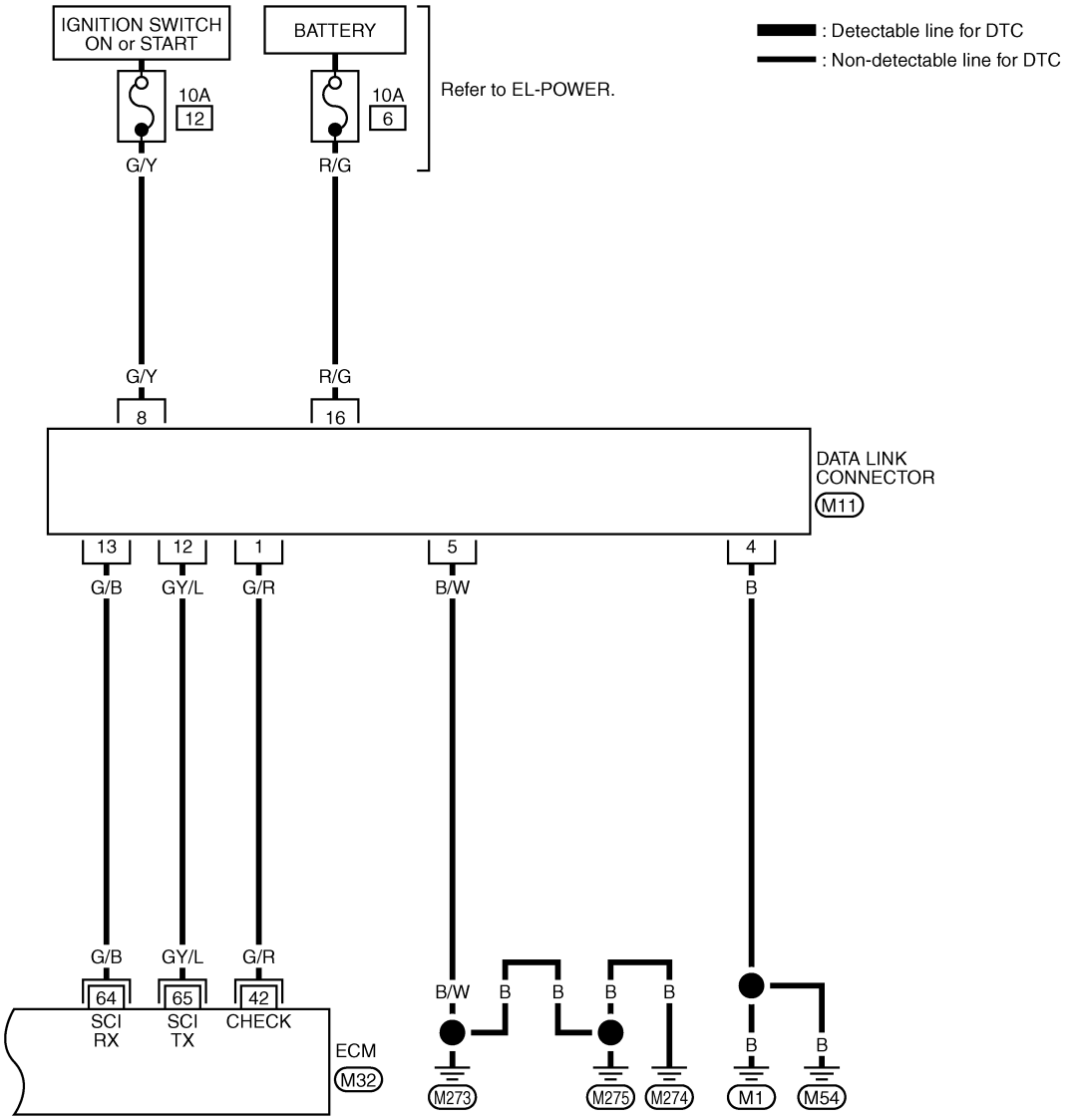


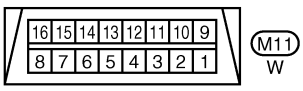


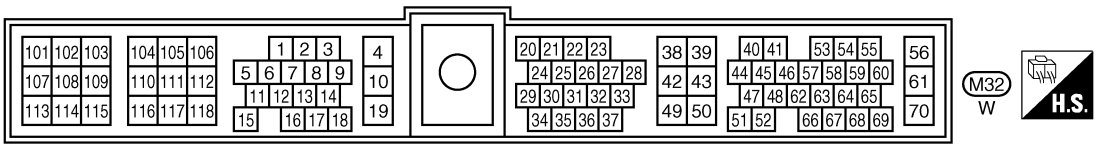
GEC290A

Wiring Diagram (Cont'd)

EC-MIL/DL-02





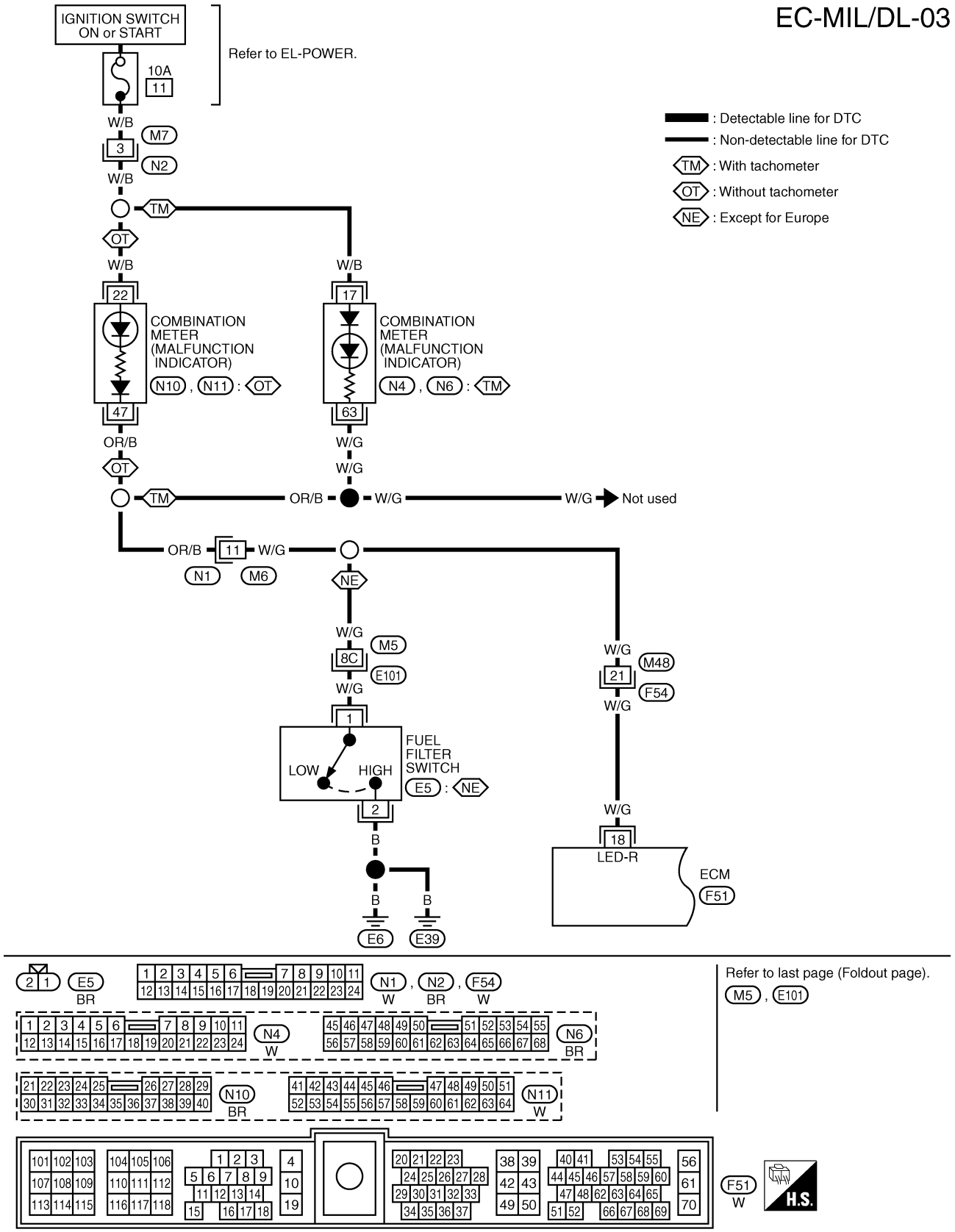


GEC157A

Wiring Diagram (Cont'd)

RHD MODELS

EC-MIL/DL-03

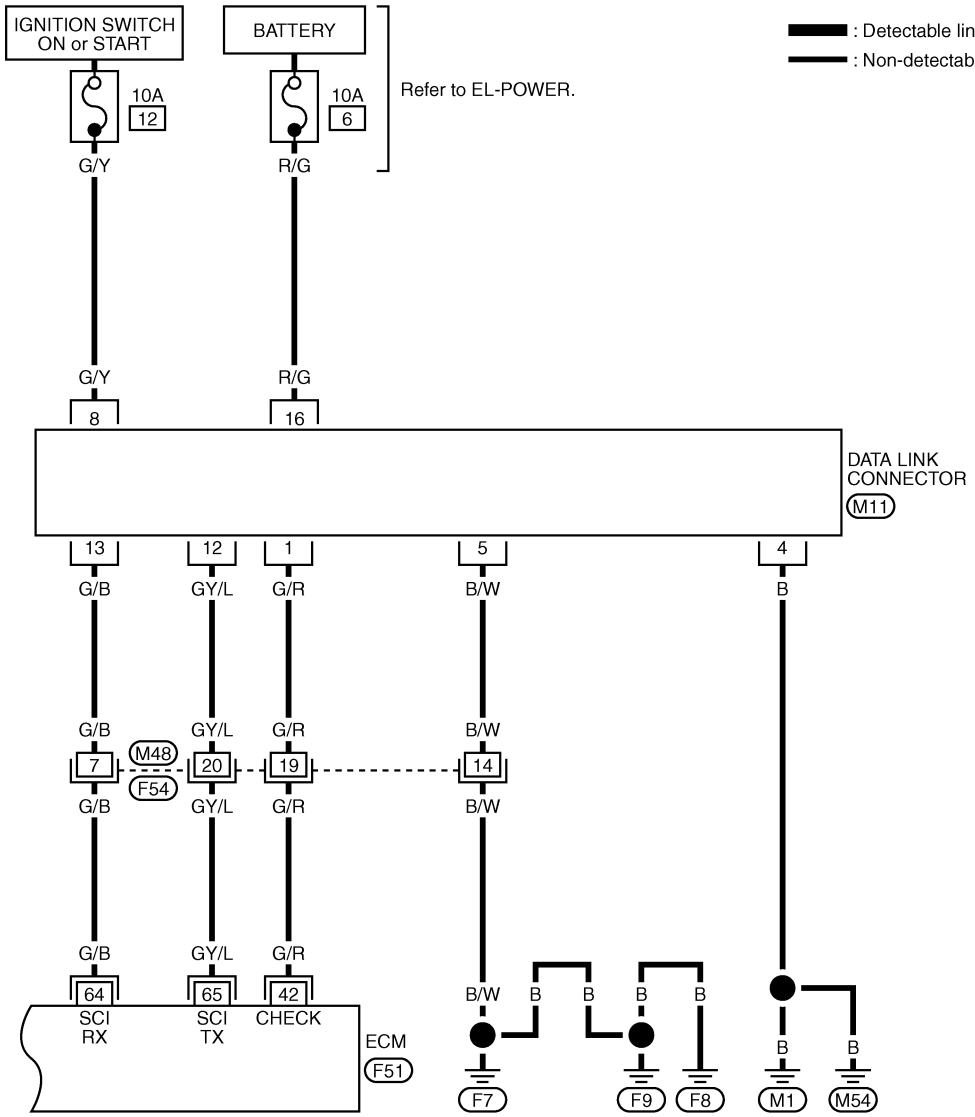


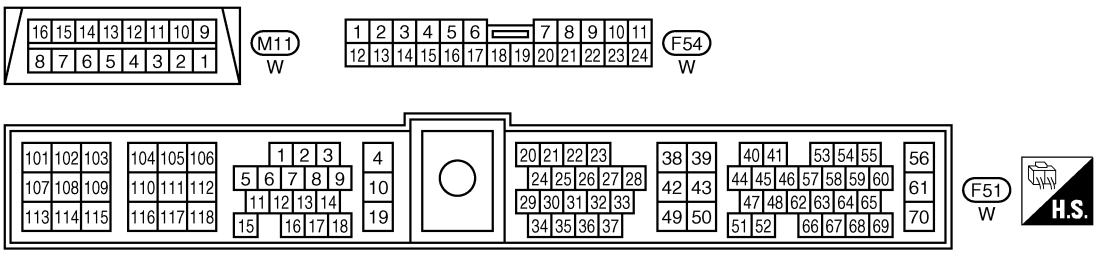
Refer to last page (Foldout page).
M5 , E101

GEC291A

Wiring Diagram (Cont'd)

EC-MIL/DL-04





GEC159A

General Specifications

Unit: rpm

Engine	YD25DDTi
Idle speed	750±25
Maximum engine speed	4,900

Injection Pump Numbers

Engine	Part number
YD25DDTi	16700 VK500

Injection Nozzle

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	Used	18,500 - 19,500 (185 - 195, 189 - 199, 2,682 - 2,828)
	New	19,500 - 20,500 (195 - 205, 199 - 209, 2,828 - 2,973)
	Limit	16,200 (162, 165, 2,349)

Engine Coolant Temperature Sensor

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
90 (194)	0.236 - 0.260

Intake Air Temperature Sensor

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

Crankshaft Position Sensor (TDC)

Resistance [at 20°C (68°F)] Ω	495 - 605

Glow Plug

Resistance [at 20°C (68°F)] Ω	Approximately 0.8

Accelerator Position Sensor

Throttle valve conditions	Voltage (at normal operating temperature, engine is not running, ignition SW ON)
Accelerator pedal fully released (A)	0.29 - 0.79V
Partially open	Between (A) - (B)
Accelerator pedal fully depressed (B)	3.48 - 4.64V

EGR Volume Control Valve

Resistance [at 20°C (68°F)] Ω	13 - 17